TEAMCENTER

Manufacturing Process Planning — Usage

Teamcenter 2412

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NX fixed plane Additive Manufacturing Integration

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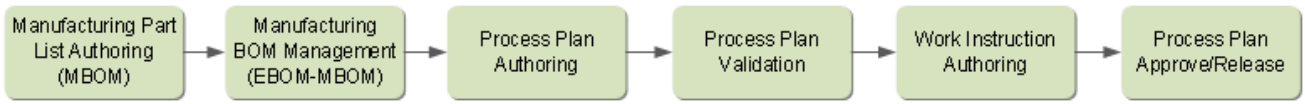
1. What is Manufacturing Process Planner?

Manufacturing Process Planner allows design and manufacturing engineers to concurrently develop product and manufacturing planning. This collaboration framework ensures that manufacturing constraints are reconciled during product design and vice versa. Using Teamcenter's change management capabilities, manufacturers can understand and react to changes originating at any point in the design/plan/manufacture cycle.

By connecting all members of the design/build process — from design, engineering and manufacturing, to plants and suppliers — into one virtual enterprise, Manufacturing Process Planner helps manufacturers implement the best production planning strategies. Manufacturing Process Planner allows manufacturers to evaluate alternative manufacturing scenarios, maximize resource utilization, and optimize throughput at the very early stages of concept planning. It also provides a platform for developing common standards and allows them to be enforced with controlled flexibility in global manufacturing locations.



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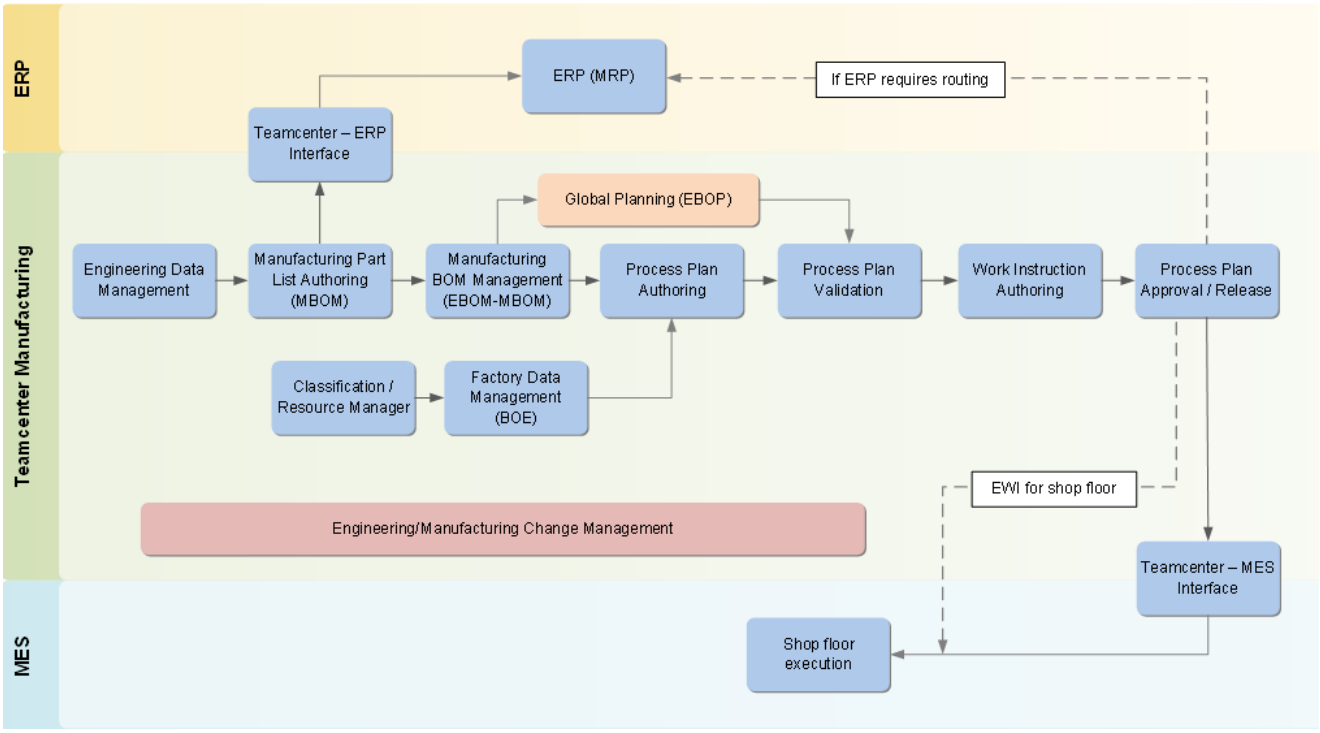
2. Teamcenter Manufacturing Solution Flow



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3. Manufacturing Process Planner general functionality

Manufacturing fundamentals

How perspectives and views work

Working with manufacturing perspectives

Teamcenter presents manufacturing data in views, each of which provides its own specific way of managing or modifying data. The views provide an environment where, for example, you can construct processes and operations, relate additional relevant information, view different alternatives or studies, and collaborate with others who are working on the same information.

For common use cases, Teamcenter provides you with several collections of views, organized in collaboration contexts (CCs), that group the views that you need to perform common tasks. These CCs behave similarly to the Manufacturing Process Planner perspective.

For all Manufacturing Process Planner CCs, you can:

- Add these perspectives to the rich client navigation pane.
- View all loaded structures in the **Open Items** list and open structures from this list. If the structure is part of a collaboration context, the name of that collaboration context is shown in brackets behind the structure.
- Unload open structures by clicking the **Unload All** button in the **Open Items** list, or unload a single structure by right-clicking it and choosing **Unload**.

You can switch between perspectives using the button. When you switch, the same structures are loaded in each perspective. You can see these structures in the **Collaboration Context Tree** view. Teamcenter displays the structures in the primary views of the perspective. If there is no suitable primary view in the perspective, the structure is listed in the **Open Items** list and the **Collaboration Context Tree** view from which you can activate it.

Secondary views are completely new between perspectives so the state of the secondary views are not the same when switching perspectives.

When you send an object from another application using the **Send To→Manufacturing Process Planner** shortcut menu command, Teamcenter opens the last Manufacturing Process Planner perspective that you used. If you have a perspective open in the current session and send a structure to Manufacturing Process Planner, the structure opens in the current Manufacturing Process Planner perspective.

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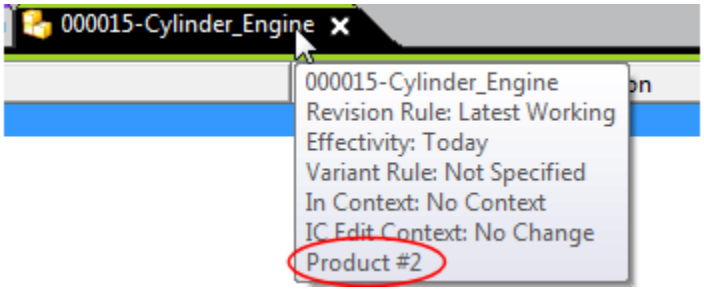
Each primary view is assigned a number which represents the view regardless of the Manufacturing Process Planner perspective. Views with the same number are the same view.



In the figure, the view tooltip in every perspective in which item 000015 is open shows **Product #2**.

By default, you can open 10 views for each type of primary structure view. Your administrator can change this number in the **MEMaxOpenViewsSameType** preference. The view remains open as long as it is open in any of the Manufacturing Process Planner perspectives. As long as there is still one instance of the view open, when you activate that view, it opens in the same state (for example, expansion state). After the last instance is closed, activating the view opens the structure, but the expansion state is lost. However, the data is still loaded, so re-expanding is fast.

Your administrator can add new perspectives to Teamcenter.

Working with manufacturing views

Teamcenter presents manufacturing data in views, each view providing its own specific way of managing or modifying the data. There are *primary* views and *secondary* views. The most commonly used views in Teamcenterinclude engineering bills of materials (EBOMs), manufacturing BOMS (MBOMs), plant and product bills of process (product and plant BOPs), and graphic views.

Views provide an environment where you can author manufacturing processes based on additional information available in Teamcenter. You can construct processes and operations, relate additional relevant information, and collaborate with others who are working on the same information using studies and alternatives. There are primary views and secondary views.

- A primary view shows one configurable structure. That structure can contain a base view and several occurrence groups.

- A secondary view shows specific types of data related to the primary view with which it is associated. It can, depending on your needs, change its content if you select a new object in a primary view. Many of the secondary views are available only if you select an object in a primary view that contains valid input.

In addition to primary and secondary views, you can use the following:

- **Collaboration Context Tree** view to show all loaded objects.

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- **Structure Search** view that allows you to search for any object regardless of view.
- **Graphics** view to display any visualization data associated with the structure. The **Graphics** view is closely associated with the primary view from which you open it.

You can open multiple views simultaneously. You can undock views and move them to a convenient position. You can open the same structure multiple times in different views. To assist you in keeping track of which views are associated, primary views and secondary views are color-coded. Primary and associated secondary views have the same framed color. In addition, Teamcenter frames the active view (the one in which you are currently working) in black.

Each view has a toolbar with buttons to execute the common tasks pertaining to that particular view. The view menu contains additional menu commands pertaining to that view. More complex tasks or tasks pertaining to several views simultaneously are found on the main application toolbar. The views have some features in common, such as the ability to change the displayed columns or filtering the results. You find these features in the view menu.

List of manufacturing views

Teamcenter presents manufacturing data in views, each view providing its own specific way of managing or modifying the data. The views provide an environment where you can author manufacturing processes based on information available in Teamcenter. You can construct processes and operations, relate additional relevant information, view alternatives and isolated studies, and collaborate with others who are working on the same information.

There are primary views and secondary views. A primary view shows one configurable structure. That structure can contain a base view and several occurrence groups. A secondary view shows specific data and, depending on your needs, can change its content if you select a new object in a primary view.

View Icon	Name	Description
	2D Viewer	You can have one or many **two-dimensional snapshots** associated with a line in your product structure. When you open a selected line in the **2D Viewer** view, Teamcenter displays an attached image dataset. If there are multiple image datasets attached, you can select any preferred image.
	Accountability Check	Displays the results of an **accountability check**. This view lists the problem lines in the source and target and provides a list of conflict details. Lines that are colored in the source and target structures are also colored in the view. Fully matched lines are not listed.
	Activities	Displays all **activities** to be completed as part of the operation selected in a process. This view is structure-dependent (it displays a tree table). Each listed activity is an expandable folder. Folder contents may include additional subactivities.

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View Icon	Name	Description
		Tip: You can open many secondary views for activities, including the **PERT** or **Attachments** views.
	Advanced Accountability Check	Displays the results of an **advanced accountability check**. The **Advanced Accountability Check** view lets you compare and propagate multiple types of views/structures, run assessment comparisons to repair one structure from another, set reporting and equivalence options, and set partial match criteria for different types of structures. Many options are available, other than those the standard accountability check offers.
	Assignments	Displays logical **assignments** and their resolved part assignments. It also displays part consumptions of the selected process/operation, even if these are not related to the logical assignments, or if the process/operation has no logical assignments. Any filtering that is applied to the assignments in the BOP tree (such as by occurrence type, revision rules, variant rules, or incremental change) is also automatically applied to the assignments in the **Assignments** view.
	Attachments	A structure-dependent data view that is always available when an object is selected in a structure view, the **Attachments** view displays the properties of all components **attached** to the selected object, including the base item component and all related subcomponents. Standard Teamcenter shortcut menu commands are available for any displayed object. Double-click an attachment on this view to open the attachment in its appropriate application. Note: The process revision is determined by the product structure's revision rule. This information cannot be specified in this view.
	Design BOM	A **CAD Bill of Materials** (BOM), also called a design structure, is a type of primary structure view that displays parts from an original Computer-Aided Design (CAD) model or Electronic BOM (EBOM) and is often aligned to a **part BOM**.
	Classic Bill of Process (BOP)	A type of legacy primary structure view that corresponds to the organization of a plant structure's Bill of Equipment (BOE), and defines process areas, stations, and operations in which a product is assembled. A best practice is to **migrate classic BOPs** to plant BOPs.
	Classification Properties	Shows the **classification attribute** values that exist in the Classification application for the object currently selected in the structure view if that object is classified. This data is informational

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View Icon	Name	Description
		only and cannot be changed in this view. You must change the data through the Classification application.
	Collaboration Context Tree	Contains a list of all structures currently open in the application. You can use the **Collaboration Context** (CC) view to load and unload structures, as well as to save structures as new structure contexts. The **Collaboration Context Tree** does not respond to selection in other views.
	Engineering BOM (EBOM)	One of the most important primary structure views, the **Engineering BOM** (EBOM), sometimes also called a Computer Aided Design (CAD) BOM, is a breakdown of a three-dimensional product design consisting of part and assembly models. Because the order of parts and assemblies does not necessarily reflect the needs of manufacturing processes, the EBOM is used to generate a Manufacturing BOM (MBOM). You must continually compare and update the EBOM and MBOM, often using an advanced accountability check, to reflect engineering and manufacturing changes that occur during the manufacturing process.
	Graphics	Displays any 3D visualization data associated with the selected structure. The **Graphics view** is closely associated with the primary view from which you open it. If you close the associated primary view, Teamcenter closes the **Graphics** view as well.
	Impact Analysis	Identifies which other database components reference and thereby **impact** an object currently selected in a structure view, and displays any assemblies in which the selected object appears. Note: You can use the **Filter by Item Type** command to display all operations currently associated with, and performed at, the work area selected in a plant structure.
	Incremental Change	Allows you to add, edit, or remove **incremental changes** from a selected line.
	IDC	Displays any Intermediate Data Captures (**IDCs**) associated with the selected structure. You can switch between captured states of an IDC by selecting from the **Captured State** list.
NA	**Linked Occurrence Paths**	Available only when you select a consumed part in a process structure. Displays the path to the root of the source product in Multi-Structure Management. Even if the source part is removed from its parent product after it is assigned to a process, you can still see the path that existed when the part was originally assigned to the process.
	Manufacturing BOM (MBOM)	One of the most important primary structure views, the **Manufacturing BOM** (MBOM) is a breakdown of a three-dimensional

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View Icon	Name	Description
		product design consisting of part and assembly models, usually derived from an Engineering BOM (EBOM) or design BOM, that reflects the needs of manufacturing processes. You must continually compare and update the EBOM and MBOM, often using an advanced accountability check, to reflect engineering and manufacturing changes that occur during the manufacturing process.
	Manufacturing Features	Shows all **manufacturing features** (welds, arc welds, and datums) under the current product scope in a table-like view. The view helps you manage scattered manufacturing features in a product structure in an easy and systematic way. Because the features displayed in the **Manufacturing Features** view are BOM lines, you can use the shortcut menu to perform many tasks.
	PAD Element	One of three views that help you to work with Process Assembly Documents (**PADs**). Displays information about **MEPADElement** items and assists you in consuming elements into the PAD structure.
	PAD	One of three views that helps you work with PADs. The **PAD view** displays information about the **MEPAD** item and lists its child **MEPSD** items.
	PERT	You can open this chart view for a process displayed in a structure view or for activities displayed in the **Activities** view. When opened on a process, the Program Evaluation Review Technique (**PERT**) view shows the sequence of the first-level processes or operations that exist for the selected process. When opened on a top-level activity, the PERT chart displays the first-level activities. Each process or operation within the selected process is represented by a box in this view. Each box contains the name and ID of the process or operation. Use this view to arrange the boxes and create a sequential flow of processes, operations, or activities within the selected object.
	Plant	A type of primary structure view that displays the **plant**, work areas, work stations, lines, or any physical location where your manufacturing processes take place. This view is sometimes referred to as a work area view.
	Plant Bill of Process (BOP)	A type of primary structure view that displays resources necessary for a plant to assemble a product.
	Process Gantt	Displays processes and operations and the relations between them in a bar chart that illustrates the work breakdown structure of a project using a time line, from the start and finish times of the operations or processes and summary elements (operations or higher level processes). The Gantt view also shows the dependency (sequence) of relationships between the elements.
NA	**Product Manual**	Displays work instructions created and edited using a **Product Manual** role.

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View Icon	Name	Description
	Product	Displays the **product** that you want to manufacture in a hierarchical tree structure. If you open a product, the structure view contains the product hierarchy being manufactured. You can allocate any consumed parts and workpieces or subsets of workpieces to an operation's setup.
	Product Bill of Process (BOP)	A type of primary structure view that displays processes and operations necessary to assemble a product. A **product BOP** is usually linked to a plant BOP.
	Product View Search	Helps you **search for all product views** associated with a particular part so that you can update them.
	PSD	One of three views that helps you work with process assembly documents. The **PSD** view displays information about the **MEPSD item** and lists its child **MEPADElement** items.
NA	**Report**	Supports the creation of reports for all three types of structures: products, processes (including their operations and activities), and plants. The generated report is presented through a browser window. You can create customized style sheets or use other formatting tools to customize both the data content and the report format.
	Schedule Manager	Helps you to perform **4D planning** within Manufacturing Process Planner. 4D planning adds a time component to process planning. It is used in very large structures to visualize what parts have already been assembled on a specific date in a specific part of the structure.
	Standard Text	Enables you to create and manage **standard text elements** such as text, data collection definitions, and symbols that are compiled to create textual work instructions. The **Standard Text** view is generally used by the standard text librarian to manage the elements that the work instruction author chooses to create work instructions. Creating work instructions using standard text promotes standardization and consistency of work instructions throughout the organization. You can create the elements once, and then reuse them many times.
	Standard Text Library	Helps you to you use to create standard textual work instructions. A standard text library is a structure comprised of standard text folders and standard text elements nested under the folders.
	Structure	When you open the application, there are three empty structure views entitled **Product**, **Process**, and **Plant**. These views are placeholders for structures that you open. When you open a structure, it opens in the associated structure view and Teamcenter displays the information as a tree structure. You can open multiple structures at once, including multiple products, processes, or plants. Each of these structures is displayed in a different view. You can configure these structures using revision rules, variant conditions, and effectivity dates.

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View Icon	Name	Description
		• If you open a process, the structure view shows the process hierarchy in the sequence it uses for manufacturing the product. The process structure contains subprocesses and operations. You can view the workflow from one process to the next, as well as see parallel processes. You can also see alternate processes for creating the target product and allocate work area items, tooling, and workpieces to a specific process. • If you open a plant, the structure view displays your factory environment hierarchy as a tree structure. The root level identifies the high-level plant structure. Each layer beneath the root level breaks down the work areas within the plant until the lowest level in the structure represents individual work areas where specific operations are performed. Structure views are primary views for which you can open a variety of secondary views that provide detail information about the selected line. Although product, process, and plant are the most common types of structures that open in a primary view, there are additional types of structures that open in primary views, including an **Intermediate Data Capture** view, a **Requirements** view (when working in Systems Engineering), and a **Standard Text** view.
	Structure Search	Helps you perform a multitude of **advanced searches** on view structures using various properties of the structure's lines. The search is not limited to the loaded lines of the structure and can search an entire structure without you having to load it.
	Study	Provides an environment where you can scope data to perform trial **study** activities. You can use the **Study** view to send structures to Process Simulate or to create and manage tool design packages.
	Textual Work Instructions	Helps you to author work instructions by choosing from a library of **standard text** elements. Using this view, you can quickly create or edit textual work instructions for manufacturing processes or operations.
	TiCon Search	Allows you to access time data and assign data to activities from TiCon, an external time management system, using a web service. You can search for time elements in **TiCon**, create new activities, or overwrite existing activities with the timing data of time elements, and update activities assigned to time elements that were changed in TiCon.
	Time	Stores and manages individual **times** for each activity, operation, or process in a process structure. This view provides information specific to the process or operation so that its appearance varies depending on which process or operation you select.

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View Icon	Name	Description
	Variants	Allows you to display and edit variant options, option defaults, and rule checks currently defined for the product selected in the structure pane.
	Viewer	Displays the content of a dataset that is attached to an item revision with a **Rendering** relationship, where possible. For example, if you select a text dataset, the viewer displays a text editor with the content of that text dataset. If you select a dataset containing a JT file, the viewer displays the JT.
	Workarea	A type of primary structure view used to display a plant, work area, work station, or any physical location where your manufacturing processes take place. This is sometimes referred to as the plant view.
	Work Instruction	If your administrator configured the publishing feature for manufacturing documentation, you may see the **Work Instruction view**. The name of this view is configurable. Use it to create published pages containing manufacturing data. You can organize collections of publishing pages into portfolios, which you can view, publish to a Web server or PDF, or print in My Teamcenter.

Note:

The **PS_assume_legacy_transform_units** preference determines how Teamcenter interprets the units of measure for legacy transform data. Teamcenter and NX currently use meters for transform units of measure; legacy measurements were in inches or millimeters. This preference affects all data using legacy transforms that have no database-resident indication of the unit measurement stored with them. The default setting is **Unknown**. If the preference is left in the default setting, you may see discrepancies between the model and display units when you view collaboration context structures in Manufacturing Process Planner.

Behavior of selected objects in active views

If you select an object in the active view, the selections in the other views change as follows. This is known as *selection synchronization*.

- Primary views can change their inner selection (highlight) to suit the active selection. The following situations can cause them not to do so:
  - The selection does not correspond to any object in the view.
  - The corresponding object is not currently expanded, and the **MEExpandToSelection** preference is set to false.
  - An expensive search is required to find the corresponding line. In this case, use one of the **Find** commands.

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- Secondary views can change their inner selection (highlight) to suit the active section when that selection occurs in a primary view or in another secondary view that is associated to the same primary view. The following situations can cause them not to do so:

  - The selection does not correspond to any object in the view.

  - The **Disable response to selections** button is turned on.

Controlling perspective behavior when opening structures in views

When working in a perspective, you can control when a perspective opens a new view for structures that are loaded. There are two ways of opening structures:

- Explicitly

  You send a structure to Manufacturing Process Planner, load it from the **History** list, or use the **Open by Name** button to open a specific structure.

- Implicitly

  You open a structure and all its associated structures are loaded as well. For example, when you open a collaboration context that contains multiple structures, all the individual structures are loaded into views. Alternatively, you open a product and its associated process or plant is loaded as well.

When you load structures explicitly, they are always opened into a view. If an empty view is available, the structure gets loaded into that view. If there is no empty view available, a new view is opened to house the structure.

When you load structures implicitly, you can control the loading of the associated structures. You can do either of the following:

- Open all related structures in their own views, first filling existing views and then opening new views for the remaining structures.

- Fill existing empty views with the appropriate structure. You must then open any remaining associated structures explicitly.

For example, you are working in the **Manufacturing - Process Sequencing** perspective and want to open a collaboration context that contains an EBOM, an MBOM, a process, and a plant structure. The **Manufacturing - Process Sequencing** perspective, by default, contains only a process view, the **Gantt** view, and the **PERT** view. Depending on which mode you choose for the perspective, one of the following happens when you send the collaboration context to Manufacturing Process Planner.

OpenExplicitOnly	The process opens in the process view. If you want to see the EBOM, MBOM, or plant structure, you must open it explicitly (for example, by selecting them in the **Collaboration Context Tree** view and choosing **Activate**).

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OpenAllStrategy	The process opens in the empty process view; the EBOM, MBOM, and plant structures open in new views. These structures are opened implicitly.

You specify which mode Teamcenter uses to open structures using the **Window→Perspective Mode** command. When you choose a mode, it is applicable to that perspective. Other Manufacturing Process Planner perspectives can use a different mode. The default mode for each perspective is set using the **MEPerspectiveMode** preference. By default, the Manufacturing Process Planner default perspective opens all structures in views (**OpenAllStrategy** mode). Other Manufacturing Process Planner perspectives fill available views with structures but only explicitly opened views open in new views (**OpenExplicitOnly** mode).

Managing loaded objects with the Collaboration Context Tree view

The **Collaboration Context Tree** view displays all structures that are loaded in your session. You can use this view to load or unload structures or to make structures that have moved behind other structures in the structure view area visible. Additionally, you can use this view to create structure contexts from loaded structures, to create configuration contexts, and to save contexts into new or existing collaboration contexts.

The **Collaboration Context Tree** view is not a primary or secondary view. It is not associated with other views and does not respond to selection in other views. You can display this view by clicking the **Open CC Tree** button in the toolbar.

You can drag a collaboration context from your **Home** folder into the **Collaboration Context Tree** view.

Viewing a process plan in the Custom Process View

You can view the process plan in an alternative view called the **Custom Process View**. This view is based on configurable style sheets and preferences and can be opened using the **Open With** command. The view provides an overview, in tabular form, of all consumed material included in a process plan, including assigned parts, tools, and features. The view also includes a **Used Equipment** tab to create or view support equipment used in each selected object (such as robots and fixtures), and an **Attachments** tab to create/view attachments associated with the selected object. Additionally, you can specify which properties are shown in each table column and modify these properties directly in this view.

The **Custom Process View** displays data that is relevant to the type of object selected. For example, when you open a **Process Station** type, the **Custom Process View** lists the properties of the station and the child operations and allows you to assign parts and tools to the operations. When you open a **Process Line** type, the **Custom Process View** lists the properties of the line (which are different than the station) and the child processes and process areas. There is no requirement to assign parts to stations.

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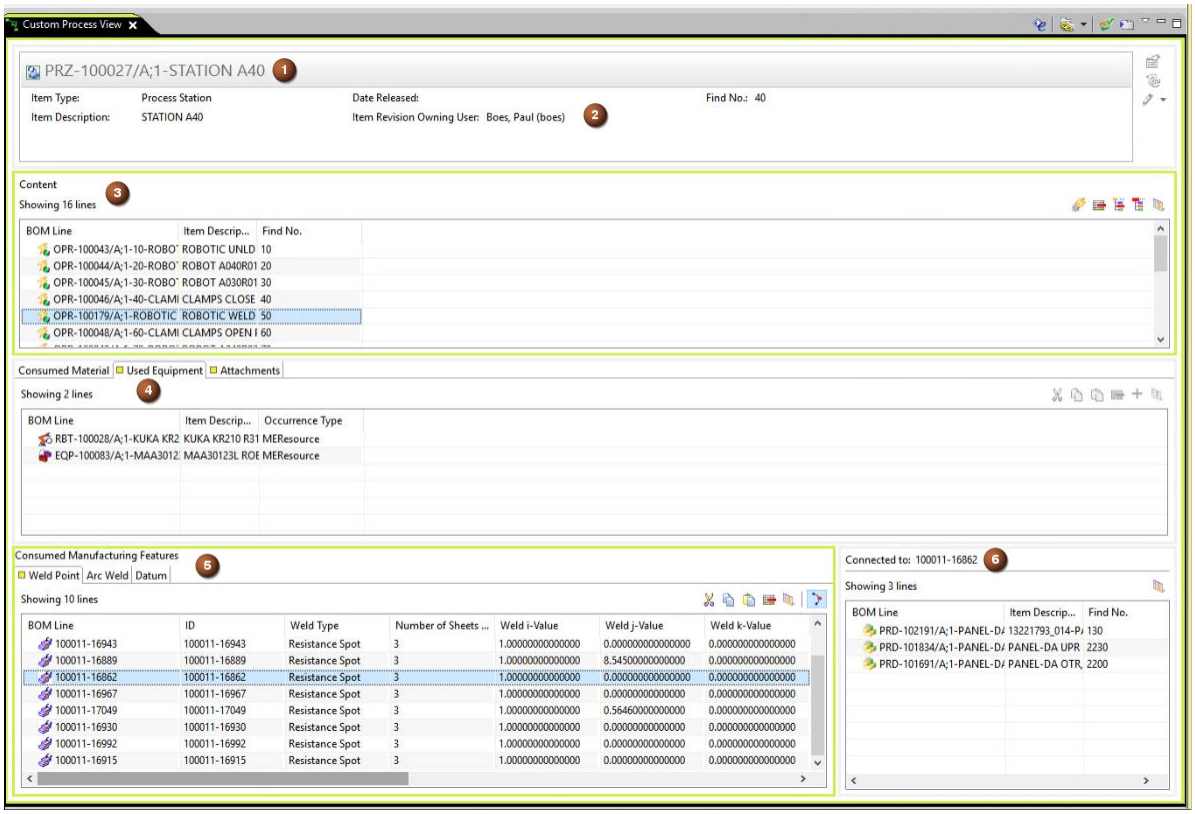

1. The top-level structures loaded from a collaboration context or structure appear here. They may be selected directly to activate them in the **Custom Process View**.

2. The top-level structure header specifies the current selected parent process (**MEProcess**) structure of the individual BOM Line selected. A toolbar provides access to the property edit tools. You can use the **Edit Rev Description** form and click **Edit** to open the **Object Properties** form.

3. The operation **Content** tables list child operations for the selected **MEProcess** and are arranged in tabular form. You create and edit **Operations** , **Remove Line**, and use **Column Management** to view and select properties displayed in the **Properties Form**.

> Note:
>
> Do not manually enter or change values in the **Estimated Time** column of the **Content** pane. Only converted time properties should be used. Manually entered estimated time values are not saved.

When you double-click an operation in the **Content** table, an operation editing table opens:

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The operation header lists the currently selected parent BOM line in the operation table. You can edit a description or a property. This may be used for updating specific properties or accessing the property form. This is same type of toolbar used in the top-level structure header.

4 This toolbar lists the objects that complete the population of the process/operation.

- The **Consumed Material** and **Used Equipment** tabs contain this set of tools when a BOM line is selected:

You can cut, copy, open, and remove objects, search classification for resources, and configure how objects are displayed in the **Column Selection**.

- The **Attachments** tab contains these tools when available:

You can add a dataset or form, open or remove an attachment, and configure how objects are displayed in the **Column Selection**.

5 The **Consumed Manufacturing Features** section contains **Weld Point**, **Arc Weld**, and **Datum** tabs that display manufacturing features included in the station or operation selected in the **Content** section. Results are ordered by find number (sequence).

When you select a feature from any tab's table, parts connected to the selected feature are displayed in the **Consumed Material** tab, and resources assigned to the station or operation are displayed in the **Used Equipment** tab.

> Note:
>
> This section is visible only if an administrator or other person with administrative rights has set the preference **MECustomViewShowMfgFeatures** to **True**.

- The **Weld Point** tab contains these feature columns: **BOM Line**, **ID**, **Weld Type**, **Number of Sheets Welded**, **Weld i-Value**, **Weld j-Value**, and **Weld k-Value**.

- The **Arc Weld** tab contains these feature columns: **BOM Line**, **ID**, **Weld Type**, parts it is **Connected To**, and **Weld Length**.

- The **Datum** tab contains these feature columns: **ID**, **Datum Type**, **Control Direction** (FA=Fore/Aft, CC=Cross Car, UD= Up/Down), and parts that the datums are **Connected To**.

The **Consumed Manufacturing Features** section contains the same tools as the **Attachments** tab, plus **Show/Hide Connected To** (see below):

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6. The **Connected to** section is displayed when you select a manufacturing feature and click **Show/Hide Connected To** in the **Consumed Manufacturing Features** section (see above).

   Whether you select a process station or operation, columns displayed include **Item Description** and **Find No.** You can also add assigned parts, resources, and manufacturing features columns using **Column Management** .

Open the Graphics view

The **Graphics** view is associated with the structure view from which you open it. You cannot change this association.

- In a structure view, click .

  Teamcenter opens the **Graphics** view displaying the structure. The **Graphics** menu is displayed in the main menu bar if there is at least one **Graphics** view open.

  - When you close the primary view from which you opened the **Graphics** view, the **Graphics** view closes with it.
  - If you unload data from the primary view, the **Graphics** view remains open, but empty.
  - If you load a new structure into the primary view, the **Graphics** view is available, but the structure is only loaded when you select a structure to view.

Display configuration information for a primary view

Do one of the following:

- Click in a primary structure view to see configuration information about that structure.

  The **Configuration Information** dialog box displays the following:

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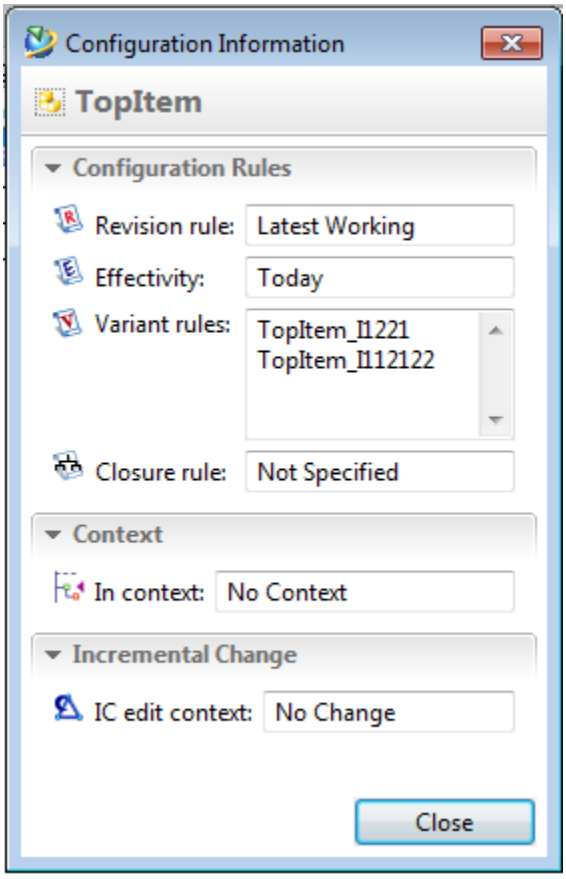

  - The revision rule.
  - The effectivity.
  - The variant rule or rules currently in effect.
  - Which structure is configuring the current structure.
  - In-context information.
  - Currently active incremental change.

- Ensure that the **MEShowConfigurationHeader** preference is set to **true**. This displays the current revision rule, effectivity, and variant rule at the top of the structure view. These entries are links that you can click to open the dialog boxes used to change the configuration.

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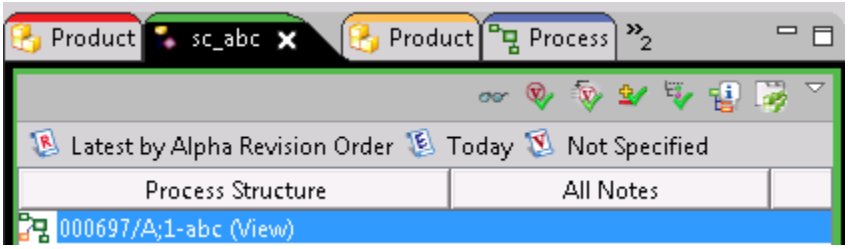

Modify the column display

1. Select a line in the table in which you want to modify the columns to make the table the active one in the view.

   This is important in views that contain multiple tables.

2. Click the **Menu** button ▾ and choose **Columns** from the view menu commands located in the top-right corner of the view.

   Teamcenter displays the **Column Management** dialog box.

3. Select the desired columns from the **Available Properties** list and move them to the **Displayed Columns** list with the right arrow.

4. (Optional) Modify the order the columns appear in the selected view table using the up and down arrows.

5. Do one of the following:

   - Click **Apply** to save the current state.
   - Click **Save** and type a name for the column configuration. You can restore a saved column layout by choosing **Apply Column Configuration** from the view menu commands and selecting the saved configuration from the list.

Find in display

1. Click the **Menu** button ▾ and choose **Find in Display** from the view menu commands.

   Teamcenter displays the **Find in Display** dialog box.

2. Click + to add a line to the table.

3. Double-click the **BOM Line** cell of the **Property Name** column and select the property name by which to search from the list.

4. Double-click the equal sign to change the operator.

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5. Type a value corresponding to the property name, for example, **MEOP** if you select **Item Type** as the property name.

6. Click **Find**.

   Teamcenter displays the number of matches in the bottom left of the dialog box.

7. Page through the matches using the right and left arrows, or display them all by clicking .

   Teamcenter selects the matches in the view.

Sort data in view pane

1. Click the **Sort** button at the top right of the view, or select **Sort** from the view menu commands.

   Teamcenter displays the **Sort** dialog box.

2. Do one of the following:

   - Sort by default order by selecting **Select default order**.
   - Specify a different sort order.

     a. Select **Select below criteria**.

     b. In each of the three boxes, double-click in the box to select from a list of columns available in the view table.

        You can modify the column display by inserting or removing columns from tables.

     c. Select whether to sort the column entries in ascending or descending order.

3. Click **OK**.

   Teamcenter sorts the data in the selected table in the order specified.

Filter search results

Several search features allow you to filter search results according to criteria that you specify.

- The **ALL** option displays properties for all the children of the object currently selected in the component view.
- You can use the **Filter Condition Editor** to create condition expressions for filtering the display.

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- Expressions cannot be edited after they are listed in the **Auto Filter** dialog box, but they can be deleted.
- Teamcenter retains your filter condition expressions until you delete them.

To create conditions, click **Add a new search condition** to display the **Filter Condition Editor**.

- To create an initial condition expression, select a property column value and a logical operator, and then enter an object value or select one from the list of objects displayed in the table, and then click **Add a new search condition**.

  Note:

  The = = operator tests for an exact match. The = operator tests for a match but is not case sensitive.

- To expand the expression with additional conditions, use the **ADD** and **OR** operators.
- Click **Remove the selected condition(s)** to delete the selected condition line.
- Click **Clean all the conditions** to delete the entire expression.
- Click **...not meet the condition(s)** to negate the selected condition.
- Click **OK** to add the condition expression to the **Auto Filter** dialog box.

Finding commands, views, and perspectives quickly

You can use the **Application Lookup** button to help you find user interface components quickly. As you type an entry in the box, Teamcenter searches for an entry that matches what you type.

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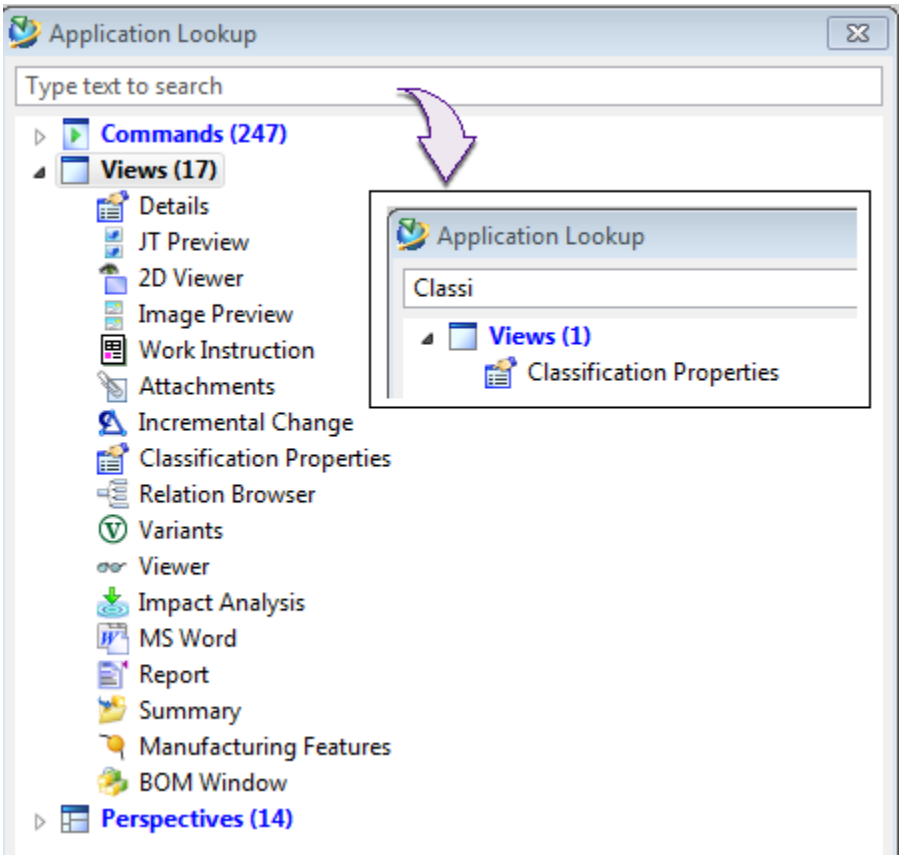

The search finds the following:

- **Commands**

  Only commands that appear in the main menu are listed. Commands that appear only in the shortcut menu, view menu, or view toolbar are not included. The command you select is applied to the object that was selected before you clicked **Quick Search**.

- **Views**

  All the views that are displayed when you right-click the selected object and choose **Open With** are listed.

- **Perspectives**

  Only Manufacturing Process Planner perspectives are listed. Other application perspectives are not available in this list.

Opening your Home folder and inbox

You can open your **Home** folder and **My Worklist** in Manufacturing Process Planner without opening My Teamcenter. This helps you quickly view your data structures or work with tasks assigned to you without

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moving between perspectives. You can also drag objects directly from your **Home** folder into a structure view.

Do one of the following:

- Click **Home** or **My Worklist** in the navigation pane.
- Click or in the toolbar.

Saving changes

Teamcenter saves changes to the structure automatically. You do not need to save them manually.

> Caution:
>
> If the same structure is open in Structure Manager and Manufacturing Process Planner, one application can overwrite the changes made in the other application. To avoid this, close Manufacturing Process Planner before making changes in Structure Manager.

Displaying information

Load data to Manufacturing Process Planner

Do one of the following:

- Use the **Send to** menu command in any other application.
- Use the **Open By Name** buttons.
- Use the **MRU** (**Most Recently Used Structures**) button.
- Use the **Quick Search** feature.
- Use the **Open Items** list.

  The **Open Items** section of the navigation pane lists all items that are currently open in the perspective.

- Use the **History** list.

  The **History** list in the navigation pane displays links to objects that you opened. Links are displayed in reverse order; the last object you opened is the first displayed in the list.

- Use the **Favorites** feature.

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- Drag a collaboration context from your **Home** folder to the **Collaboration Context Tree** view.

If you want the related product and plant to open when you load a process, set the **MSE_load_related_product_process_plant** preference to **true**. Also, to enable auto-loading of all the linked product structures and plant structures to a Bill of Process or Plant Bill of Process, the **MELoadAllLinkedStructures** preference should be set to **true**.

> Tip:
>
> Use the **Open Items** list in the navigation pane to activate a structure that is already loaded but not currently visible.

Open structure by name

You can search for and open a product, process or operation, work area, collaboration context or structure context by name or object ID.

1. In the toolbar, click **Open by Name** .

2. Click one of the following:

Button	To open a
	Subset by name
	Generic BOP
	Product BOP
	Plant BOP
	Product
	Process or operation
	Work area
	Collaboration context
	Structure context
	Schedule
	Study
	Production program collection

If a structure is currently open in a structure view, it is listed in the **Association to** box.

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3. To find structures associated with the listed structure, select the **Association to** option and skip to step 4, otherwise, do one of the following:

   - If there is no structure identified or if you want to search for structures associated with a different structure, select the new structure and click the **Set to selected** button .

     You can use this option to search for structures that are not associated to loaded root structures.

   - Select the **Attributes** option and type a structure name or ID.

     > Note:
     >
     > You can type an asterisk (*) as a wildcard character if you do not know the entire name or ID.

4. Click **Search** or press the Enter key.

   All structures that match your search criteria are listed in a table in the open structure dialog box.

5. Double-click a structure in the table. It is opened in a structure view.

Opening the most recently used object

You can click the **MRU** (most recently used) button to open any of the last few top-level structures you opened. This list is saved across sessions and is an easy way to reopen structures you were previously working on. Click an item revision in the MRU list to open it.

> Note:
>
> If the business object display rule for the **Item** business object is hidden in the Business Modeler IDE, **Service Plan** does not show up in the most recently used (MRU) list.

Unload data

- Select the structure in the **Collaboration Context Tree** view and choose **Unload** from the shortcut menu or from the view menu.

  This unloads the selected structure from the perspective.

- In the structure view, choose **Unload** from the view menu.

  This unloads the selected structure from the perspective.

- In the **Collaboration Context Tree** view, choose **Unload All** from the view menu or **File → Unload All**.

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This unloads all structures from the perspective.

- In the **Open Items** section of the navigation pane, right-click the structure you want to unload and choose **Unload**.

  This unloads the selected structure from the perspective.

- In the **Open Items** section of the navigation pane, click **Unload All** to unload all the structures open in the perspective.

  This unloads all structures from the perspective.

> Note:
>
> - When you close the primary view without unloading data, the structure is still open. You can activate it from the **Collaboration Context Tree** view.
> - You can only unload a structure context object separately if you loaded it separately. You can unload only an entire collaboration context object—not parts of it.

Expand and collapse a structure

1. Select an object in the loaded structure.

2. Do one of the following:

   - Choose **View** → **Expand Options** → **Expand** to expand the structure to one level below the selected line.

   - Choose **View** → **Expand Options** → **Expand Below** to expand the entire structure below the selected line.

     Teamcenter expands only to the level of consumed objects. If you want to expand further, your administrator must define an appropriate closure rule, and then you can expand based on the closure rule.

     > Note:
     >
     > This can be time-consuming in very large structures.

   - Choose **View** → **Expand Options** → **Expand Below...** and select a level to which you want to expand the structure.

   - Choose **View** → **Expand Options** → **Expand to Type**.

     Teamcenter displays the **Expand to Type** dialog box.

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a. In the **Type** list, select the type to which you want to expand the structure.

The types listed are dependent on the type of selected object and the **MEExpandToBaseTypes** preference. The **MEExpandToBaseTypes** preference is only applicable to selected processes.

Selected object type	Behavior
Process	The list contains subtypes of both **Process** and **Operation**.
Operation	The **Expand to Type** command is unavailable.
Plant	The list contains subtypes of **Plant**.
Product	The list contains subtypes of **Product**.

b. Click **OK**.

Teamcenter expands the tree to the selected type.

- If the expand mechanism reaches the given type in a branch, it stops and moves to the siblings.
- If the expand mechanism does not find an object of the selected type in the tree, it does not expand the tree.
- If the expand mechanism does not find an object of the selected type in a branch, the branch remains collapsed.

3. (Optional) Collapse the structure by choosing one of the following:

- **View → Collapse Below** to collapse the entire structure.
- **View → Expand Options → Expand Below...** and selecting the **Collapse lower level** check box.

> Tip:
>
> Each of these commands are also available from the shortcut menu.

Hide subassemblies using end items

To improve Teamcenter performance and hide information that is not active in your process, you can make one or more assemblies in a product or plant structure into an end item. When you expand a structure containing an end item, Teamcenter does not expand beyond the end item. You can apply end items to an entire item, to all occurrences of the item in structures where it exists, or to the current occurrence only.

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1. In a product or plant structure, select one or more product or plant lines and choose **Edit→End Item Assembly State**.

2. In the **End Item Assembly State** dialog box, to create the end item on the item itself as well as all structures that contain the selected item or items, select the **Item** check box.

   When you select the **Item** check box, the **Occurrence** check box is also selected, and by default, the end item also applies **In all structures where this selected occurrence appears**.

3. To apply the end item:

   - To only the current selected occurrence so that it effects no other structures that contain it, select **For the current selection only**.

   - On only the selected item or items, clear the **Occurrence** check box.

4. Click **OK**.

The selected item appears as an end item or overridden end item in the structure.

Note:

- To remove an end item assembly designation, repeat step 1, clear the check boxes in the **End Item Assembly State** dialog box, and click **OK**.

- You can temporarily allow expansion to display the lines below the end item assembly in Manufacturing Process Planner. This expansion is valid for the current session only. Expansion also occurs when you use **Find** commands.

Understanding end item assemblies

An end item is a final combination of consumed end products, component parts, and/or materials that are not currently of interest in a manufacturing process. You can specify an assembly in a product or plant structure as an end item assembly. When you expand a product structure, Teamcenter does not expand beyond the item designated as an end item assembly. Teamcenter does, however, store all visualization information necessary to view the assembly in both the embedded and stand-alone viewers.

You can define an end item assembly on the item level or on the occurrence level. Once defined on the item level, every future occurrence is defined as an end item assembly on its occurrence as well. If you define it on the selected occurrence, and that occurrence exists in other places, it is technically the same occurrence and is defined as an end item assembly there as well. This is the same occurrence only if a parent node is shared between the structures. If the end item assembly itself is copied to another structure, this is a different occurrence.

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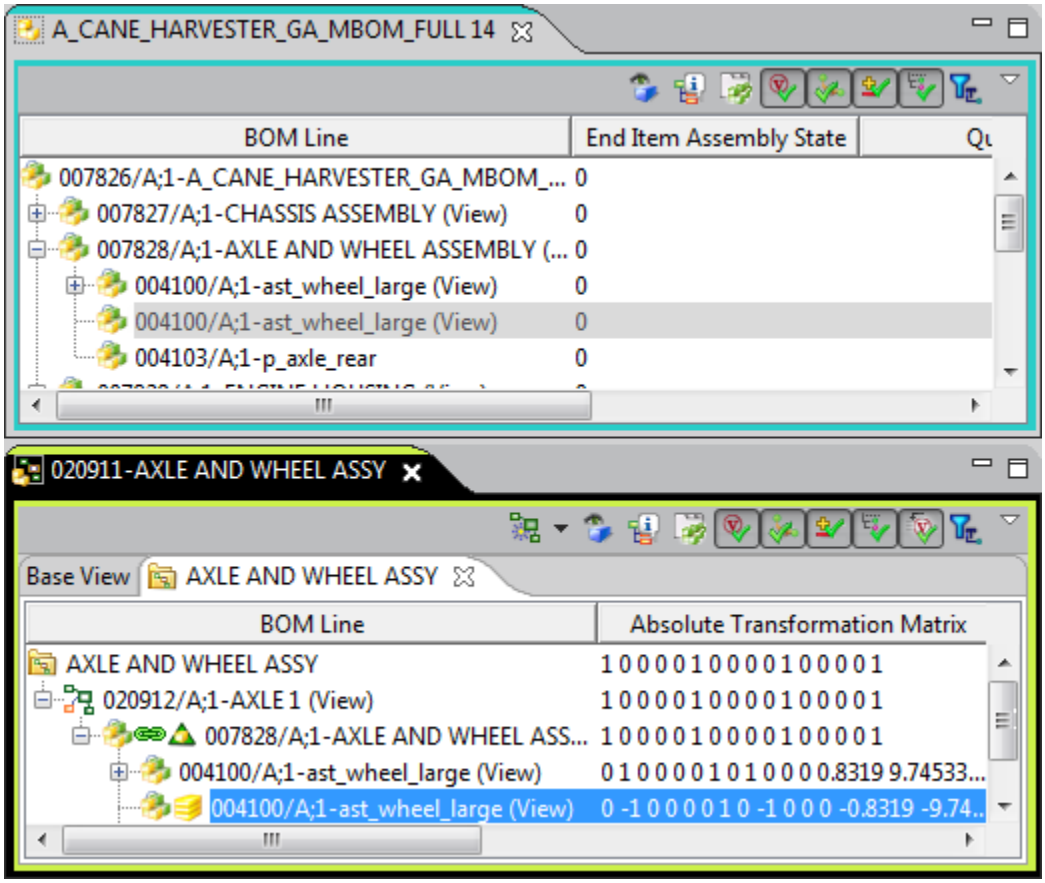
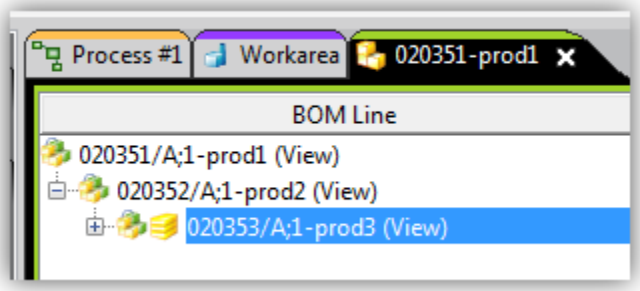
You can also apply an end item to a specific line in a structure without affecting occurrences in other structures. The end item applies only to that occurrence and has no impact on the source structure or other occurrences.



You can temporarily allow expansion to display the lines below the end item assembly in Manufacturing Process Planner. This expansion is valid for the current window session only. Expansion also occurs if you use **Find** commands or when loading product views that contain references to lines below an end item assembly.



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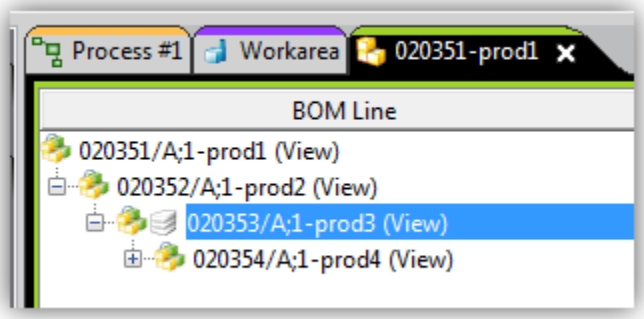
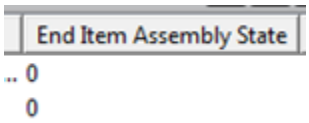


The end item assembly feature is enabled using the **EndItemState** preference.

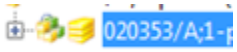
> Note:
>
> Your administrator must configure the export behavior for suppressed end item assemblies using closure rules.

Key points about viewing End Item Assemblies

- It is recommended that the **End Item Assembly State** column not be displayed. It is not an editable column and is not critical for determining if an item is an end item assembly.

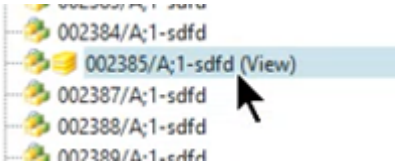


- To identify end items, it is best to refer to the icon that represents an end item.



- To show an end item structure:

  1. Right-click the end item.



  2. Choose **Expand End Item**.

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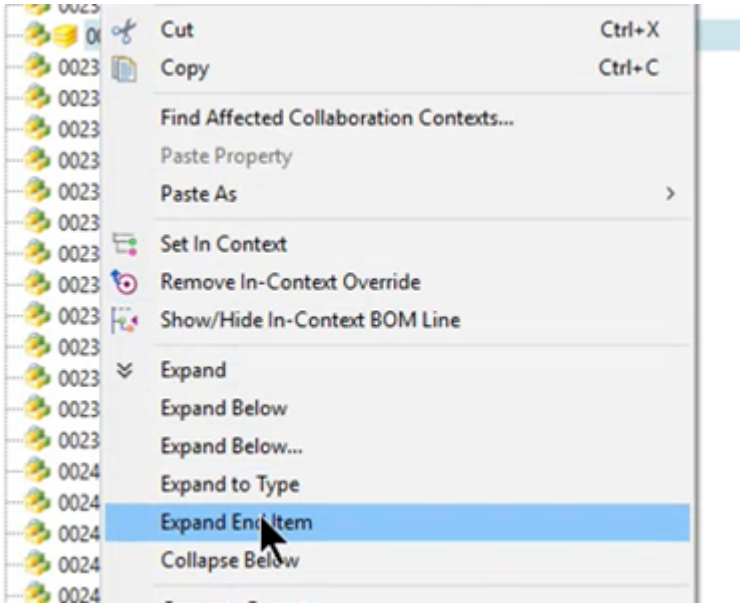
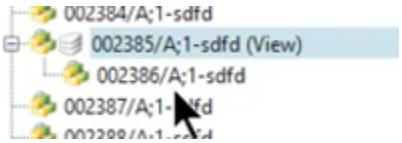


The end item structure is displayed, and the end item icon turns white.



- After expanding an end item, to hide it again, you must unload and then reload the structure.

Minimize expansion of structures using closure rules

You can limit the expansion of the structure using site-specific criteria to reduce potentially time-consuming expansions. For example, if a line has a monolithic JT file attached to it, you may not want to expand the subassembly below it. Similarly, you may not want to expand an assembly if it is not assigned to the current project. The site administrator specifies the available rules in the **ClosureRulesForBomExpansion** preference.

Lines filtered out by a closure rule are not exported.

If lines are hidden by a closure rule, you cannot find them from other views using the **Find** menu commands.

> Note:
>
> Expanding a structure based on a closure rule can affect the outcome of an accountability check. Because this type of expansion filters the displayed lines, it can interact with any inclusion rules you may set for the accountability check.

Select a closure rule before expanding the structure:

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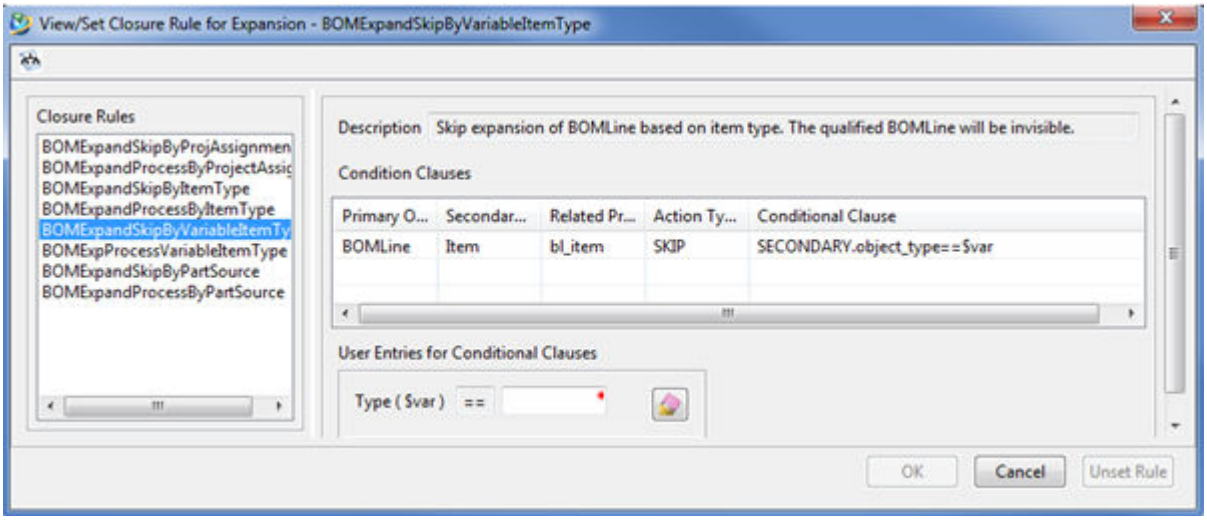
1. Choose **Tools→View/Set Closure Rule for Expansion**.

   Teamcenter displays the **View/Set Closure Rule for Expansion** dialog box.



> Note:
>
> If the closure rules differ from those shown, the site administrator must edit the **ClosureRulesForBomExpansion** preference.

2. Select the required closure rule in the **Rules** list, and then enter any filter attributes necessary for the selected rule. In the example shown, you must specify at least one project identifier.

> Note:
>
> In a conditional clause, evaluation of the left-hand expression must give primitive data types such as string or integer. If the related property is a typed reference, untyped reference, relation, or external references, the left-hand expression must evaluate to a primitive data type that uses the property of the object. You must use the property of the object, rather than the object itself. For example, instead of using **PRIMARY.bl_uom==”kg”** in a condition clause, you should traverse from **BOMLine** to **UnitOfMeasure** using **bl_uom** and then use a icon property of **UnitOfMeasure**.

Primary object class	Primary object	Secondary object class	Secondary object	Relation type	Related property	Action type	Conditional clause
CLASS	**BOMLine**	**CLASS**	**UnitOfMeasure**	**Property**	**bl_uom**	**Skip**	**SECONDARY.symbol ==$var**

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> Note:
>
> Line breaks are not supported in closure rules with variables.

3. After you enter the attributes, click **OK** to set the closure rule.

   Teamcenter applies the closure rule to all future structure expansions until you unset it or set another rule.

> Note:
>
> You can set the **SkipClosureRuleEquivalent** user preference to determine whether the closure rule is re-evaluated if you reapply it in the same session and the referenced property has changed.

To unset the closure rule, select it in the **Rules** list and then click **Unset Rule**.

> Tip:
>
> You can see the name of the current closure rule in the tooltip on the structure tab or in the configuration information when you click .
>
> If the action type in the closure rule is **SKIP**, lines meeting the criteria do not appear. If the action type is **PROCESS**, qualified lines appear but are not expanded (they show a **+** icon). To expand such a line, unset the closure rule from the window and then repeat the expansion of the subassembly.

Suppress and unsuppress occurrences

You can hide lines in a structure in the context of another line higher in the structure. This is useful if a structure contains content that is not pertinent to every user. For example, if you want to send a tool design package to a tool designer, not every operation that is contained in the package is relevant to the tool designer's work. You can hide the nonrelevant lines in a structure as follows:

1. Right-click the line in the structure that is the context of the suppression and choose **Set In Context**. For example, if you want to hide some lines in a tool design package, you select the root process.

2. Select the line you want to hide and choose **Edit→Suppress/Unsuppress Line**.

Teamcenter hides the line in the structure. If you export a structure with hidden lines, they are not included in the PLM XML of the structure and are not exported.

You can display lines that are suppressed as follows:

- In the structure view, click or choose **Show Suppressed Occurrences** from the view menu.

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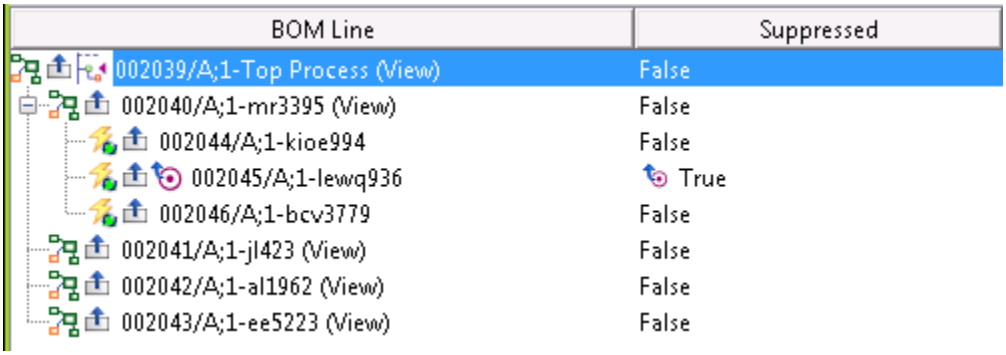
Teamcenter displays the lines that are suppressed with a symbol in front of them. You can display the **Suppressed** column to assist you in determining whether a line is suppressed.



You can unsuppress lines in a structure as follows:

1. Display all suppressed lines by clicking or choosing **Show Suppressed Occurrences** from the view menu.

2. Select the suppressed lines that you want to show and choose **Edit→Suppress/Unsuppress Line**.

View only specific occurrence types

You can use the occurrence type filter to specify which occurrence types to display in the structure. The occurrence type filter is available on all loadable structures.

1. Select the desired structure root (product, process, or plant).

2. Choose **Select Occurrence Type Filters** from the view menu.

3. Choose the types of occurrences that you want to appear in the selected structure.

4. Click **OK**.

   Only the occurrence types that you selected are shown in the structure.

> Note:
>
> You can turn the filter on and off by choosing **Apply Occurrence Type Filter** from the view menu or clicking in the view toolbar.

Expand partially loaded structures

When Teamcenter displays a BOM or manufacturing view containing the results of a search, the siblings of the node you searched for are hidden so the search results are displayed quickly. Each hidden node is represented by a **...** symbol enclosed in a box. The ancestors of the found node are loaded and visible.

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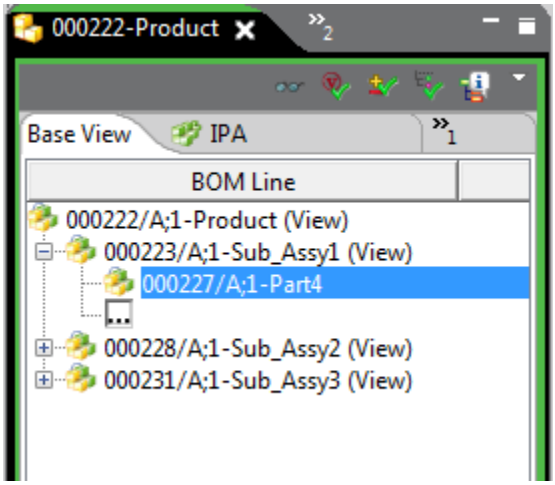
The following figure shows how a partly loaded structure displays in the BOM. In this example, three nodes are hidden and these nodes are siblings of the **000227/A;1-Part4** node found by the search.

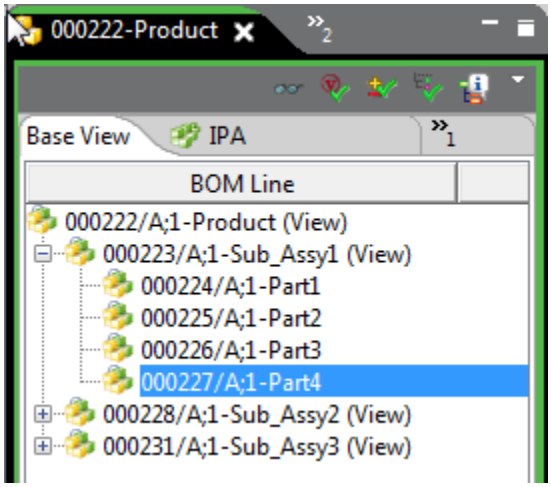


Partially loaded structure displayed as a result of a search

To expand this structure:

- Click ....

  Teamcenter expands the structure showing the siblings of the search result.



Expanded structure

Refresh the display of attachments

Generally, when you modify a structure, it is automatically refreshed by Teamcenter. In some cases, however, the automatic refresh of new attachments is disabled, for example, when adding an attachment in another application such as My Teamcenter or NX. This is to ensure that performance

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is not impaired. Because of this, a new release status does not appear automatically in the **Attachments** view. To refresh, you can:

- Select a different line in the structure then select the original one again.
- Use the **Refresh Current Structure** command.
- Set the **MEAttachmentPanelEnableRefreshChildren** preference to **True**. This causes Teamcenter to automatically refresh the attachments in the **Attachments** view.

Pasting into a pseudofolder does not refresh the **Attachments** view. After pasting the design object under the **Represented by** pseudofolder in the **Attachments** view, choose one of the following solutions to see the pasted object:

- Reload the part object again.
- Send the object from My Teamcenter to Manufacturing Process Planner.
- If the structure has more than one product, move the selection between the children.

  The **Attachments** view is refreshed and you can see the pasted design object.

Displaying activities in the Activities view

You display activities associated with an operation in the **Activities** view. Activities can have associated objects such as other activities or attachments. You can filter out which types of attachments are displayed in the **Activities** view using the **MEOperationActivitiesFilteredComponents** preference. To see all attachments, you can open the **Attachments** view on an activity in the **Activities** view.

> Note:
>
> Do not use the **Activities** view to manage activity times. Do this in the **Time** view.

Displaying and hiding structures using the Show Unconfigured buttons

Teamcenter provides you with several buttons or menu commands that show or hide objects in a structure.

- **Show Suppressed Occurrences**
- **Show Unconfigured Variants**
- **Show Unconfigured By Occurrence Effectivity**
- **Show Unconfigured Changes**

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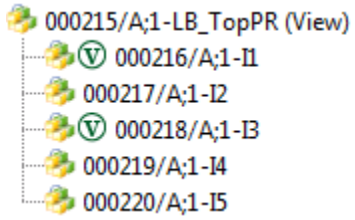
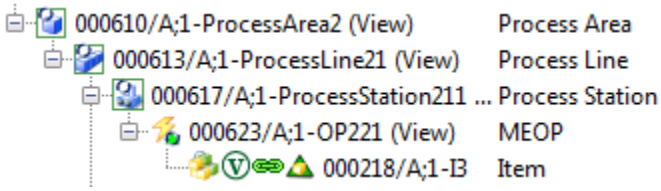
- **Show Unconfigured Assigned Occurrences** (only applicable to a bill of process)
- **Apply Occurrence Type Filters**

If you have several structures open, the state of these buttons in the various structures affects what is visible in the structure. It can occur that you try to show unconfigured variants in a composition structure but are unsuccessful because they are not hidden in the parent structure. For example, you have the following product structure with Part2 configured out as a result of a variant rule, but with all variants exposed using the **Show Unconfigured Variants** button.



Additionally, you have a process structure that consumes Part2 from the product structure.



If, in the process structure, you turn off the **Show Unconfigured Assigned Occurrences**, you may expect the assigned part and the owning operation (depending on the settings of the **typeAndRuleForProcessConfiguration** preference) to be hidden in the process structure. If, however, in the product structure, the **Show Unconfigured Variants** button is turned on, you cannot hide the assigned occurrences in the plant BOP structure.

The following control only nodes in the process structure (processes and operations) and not assigned lines:

- **Show Suppressed Occurrences**
- **Show Unconfigured Variants**
- **Show Unconfigured By Occurrence Effectivity**
- **Show Unconfigured Changes**

The following control assignments being configured in and out:

- **Show Unconfigured Assigned Occurrences**

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- **Apply Occurrence Type Filters**

> Tip:
>
> You can simultaneously show or hide all **Show unconfigured** options using the **Show Hide Unconfigured All** list if your administrator sets the **MEShowHideUnconfiguredAll** preference to **All**.

Pack/Unpack a bill of materials

- Click one of the following two buttons on the toolbar to group or ungroup multiple, identical components in one level of the assembly to pack and unpack the BOM.
  - Click to pack.
  - Click to unpack.

> Note:
>
> When lines are packed, one of the packed lines is always designated the master packed line. If the **TCVIS_Selection_From_Viewer** preference is set to true, you can select packed objects in the viewer using the buttons available in the **3D Selection** toolbar. However, if you select the master packed line, all packed lines are selected. If you do not want this behavior, you must unpack the packed lines before selecting the individual objects in the viewer.

Use manufacturing check out and check in

You can check out process data (operations, processes, activities, datasets, forms, work areas, and studies) from bills of procedures (BOPs), bills of equipments (BOEs), plants, plant BOPs, and shared and isolated studies. This functionality is useful in cases where you want to modify operations but not resources, or you want to add time to an individual operation without affecting station content. You can also check out assigned work areas and resources. The contents of end items, as well as consumed items and other items for which you do not have write access, are not included. This command, **Manufacturing Check-Out**, was previously named **Process Simulate Check-Out**.

1. Right-click a process area or other preferred element (see preferences below) from the structure and choose **Check-In/Out→Manufacturing Check-Out**.

   > Note:
   >
   > You can also select multiple nonconsecutive objects by pressing Ctrl and clicking each object in a structure.

   By default, the **Include Sub Hierarchies** check box is selected in the **Manufacturing Check Out** dialog box. This option performs the check out recursively, checking out the item

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revisions of all the operations/processes under the selected process to which you have write access, including datasets, operation activities, and attachments such as master forms and **ProcessSimulatePLCDetails**.

If you deselect the check box, the only objects checked out are the selected object, its datasets, and its forms.

> Note:
>
> You can use the following preferences to define form and database check-out details.
>
> - **ME_CHECHOUT_EXCLUDED_FORM_TYPES** indicates which forms will not be checked out. Valid values are the pairs of form types and relations separated by a **:** character.
> - **ME_CHECHOUT_EXCLUDED_DATABASE_TYPES** indicates which datasets will not be checked out. Valid values are the pairs of dataset types and relations separated by a **:** character. By default, this preference excludes Microsoft Office dataset types.

2. To also check out assigned work areas and resources, select **Include Assigned Workarea and Resource**.

   You can use the following preferences to define work area and resource check-out details.

   - **MERelationTypeWorkarea** defines which relations will indicate that an assigned item is a work area. The types defined here are used to assign work area objects to operations and processes, and can include custom occurrence types.
   - **MERelationTypeUserEquipment** defines which relations will indicate that the assigned item is a tool. The types defined here are used to assign equipment to operations and processes, and can include custom occurrence types.

3. (Optional) Type a unique change ID and any comments you want to make on the reason for the check out.

4. Click **OK**.

   Teamcenter checks out the required objects. If some objects are not checked out properly, Teamcenter displays the **Objects that Failed to Check-Out** dialog box listing all objects that were not successfully checked out.

5. Make any necessary changes to the checked out objects and when you are finished, select the top checked-out line, right-click the selection, and choose **Check-In/Out→Manufacturing Check-In**.

   No dialog box appears. The selected line and anything below it are checked in.

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Manage checked-out objects

You manage checked out objects by doing one of the following:

- Check in the object by clicking **Check In**.
- Return the object to the database without saving any of the changes you made by clicking **Cancel Check Out**.
- Transfer the checkout ownership to another user by clicking **Transfer Check Out**.
- If you have only one object selected, view a listing of previous checkout activity by clicking **View Check Out History**.

> Note:
>
> You can configure the columns that appear in the **Checked Out Objects** dialog box and filter its content.

Understanding equivalence and in-context ID (IDIC)

Teamcenter has several features that depend on finding parts that are considered *equivalent*. This equivalency is often dependent on the in-context ID (IDIC), also known as the *absolute occurrence ID*. The in-context ID is a unique identifier, generally alphanumeric, that determines if two parts or processes are equivalent.

You can view the in-context ID by displaying the **ID in Context Top Level** column. It is usually automatically generated, and you should exercise caution in modifying its value.

The following features depend on the in-context ID:

- Reconciling and engineering bill of process (EBOM) with a manufacturing bill of process (MBOM)
- Finding products in processes that are not yet expanded
- Running an accountability check to verify line equivalence
- Assigning parts to a cloned process structure
- Comparing structures to intermediate data captures

An in-context ID is automatically generated in the following situations:

- When you assign a bill of materials (BOM) to a BOM or a bill of process (BOP) to a BOP

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- When you assign a BOM to a BOP or enterprise BOP (EBOP) structure if the **MECopyIdInContextToAssignedLine** preference is set to true

An in-context ID is not generated when you assign from an EBOP structure to an EBOP structure.

> Caution:
>
> If a line has an in-context ID and you cut it and paste the same line back into the structure, Teamcenter creates a new occurrence without an in-context ID. Therefore, any of the above comparisons based on the in-context ID no longer work.

Searching for a component in other open structures

Setting up the search for components in other structures

You can select one or more objects in the following areas of the user interface and search for them in a different structure.

- Lines in a view
- Consumed parts in a process
- An object in the **Navigation** pane (**Favorites**, **History**, **Open Items**)
- Objects in the **Home** folder
- Objects in the **My Worklist** folder
- Items attached to a Teamcenter mail
- Lines in the **Summary** view
- Objects in the **Graphics** view

Whether you need to expand a target structure before choosing the **Find in All Visible Views** menu command depends on the settings of the following two preferences:

MECopyIdInContextToAssignedLine
MECopyIdInContextLowerLevels

> Note:
>
> Whether you need to expand a structure before a found component can be highlighted within it depends on the value of the **MEExpandToSelection** preference. If this preference is set to **false**, you must manually expand the target structure to highlight lines found within that structure.

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Find components in open structures

1. Right-click one of the following:

   - Lines in a view
   - Consumed parts in a process
   - An object in the **Navigation** pane (**Favorites**, **History**, **Open Items**
   - Objects in the **Home** folder
   - Objects in the **My Worklist** folder
   - Items attached to a Teamcenter mail
   - Lines in the **Summary** view
   - Objects in the **Graphics** view

2. Choose one of the following from the shortcut menu.

   - **Find** → **Find in all visible views** to find the line in all views that are open, not tabbed behind others, and not minimized.
   - **Find** and select the view in which you want to find the source line.
   - If the source structure is an occurrence group, choose **Find in Base View** to find the selected structure line in the base view associated with the occurrence group.

   Teamcenter searches for the item in the alternate structure and, if successful, highlights it, as shown in the following figure.

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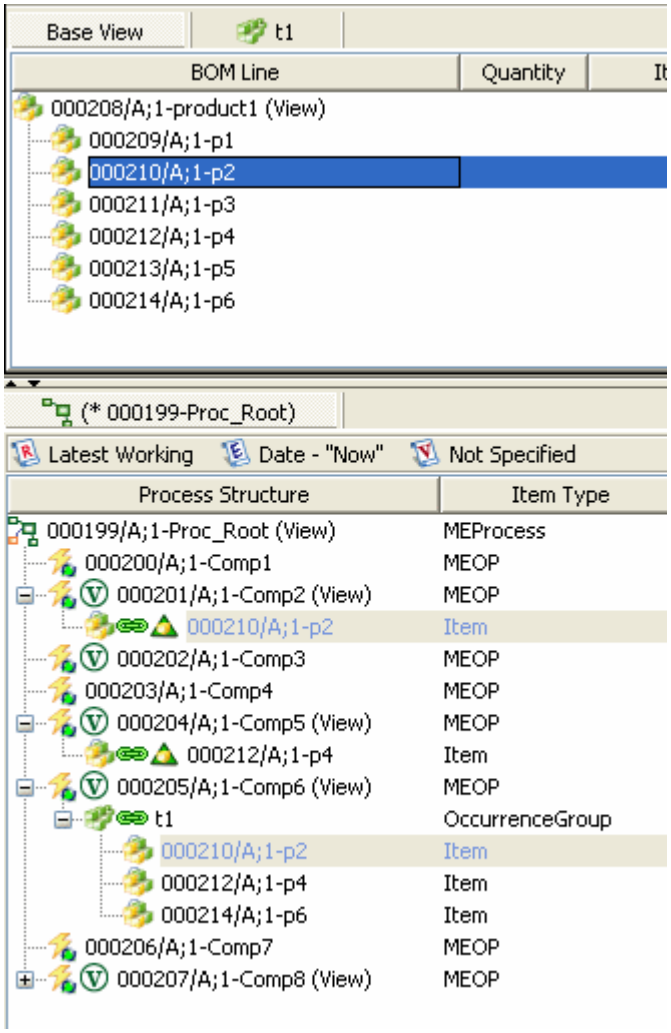

Individual search result

Find in other enterprise BOP structures

The **Find** command functions on enterprise bill of process structures. You can select a line in a generic, product, or plant bill of process (BOP) and find all lines with the same origin in other enterprise BOP structures. You can use this menu command on processes and operations but not on consumed items.

If you use the **Disconnect** menu command to remove the origin link between structures, the **Find** command no longer finds the other structure.

- Select a line in a BOP structure and choose **Find→Find in All Visible Views** from the shortcut menu. Alternatively, you can choose **Find** and select a specific view from the list of open views (for example, **Find→Find in Selected View**).

  Teamcenter highlights all lines sharing a common origin in the specified views.

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Note:

- From a plant BOP, Teamcenter shows only matching objects from the product BOP and not the generic BOP.
- When searching from a generic BOP to a plant BOP, by default, Teamcenter searches by in-context ID (IDIC). If it does not locate the IDIC value it prompts you to search by item ID, which in some cases may not be helpful. To search by alternate values, you or your administrator can create a string preference named **METypesIgnoredForFindByItemId** and add values such as **Mfg0BvrOperation** or **Mfg0BvrProcess** to suppress the item id search prompt.

Comparing structures graphically

About comparing structures graphically

You can compare two structures (BOMs) and view the results to identify differences. The BOMs can contain different types of objects, such as mechanical parts, electrical parts, routes, and connections. You can use the graphical comparison capability with released BOMs or with structures that are configured by effectivity.

You can compare an assembly with an assembly, a part with a part, or two revisions of the same assembly. If you compare two revisions of an assembly, Teamcenter identifies the following supersedure information:

- Adds

  These are objects that are in the target assembly but not in the source assembly. They have been added to the assembly.

- Cancels

  These are objects that are in the source assembly but not in the target assembly. They have been removed from the assembly.

- Moves

  These are objects that are in different positions in the source assembly and target assembly. Any object whose transform matrix differs between the source and target is identified as repositioned.

- Reshapes

  These are objects that have alternate representations between the source assembly and target assembly. Any object identified with a **UG ALTREP** note type is identified as reshaped.

- Common

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These are objects that are in both the source assembly and target assembly.

Compare two BOMs

1. Apply any revision rules or effectivity needed to configure the structures you want to compare.

2. Choose **Tools** → **Graphical BOM Compare**.

   Teamcenter displays the **Graphical BOM Compare...** dialog box listing all loaded structures in both the **First Structure** and **Second Structure** boxes.

3. Select a first and second structure for compare from the lists and click **OK**.

   Teamcenter analyzes the BOMs to identify any differences and displays the **Graphical BOM Compare** dialog box containing a visual indication of those differences.

   Depending on the type of comparison, you can use the tools and controls in the window to change the view and examine differences more closely.

   If you compare two versions of an assembly under change control (for example, a problem item and an affected item of an engineering change), Teamcenter displays a list of supersedures.

4. Click **Close** to close the window on completion.

Set color options

You can change the default colors in which differences and supersedures are displayed in the **Graphical BOM Compare** dialog box as follows:

1. Choose **Edit** → **Options**.

   Teamcenter displays the **Options** dialog box.

2. Choose **Change Management** → **BOM Tracking** from the list of options.

   Teamcenter shows the list of current colors assigned to the **Graphical BOM Compare** dialog box.

3. To change the color assigned to a difference type, double-click the current color assignment.

   Teamcenter displays the palette of available colors. Click the required new color and click **OK** or **Apply** to change the color; alternatively, you can click **Cancel** to exit without changing the color.

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Recovering a manufacturing session

If you are working in a four-tier environment and a server or network failure or time-out occurs, Teamcenter reassigns the client session to another server. It also attempts to use the client cache to reconstruct the run-time configured structure views and minimize loss of information.

If the server connection is lost, Teamcenter displays two dialog boxes:

- **Server Reassigned**

  Informs you that the server connection was lost. Click **OK** to dismiss the dialog box.

- **BOM Session Recovery**

  Informs you that a BOM recovery session has started. Click **OK** to dismiss the dialog box.

Additional error messages may appear, depending on the state of the recovered session.

The primary structure views are recovered and the secondary views have one of the following states:

- Where possible, the view remains open.
- The view stays open, but its content is cleared.
- The view is closed.

The following limitations apply to BOM session recovery:

- BOM sessions are recovered only for the four-tier rich client.
- Teamcenter recovers the BOM session to a usable status, but not necessarily the exact state before failure or time-out occurred. For example, if you expanded multiple levels of the structure, Teamcenter recovers only the first-level expansion of the structure.
- The recovery may take an appreciable time to complete, depending on the quantity of data Teamcenter must process.
- Unsaved changes are lost. For example, if you modified the effectivity date on a revision rule but had not yet saved the change, the changes are not recovered.
- If you copied BOM lines to the clipboard before the server terminated, Teamcenter removes them.
- If the server terminated after encountering bad data during expansion, the recovery process may expand the same structure and encounter the same bad data. You must resolve these data issues in the database manually.

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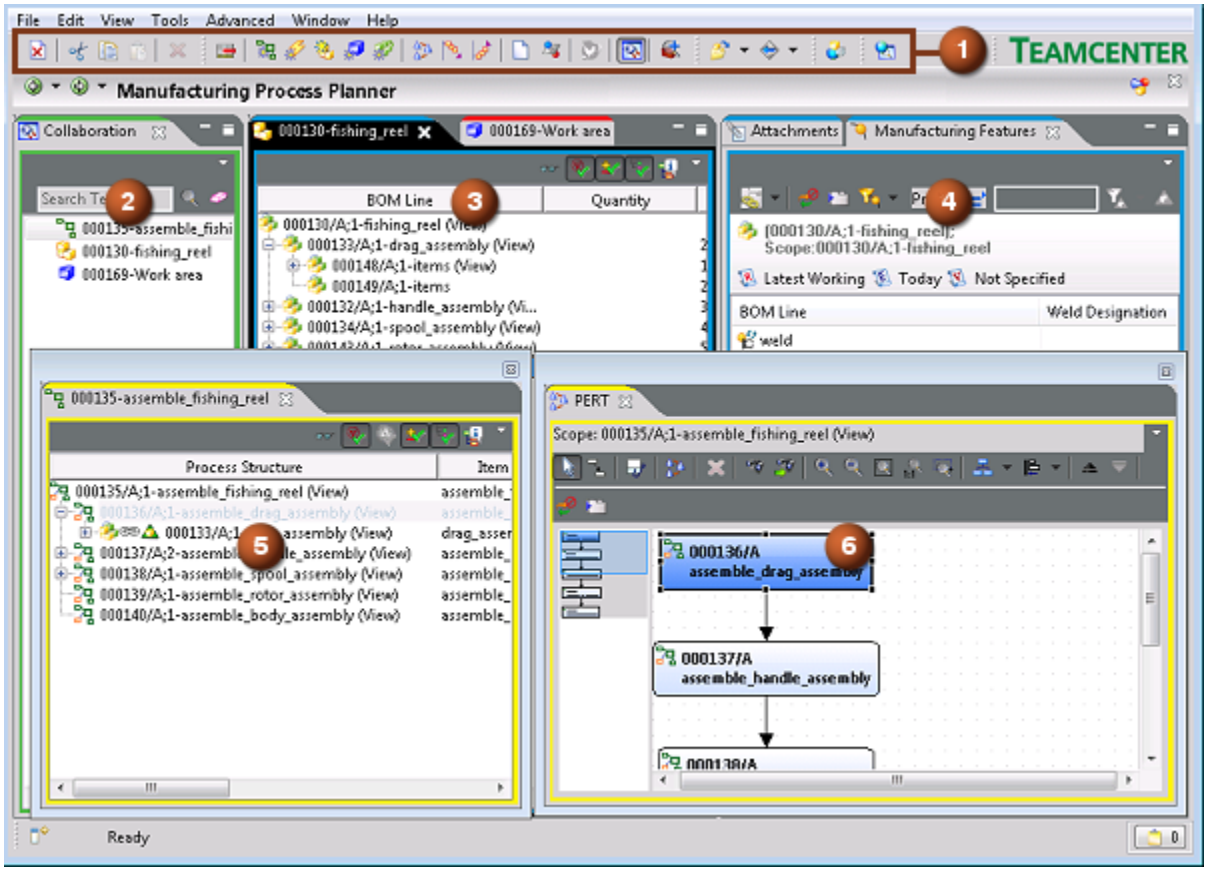
- If the server terminated due to memory shortage when expanding the first level of the structure, the recovery process may expand the same structure and encounter the same memory shortage. You must resolve such memory issues separately.
- The **Report** view is not recovered.
- The knowledge of which variant rule is in effect at the time of the crash is not recovered.

Manufacturing Process Planner interface

Manufacturing Process Planner interface overview



1	Toolbar	Provides a quick method for performing many of the most common tasks such as creating a structure, opening a structure by name, and adding resources.
2	**Collaboration Context Tree** view	Shows all open structures in the application.
3	**Structure** view	Shows each structure that is currently open in a separate view. A structure view contains, most commonly, a product, process, plant, or structure context. You can open

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		multiple structures at once, including multiple products, processes or plants. A structure view is a primary view for which you can open multiple secondary views.
4	**Manufacturing Features** view	Shows all the features found under the currently selected scope. The **Manufacturing Features** view is an example of a secondary view opened for a primary product structure view. The blue border around the **Manufacturing Features** view and the product structure view shows that they are associated.
5	Detached structure view	Shows a process structure view that is detached from the Teamcenter window. You can detach and move any views to suit your needs.
5	Detached secondary view	Shows the **PERT** view that allows you to modify the flow of processes or activities in a graphical manner. You can detach secondary views and associate them with detached primary views. You can move the detached primary and secondary views anywhere in the display area, including to a second monitor.

Manufacturing Process Planner perspectives

4G Designer-MBOM Reconciliation perspective

This perspective displays the **Content Explorer** view and a product view to help you assign 4G objects to a manufacturing BOM.

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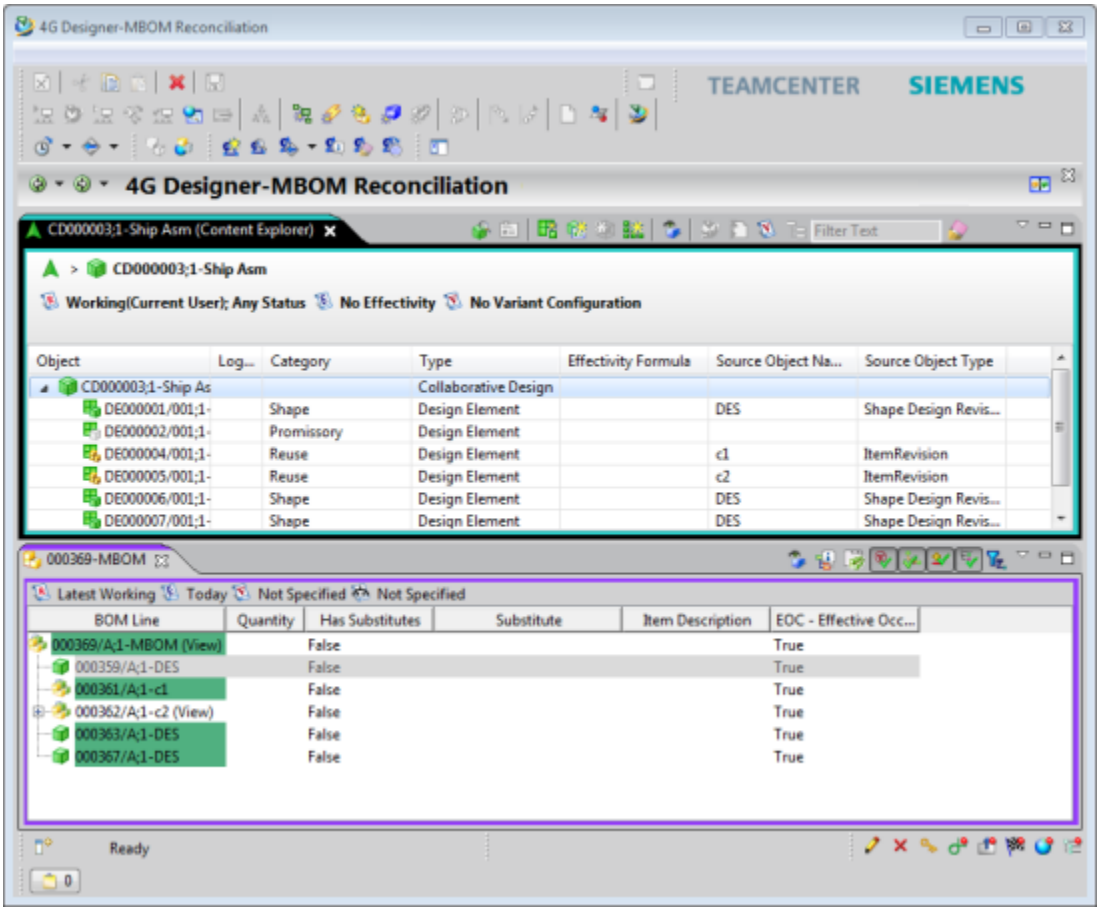

Manufacturing – 4D Scheduling perspective

This perspective includes a schedule manager view, in addition to a process and product view to assist you in associating tasks to processes. This allows you to perform spatial searches on a process that specify a time input (for example, what is already built in a specific area on a specific date).

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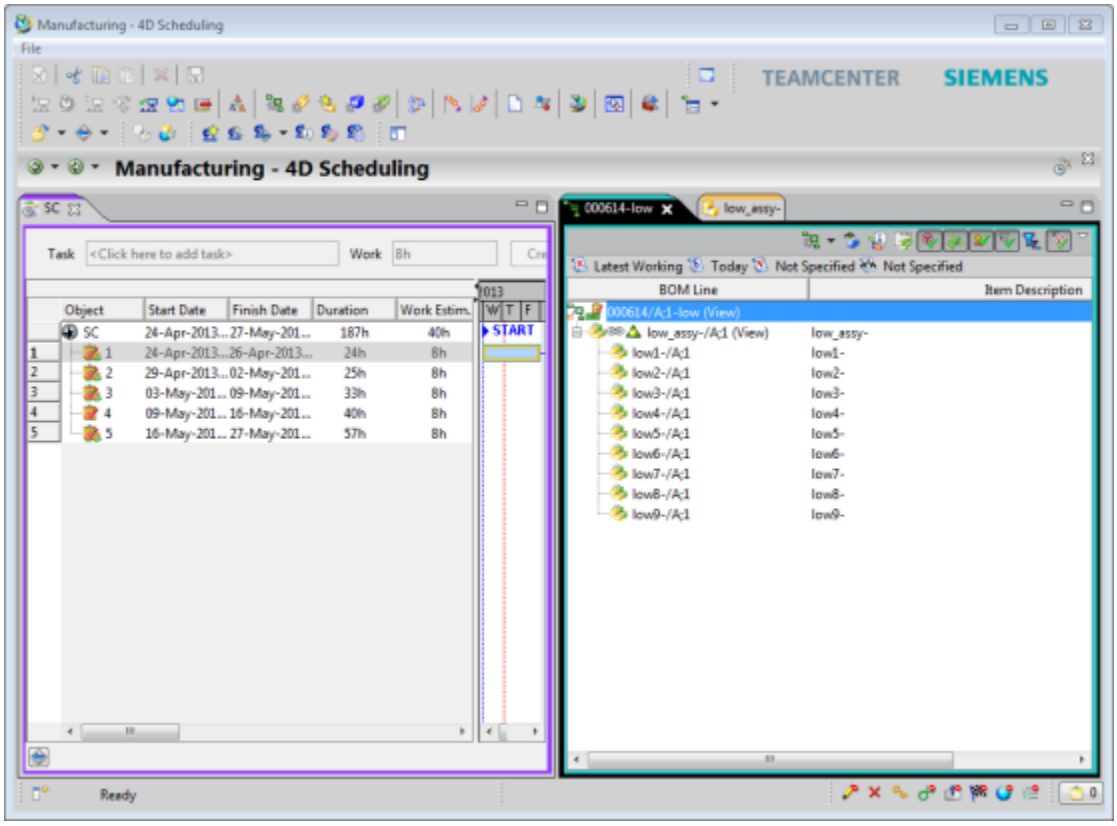

Manufacturing – Process Sequencing perspective

This perspective includes the **PERT** and **Process Gantt** views to help you specify the process flow.

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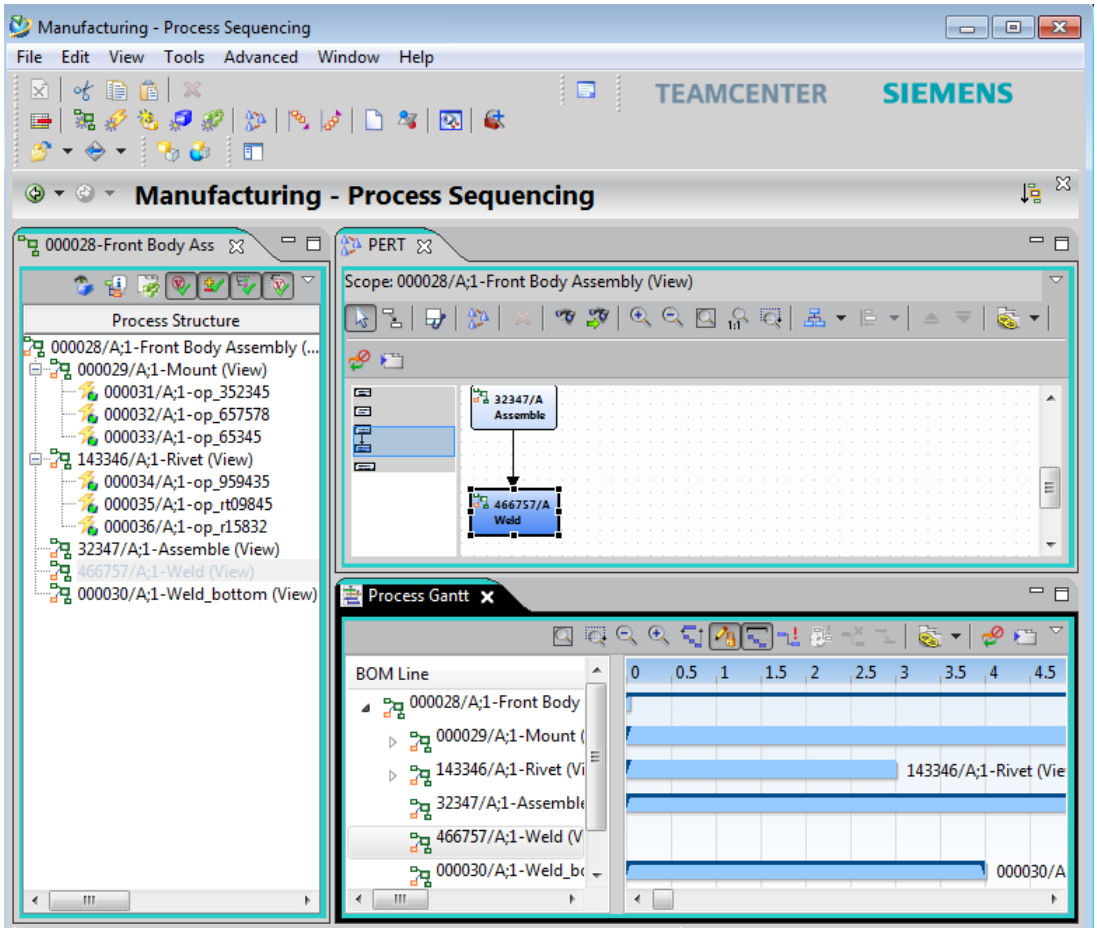

Manufacturing – BOM Reconciliation perspective

This perspective includes two structure views with their accompanying **Graphics** views to help you align the engineering BOM with the manufacturing BOM.

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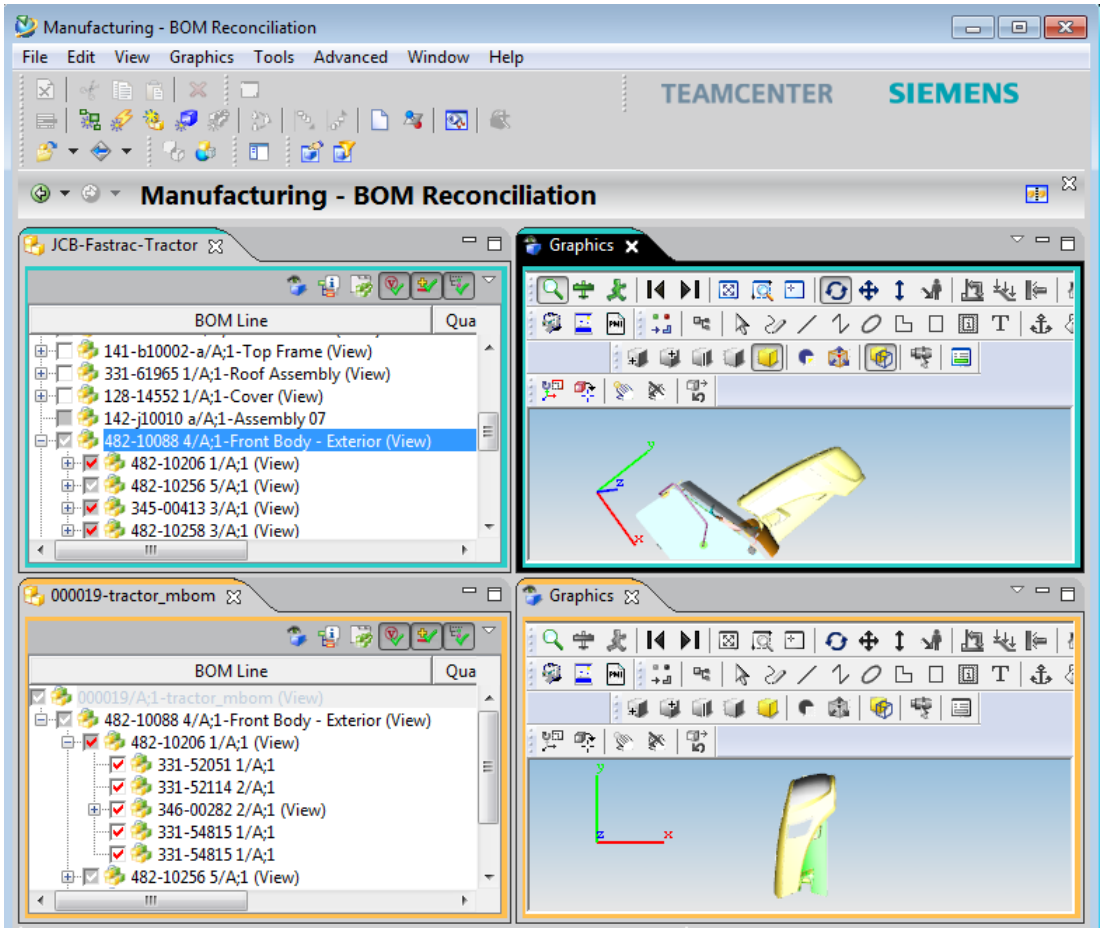

For more information, see *Comparing the EBOM and MBOM*.

Manufacturing – Work Instruction perspective

This perspective includes process and standard text views necessary to add work instructions to a process structure.

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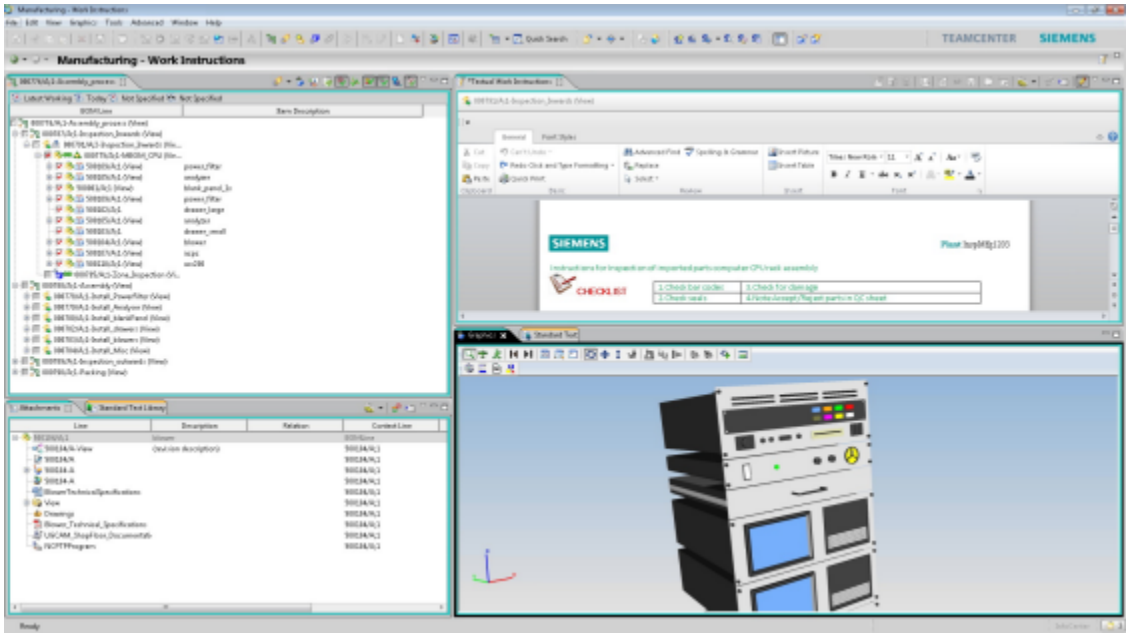
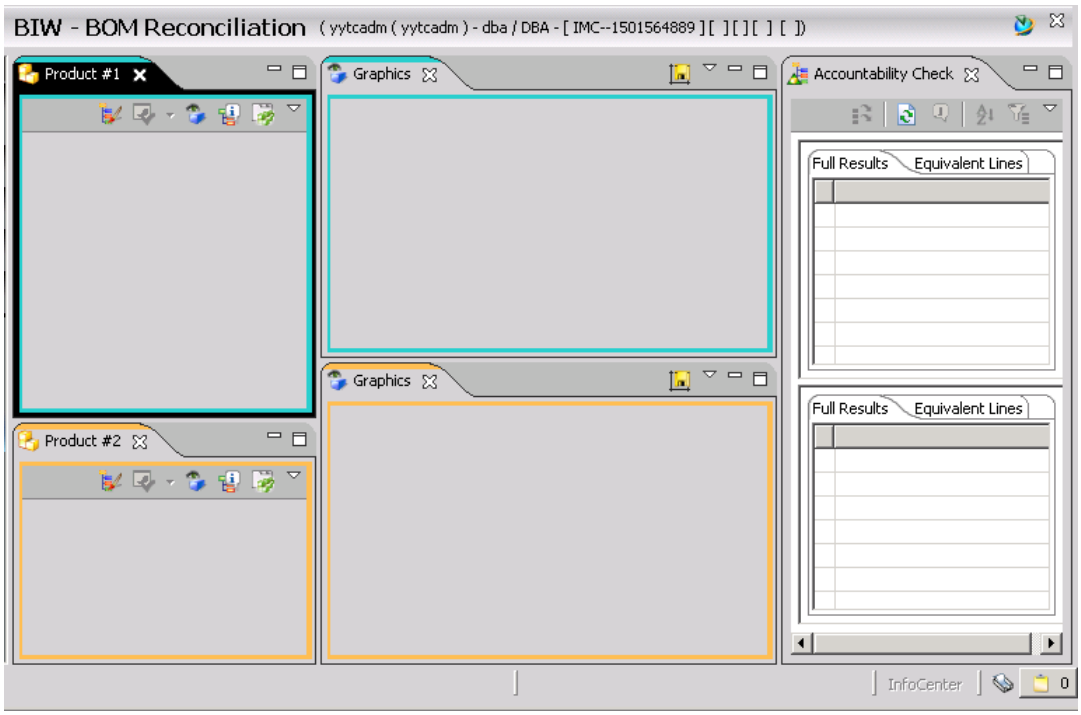


BIW – BOM Reconciliation perspective

The BIW – BOM Reconciliation perspective is for the body in white (BIW) lead person who manages product and manufacturing feature updates. When you open this perspective, it opens in Manufacturing Process Planner with the preloaded views shown below. The menu options for the perspective and views are also predefined for this particular business use case.



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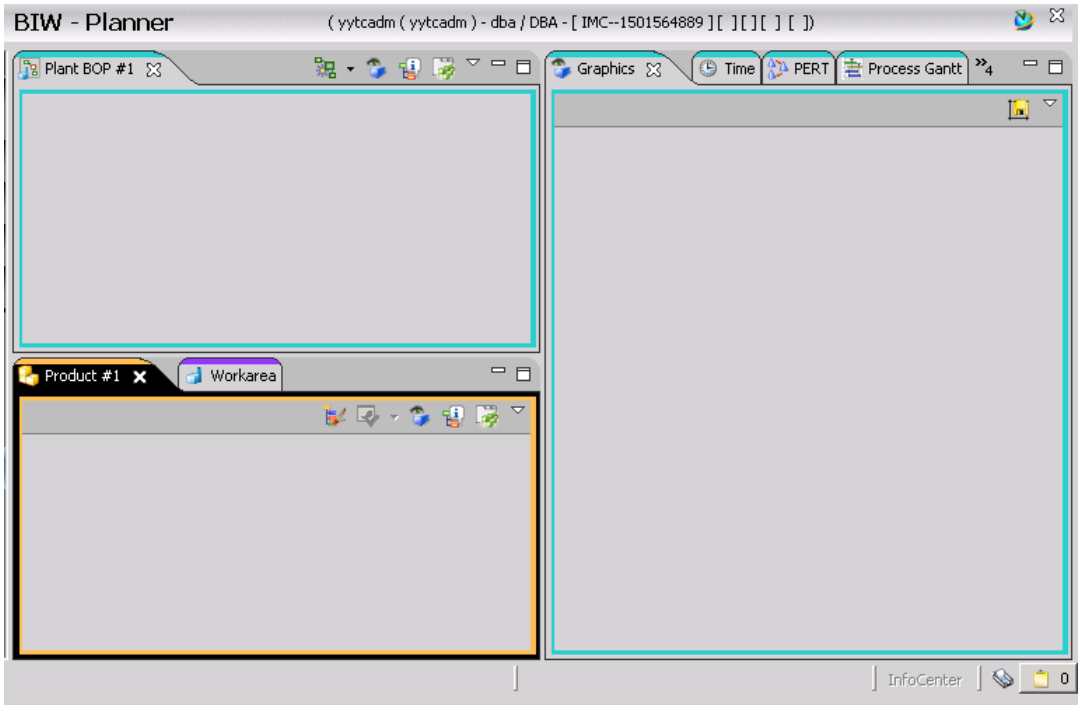
BIW – Planner perspective

The BIW – BOM Planner perspective is for the body in white (BIW) planners who create structures, assign product and manufacturing features, select resources, evaluate time, and create, release, and revise documentation. When you open this perspective, it opens in Manufacturing Process Planner with the preloaded views shown below. The menu options for the perspective and views are also predefined for this particular business use case.



BIW – Project Integrator perspective

The BIW – Project Integrator perspective is for the body in white (BIW) lead person who manages supplier collaboration. When you open this perspective, it opens in Manufacturing Process Planner with the preloaded views shown below. The menu options for the perspective and views are also predefined for this particular business use case.

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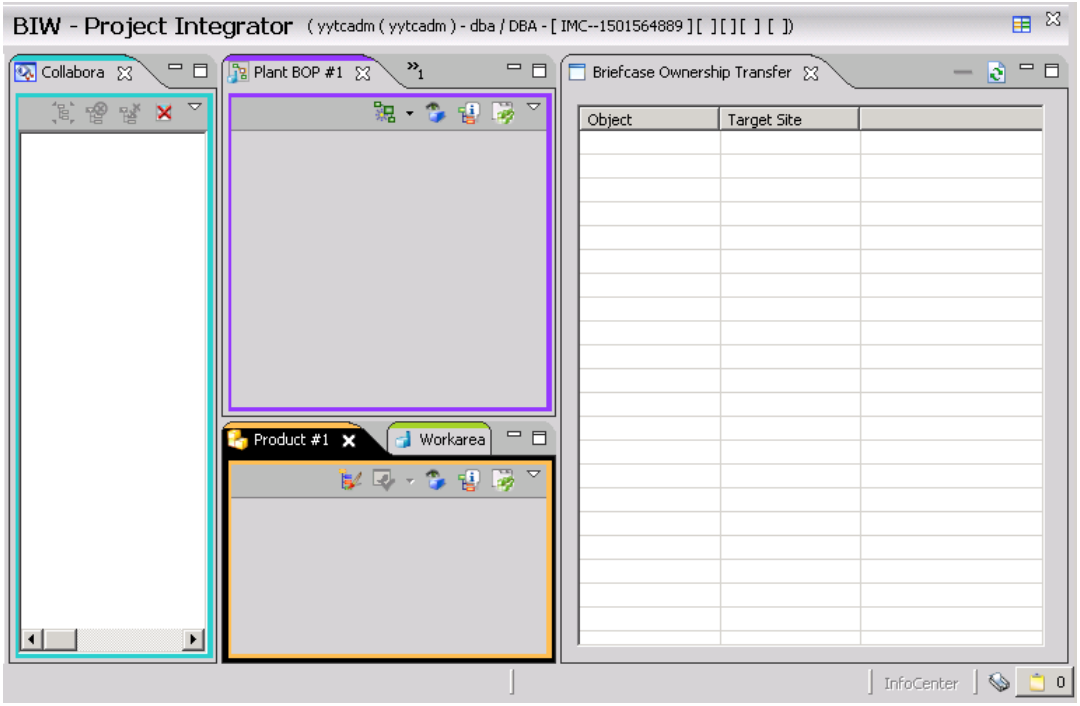

List of manufacturing views

Teamcenter presents manufacturing data in views, each view providing its own specific way of managing or modifying the data. The views provide an environment where you can author manufacturing processes based on information available in Teamcenter. You can construct processes and operations, relate additional relevant information, view alternatives and isolated studies, and collaborate with others who are working on the same information.

There are primary views and secondary views. A primary view shows one configurable structure. That structure can contain a base view and several occurrence groups. A secondary view shows specific data and, depending on your needs, can change its content if you select a new object in a primary view.

View Icon	Name	Description
	2D Viewer	You can have one or many **two-dimensional snapshots** associated with a line in your product structure. When you open a selected line in the **2D Viewer** view, Teamcenter displays an attached image dataset. If there are multiple image datasets attached, you can select any preferred image.
	Accountability Check	Displays the results of an **accountability check**. This view lists the problem lines in the source and target and provides a list of conflict details. Lines that are colored in the source and target structures are also colored in the view. Fully matched lines are not listed.
	Activities	Displays all **activities** to be completed as part of the operation selected in a process. This view is structure-dependent (it displays

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View Icon	Name	Description
		a tree table). Each listed activity is an expandable folder. Folder contents may include additional subactivities. Tip: You can open many secondary views for activities, including the **PERT** or **Attachments** views.
	Advanced Accountability Check	Displays the results of an **advanced accountability check**. The **Advanced Accountability Check** view lets you compare and propagate multiple types of views/structures, run assessment comparisons to repair one structure from another, set reporting and equivalence options, and set partial match criteria for different types of structures. Many options are available, other than those the standard accountability check offers.
	Assignments	Displays logical **assignments** and their resolved part assignments. It also displays part consumptions of the selected process/operation, even if these are not related to the logical assignments, or if the process/operation has no logical assignments. Any filtering that is applied to the assignments in the BOP tree (such as by occurrence type, revision rules, variant rules, or incremental change) is also automatically applied to the assignments in the **Assignments** view.
	Attachments	A structure-dependent data view that is always available when an object is selected in a structure view, the **Attachments** view displays the properties of all components **attached** to the selected object, including the base item component and all related subcomponents. Standard Teamcenter shortcut menu commands are available for any displayed object. Double-click an attachment on this view to open the attachment in its appropriate application. Note: The process revision is determined by the product structure's revision rule. This information cannot be specified in this view.
	Design BOM	A **CAD Bill of Materials** (BOM), also called a design structure, is a type of primary structure view that displays parts from an original Computer-Aided Design (CAD) model or Electronic BOM (EBOM) and is often aligned to a **part BOM**.
	Classic Bill of Process (BOP)	A type of legacy primary structure view that corresponds to the organization of a plant structure's Bill of Equipment (BOE), and defines process areas, stations, and operations in which a product is assembled. A best practice is to **migrate classic BOPs** to plant BOPs.

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View Icon	Name	Description
	Classification Properties	Shows the **classification attribute** values that exist in the Classification application for the object currently selected in the structure view if that object is classified. This data is informational only and cannot be changed in this view. You must change the data through the Classification application.
	Collaboration Context Tree	Contains a list of all structures currently open in the application. You can use the **Collaboration Context** (CC) view to load and unload structures, as well as to save structures as new structure contexts. The **Collaboration Context Tree** does not respond to selection in other views.
	Engineering BOM (EBOM)	One of the most important primary structure views, the **Engineering BOM** (EBOM), sometimes also called a Computer Aided Design (CAD) BOM, is a breakdown of a three-dimensional product design consisting of part and assembly models. Because the order of parts and assemblies does not necessarily reflect the needs of manufacturing processes, the EBOM is used to generate a Manufacturing BOM (MBOM). You must continually compare and update the EBOM and MBOM, often using an advanced accountability check, to reflect engineering and manufacturing changes that occur during the manufacturing process.
	Graphics	Displays any 3D visualization data associated with the selected structure. The **Graphics view** is closely associated with the primary view from which you open it. If you close the associated primary view, Teamcenter closes the **Graphics** view as well.
	Impact Analysis	Identifies which other database components reference and thereby **impact** an object currently selected in a structure view, and displays any assemblies in which the selected object appears. Note: You can use the **Filter by Item Type** command to display all operations currently associated with, and performed at, the work area selected in a plant structure.
	Incremental Change	Allows you to add, edit, or remove **incremental changes** from a selected line.
	IDC	Displays any Intermediate Data Captures (**IDCs**) associated with the selected structure. You can switch between captured states of an IDC by selecting from the **Captured State** list.
NA	**Linked Occurrence Paths**	Available only when you select a consumed part in a process structure. Displays the path to the root of the source product in Multi-Structure Management. Even if the source part is removed from its parent product after it is assigned to a process, you can still see

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View Icon	Name	Description
		the path that existed when the part was originally assigned to the process.
	Manufacturing BOM (MBOM)	One of the most important primary structure views, the **Manufacturing BOM** (MBOM) is a breakdown of a three-dimensional product design consisting of part and assembly models, usually derived from an Engineering BOM (EBOM) or design BOM, that reflects the needs of manufacturing processes. You must continually compare and update the EBOM and MBOM, often using an advanced accountability check, to reflect engineering and manufacturing changes that occur during the manufacturing process.
	Manufacturing Features	Shows all **manufacturing features** (welds, arc welds, and datums) under the current product scope in a table-like view. The view helps you manage scattered manufacturing features in a product structure in an easy and systematic way. Because the features displayed in the **Manufacturing Features** view are BOM lines, you can use the shortcut menu to perform many tasks.
	PAD Element	One of three views that help you to work with Process Assembly Documents (**PADs**). Displays information about **MEPADElement** items and assists you in consuming elements into the PAD structure.
	PAD	One of three views that helps you work with PADs. The **PAD view** displays information about the **MEPAD** item and lists its child **MEPSD** items.
	PERT	You can open this chart view for a process displayed in a structure view or for activities displayed in the **Activities** view. When opened on a process, the Program Evaluation Review Technique (**PERT**) view shows the sequence of the first-level processes or operations that exist for the selected process. When opened on a top-level activity, the PERT chart displays the first-level activities. Each process or operation within the selected process is represented by a box in this view. Each box contains the name and ID of the process or operation. Use this view to arrange the boxes and create a sequential flow of processes, operations, or activities within the selected object.
	Plant	A type of primary structure view that displays the **plant**, work areas, work stations, lines, or any physical location where your manufacturing processes take place. This view is sometimes referred to as a work area view.
	Plant Bill of Process (BOP)	A type of primary structure view that displays resources necessary for a plant to assemble a product.
	Process Gantt	Displays processes and operations and the relations between them in a bar chart that illustrates the work breakdown structure of a project using a time line, from the start and finish times of the operations or processes and summary elements (operations or higher level

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View Icon	Name	Description
		processes). The Gantt view also shows the dependency (sequence) of relationships between the elements.
NA	**Product Manual**	Displays work instructions created and edited using a **Product Manual** role.
	Product	Displays the **product** that you want to manufacture in a hierarchical tree structure. If you open a product, the structure view contains the product hierarchy being manufactured. You can allocate any consumed parts and workpieces or subsets of workpieces to an operation's setup.
	Product Bill of Process (BOP)	A type of primary structure view that displays processes and operations necessary to assemble a product. A **product BOP** is usually linked to a plant BOP.
	Product View Search	Helps you **search for all product views** associated with a particular part so that you can update them.
	PSD	One of three views that helps you work with process assembly documents. The **PSD** view displays information about the **MEPSD item** and lists its child **MEPADElement** items.
NA	**Report**	Supports the creation of reports for all three types of structures: products, processes (including their operations and activities), and plants. The generated report is presented through a browser window. You can create customized style sheets or use other formatting tools to customize both the data content and the report format.
	Schedule Manager	Helps you to perform **4D planning** within Manufacturing Process Planner. 4D planning adds a time component to process planning. It is used in very large structures to visualize what parts have already been assembled on a specific date in a specific part of the structure.
	Standard Text	Enables you to create and manage **standard text elements** such as text, data collection definitions, and symbols that are compiled to create textual work instructions. The **Standard Text** view is generally used by the standard text librarian to manage the elements that the work instruction author chooses to create work instructions. Creating work instructions using standard text promotes standardization and consistency of work instructions throughout the organization. You can create the elements once, and then reuse them many times.
	Standard Text Library	Helps you to you use to create standard textual work instructions. A standard text library is a structure comprised of standard text folders and standard text elements nested under the folders.
	Structure	When you open the application, there are three empty structure views entitled **Product**, **Process**, and **Plant**. These views are placeholders for structures that you open. When you open a structure, it opens in the associated structure view and Teamcenter displays the information as a tree structure. You can open multiple structures at once, including

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View Icon	Name	Description
		multiple products, processes, or plants. Each of these structures is displayed in a different view. You can configure these structures using revision rules, variant conditions, and effectivity dates. • If you open a process, the structure view shows the process hierarchy in the sequence it uses for manufacturing the product. The process structure contains subprocesses and operations. You can view the workflow from one process to the next, as well as see parallel processes. You can also see alternate processes for creating the target product and allocate work area items, tooling, and workpieces to a specific process. • If you open a plant, the structure view displays your factory environment hierarchy as a tree structure. The root level identifies the high-level plant structure. Each layer beneath the root level breaks down the work areas within the plant until the lowest level in the structure represents individual work areas where specific operations are performed. Structure views are primary views for which you can open a variety of secondary views that provide detail information about the selected line. Although product, process, and plant are the most common types of structures that open in a primary view, there are additional types of structures that open in primary views, including an **Intermediate Data Capture** view, a **Requirements** view (when working in Systems Engineering), and a **Standard Text** view.
	Structure Search	Helps you perform a multitude of **advanced searches** on view structures using various properties of the structure's lines. The search is not limited to the loaded lines of the structure and can search an entire structure without you having to load it.
	Study	Provides an environment where you can scope data to perform trial **study** activities. You can use the **Study** view to send structures to Process Simulate or to create and manage tool design packages.
	Textual Work Instructions	Helps you to author work instructions by choosing from a library of **standard text** elements. Using this view, you can quickly create or edit textual work instructions for manufacturing processes or operations.
	TiCon Search	Allows you to access time data and assign data to activities from TiCon, an external time management system, using a web service. You can search for time elements in **TiCon**, create new activities, or overwrite existing activities with the timing data of time elements, and update activities assigned to time elements that were changed in TiCon.
	Time	Stores and manages individual **times** for each activity, operation, or process in a process structure. This view provides information specific

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View Icon	Name	Description
		to the process or operation so that its appearance varies depending on which process or operation you select.
	Variants	Allows you to display and edit variant options, option defaults, and rule checks currently defined for the product selected in the structure pane.
	Viewer	Displays the content of a dataset that is attached to an item revision with a **Rendering** relationship, where possible. For example, if you select a text dataset, the viewer displays a text editor with the content of that text dataset. If you select a dataset containing a JT file, the viewer displays the JT.
	Workarea	A type of primary structure view used to display a plant, work area, work station, or any physical location where your manufacturing processes take place. This is sometimes referred to as the plant view.
	Work Instruction	If your administrator configured the publishing feature for manufacturing documentation, you may see the **Work Instruction view**. The name of this view is configurable. Use it to create published pages containing manufacturing data. You can organize collections of publishing pages into portfolios, which you can view, publish to a Web server or PDF, or print in My Teamcenter.

Note:

The **PS_assume_legacy_transform_units** preference determines how Teamcenter interprets the units of measure for legacy transform data. Teamcenter and NX currently use meters for transform units of measure; legacy measurements were in inches or millimeters. This preference affects all data using legacy transforms that have no database-resident indication of the unit measurement stored with them. The default setting is **Unknown**. If the preference is left in the default setting, you may see discrepancies between the model and display units when you view collaboration context structures in Manufacturing Process Planner.

Manufacturing Process Planner menu commands

Menu command	Purpose
File→New→Process	Creates a new **process** under the selected line in the structure pane or as a new root process.
File→New→Process Area	Creates a new **process area** under the selected plant bill of process (BOP).
File→New→Operation	Inserts a new **operation** under the selected line in the process structure.
File→New→Activity	Creates an **activity** under the selected item in the process structure.

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Menu command	Purpose
File→New→Workarea	Adds a work area to the **plant structure**.
File→New→Occurrence Group	Creates a holder for a collection of occurrences and absolute occurrences in the BOM. An occurrence group typically represents an assembly.
File→New→Study	Creates a **study** object in which you can collect different kinds of data in one object.
File→New→Partition	Creates a new partition within the selected generic BOP or product BOP.
File→New→Generic BOP	Creates a new generic bill of process (**BOP**).
File→New→Product BOP	Creates a new product bill of process (**BOP**).
File→New→Plant BOP	Creates a new plant bill of process (**BOP**).
File→New→From Template→Process From Template	Creates (**clones**) a new process from an existing one.
File→New→From Template→Operation From Template	Creates (**clones**) a new operation from an existing one.
File→New→From Template→Workarea From Template	Creates a new work area from an existing one.
File→New→From Template→Item From Template	Creates a new item from an existing one.
File→New→From Template→Activity From Template	Creates a new activity from an existing one. This command is available only if you have an activity selected in the **Activities** view or in the **Activities** section of the **Time** view.
File→New→Standard Text→Standard Text Library	Creates a standard **text** library that you can use to manage text and symbol building blocks to create textual work instructions. A standard text library is a structure comprised of standard text folders and standard text elements nested under the folders.
File→New→Standard Text→Standard Text Folder	Creates a standard **text** folder that helps you manage the structure of a standard text library.
File→New→Standard Text→Standard Text Element	Creates a standard **text** element that is one of the building blocks used to create textual work instructions. Standard text elements are stored in a standard text library.
File→New→Item	Creates a new item under the selected item in the **product structure** or as a new root product.
File→New→Part	Creates a new part.

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Menu command	Purpose
	Note: If 4th Generation Product Master is installed with Teamcenter on a 64-bit Linux server, you can only create legacy part objects (**File→New→Legacy Part**).
File→New→Design	Creates a new design.
File→New→Form	Attaches a form to an object in the structure context. This menu command is available only if the attachments pane is open.
File→New→Folder	Attaches a folder to an object in the structure context. This menu command is available only if the attachments pane is open.
File→New→Dataset	Attaches a dataset to an object in the structure.
File→New→BOM View Revision	Creates a new BOM view revision for the selected line.
File→New→Snapshot	Creates a snapshot of the selected structure.
File→New→Item Element	Creates objects to represent design or manufacturing features that are not defined as part of the physical structure in the BOM. Features are implemented as item elements, sometimes called general design elements (GDEs).
File→New→Connection→ Non-Revisable	Creates a new nonrevisable **Tc Link** connection (for example, connection or datum point connection).
File→New→Connection→ Revisable	Creates a new revisable **Tc Link** connection (for example, connection or datum point connection).
File→New→Manufacturing Feature	Creates a new weld point **feature** in a product structure.
File→New→Collaboration Context	Creates an empty collaboration context.
File→New→Structure Context	Creates an empty structure context.
File→New→Configuration Context	Creates an empty configuration context.
File→New→Workflow Process	Creates a new workflow process with attachments, an associated process template and the ability to assign tasks to specific users.
File→New→URL	Attaches a URL to an object in the structure context. This menu command is available only if the attachments pane is open.

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Menu command	Purpose
File→New→Envelope	Allows you to attach an envelope to an object in the structure context. This menu command is available only if the attachments pane is open.
File→New→Custom Note	Attaches a custom note to capture issues, action, questions, or other ad hoc types of information to the selected line.
File→Collaboration Context→Save as New Collaboration Context	Saves the selected structure context as a new collaboration context. You can assign a name and description for the new collaboration context.
File→Collaboration Context→Save as New Structure Context	Saves the currently selected structure as a new structure context. The original structure view is replaced with the new structure context view. In the **Collaboration Context Tree** view, the original structure is removed and the new structure context is displayed.
File→Collaboration Context→Save Configuration	Saves the **configuration** of the currently selected structure.
File→Collaboration Context→Save as New Configuration Context	Saves the current configuration of the structure pane to a new configuration context and adds it to the structure context. This menu command is available only if a structure context is opened.
File→Collaboration Context→Apply Configuration Context	Applies the configuration of the selected **configuration context** to the currently opened structure.
File→Collaboration Context→Restore Configuration	Resets a structure view's configuration back to its previously saved configuration context. This menu command is available only if a structure context is opened.
File→Collaboration Context→Remove Structure Context from CC Object	Removes the selected structure context from a collaboration context object in which it currently resides. This command is available only when working in the **Collaboration Context Tree** view.
File→Collaboration Context→Move Structure Context into CC Object	Moves the selected structure context into a loaded collaboration context. This command is available only when working in the **Collaboration Context Tree** view.
File→Save As→Item(Revision)	Creates a new item revision of the selected line.
File→Save As→BOM View Revision	Creates a new BOM view revision of the selected item.
File→Save As→Replace Assembly In Context	Creates a new MBOM substructure (kit) from an existing one, while preserving the alignment of items within the kit.
File→Open	Opens the selected object.
File→Open With	Allows you to select with which tool an object is opened.

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Menu command	Purpose
File→Open In NX	Sends PLM XML data representing the geometry of the selected assembly to NX.
File→Open In Lifecycle Visualization	Opens the selected object in Teamcenter lifecycle visualization.
File→Revise	Revises the selected item.
File→Open By Name	**Open** a product, process, work area, collaboration context, or structure context by name or ID.
File→Most Recently Used Structures	Displays a list of structures that you recently closed. Use this as a way to quickly open desired structures.
File→Print	Views, prints, or saves information about the currently selected structure.
File→Print...	Views, prints or saves properties, textual information, graphics or information associated with the selected item.
File→Close	Closes the current application, in this case, Manufacturing Process Planner.
File→Unload All	Removes all structures from the collaboration pane and structure panes.
File→Exit	Ends your session.
Edit→Cut (Ctrl+X)	Marks the selected lines for removal and copies their contents to the clipboard. Cut lines are only removed once pasted elsewhere in the product structure.
Edit→Copy (Ctrl+C)	Copies the selected lines to the clipboard.
Edit→Paste (Ctrl+V)	Pastes item revisions from the clipboard as components of the selected lines.
Edit→Paste Duplicate	**Pastes** (clones) a process, operation, or partition from a generic BOP to a product BOP or vice versa.
Edit→Paste Substitute	Pastes item revisions from the clipboard as substitutes of the selected (assembly) lines.
Edit→Paste Special	Pastes components on the clipboard to the selected assembly (line). You can use the **Paste Special** command to specify the number of occurrences, quantity per occurrence, and the find number, as well as the occurrence type.
Edit→Replace	Replaces the selected line with the item revision or item element on the clipboard.

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Menu command	Purpose
Edit→Replace...	Opens a dialog box where you can type the item identifier of the component to replace the selected line.
Edit→Split Occurrence	**Splits** a line that represents several occurrences into two branches. The new branch and the original (changed) branch initially have the same notes, variant conditions, and other data, but you can subsequently modify them independently.
Edit→Insert Level	Creates an item and **inserts** it in the current structure as a new level below the selected line. The number of relative occurrences of the children is preserved.
Edit→Delete	Deletes a single item or an item and all its children. Optionally, you can also remove any associated referenced objects. This command permanently removes any selected item from the structure and the database.
Edit→Remove	Removes the selected lines from the structure. The lines removed by this method are not placed on the clipboard.
Edit→Notes	Views and edits all occurrence notes for the selected line.
Edit→Properties	Views and edits all properties of the selected line.
Edit→Purge	Permanently removes old versions of a dataset from the database. You can select whether to purge all old versions or specific versions of a dataset.
Edit→Latest	Displays the latest versions of all datasets in a selected folder. The **Latest** menu command updates all version-0 datasets to reference the latest saved version in the database. This feature is useful in a network environment when multiple users are working on the same dataset.
Edit→Change Ownership	Changes ownership of one or more objects. Using the **Explore Selected Components** option, you can select component objects and attachments, such as datasets, forms, and part files for ownership change.
Edit→User Setting	Changes your group, role or volume assignments, also your application logging and journaling options.
Edit→Options	Changes user interface settings that affect all applications.
Edit→Activity Assignments	Adds resources to a selected activity.
Edit→Assign Resource	Assigns resources to a selected process or operation.
Edit→Variant Condition	Creates a variant condition on the selected line.
Edit→Toggle Precise/Imprecise	Changes the precision of the selected assembly (line).

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Menu command	Purpose
Edit→Suppress/Unsuppress Line	Hide or reveal a line in a structure. When suppressed, a line is not included in a PLM XML export of the structure.
View→Refresh Window	Reads information from the database and updates the information displayed in the application.
View→Refresh Current Structure	Updates information in the currently open and active structure. If you add datasets to an object in a different application (for example, My Teamcenter), use this menu command to update the **Attachments** view in Manufacturing Process Planner.
View→Show Connected Lines	Shows or hides all lines that are connected by the selected connection.
View→Open Collaboration Context Tree	Shows or hides the **Collaboration Context Tree** view.
View→Access	Views, changes, and/or applies access permissions for a selected object.
View→Named References	Views, opens, imports, or exports the named references of a selected dataset. You can use the function buttons in the dialog box to cut or copy a selected reference to the clipboard and paste references from the clipboard.
View→Collapse Below	Collapses the complete substructure below the selected lines (hide all child lines).
View→Pack/Unpack→Pack	Packs the selected lines so that all lines with the same item revision and find number are displayed as a single line. The actual quantity of lines is appended to the node.
View→Pack/Unpack→Pack All	Packs all packable lines in the displayed structure.
View→Pack/Unpack→Unpack	Unpacks the selected packed lines so that they are displayed as separate lines, one for each occurrence.
View→Pack/Unpack→Unpack All	Unpacks all lines in the displayed structure.
View→Expand Options→Expand	Expands the substructure immediately below the selected lines.
View→Expand Options→Expand Below	Expands the complete substructure below the selected lines.
View→Expand Options→Expand Below...	Expands the substructure below the selected lines to a user-selected level. You can also collapse an expanded substructure when you choose this command (hide certain child lines).

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Menu command	Purpose
View→Expand Options→Expand to Type	**Expands** the substructure below the selected lines to a user-selected type.
View→Cross Probing Mode	Follows the change effect of trace links from a selected object to its defining and complying objects.
Tools→Check-In/Out→ Check-Out	Checks a selected component out of the database.
Tools→Check-In/Out→Check-In	Checks a selected component into the database.
Tools→Check-In/Out→Cancel Check-Out	Reverts the checkout procedure.
Tools→Check-In/Out→Transfer Check-Out	Transfers a selected, checked-out component to another user.
Tools→Check-In/Out→ Notification List	Views or edits the list of users who are informed if the selected component is checked in or checked out.
Tools→Check-In/Out→ Check-Out History	Views the history of check out actions for the selected component.
Tools→Check-In/Out→ Manufacturing Check-Out	**Checks out** process data (operations, processes, activities, datasets, forms, work areas, and studies) from Teamcenter for modification.
Tools→Check-In/Out→ Manufacturing Check-In	Checks data that has been modified back into the database.
Tools→ID Display Rule→View/Set Current	Views the ID display rule currently applied to the selected structure or set a different ID display rule.
Tools→ID Display Rule→Modify Current	Modifies the ID display rule currently applied to the selected structure.
Tools→ID Display Rule→Create/Edit	Creates a new ID display rule or modify an existing ID rule.
Tools→Project→Assign	Assigns the selected structure to a predefined project.
Tools→Project→Remove	Removes the selected structure from a project to which it is assigned.
Tools→License→Attach	Attaches a license to the selected workspace object.
Tools→License→Detach	Detaches a license from the selected workspace object.
Tools→Revision Rule→View/Set Current	Views or sets the revision rule for the currently displayed structure.
Tools→Revision Rule→Set Date/ Unit/End Item	Sets the date, unit number, or end item to configure the structure, if the current rule allows.

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Menu command	Purpose
Tools→Revision Rule→Set Override folder	Sets an override folder to override item revisions that would otherwise be selected by other criteria.
Tools→Revision Rule→Modify Current	Modifies the current revision rule and apply the modified rule to the current structure. You can save the change if you have write access to the original rule.
Tools→Revision Rule→Create/Edit	Creates or edits a revision rule.
Tools→Effectivity→Occurrence Effectivity	Views, edits, creates, or copies occurrence date effectivity data for the occurrence of the selected line, or for multiple lines. You must have the appropriate permissions to create or edit effectivity data.
Tools→Effectivity→Revision Effectivity	Allows you to view, edit, create, or copy effectivity data for the item revision of the selected line. You must have the appropriate permissions to create or edit effectivity data.
Tools→Effectivity→Effectivity Mapping	Allows you to view, edit, create, or copy effectivity mapping for an end item. Effectivity mappings are needed if you implement nested effectivity.
Tools→Variants→Configure Variants	Configures or edits a variant structure for the selected top-level module.
Tools→Variants→Only Configure Root	When **on**, displays options only for the top-level module, regardless of the line selected. Set to **off** to configure the structure for a lower level module.
Tools→Variants→Search	Searches for an existing variant item.
Tools→Variants→Count Modules	Counts the modules defined for the selected variant structure.
Tools→Variants→Unlink Variant Item	Unlinks a variant item from the generic module item to make changes.
Tools→Variants→Update Variant Items	Manually updates variant items. If you make structural changes to a generic item and create a new item revision, Teamcenter does not automatically propagate such changes to each associated variant item. You must make such changes manually.

Note:

The **Incremental Change** menu commands appear only if you set the **Incremental_Change_Management** preference to **true**.

Tools→Incremental Change→Add	Retrospectively creates an add change and attaches it to the active incremental change.

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Menu command	Purpose
Tools→Incremental Change→Remove	Retrospectively creates a remove change and attaches it to the active incremental change.
Tools→Incremental Change→Create on Object	Establishes a create change to the attachment.
Tools→Incremental Change→Delete on Object	Establishes a delete change to the attachment.
Tools→Incremental Change→Edit an Attachment	Edits an attachment (dataset or form) and track the changes with the active incremental change.
Tools→Incremental Change→Remove Changes	Removes (undoes) changes on the active incremental change.
Tools→Incremental Change→Incremental Change Baseline	Revises the parent assembly to create an incremental change baseline.
Tools→Incremental Change→Display Icons	Customizes how incremental change icons are displayed and the contexts in which you want to see icons.
Tools→Incremental Change→Split	Splits some of the changes from the active incremental change into another existing incremental change.
Tools→Accountability Check→Check	Allows you to compare two structures and view the differences (that is, how one structure uses objects compared to the other structure). This submenu is active when two structure panes are visible.
Tools→Accountability Check→Mark Broken Links	Highlights all **broken links** under a process or operation in a background color of your choice.
Tools→Accountability Check→Mark in Base View	When reporting accountability check results in occurrence groups, highlights a selected occurrence group **line** in the base view.
Tools→Accountability Check→Clear Accountability Check Display	Removes color highlights created by the accountability check.
Tools→Accountability Check→Propagation Settings	Allows you to modify the settings governing the propagation of properties or relations in a partial match after running an accountability check.
Tools→Accountability Check→Propagate	Passes along changes from the source structure to the target structure in a partial match.
Tools→Accountability Check→Select Unused	Runs the accountability check and shows all occurrences in the source pane that do not match an occurrence in the target pane in an occurrence group.

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Menu command	Purpose
Tools→Accountability Check→Select Completely Used	Runs the accountability check and shows all occurrences in the source pane that match more than one occurrence in the target pane in an occurrence group.
Tools→Accountability Check→Select Over-used	Runs the accountability check and shows all occurrences in the source pane that match a corresponding occurrence in the target pane in an occurrence group.
Tools→Accountability Check→Partial Compare Results	Displays all properties that were included in the partial compare criteria that you set in the **Partial Match Options** pane when running an accountability check.
Tools→Repair Broken Links	Identifies **broken links** and searches for possible repair candidates.
Tools→Multi-Site Collaboration	Controls the data shared with participating sites in a distributed network. Multi-Site Collaboration allows you to publish and unpublish objects.
Tools→Graphical BOM Compare	Compares two revisions of a part or assembly and examine the difference in the **Viewer** pane.
Tools→Resequence Structure	Reorders the process to reflect a change in the process step numbers.
Tools→Update Flows	Updates PERT flows according to the find number of the selected component's children, or in the case of multiple selections, of the selected components.
Tools→Import→Objects	Imports objects into the database using various import formats.
Tools→Import→From PLMXML	Imports a PLM XML file into the database.
Tools→Import→Remote	Imports a structure from a remote site in a Multi-Site Collaboration environment. Search for the remote object in My Teamcenter.
Tools→Export→Objects to Excel	Exports the selected structure lines to an Excel spreadsheet.
Tools→Export→Objects to Word	Exports the selected structure lines to a Microsoft Word document.
Tools→Export→Objects	Exports objects using a Teamcenter or STEP format. You can also use this command to export an application interface object.
Tools→Export→To PLMXML	Exports the selected structure and its attachments in PLM XML format to a selected export directory. You must choose the appropriate transfer mode for the destination system.

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Menu command	Purpose
Tools→Export→To Remote Site Via Global Services	Exports local data to a remote site using Global Services.
Tools→Import Manufacturing Features	**Imports** a list of weld points from an external CAD or legacy system.
Tools→Auto Feature Part Connector	Enables you to assign large quantities of **features** (weld points and datums) to parts automatically, eliminating the need to assign each feature manually.
Tools→Send Data To	Sends selected data to an external application using an application interface object. Your Teamcenter administrator uses the Business Modeler IDE application to create new application interface types associated with a specific application. Each of these types are available in the **Send Data To** dialog box.
Tools→Send Additional Data To	Sends additional data to a running session of the application launched using the **Send Data To** menu command.
Tools→Populate Allocated Time	Updates the **allocated time** of all the descendants of the selected process or operation.
Tools→TiCon→Update	Update the TiCon time elements contained in your structure with more recent information from the TiCon time system.
Tools→TiCon→Logout	Logs out of the TiCon time system.
Tools→Search Study	Finds all studies that contain the selected object.
Tools→Open with Process Simulate	Loads data into the current **Process Simulate** session.
Tools→Open with Process Simulate in Line Simulation Mode	Loads products, resources, operations, relations between objects, relevant XML and graphic JT files into Process Simulate opened in Line Simulation Mode.
Tools→Merge Scenes	Copies scene data that is assigned to processes in Process Simulate to another process or merges data (except snap shots) from several scenes.
Tools→View/Set Closure Rule for Expansion	Allows you to view the available **closure rules** and select a rule to limit structure expansions.
Tools→Schedule→4D Analysis	Allows you to perform a search on your structure that includes a **scheduling parameter**.
Tools→Schedule→Detail Task	**Automatically creates** a process structure from an existing schedule.
Tools→Structure Search	**Searches a structure** using various properties of the structure's lines. The search is not limited to the loaded lines

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Menu command	Purpose
	of the structure and can search an entire structure without loading it. It then expands the structure to the found lines.
Tools→Alignment Check	Identifies discrepancies and resynchronizes aligned occurrences between **EBOM and MBOM**.
Tools→Define Configuring Structures	Enables you to specify which open structure configures a process structure.
Tools→Baseline	Copies work-in-progress (WIP) **baseline** item revisions. During the development of a product design, you may need to share such copies of your working design with other users at the same or different sites. You can also save your design for future reference.
Tools→List Substitutes	Adds or removes substitute components or set the preferred substitute.
Tools→Manage Global Alternates	Shows a list of the global alternates available for the selected line. The preferred global alternate is indicated by an asterisk (*).
Tools→Intermediate Data Capture	Saves the current structure configuration to a PLM XML format that you can browse and compare against existing structures.
Tools→Validate Occurrences	Allows you to validate that a selected line and (optionally) any child lines meet the business rules defined by your administrator for structure edits.
Tools→MES→Release to MES	Creates a work package to send to an external manufacturing execution system (MES).
Tools→MES→Set Order ID	Sets an order ID to differentiate an order from a master when sending an execution package to a manufacturing execution system.
Tools→MES→Apply Order Effectivity	Configures an execution package to hold only the order-pertinent data for transfer to an MES.
Tools→MES→Load Last Released Execution Plan	Retrieves the execution plan that you most recently released to the manufacturing execution system. This allows you to compare the current state of an execution plan with the retrieved one.
Tools→MES→Validate for MES	By default, checks that all data has a released status. You can add custom validation checks to suit your business needs.
Tools→MES→Launch MES Web Page	Opens the Teamcenter Web Browser that displays MES information.

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Menu command	Purpose
Tools→Generate 3D PDF Report	Creates an interactive 3D documentation report that derives directly from process data stored in the database. The report is in PDF format and contains process information and 3D data.
Tools→Find Product Views	Finds all **product views** associated with the selected line so that you can update them.
Tools→Link/Associate→Link Structures	Links an **EBOM to an MBOM**.
Tools→Link/Associate→Link To Manufacturing Process	Enables you to **share** an operation across top levels to two process plans.
Tools→Link/Associate→Link As Required	Links product items that are required to carry out an operation. This menu command is available only on operations. The **Link as Required** relationship does not add an occurrence below the operation, unlike when you assign a product item as **MEConsumed**.
Tools→Link/Associate→ Associate Product As Target	Associates a product to a process so that when opening one, the other opens automatically. You can turn this behavior off using the **MSE_load_related_product_process_plant** preference.
Tools→Link/Associate→ Associate Workarea	Associates a work area to a process so that when opening one, the other opens automatically. You can turn this behavior off using the **MSE_load_related_product_process_plant** preference.
Tools→Link/Associate→ Link Plant BOP	**Links** a product BOP to a plant BOP.
Tools→Assembly Tree→Create/ Update Assembly Tree	Automatically creates or updates an **assembly tree** from a process plan. When updating, you cannot change the options you set at creation.
Tools→Assembly Tree→Perform Local Update	Changes the in-process assembly on which the command is invoked. If necessary, it also **updates** the occurrence pointing to this assembly tree in the process structure.
Tools→Assembly Tree→Delete Assembly Tree	Deletes an in-process assembly tree.
Tools→Assembly Tree→Create/ Update Filtered Assembly Tree	Allows you to make a **proximity** search of an IPA tree and store the search results.
Tools→Assembly Tree→Delete Filtered Assembly Tree	Deletes a specific filtered in-process assembly tree.

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Menu command	Purpose
Tools→Assembly Tree→Delete All Filtered Assembly Tree	Deletes all filtered in-process assembly trees.
Tools→Structure Alignment→Completeness Check→Verify Part Structure	Highlights all part occurrences that are aligned with positioned designs in green. Part occurrences that do not have links to positioned designs are highlighted in red.
Tools→Structure Alignment→Completeness Check→Clear Display	Removes highlighting after performing a completeness check.
Tools→Structure Alignment→Publish Data	Creates a snapshot of transformation and shape information on a source design occurrence and publish it to the destination part occurrence. Note: If you receive the error "Could not convert old format transform to PLM XML format," set the preference **PS_assume_legacy_transform_units** to the approprate unit value (**Inches** or **Millimeters**).
Tools→Structure Alignment→Create PublishLink	Aligns part and design by creating a publish link between the selected occurrences
Tools→Structure Alignment→Delete PublishLink for Source	Removes the link between occurrences aligned between part and design.
Tools→Structure Alignment→Add Target to PublishLink	Adds a new target part occurrence to a publish link.
Tools→Structure Alignment→Remove Target from PublishLink	Removes a target part occurrence from the selected publish link. Removing the target of the publish link does not delete the part occurrence or the publish link.
Tools→Structure Alignment→Find PublishLink Source	Identifies all publish links for which the selected occurrence is a destination. It highlights the linked occurrences in the companion pane. If it does not find any publish links, it displays an error message.
Tools→Structure Alignment→Find PublishLink Targets	Identifies all publish links for which the selected occurrence is a source. It highlights the linked occurrences in the companion pane. If it does not find any publish links, it displays an error message.
Tools→Structure Alignment→Open PublishLink Source Structure	Opens source structure in the structure pane.

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Menu command	Purpose
Tools→Structure Alignment→Find Lines With Same Logical Identity	Highlights all lines with the same logical identity as the selected line, that is, lines that are associated with it by a publish link.
Tools→Logical Assignment→Assign Parts by Logical Designator	Creates a logical assignment on the currently selected process or operation. This is a placeholder for a part that you can later resolve to a specific instance of the part.
Tools→Logical Assignment→Resolve Logical Part Assignments	Assigns parts to products based on the usage address and the **logical** position.
Advanced→Connect	Connects two selected lines with a revisable or nonrevisable connection.
Advanced→Disconnect	Disconnects the currently selected line with a revisable or nonrevisable connection to another line.
Advanced→Generate Portfolio	Creates a portfolio to hold manufacturing documentation.
Advanced→Publish Batch	Updates Teamcenter work instructions and portfolios in **batch mode**, processing multiple documents at once.
Advanced→Address List	Displays lists of users who participate in workflow processes.
Advanced→Connect MFG to Parts	Teamcenter function that connects the **feature** to all selected parts
Advanced→Configure Structures	Opens the Configure **Structure** Contexts dialog with options to configure the selected structure's revision rule, effectivity and other configuration items.
Advanced→Organization	Displays your Teamcenter organizational structure including the groups in your enterprise, the roles in each group, and the users assigned to each role. *Organization Management Using Groups, Roles, and Users* explains how a user with **dba** privileges creates and manages the information displayed in the organization chart.

Note:

The **Graphics** menu appears only if you open the **Graphics** view.

Graphics→Selection→Select All	Selects all the objects displayed in the viewer.
Graphics→Selection→Select None	Clears any objects currently selected in the viewer.
Graphics→Selection→Reverse Selection	Selects all objects not selected in the viewer, while simultaneously unselecting any objects currently selected in the viewer.

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Menu command	Purpose
Graphics→Selection→Define Selection Filter	Sets the object and/or occurrence types you want to hide from display in the **Graphics** view.
Graphics→Selection→Apply Selection Filter	Filters the objects and occurrence types that you specified in the **Visualization Filter** dialog box from view in the **Graphics** view.
Graphics→Visibility→View Selected	Blanks and unblanks objects loaded in the viewer. Note: The term *loaded* refers to an object whose JT file has been loaded in the viewer. A loaded object may or may not be visible, depending on whether it is blanked or unblanked.
Graphics→Visibility→Blank Selected	Makes any objects selected in the viewer invisible.
Graphics→Visibility→Blank All	Makes all objects in the viewer invisible.
Graphics→Visibility→Unblank All	Makes all objects loaded in the viewer visible.
Graphics→Visibility→Reverse Blank All	Makes any currently visible objects invisible, while simultaneously making visible any loaded objects that are currently invisible.
Graphics→Visibility→Unload Selected	Unloads any objects selected in the viewer.
Graphics→Visibility→Define Visualization Filter	Allows you to select object types to permanently **hide from display** in the viewer.
Graphics→Visibility→Apply Visualization Filter	Turns on the visibility filter that you specified using the **Graphics→Visibility→Define Visualization Filter** menu command.
Graphics→Visibility→Blank All By Type	**Hides** objects in the viewer based on their types.
Graphics→Visibility→Display All By Type	**Displays** objects in the viewer based on their types.
Graphics→Edit Color/Translucency	Modifies the color, transparency, and shine of selected objects in the viewer. These settings only apply to the currently loaded objects. The next time the edited object is loaded, the settings revert to the default color and translucency.
Graphics→Insert	Allows you to insert JT, stereolithography (**.stl**) and VRML (**.wrl**) files as reference graphics.

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Menu command	Purpose
Graphics→Insert→Insert from File	Inserts a reference graphic from the operating system, using the **Open by Name** dialog box.
Graphics→Insert→Insert from Clipboard	Inserts a reference graphics object from the clipboard. Note: Only item revisions (not items) can be displayed as reference graphics.
Graphics→Views→View Control	Creates, edits, and displays standard views, using the **Rotate** and **Standard Views** dialog boxes.
Graphics→Draw Children	Displays the components of a subassembly. You can also access this command if you right-click in the BOM.
Graphics→Show Subcomponents	Breaks down solids in the corresponding monolithic JT files and make the subcomponents independently controllable. This function is available only for leaf and unpacked BOM line nodes.
Graphics→Hide Subcomponents	Removes all merged subcomponents and the one-level tree from the tree. You can load or unload the monolithic JT file related to this structure line node in the normal way.
Graphics→Export 3D File	Exports the current visible objects to a STEP or VRML file.
Graphics→Replace JT File	Replaces the JT file that represents an item revision. You can choose a replacement file from one of the JT files associated with the current structure line item.
Graphics→Clearance→ Preferences	Sets clearance analysis and preferences.
Graphics→Clearance→ Toggle Results Window	Shows clearance results in a separate window.
Graphics→Transformation→ Temporary Transformation	Repositions or scales objects in the viewer. These transformations are not saved in the database.
Graphics→Transformation→ Persistent Transformation	Repositions objects in the viewer window and saves the transformations in the database.
Graphics→Performance	Sets rendering, culling, and general performance preferences.
Graphics→Preferences	Sets clearance analysis and general viewer preferences.

The following menu commands are shown in the view menu of the primary structure views.

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Menu command	Purpose
Show Graphics	Opens the **Graphics** view that displays visualization data associated with the selected structure. The **Graphics** view remains associated with the primary view from which it is opened.
Show Information	Displays configuration information about the open structure.
View/Set Current Revision Rule	Views or sets the revision rule on the currently selected line.
Configure Variants	Views, sets, saves, and loads the variant option values for the selected line.
Set Date/Unit/End Item	Sets the date, unit number, or end item to configure the structure, if the current rule allows.
Find in Display	Searches for an object in the currently displayed structure.
Search by ID in context	Searches for absolute occurrences using the identifier assigned in the **ID In Context** column of the property table.
Show/Hide Occurrence Groups	Enables you to show or hide any related occurrence groups.
Apply Occurrence Type Filter	Adjusts the display to show only the objects that you select using the **Select Occurrence Type Filters** command. This gives you a more compact and tidy view of very large structures.
Select Occurrence Type Filters	Chooses which objects are visible in the structure. Select the object types that you want to see.
Define Configuring Structures	Enables you to specify which open structure configures a process structure.
Save as New Structure Context	Saves the selected structure as a new structure context.
Set In Context	Enables you to set the currently selected structure as the context for additional information set on child objects. For example, you can add an occurrence note to a child line in the structure that is only pertinent in the context of the currently selected structure line.
Unload	Unloads the current structure.
Show Unconfigured Variants	Shows lines that are hidden because they are configured out using variants and options.
Show Unconfigured Changes	Shows lines that are configured out because an incremental change associated has an effectivity on it and the lines are not currently effective.

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Menu command	Purpose
Show Unconfigured by Occurrence Effectivity	Shows lines that are configured out because they have an occurrence effectivity associated with them and the lines are not currently effective.
Show Unconfigured Assigned Occurrences	Shows lines that are configured out because they are assigned occurrences that are configured out for any reason in the original structure.

Manufacturing Process Planner buttons

Button	Purpose
	Triggers a soft abort to the current operation.
	Cuts the selected lines from the structure and places them on the clipboard.
	Copies the selected lines in the structure and places them on the clipboard.
	Pastes the components from the clipboard as children of the currently selected (assembly) line in the structure or into NX.
	Deletes the selected lines from the structure and does not place them on the clipboard.
	Adds a **custom note** to the structure. Custom notes are used to capture issues, actions, questions, or other ad-hoc types of information.
	Releases the selected execution plan to a manufacturing execution system.
	Sets an order ID for an execution plan that you want to send to a manufacturing execution system.
	Applies order effectivity to differentiate a master from an order when preparing an execution plan for release to a manufacturing execution system.
	Loads last execution plan that you released to a manufacturing execution system.
	Verifies that the selected data is valid for transfer to a manufacturing execution system.
	Opens the Teamcenter Web Browser to a link originating with a manufacturing execution system.
	Removes the selected lines from the structure completely and does *not* place them on the clipboard.
	Opens your **Home** folder as a view in Manufacturing Process Planner. Any objects you open in this view open in Manufacturing Process Planner and not My Teamcenter.

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Button	Purpose
	Opens your **Worklist** folder as a view in Manufacturing Process Planner. Any objects you open in this view open in Manufacturing Process Planner and not My Teamcenter.
	Initiates a trace of a selected object's downstream and upstream relationships across structures in different Teamcenter applications.
	Creates a new process under the selected line in the process structure view. If nothing is selected, this command creates a new root process.
	Inserts a new operation under the selected line in the process structure view.
	Creates a new item under the selected item in the process structure view. If no item is selected, this command creates a new root product.
	Adds a work area to the plant structure. You should only do this in the plant structure view.
	Creates a holder for a collection of occurrences and absolute occurrences in the BOM. An occurrence group typically represents an assembly.
	Reorders the process to reflect a change in the process step numbers.
	Unpacks the selected packed lines so that they are displayed as separate lines, one for each occurrence.
	Packs the selected lines so that all lines with the same item revision and find number are displayed as a single line. The actual quantity of lines appended to the node.
	Adds or edits the occurrence notes of the selected line.
	Opens the **Graphical Compare** dialog box, allows you to visually compare two revisions of the same structure.
	Opens the **Collaboration Context Tree** view that displays all the open structures. You can use this view to make structures visible in the structure pane or to unload structures.
	Opens the Classification Search Dialog that you can use to assign a specific resource to a selected line in your structure.
	Switches from one **manufacturing perspective** to another. If you save a custom perspective, it is also displayed in this list.
Quick Search	Searches for **commands, views, and perspectives** applicable to the selected object.
	Browses for and opens a specific structure by name or ID. Click the arrow beside this button to open a product, process, work area, collaboration context, structure context, or enterprise bill of process structure.

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Button	Purpose
	Shows a list of your most recently accessed structures. If you select an entry from the list, Teamcenter loads the structure into the structure pane. You can configure the number of entries shown in the MRU list by right-clicking the button and moving the slider to the desired number.
	Adds or removes substitute components or set the preferred substitute. This button is enabled if the selected line may have substitutes, otherwise it is disabled.
	Shows a list of the global alternates available for the selected line. The preferred global alternate is indicated by an asterisk (*).

The following toolbar buttons are available only if you enable **incremental change**.

	Creates a new incremental change object.
	Searches for a specific incremental change object.
	Displays a list of the most recently used incremental change objects.
	Displays information about the incremental change object.
	Turns off incremental change tracking.
	Sends an incremental change object to My Teamcenter.

The following buttons are found in most views:

	Associates the secondary view to the currently selected primary view or to the view that you select when you click the arrow beside this button.
	Locks the secondary view to the currently selected primary view. The secondary view then does not change its view association if you select a different primary view.
	Changes the association of the secondary view to the currently selected view, even if you have disabled the response to selection.

The following buttons are located in the **Collaboration Context Tree** view.

	In the **Collaboration Context Tree** view, makes the structure that you select visible and active in the structure view.
	In the **Collaboration Context Tree** view, unloads the open structures from all views. The empty views remain open.
	In the **Collaboration Context Tree** view, unloads all structures from all views. The empty views remain open.

The following buttons are located in the structure views.

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Button	Purpose
	In process structure views only, creates new process objects. You can create a new process , operation , compound operation , or execution step within the process view.
	Opens the **Graphics** view to display visualization data associated with the structure.
	Displays configuration information about the open structure.
	Shows lines that are hidden because they are configured out using variants and options.
	Shows lines that are hidden using the **Edit→Suppress/Unsuppress Line** menu command.
	Shows lines that are configured out because an incremental change associated has an effectivity on it and the lines are not currently effective.
	Shows lines that are configured out because they have an occurrence effectivity associated with them and the lines are not currently effective.
	In a process structure view, shows lines that are configured out because they are assigned occurrences that are configured out for any reason in the original structure.
	Shows or hides the occurrences that are specified in the **occurrence type** filter.
	Enables you to show or hide any related occurrence groups.
The following buttons are located in the **Accountability Check** view.	
	Displays configuration information about the source and target structures.
	Sorts the check results in an order you specify in the dialog box.
	Filters the results by category. Using the filter, you can choose to show all categories or only a selection.
The following buttons are located in the **Manufacturing Features** view.	
	Displays only the types of manufacturing features that you select from the list.
Process	Displays which manufacturing features are assigned to the specified process.
	Displays only assigned or only unassigned manufacturing features.
	Displays the symbol beside consumed manufacturing features.
The following buttons are located in the **Process Gantt** view.	
	Scales the chart up or down to accommodate the entire process flow.
	Scales the chart up to show the currently selected time element placed in the middle of chart and taking up most approximately two thirds of the chart.

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Button	Purpose
	Reduces the scale of the chart by a factor of two.
	Enlarges the scale of the chart by a factor of two.
	Copies the calculated duration to the allocated time field in the selected element.
	Unlocks the edit mode enabling you to changes activity duration times by dragging the time bar.
	Shows the calculated duration time. Teamcenter draws a bar across the top of each time element displaying the calculated duration path of the children of this time element.
	Displays the critical path.
	Displays the duration of the critical path.
	Deletes the flow between elements in the Gantt chart.
	Creates a flow between elements in the Gantt chart. The flow represents a chronological relationship between two elements.

The following buttons are located in the **PERT** view.

	Activates default select mode. You can make single/multiple selection by clicking or by using a rubber band selection, or relocate objects using drag-and-drop.
	Activates draw mode to create single or multiple flows continuously.
	If activated, shows information about assigned parts, resources, and features assigned to the object. If you hover with the mouse over the object, Teamcenter provides more information about the assigned objects.
	Reassigns the find number of all processes currently visible in the PERT chart according to the flow defined. You must define a start number and an increment.
	Removes flows from the PERT chart.
	Searches for a pattern within PERT node texts.
	Finds the next occurrence of the pattern.
	Enlarges PERT graphics.
	Makes PERT graphics smaller.
	Fits all the selected PERT boxes into the PERT chart window. If you do not make a selection, the command fits all boxes into the PERT chart window.
	Adjusts PERT graphics so that one pixel equals one point.
	Zooms into a selected area in the PERT graphics by using a rubber band selection.

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Button	Purpose
	Changes the layout of the PERT chart to one of the following: • Hierarchical—Top to bottom • Hierarchical—Right to left • Hierarchical—Left to right • Hierarchical—Bottom to top • Hierarchical—Incremental • Circular • Orthographic • Organic
	Aligns selected PERT nodes to the desired position. You can align to the following positions: • Left • Center • Right • Top • Middle • Bottom • Distribute horizontally • Distribute vertically
	Moves to the parent of the selected node and displays its children in the PERT chart.
	Displays the children of the selected node in the PERT chart.

The following buttons are located in the **Assignments** view.

	Searches for an object within the **Assignments** view whose name matches the specified string.

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Button	Purpose
	Clears the text in the search field.
	Assigns parts by logical designator.
	Resolves part assignments.
	Removes a line from the structure.
The following buttons are located in the **Line Balancing Chart** view.	
	Displays the line balancing chart in its original, as-designed size.
	Decreases the magnification and allows you to view a correspondingly larger area.
	Increases the magnification and allows you to view a correspondingly smaller area.
	Increases the width of the bars in the bar chart.
	Decreases the width of the bars in the bar chart.
The following buttons are located in the **Line Balancing Constraints** view.	
	Changes to select mode.
	Changes to constraint creation mode.
	Adds or edits information on a constraint.
	Deletes a selected constraint.
	Loads all selected operations to the view.
	Loads all the operations under the selected process, including all operations under all subprocesses.
	Specifies the number of predecessors to be loaded.
	Specifies the number of successors to be loaded.
	Displays the **Line Balancing Constraints** view in its original, as-designed size.
	Decreases the magnification and allows you to view a correspondingly larger area.
	Increases the magnification and allows you to view a correspondingly smaller area.
	Sets the view's zoom ratio to fit all the selected boxes into the view window. If you do not select anything, the command fits all boxes into the view window.
	Automatically organizes the layout of the nodes in the view.
	Turns the automatic layout capability on and off. When turned on, Teamcenter automatically arranges the nodes after each operation your perform in the view, such as adding new operations or adding or removing constraints.

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To format rich text, use the following buttons that are available in the **Drafting Symbols** tab and the **GDT Symbols** tab.

Symbol	Description
	Manually refreshes the editing box.
	Adds a frame around the selected characters.
	Bolds the selected text.
	Italicizes the selected text.
	Underlines the selected text.
	Sets the color of the selected text.
	Decreases the size of the selected text.
	Increases the size of the selected text.
	Subscripts the selected text.
	Superscripts the selected text.
	Aligns the selected text.
	Center aligns the selected text.
	Right aligns the selected text.
	Inserts the text you entered in the two boxes to the left of this button.
	Inserts a control frame around the selected characters.

Creating structures from templates

About cloning structures

When creating structures, it can be convenient to create a structure identical to another one. This may be because, over time, you may design standard products, processes, operations, and activities that act as templates that can be reused to manufacture typical products. Or, it may simply be the most convenient way to quickly generate another structure.

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You can clone structures in one of two ways:

- Use the **Paste Duplicate** command to quickly clone a structure from another structure that is visible or easily available in the user interface.

- Use the **File→New→From Template** menu commands to create a structure that is based on another structure that is not currently open. You also use this method to clone structures when you want to select configuration options for the cloning process.

You can clone a process, product, or plant structure. Your administrator specifies *cloning rules* that determine the actions taken when you clone a structure, as follows:

- **Clone**

  The new structure includes a copy of the object that is referenced by the source structure.

- **Reference**

  The new structure references the same object that is included in the source structure.

- **Ignore**

  The new structure does not include or reference the object.

- **Map**

  The system maps the template to a replacement structure. For example, this allows you to create a process structure from an existing process or from a process template. Optionally, this rule may be allowed by a second (default) action: **Reference** or **Ignore**.

You can use the cloning mechanism to create a new process structure that consumes the same parts as an existing structure. This action is based on in-context IDs.

> Note:
>
> Cloning is a core capability and is used in various functions, such as, create alternate, create from template, process synchronize, and isolated study. It is very recursive and database I/O intensive. To help reduce the number of database commits to the minimum needed, your Teamcenter administrator can create a preference named **ME_defer_save_in_clone** and set it to **true**.
>
> **IMPORTANT:** The value of this preference should be made **true** only after running cloning usecases in a test environment. This is required as cloning may fail in specific data conditions when the preference is set to **true**.

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Create a structure from a template

> Note:
>
> Ensure that the necessary **Product.Template**, **Process.Template**, and **Plant.Template** cloning preferences are defined. These preferences contain the rules that determine how the objects in the template are mapped to the objects in the new plant structure.

1. Select the line under which you want to add the cloned object.
2. Choose **File→New→From Template** and the type of structure that you want to create.
3. Click the **Choose Template** tab.
4. In the **Template ID** box, enter the ID of the structure that you want to use as a template and press Enter.

   Alternatively, you can select the structure that you want to clone in the structure view and click .

   You can also browse to the template you want to clone using Resource Manager, either by name or by searching for a template in the Classification Search Dialog if it is classified.

   If you use the enterprise BOP feature, you may see generic and product BOPs in the list of available templates. Do not use this method of cloning these structures as it will not invoke the required cloning rules.

   Teamcenter assigns a new ID in the **Process ID** box.
5. (Optional) Rename the new structure in the **Name** box.
6. Click the **Configuration** tab.
7. Select a revision rule from the **Revision Rule** list.
8. Select an effectivity by clicking **Set Date/Unit/End Item**.
9. Do one of the following:

   - Click **Process all variants** to traverse the structure considering all unconfigured variants.
   - Click **Process configured** to only process the configured structure. You must specify a variant rule when you choose this option. The structure is configured using the variant rule and unconfigured variants are not considered during cloning.
10. From the **Cloning Rule** list, select a rule.

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11. If you are creating a process from a template,

    - Choose the product to which you want to map the consumed products by selecting it in the **Product Reference Structure** list.

    - Choose the work area to which you want to map the consumed work areas by selecting it in the **Plant Reference Structure** list.

    This allows you to clone a process and map the consumed objects to different structures from the one chosen in the prototype.

12. (Optional) Select **Carry over future incremental changes**.

    If you select this option, you must set the date in the cloning dialog. If you do not select this option, cloning copies the configured structure only.

13. (Optional) Select **Show as new root** to create the cloned structure as a top-level object.

14. Click **OK** or **Apply** to create the new structure from the template you choose.

    At the end of any cloning operation, if new incremental changes are created as part of cloning process, Teamcenter displays a dialog box listing the new incremental changes.

Clone using Paste Duplicate

You can quickly clone structures using the **Paste Duplicate** command. This command clones selected structures as specified in preference-based cloning rules.

1. Select any structure line and click **Copy** .

   The selected line can have children.

2. Right-click the parent line under which you want to place the cloned structured and choose **Paste Duplicate**.

Teamcenter pastes a clone of the copied structure line and all its children to the selected line. It creates a new occurrence of any consumed objects.

Consuming products in cloned processes

Set a cloned process structure to consume products from a cloned product structure

A process structure consumes products from a product structure. By default, a cloned process structure consumes products from the same product structure as the original process structure. If you want a cloned process structure to consume products from a cloned product structure, you must set up this type of cloning when you create the cloned process structure.

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In this example, the original process structure is called **Process Structure 1**. The original product structure is called **Product Structure 1** and the clone of **Product Structure 1** is called **Product Structure 2**.

1. Make sure that the in-context IDs in **Product Structure 2** are the same as those in **Product Structure 1**. This is the case when you clone **Product Structure 2** from **Product Structure 1**.

2. Make sure **Product Structure 2** is loaded when you clone the process structure.

3. In the **New Process from Template** dialog box:

    a. Select **Process Structure 1** as the template.

    b. Click the **Configuration** tab.

    c. Select **Product Structure 2** from the **Product Reference Structure** list.

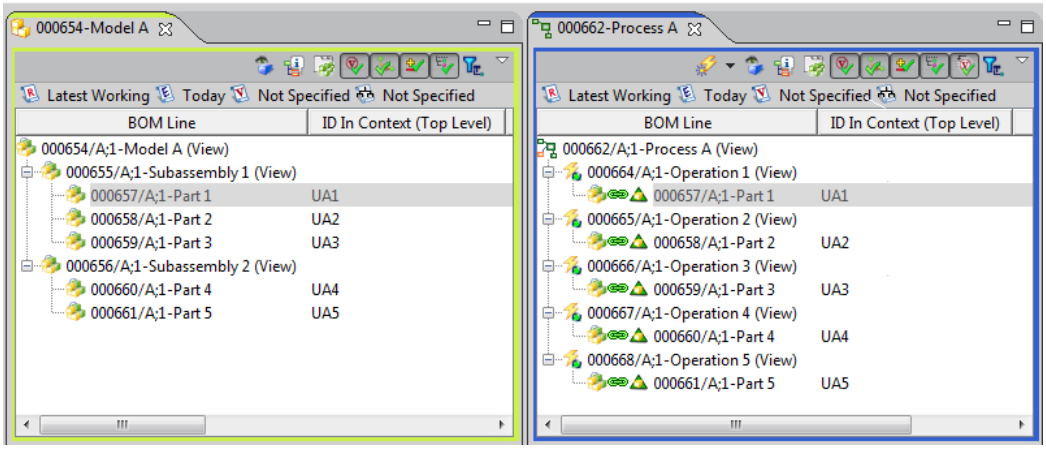
    d. Click **OK**.

    The newly cloned **Process Structure 2** now consumes a part in **Product Structure 2** for each part in **Product Structure 1** that is consumed by the **Process Structure 1** template process.

Consuming parts in a cloned process using smart in-context IDs

You can use smart in-context IDs (IDICs) to consume parts with the same usage into cloned process structures. Your administrator can set up the in-context ID to be based on other BOM line properties such as usage address or reference designator so that they are independent of the top line.

For example, you have a product structure (**Model A**) which is consumed in a process (**Process A**).



You also have a new product, **Model B**, with the same part usages. You then clone **Process A** to create the new process to manufacture **Model B** and call it **Process B**. Ideally, you want all the parts that are

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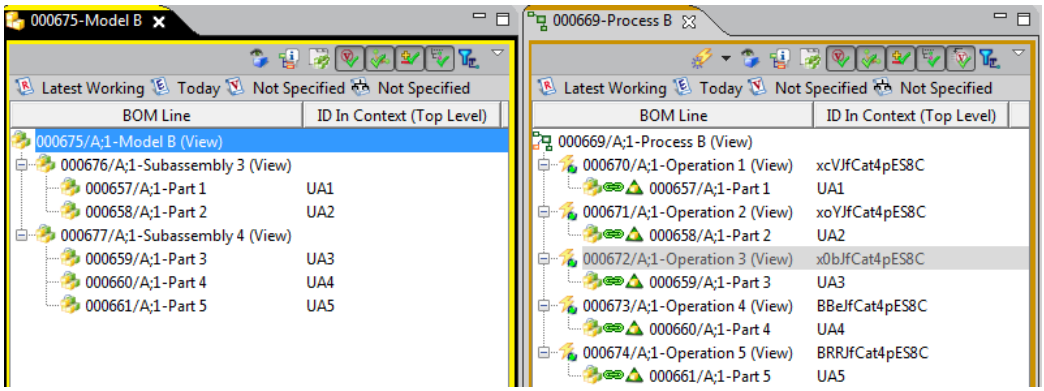
consumed in **Process A** to be automatically consumed in their counterparts in **Process B**, based on the same pat usage.

Your administrator has configured the in-context ID to consist of the property or properties that represent the part usage (for example, usage address). The parts in **Model A** are stamped with these in-context IDs which are carried with the parts when they are assigned to **Process A**.

When **Process A** is cloned to fetch consumed parts from **Model B** (cloned with the option to map consumed from a reference product), **Process B** is created with the appropriate consumed parts from **Model B**.



Apply revision rules to templates

1. On the **New Process from Template** or **New Operation from Template** dialog box, click the **Configuration** tab.

2. Click **Revision Rule** to select a revision rule for the template. The box lists all revision rules that are defined in the database.

   -or-

   Click **Cloning Rule** to select a cloning rule for the template. The box lists all cloning rules that are defined in the database.

Save template favorites

Save commonly used templates to a favorites palette so they can be quickly accessed and used.

1. Open the **New Process from Template**, **New Operation from Template**, or **New Activity** dialog box.

2. Select the template using one of the following methods:

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- For processes and operations, type a **Template ID** value on the **Choose Template** tab. The template ID is the process ID or operation ID of the process or operation being cloned.

- For activities, specify an **Operation ID** value for the operation where the activity occurs on the **Find Template** tab, then select the **Operation Revision** and **Activity** as a basis for the template.

> Note:
>
> You may also use the **Find by Name** or **Find by Class** buttons to find the template in the database.

3. Click **Add to Favorites**.

Select a process or operation template

Any template previously saved as a favorite is displayed by name on the **Choose Template** tab. Templates not saved as favorites may be accessed from the database.

To select template that is saved as a favorite:

1. Open the **New Process from Template** or **New Operation from Template** dialog box.

2. On the **Choose Template** tab, click the favorite template you want to use. Use the scroll bars on the right of the tab if the list is extensive.

   - The **Template ID** text box is automatically updated with the template ID of the selected favorite template.

   - The **Item Details** section in the dialog box is automatically completed with the process or operation ID, revision, and name upon which the template is based.

3. If necessary, click the **Configuration** tab and set a revision rule for the template.

4. Select **Show as new root** to open this new process or operation as the root process or operation in a structure view.

5. Click **OK**.

   The new process or operation is created.

To select a template from the database:

1. Open the **New Process from Template** or **New Operation from Template** dialog box.

2. On the **Choose Template** tab, use one of the following methods to search for the template.

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- In the **Template ID** box, type the ID of the process or operation to be used as a template.
- Click the **Find Template by Name** button and search for the template using its name or ID. Use wildcard characters in your search, if necessary.
- Click the **Find Template by Class** button to open the Classification Search Dialog and search for a classified template.

The **Item Details** section is completed with the information for the template you have selected.

3. If necessary, click the **Configuration** tab and set a revision rule for the template.
4. Select **Show as new root** to open the template as the new root process or operation.
5. Click **OK**.

Select an activity template

Any templates previously saved as favorites display by name on the **Favorite Templates** tab in the dialog box. Templates not saved as favorites can be accessed from the database.

To select a template that is saved as a favorite:

1. In the **New Activity** dialog box, click the **Favorite Templates** tab.

   All activities previously saved as favorites are listed.
2. Click the favorite template to be used.
3. Click **OK**.

To select a template from the database:

1. In the **New Activity** dialog box, click the **Find Template** tab.
2. Use one of the following methods to specify the template ID:
   - In the **Operation ID** box, type the ID of the parent operation for the activity to be used.
   - Click the **Find Operation by Name** button and search for the parent operation using its name or ID. Use wildcard characters in your search, if necessary.
   - Click the **Find Operation by Class** button to open the Classification Search Dialog and search for a classified activity template.

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3. After you specify an operation ID, click the **Operation Revision** button to open the **Revision Selection** dialog box.

4. In the **Revision Selection** dialog box, use **Revision Display Filter** to filter revision types for the selected operation. Use the additional filter buttons to clarify the filter further for only released, in-process, or working revisions.

5. Double-click the appropriate revision.

   The revision is displayed in the **New Activity** dialog box. All activities that exist as part of the operation revision are loaded into the **Activity** list.

6. Select an activity.

7. Click **OK**.

Remove a favorite template

1. Open the **New Process from Template**, **New Workarea from Template**, **New Operation from Template**, or **New Activity** dialog box.

2. From the **Choose Template** (processes and operations) or **Favorite Templates** (activity) tab in the **Template** pane, choose the template to be removed.

3. From the shortcut menu, choose **Remove from Favorites**.

   The template is removed.

> Note:
>
> To remove a database template that is not saved as a favorite, use the same process you would use to remove any other database item.

Carrying over future incremental change when cloning

When cloning, you have the option to carry over future effective incremental changes. If you are using date effectivity, *future* is anything falling after the date set in cloning dialog box. If you are using unit effectivity, future is anything after the unit number set in the cloning dialog box. Incremental changes that are currently effective are merged with the currently set incremental change. Those that are effective in the future are carried forward to the new cloned structure or re-created under new incremental change revisions. Any incremental changes whose effectivities are in the past are dropped from the cloned incremental change.

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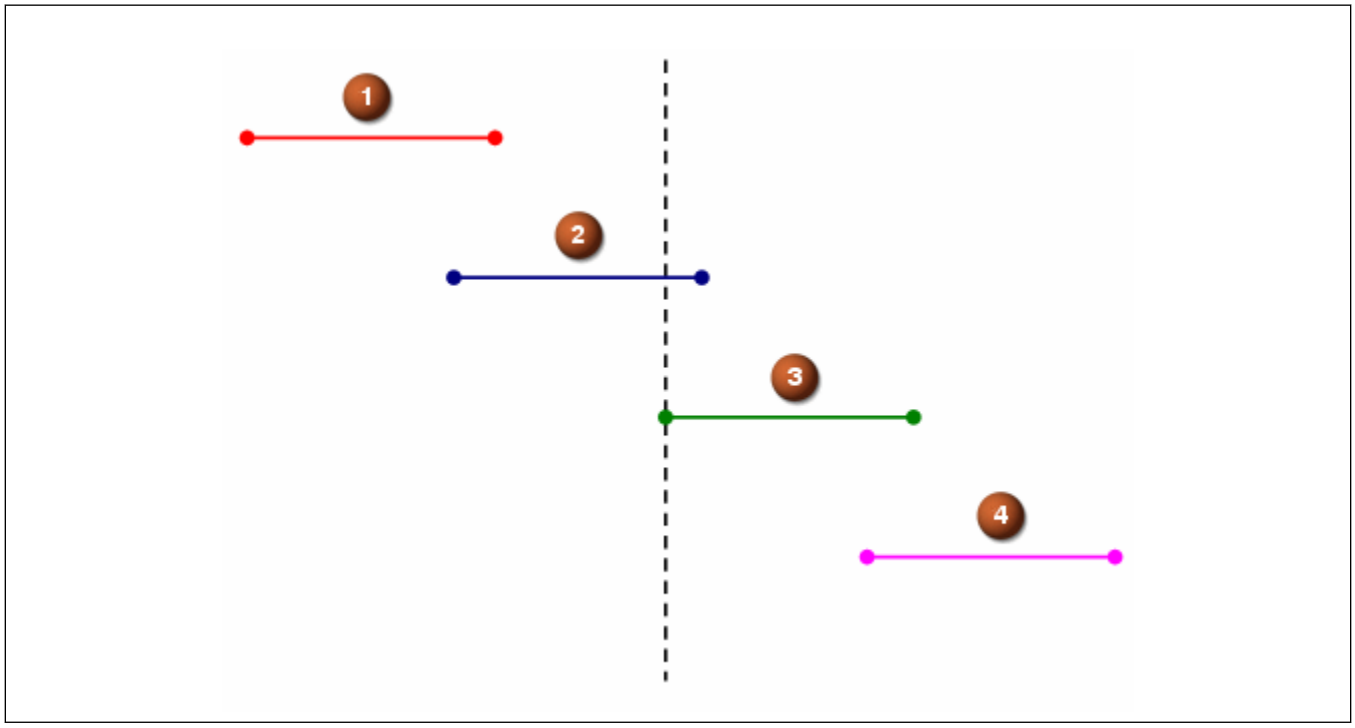
Note:

- Specify the release status type that is assigned to any newly created incremental change revisions during cloning in the **Clone_Pending_Release_Status** preference.
- Specify the release status type that should be considered as secure in the **Clone_Secured_Release_Status** preference.

In the following figure, the vertical line represents the point of cloning.



Cloning with incremental changes

1	IC1	Incremental change 1 whose effectivity lies in the past.
2	IC2	Incremental change 2 that is secure and configured.
3	IC3	Incremental change 3 is the current IC (set at the bottom of the pane) that is configured and pending. This is the target IC.
4	IC4	Incremental change 4 is pending and unconfigured.

After cloning, Teamcenter:

- Disregards IC1.

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- Clones IC2 to a new IC5 and the change elements in IC2 (that is, **add** or **remove**) that are associated with the cloned object are cloned and added to IC5. IC5 then has a **pending** status.

- IC4 is left alone and the new change elements are added to it. This is not cloned because the status is pending and the **out** effectivity does not match the currently set IC revision (IC3).

Override copy action rules

To override the template copy action for any object found in a structure, add a template action occurrence note to the object in the cloned structure as follows:

1. From the **Edit** menu, choose **Notes**, or click the **Notes** button on the toolbar.

2. In the **Create** list, choose **TEMPLATE ACTION**.

3. Enter **Ignore**, **Reference**, or **Clone** in the **Description** box.

4. Click **OK**.

For more information about adding, editing, and deleting occurrence note types, see *BMIDE for Data Model Design*.

Visualizing structures

Ways to visualize structures

You can visualize a structure in several ways.

- The **Graphics** view available in the manufacturing applications allows you to visualize the product, process, or plant structure. You open the **Graphics** view, sometimes referred to as the *embedded viewer*, by clicking in the structure view toolbar.

  When the **Graphics** view is open, many of the secondary views exhibit boxes in front of the nodes in the hierarchy structure that you can use to turn graphics display on and off.

- The rich client Lifecycle Viewer application provides you with nearly all of the visualization tools offered by the stand-alone viewer, many of which are not available in the embedded viewer within Teamcenter applications. You open the rich client Lifecycle Viewer application by clicking the **Lifecycle Viewer** application icon.

- Stand-alone Lifecycle Visualization provides you with all the functionality of a viewer view or the Lifecycle Viewer but with support for optional software modules such as Concept, Visualization Illustration, Quality Producer, and Variation Analysis. Stand-alone Lifecycle Visualization is integrated with Teamcenter, so you can send data from Teamcenter applications into the stand-alone viewer, perform analysis, and then save your work back to the database.

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Display images in the Graphics view

If an image is associated with the object selected in a structure view, opening the associated **Graphics** view displays that image.

The following image types are available in this view:

- **DirectModel**

  Imported **.jt** files or **.jt** files created by the translators. These datasets containing these files must be attached to the item or item revision with a **Rendering** relation.

- **DirectModelMarkup**

  Captured image of a DirectModel dataset.

- **DrawingSheets** and **Markup**

  Imported **.cgm** files.

- **Image**

  Imported **.tif**, **.gif**, **.jpeg** and similar file types.

> Note:
>
> If the images that are attached to the BOM line are 2D snapshots, Teamcenter displays them in the **2D Viewer** view.

When you open an image in the **Graphics** view, the **Graphics** menu is displayed in the menu bar.

1. Right-click a line in the structure view and click in the view toolbar.

   Teamcenter opens the **Graphics** view associated with the structure view from which you open it.

   > Note:
   >
   > Do not confuse this assembly viewer with the viewers that you can open using the **Open With** shortcut menu command. The assembly viewer has more features that you can use to view and manipulate 3D assemblies.

2. Select the check boxes next to the components in the tree that you want to display in the **Graphics** view. If you select the root item, the entire structure is displayed.

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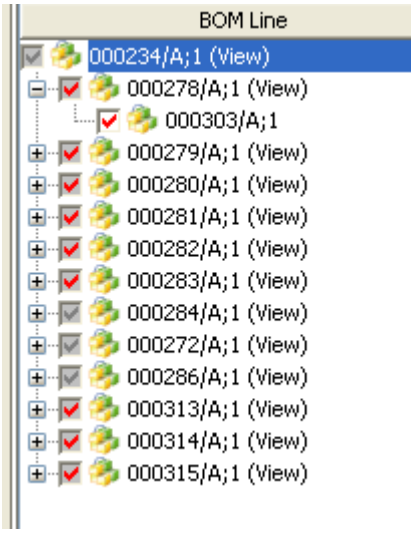

When you open the **Graphics** view, other views that display the hierarchy also display the check boxes that you can use to blank and display graphics. These check boxes are slightly different.

The following states exist for the check boxes.

Check box	State
	The part or assembly is fully loaded and visible.
	The assembly component is fully loaded but only partly visible. This can be because a part is turned off or because geometry does not exist for one or more parts.
	The assembly component is partially loaded and only partially visible.
	All available geometry is visible, but geometry does not exist for every part.
	The part or assembly is loaded but not visible.
	No geometry exists for the selected part, or if this is a parent structure, it is not fully loaded and not visible.

Tip:

If you want to display a single component in a large structure, additionally use the **Viewer** view that you open using the **Open With** shortcut menu command.

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Toolbars available in the Graphics view

Use this toolbar	To
3D Alignment	Move individual parts or groups of parts and align them to other parts in the viewer.
3D Appearance	Work with advanced appearance attributes.
3D CAE Viewing	View Computer Aided Engineering (CAE) Finite Element Analysis (FEA) results.
3D Clearance	Check the clearance of parts in your model.
3D Comparison	Compare the geometry of two sets of parts.
3D Coordinate System	Create and manage coordinate systems. You can also align parts or your view to a coordinate system.
3D Display Modes	Control the display mode of geometry in the viewer. You can display geometry as shaded, tessellated lines, feature lines, or any combination of these. Tessellation or feature lines hidden by other geometry can be viewed as normal, semi-transparent, or invisible.
3D GDT Markup	Insert GD&T markups on your 3D models.
3D Markup	Add text or graphical elements on your 3D model in the viewer.
3D Measurement	Measure your 3D model.
3D Movie Capture	Capture the contents of the viewer as you move the camera around, show or hide parts, transform parts, play animation sequences, and play VFM motion files associated with your model.
3D Navigation	Manipulate the 3D view.
3D PMI	Display and control Product and Manufacturing Information (PMI) in your model.

Note:

PMI functionality is available only when PMI is enabled on your system. If PMI is enabled, you can right-click a part and choose one of the following commands:

- **Show PMI**

  Shows all effective PMI on the selected part or subassembly and its children.

- **Toggle in PMI Tree**

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Use this toolbar	To
	Adds PMI from the selected part or subassembly and its children to the PMI tree. Alternatively, if the part or subassembly is already in the PMI tree, Teamcenter removes it.
3D Part Manipulation	Manipulate parts by dragging.
3D Part Transformation	Translate, rotate, and scale parts in your model.
3D Section	Work with cross sections of your 3D model.
3D Selection	Pick part entities.
3D Standard Views	Examine your model from different views.
3D Thrustline Editor	Create and manipulate thrustlines.
3D Visibility	Hide obscuring parts and clip areas of your model.
Create Markup	Create product views, capture an image of the current geometry or show or hide the **3D PMI** tree.
Print	Print an image or display a print preview.

Displaying images in views other than the Graphics view

When you open the **Graphics** view, other views that display the hierarchy also display the check boxes that you can use to blank and display graphics. These slightly different check boxes are displayed in the following views:

- **Gantt** view
- **Manufacturing Features** view
- **Structure Search Criteria** view (in the **Current Scopes** section)
- **Structure Search Results** view
- **Accountability Check** view
- **Assignments** view

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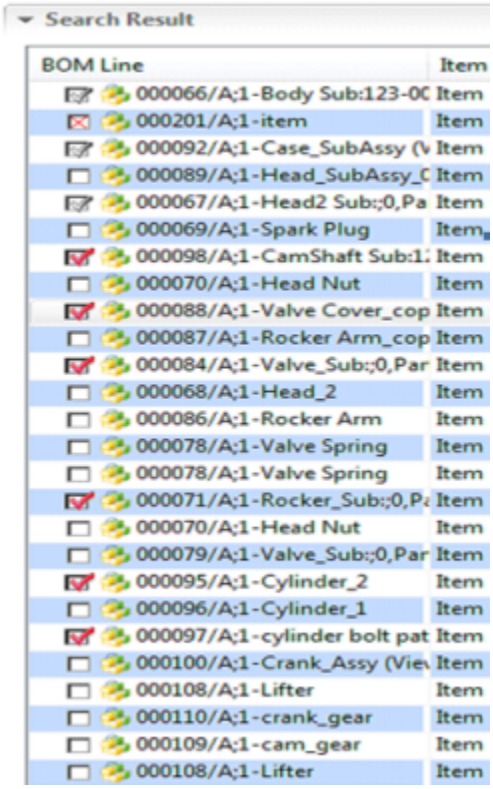

The following states exist for the check boxes.

Check box	State
☑	The node is displayed in the **Graphics** view. If it is a leaf node (no children), it has geometric data. If it has children, all the children are currently visible.
☑	The node has children, and only some of them are currently displayed.
☐	The node is not displayed in the **Graphics** view for one of the following reasons: • The user has chosen to hide it. • There is no geometric data attached to it. • The geometric data of the node is not yet loaded, so it is uncertain whether the node has geometric data.
☒	The node is a leaf node and has no geometric data.

Isolate parts for viewing

You can remove unwanted parts from the viewer, isolating the part of interest:

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1. Select one or more the parts you want to see in the viewer and deselect unwanted parts.

2. Choose **Graphics→Visibility→View Selected** and Teamcenter blanks all unwanted visible parts and shows only the selected parts. Alternatively, you can right-click required parts in the viewer and choose **View Selected**.

Displaying objects by type

Overview of displaying objects by type

You can display or blank objects in the **Graphics** view based on their type, occurrence type, or a combination of both. For example, you may want to blank all weld points or display only the parts consumed by a process. In addition, a visualization filter allows you to set the object and/or occurrence types you want to hide from the display on a more permanent basis.

The types of objects you can blank or display depend on the type of structure on which you are working. For a process structure, you can display or blank:

- Item types such as **Item**, **WeldPoint**, or **Workarea**. All item types that derive from **Item**, **Workarea**, and **PSConnection** (including **WeldPoint**) are supported.
- All available occurrence types such as **MEConsumed** or **ME Weld Point**.
- Any combination of these item and occurrence types.

For a product structure, you can display all types that derive from:

- **Item**
- **PSConnection**

For a plant structure, you can select all types that derive from the **Workarea** item type.

The object types to be blanked or displayed in the structure must exactly match the selected types. Selecting an item does not select every object derived from the **Item** type.

To reduce the size of this potentially long list of candidates, you can store the commonly used item list in the **MEBlankDisplayTypes** preference.

Display/blank objects by type

1. With a structure open in the **Graphics** view, do one of the following:
   - Choose **Graphics→Visibility→Display/Blank Selected by Type→Object/Occurrence Type**
   - Right-click in the viewer pane and choose **Display/Blank Selected by Type**.

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- Right-click a subassembly in the structure tree and choose **Display/Blank Selected by Type**.

2. Choose the type of object or occurrence type that you want to blank or display.

   The entries in this list are dictated by the value in the **MEBlankDisplayTypes** preference.

The object types that you select are displayed or blanked in the viewer.

Display/blank multiple object types

1. Choose **Graphics→Visibility→Display/Blank Selected by Type→Advanced**.

2. Select all the object types that you want to display. If you open the dialog box with a process displayed in the viewer, you can also select occurrence types.

3. (Optional) Select **Display only selected types** to blank all types other than those selected in the dialog box.

4. Click **OK**.

Set the visualization filter

Use the visualization filter to set the object and/or occurrence types you want to permanently hide from the display.

1. With a structure open in the **Graphics** view, choose **Graphics→Visibility→Define Visualization Filter**, or click the **Define Visualization Filter** button in the toolbar.

2. Choose the object or occurrence types that you want to hide permanently from the display.

3. (Optional) Select **Apply visualization filter** to activate the filter as soon as you close the dialog box.

4. Click **OK**.

5. (Optional) If you did not activate the filter in step 3, activate it by choosing **Graphics→Visibility→Apply Visualization Filter** or clicking the **Apply Visualization Filter** button in the toolbar.

Select objects by type

If you have a very complex assembly, it can be difficult to select only objects of interest to you. For example, you may want to select all weld points in an assembly or you may want to select only consumed parts.

You can specify that Teamcenter selects only objects of a certain type when you select an area or volume in the **Graphics** view.

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Note:

The **Graphics** menu is available only if a **Graphics** view is open.

1. Set a selection filter as follows:

   a. Choose **Graphics→Selection→Define Selection Filter**.

   b. In the **Set Selection Filter Types** dialog box, select the item and occurrence types in the tree that you want to select in the **Graphics** view.

2. Select objects in the **Graphics** view. To do so, you must use one of the following methods available on the **3D Selection** toolbar in the **Graphics** view:

   - **Select Parts by Area**
   - **Select Parts by Volume**

   Teamcenter selects only those objects that are of the type you specified in the selection filter.

3. (Optional) Turn the selection filter on and off by choosing **Graphics→Selection→Apply Selection Filter**.

Selecting packed objects for display

When lines are packed, one of the packed lines is always designated the master packed line. If the **TCVIS_Selection_From_Viewer** preference is set to true, you can select packed objects in the viewer using the buttons available in the **3D Selection** toolbar. However, if you select the master packed line, all packed lines are selected. If you do not want this behavior, you must unpack the packed lines before selecting the individual objects in the viewer.

Paste objects to a specific position

You can use the embedded viewer for rough layout planning to add resources into the graphics at a specific position. If you paste or drop resources into the tree, the resources are created at the 0,0,0 position, meaning that you must relocate the resources to the station where they are needed. To simplify this, you can add objects into the **Graphics** view at the right position using the **Paste Here** command.

Copy the objects that you want to paste to the clipboard and do one of the following:

- To add the objects under the top line of the structure, right-click the desired point in the viewer and choose **Paste Here**.

- To add the objects at a different location in the structure:

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1. Right-click the desired parent object in the structure tree or in the viewer and choose **Set Active Parent**.

   This menu command is available only when the **Graphics** view is open.

   Teamcenter displays the active parent in the viewer in the color that you specify in the **MEActiveParentColorPref** preference.

2. Right-click the desired point in the viewer and choose **Paste Here**.

3. (Optional) Unset the active parent by right-clicking it and choosing **Set Active Parent** again.

Teamcenter places the objects at the specified location in the viewer, adds them under the active parent in the structure, and updates the transformation matrix to reflect the chosen location.

- The **Paste Here** command is available only for product and work area structures. It is not available for process structures.

- If you unload the structure view, the active parent selection is lost.

Temporarily reposition items

You can temporarily reposition items to visualize the result of a change.

- Choose **Graphics→Transformation→Temporary Transformation**.

  The drawing displayed depends on the line in the BOM that is currently selected.

The **Temporary Transformation** dialog box provides the same options and commands as the Lifecycle Viewer **Part Transformation** dialog box.

Permanently reposition one or more items

Use this method to permanently reposition the BOM. The transformations are saved in the database.

Do one of the following:

- Save using the **Persist Transformation of Selected Objects** button by doing one of the following:

  - Reposition the part using Lifecycle Viewer repositioning capabilities and then click .

  - Select either the BOM line that you repositioned or the top line of the structure if you reposition several objects and click in the **Graphics** view toolbar.

  Teamcenter saves the temporary transformation in the structure.

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- Save using the menu command.

  1. Select the appropriate line in the BOM.
  2. Choose **Graphics→Transformation→Persistent Transformation**.
  3. Use the **Persistent Transformation** dialog box controls to move and rotate the selected items.

     The **Persistent Transformation** dialog box provides the same options and commands as the Lifecycle Viewer **Part Transformation** dialog box.

Note:

- The new position is saved in the database but it has no effect on positioning in the CAD part.
- Scale transformations are not saved.

Working with product views

About product views

You can save data in the assembly viewer, including current items, zoom factor, rotation angle, and pan displacements. You can retrieve a saved product view (sometimes called a *3D snapshot or snapshot view*) during a subsequent session or share it with other users. You can only save or retrieve product views when a base view structure is displayed in the viewer. You cannot create product views of occurrence groups.

You can create product views that contain one or more of the following:

- Collaboration contexts
- Structure contexts
- Configurator contexts
- Item revisions (structure lines)
- 2D and 3D NX CAD and Lifecycle Visualization files
- Motion (VFM) files
- Published documents, including work instructions

Each product view is stored in a dataset containing a thumbnail image file, a PLM XML session file, 3D markup layers, and the top-level item of the view.

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You can configure the structure with revision rules, effectivity, variant rules, and similar techniques. If appropriate, you can use several **Show Unconfigured** menu commands to hide unconfigured objects in the structure and in the viewer. When product views are captured, these view selections are taken into account; otherwise, potentially unbuildable combinations of parts may be displayed when the view is restored. You can retrieve the original state of the menu commands and consequently the original state of the view.

If the product view is attached to a structure and the structure is cloned, the product view functions correctly in the new (clone) structure. Likewise, product views may be attached to a structure that is shared with Multi-Site Collaboration.

You can also update product views in the Lifecycle Viewer or stand-alone Lifecycle Visualization. You send a dynamic product view to one of these applications, and then create a new product view or update and replace the existing one. When you send the updated product view back to Teamcenter, you can open it in the assembly viewer.

Your Teamcenter administrator sets the size and presentation of the product views with system properties and preferences..

> Note:
>
> In Teamcenter 8.0, the file format of 3D product views changed. If you open a file that was created in an earlier Teamcenter version, it is automatically converted to the new format.

Create and save a product view

1. Adjust the content of the viewer window using the pan, rotate, eyeball, and zoom buttons to create the necessary scene.

2. Select an object in the structure base view window.

3. If necessary, right-click in the viewer menu bar and choose **Create Markup**.

   Teamcenter displays the **Create Markup** toolbar.

4. Click **Create 3D Product Views** on the **Create Markup** toolbar in the assembly viewer.

   Teamcenter displays the **Product View Gallery** dialog box, which contains thumbnails of any previously saved product views that are associated with the selected object.

5. Do one of the following:

   - Click **New Product View** .
   - Right-click in the window and choose **Create New Product View**.

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You are prompted to enter a name for the product view if the **Vis_PV_Show_Name_Dialog** user preference is set to **True**. If it set to **False**, Teamcenter generates a name automatically.

Teamcenter saves the product view and its configuration in a dataset. It also adds a thumbnail of the view to the **Product Views** dialog box.

> Note:
>
> Thumbnails of all product views are not visible at all times, only for those items related to the selected end item (the top entry in the structure window).

Configure and manage product views

1. Choose **Options→Visualization→Product View**.

   Teamcenter displays the **Product View Creation Preferences** pane.

2. Set the following preferences as required:

Preference	Description
Geometry Asset	Determines whether a geometry asset file is added when a product view is created. This file is required if you want to export a PLM XML file of the product view. This option is equivalent to the **Vis_PV_Geometry_Asset** preference.
Show Product View name dialog	If selected, you are prompted for a name each time you create a product view. If not selected, Teamcenter generates the name automatically. This option is equivalent to the **Vis_PV_Show_Name_Dialog** preference.
View Toggle Warning Level	If selected, Teamcenter displays a warning or prevents you from continuing if you try to create a product view when one or more of the **View** menu commands to show unconfigured data is selected. This option is equivalent to the **Vis_PV_InvalidConfigWarnLevel** preference.
View Toggles to consider	Select the **View** menu commands to show unconfigured data that are considered if the **View Toggle Warning Level** option is selected. This option is equivalent to the **VisPVBlockingViewToggles** preference.
Image Capture	Determines if Teamcenter saves a preview image of the 3D product view when it is created. If you choose **Perform Image Capture (Using Image Export Dialog)**, you are prompted for the settings to use. If you choose,

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Preference	Description
	Perform Image Capture (with preferences), it uses values set in preferences. This option is equivalent to the **Vis_PV_ImageCapture** preference.
Image Format: **Image Resolution**, **Width of image**, and **Height of image**	Depending on the setting of the **Image Capture** option, these options may determine the file format, resolution, and size of the preview image. If **Perform Image Capture (Using Image Export Dialog)** is set, these options are disabled. These options are equivalent to the **Vis_PV_ImageCaptureType**, **Vis_PV_ImageCaptureResolution**, **Vis_PV_ImageCaptureWidth**, and **Vis_PV_ImageCaptureHeight** preferences, respectively.
Thumbnail: **Width**, **Height**, and **Quality**	Determine the size and resolution of the thumbnail image created for each product view. These options are equivalent to the **Vis_PV_ThumbnailWidth**, **Vis_PV_ThumbnailHeight**, and **Vis_PV_ThumbnailQuality** preferences, respectively.
Play motion in current view	If selected, any motion (VFM) file in the current product view plays when the view is selected. This option is equivalent to the **Vis_PV_Play_Motion** preference.
Configuration rule to use	Offers you two choices: • **Use configuration from the current BOM** ignores stored rules and preserves the configuration that was active before you applied the product view. • **Use configuration from product view** considers any arrangements, effectivity, variant rules, and revision rules stored with the product view when you apply it. This option is equivalent to the **Vis_PV_HowTo_Configure_BOM** preference.

Note:

Your administrator may configure these preferences with SITE or GROUP protection scope, rather than USER protection scope. If so, you may be able to view but not change the current settings.

3. Right-click a selected product view thumbnail in the **Product View Gallery** dialog box.

Teamcenter displays a shortcut menu.

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> Note:
>
> You can identify the currently selected product view by the green border (if checked out) or red border (if not checked out) around its thumbnail.

4. Choose one of the following.

Command	Description
New Tab	Creates a new tab for the element currently selected in the structure. This tab is unavailable if no element is selected in the structure base view window.
Refresh Tab	Refreshes the currently selected tab in the product view gallery to reflect structure configuration changes.
Remove Tab	Removes the current tab from the dialog box.
Refresh All Tabs	Refreshes all the tabs in the product view gallery to reflect structure configuration changes.
Remove All Tabs	Removes all tabs from the dialog box.
Add	Creates a new product view from the current contents of the viewer.
Apply	Applies the configuration of the selected product view to the viewer.
Delete	Deletes the selected product view.
Update	Refreshes the stored product view with changes made in the viewer. This command is enabled only if you check out the product view dataset.
Rename	Displays a dialog box that allows you to change the name and description of the selected product view. A product view name appears below each button; the description appears when the cursor is placed over the button. If you rename a product view, the order in which thumbnails are displayed in the **Product View Gallery** dialog box changes. Teamcenter generates the default name of a view from the date and time it was initially created. It lists available views in alphanumeric order. You can choose an appropriate new name to move the view up or down the list.
Enable Multiple Selection	Allows you to select more than one product view.
Options	Displays the **Product View Creation Preferences** pane.

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Note:

If you right-click any part of the **Product View Gallery** dialog box (except one of the buttons) and no product view is selected, the menu commands to apply, update, rename, and delete the product view are unavailable.

Create product view preview manually

Note:

The menu commands described in this procedure are available only if the **Image Capture** option is set to **Perform Image Capture (using Image Export dialog)**. If you do not select this option, you cannot manually adjust the size, resolution and file format each time you create or update a product view.

1. Right-click a product view or the **Product View Gallery** tab and select **Image Capture**.

   Teamcenter enables the capture of 2D images, as indicated by a check mark next to the menu command.

2. Create or modify the product view.

   If you selected **Perform Image Capture (using Image Export dialog)** previously, Teamcenter displays the **Image Export** dialog box.

3. Change the size and file format of the image if necessary, then click **OK**.

   Teamcenter creates the product view using the parameters you entered.

Manage unconfigured data in a product view

You can use several menu commands to show or hide unconfigured objects in the structure and in the viewer, as follows:

- **Show Unconfigured Variants**
- **Show Unconfigured By Occurrence Effectivity**
- **Show Unconfigured Changes**
- **Show Unconfigured Assigned Occurrences**
- **Show GCS Connection Points**
- **Apply Occurrence Type Filters**

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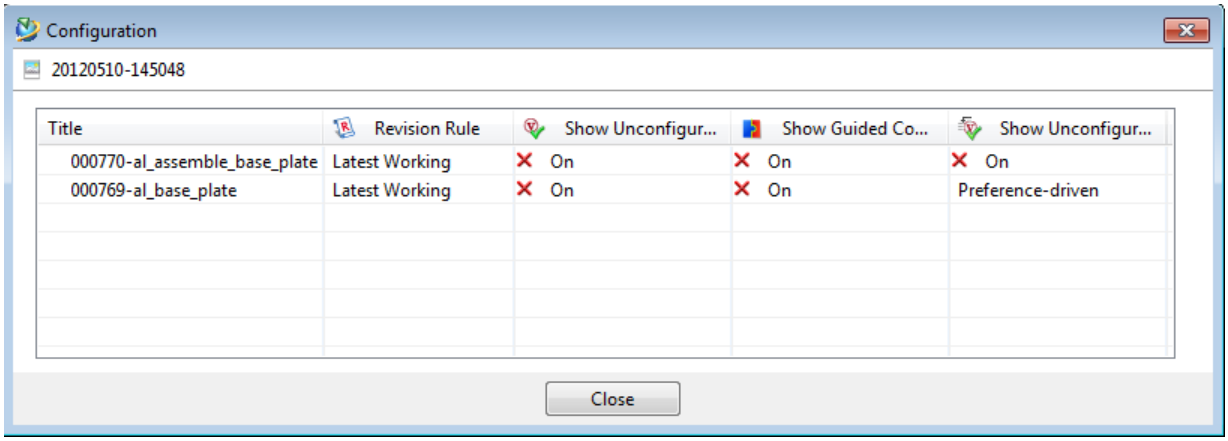
When product views are captured and restored, these view selections are preserved; otherwise, potentially unbuildable combinations of parts may be displayed when the view is restored. If you choose to update the configuration from the product view when you reopen it, the saved view selections are retrieved; if you choose to use the current configuration, the saved view selections are ignored.

To evaluate the configuration of an existing product view, right-click a product view in the **Product View Gallery** and choose **Show Configuration**.

Teamcenter displays a dialog box that shows the assembly configuration when the product view was created. The name of the product view is shown in the title bar of the dialog box. The dialog box also lists any **Show Unconfigured** menu commands that were active at the time the product view was created.

If you show the configuration for product views created on a composite structure (such as a process), the results are displayed in tabular form with each member structure occupying a line in the table. If any **Show Unconfigured ...** command was set to **Off** for all the assemblies contained in the structure, the corresponding column is not displayed. In the following figure, the **Show Unconfigured Changes** and **Show Unconfigured by Occurrence Effectivity** commands were turned off when the product view was created and those entries do not appear as columns.



Retrieve and open an existing product view

- Open the product view in Teamcenter:

  1. Select an object in the structure base view window and open the assembly viewer.

  2. Click the **Create 3D Product Views** button on the viewer toolbar.

     Teamcenter displays the **Product View Gallery** dialog box containing thumbnails of available product views of the selected structure. Only product datasets associated with the currently selected end item are visible.

  3. Right-click below the image area in the **Product View Gallery** dialog box and select the configuration that you want to use for the product view.

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Command	Description
Options→Configuration rule to use→Use configuration from Current BOM	Applies the product structure configuration that is currently set to the product view that you are loading.
Options→Configuration rule to use→Use configuration from product view	Adopts the configuration that was set at the time the product view being loaded was created.

4. Do one of the following:

   - Select the thumbnail of the product view you want to open and click **Apply**.

     Teamcenter opens the product view and retrieves the saved configuration for the structure window and viewer. You can then click **Cancel** to close the dialog box without opening the product view.

   - Select the thumbnail of the product view you want to open and click **OK**.

     Teamcenter opens the product view as before and closes the dialog box immediately.

5. If the product view contains a motion file, replay it by right-clicking the product view and choosing **Load Motion File(s)**. If **Play motion in current view** is selected, the motion file is played against the current structure; otherwise, it is played against the original structure.

- Open the product view in stand-alone Teamcenter lifecycle visualization:

  1. Select one or more product view datasets in the **Attachments** tab.

  2. Click the **Send to Lifecycle Visualization** button.

Checking product views in and out

After you create a product view (3D snapshot), you can check it into the Teamcenter database to make it available to other users. To refresh or delete an existing product view, you must first check it out to prevent other users from inadvertently overwriting your changes.

You can identify a checked out product view by a green frame around the thumbnail image in the **Product View Gallery** dialog box. Similarly, you can identify a checked in product view by a red frame around the thumbnail.

Check out product view dataset

Select a product view and choose **Tools→Check-In/Out→Check-Out**.

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Teamcenter applies a checkout lock to the dataset, allowing you to refresh or delete the product view. Other users cannot refresh or delete the product view while you have checked it out.

> Note:
>
> If you close the **Product View Gallery** dialog box while you still have datasets checked out, Teamcenter displays a request for confirmation that you want to continue. If you do, all active checkout locks are canceled.
>
> The **Check-Out** command is enabled only if you select a product view that is not checked out by another user.

Check in product view dataset

Select the product view you checked out and choose **Tools→Check-In/Out→Check-In**.

Teamcenter removes the checkout lock from the dataset, allowing other users to update or delete the product view.

Cancel checkout of product view dataset

Select the checked out product view and choose **Tools→Check-In/Out→Cancel Check-Out**.

Teamcenter removes the checkout lock from the dataset, allowing other users to update or delete the product view.

Refresh a product view

You can refresh a saved product view of the current structure at any time with changes you make during the current session in one of the following ways:

- Right-click the product view gallery and choose **Refresh Tab** to update the 3D snapshot in the selected tab to reflect any structure configuration changes.
- Right-click the product view gallery and choose **Refresh All Tabs** to update the 3D snapshots in all tabs to reflect any structure configuration changes.
- Right-click the product view and click the refresh product view button, which is the center graphical button in the middle row of buttons.
- Right-click the product view and choose **Apply**.

> Note:
>
> The **Apply** command and refresh button are only enabled if you check out the product view.

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Send a product view to an external viewer

Select one or more product views in the structure tree and choose **File→Open in TcVis** or right-click and choose **Send to→Lifecycle Viewer**.

The selected viewer opens the product view with a configured structure. If you already have a 3D document active, Teamcenter allows you to open your product view or merge it into the active document, if the formats are compatible.

> Note:
>
> This method is not available if an incremental change is applied to the structure.

> Note:
>
> You can also select multiple product views in the product view gallery and send them to the Lifecycle Viewer or stand-alone Lifecycle Visualization. The product views open one at a time and any configuration of the original structure is retained.

Delete a product view

1. Click the floppy disk button on the Viewer toolbar.

   Teamcenter displays the **Product Views** dialog box.

2. Select the thumbnail of the product view you want to delete and click the delete product view button, which is the right graphical button in the middle row of buttons. Alternatively, you can right-click in the window and choose **Delete**.

   Teamcenter deletes the product view and its associated dataset.

Finding product views

Searching for product views

After creating product views, there are many situations that may require finding all product views associated with a particular part so that you can update them. For example:

- A part in the original product structure may be replaced by another part. You must then update all product views containing the replaced part.
- A part's geometry or transformation data may change.
- A part may be removed from the product structure.
- A part may be moved from one operation to another or from one subassembly to another.

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- You may want to re-create a product view based on an existing one.

> Note:
>
> If you want to use the **Auto Update** feature, your administrator must first install Dispatcher Server, as detailed in *Getting started with administering Manufacturing Process Planner*.

Find product views

1. Open a product or process structure.
2. Select one or more products, processes, or operations from the structure as the scope of the search.
3. Choose **Tools→Find Product Views** or **Find Product Views** from the shortcut menu.

   Teamcenter opens the **Product View Search** view that displays the scope that you selected and the search definitions.
4. (Optional) Change the scope at any time by selecting a new root and clicking .
5. Enter the search definitions by doing one of the following:

   - Navigate through the structure and select the required part for which you want to search and click . The view can remain open as you do this.

     If you selected a process or operation as the search scope, you can select parts that are assigned to these structures from their product structures, or vice versa. For the search to work correctly in this case, your administrator must set the value of the **MECopyIdInContextToAssignedLine** preference to **True** before you assign parts from the product structure to the process structure.

   - Click and type the ID or name of the part for which you want to search.

   Teamcenter adds the part to the **Parts** list, showing the item revision symbol for parts that you select from the bill of process and the item symbol for parts whose ID you enter by hand.

   > Caution:
   >
   > When you search by ID, you search by item and not revision. Therefore, the search results will display all revisions associated with this item.
6. (Optional) Remove a part from the **Parts** list by selecting it and clicking **Delete**.
7. Click **Search**.

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Teamcenter lists each search result in a separate line, displaying the process or operation to which it is attached as well as a thumbnail of the product view as you select the line. The **Parts found in selected Product View** list displays the searched parts found in the selected product view.

8. (Optional) Click **Back** to discard the search results and collapse the **Search Results** section. You can then modify the search criteria and rerun the search.

Update a product view

> Caution:
>
> The relevant product structures must always be loaded when working with product views. Not loading the product structures can lead to unexpected results.

> Note:
>
> This command will not work without a Teamcenter lifecycle visualization mockup license.

1. Open the **Graphics** view.

2. Find the product view you want to update.

3. In the **Search Results** section, select a product view.

4. Click the **Apply** button or choose **Apply** from the shortcut menu to load the product view that contains the new or changed part into the **Graphics** view.

5. Click the **Update** button or choose **Update** from the shortcut menu.

   Teamcenter checks out the product view, updates it with the new or changed part, and highlights the row in the **Product View** list green to indicate that the selected product view is updated. If there is an error, Teamcenter highlights the row in red.

   The highlighting is displayed for the current session only.

6. (Optional) Click **View Log** to see a log of the update activity. Teamcenter lists any errors encountered in this log.

> Caution:
>
> - Teamcenter cannot update product views that are checked out by another person or ones containing a release status.
>
> - Legacy product views created with a version earlier than Teamcenter 8.1 must be updated manually.

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- This mechanism does not find product views attached to parts newly added to the product structure. You must update these manually.

Update multiple product views

You can update all or some of the product views that you find in the product view search at one time.

Caution:

The relevant product structures must always be loaded when working with product views. Not loading the product structures can lead to unexpected results.

1. Perform a search to find product views.
2. Select multiple product views from the **Search Results** section of the **Product View Search** view.
3. Click **Auto Update**.

   Teamcenter updates all the selected product views and highlights the row in the **Product View** list green to indicate that the selected product view is updated. If there is an error, Teamcenter highlights the row in red.

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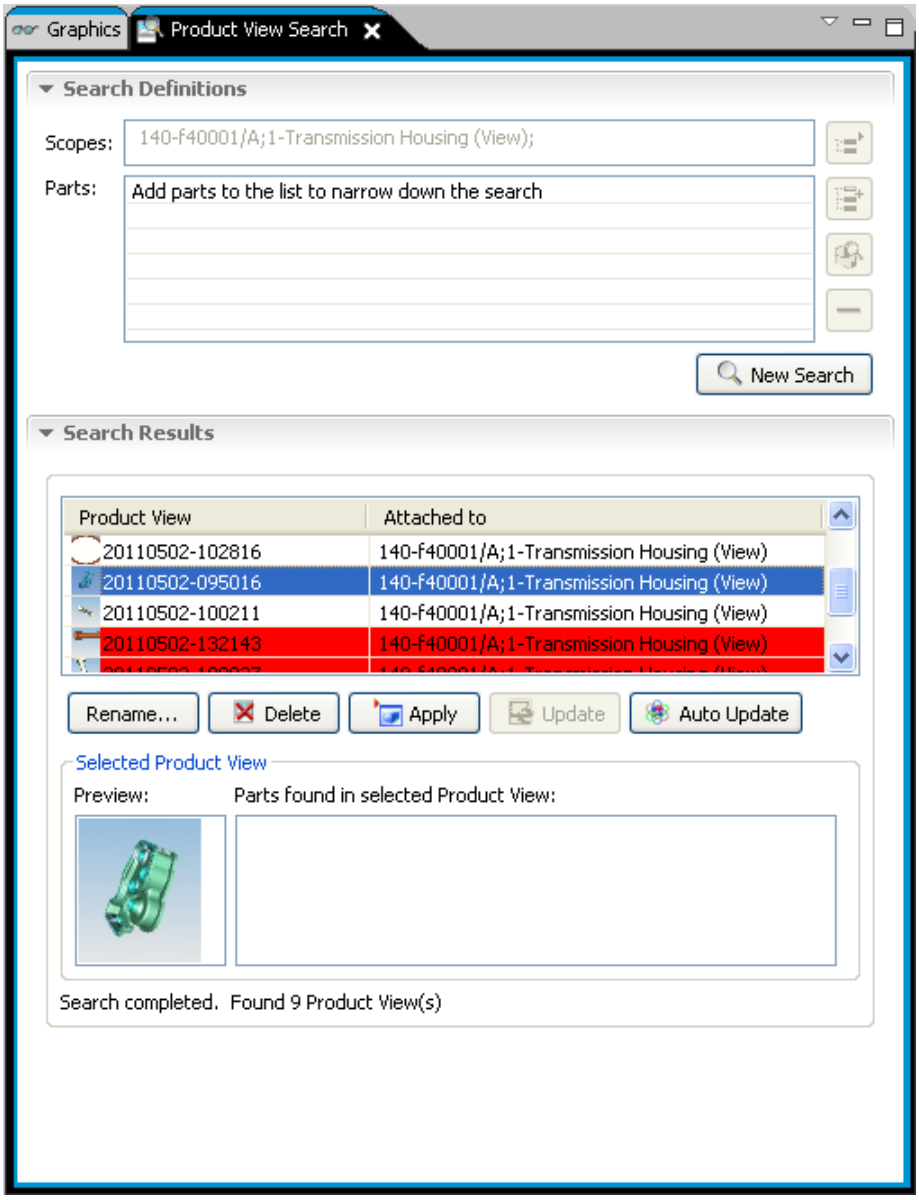

4. (Optional) Click **View Log** to see a log of the update activity.

   Teamcenter lists any errors encountered in this log.

Caution:

- Teamcenter cannot update product views that are checked out by another person or ones containing a release status.
- Legacy product views created with a version earlier than Teamcenter 8.1 must be updated manually.

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- This mechanism does not find product views attached to parts newly added to the product structure. You must update these manually.

Remove a product view

1. Find the product view you want to update.
2. In the **Search Results** section, select a product view.
3. Click the **Delete** button or choose **Delete** from the shortcut menu.

   Teamcenter deletes the product view from the database.

   Note:

   You must have delete permission on the product view to be able to delete it.

Re-create a product view based on an existing one

1. Find the product view you want to update.
2. In the **Search Results** section, select a product view.
3. Click the **Apply** button or choose **Apply** from the shortcut menu to load the product view that contains the new or changed part into the **Graphics** view.
4. Modify the product view as desired.
5. Select the operation or process to which you want to attach the new product view.
6. Open the **Product View Gallery** dialog box and create and save a new snapshot.

Rename a product view

1. Find the product view you want to update.
2. In the **Search Results** section, select a product view.
3. Click the **Rename** button or choose **Rename** from the shortcut menu to load the product view that contains the new or changed part into the **Graphics** view.
4. Type a new name in the box.
5. Click **OK**.

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Show product view configuration

1. Find the product view for which you want to see the configuration.
2. In the **Search Results** section, select the product view.
3. Choose **Show Configuration** from the shortcut menu.

   Teamcenter displays a dialog box containing the configuration of the structure for which the product view was created.

Working with 2D snapshots

2D snapshot overview

2D snapshots are dynamic objects that represent a 2D scene (a view of the base image and markups) but are more than just image captures. You can have one or many snapshots associated with a BOM line in your product structure. When you select a BOM line, Teamcenter displays the attached image dataset in the **2D Viewer** pane. If there are multiple images attached, you can select the desired image dataset. You can:

- Use 2D snapshots to load base images and markups into the **2D Viewer** pane and restore the saved positioning information.
- Populate assets in technical illustrations with 2D snapshots.
- Query 2D snapshots to find related item revisions and technical illustrations.
- Update 2D snapshots to reflect changes in base images and markups.
- Print 2D snapshots from Teamcenter.
- Send 2D snapshots to Lifecycle Viewer or a standalone application viewer.

You can create 2D snapshots from any file displayed in the 2D viewer.

To work with 2D snapshots in the **2D Viewer** view, you must activate the **2D Snapshots** toolbar.

The 2D snapshot mechanism works best when the BOM structure used has a one-to-one relationship between BOM lines and image datasets. Although the functionality works when this condition is not satisfied, the user interaction is not as clean. This is especially true when the image datasets are revised. As a result, Siemens Digital Industries Software recommends as a best practice to maintain a one-to-one relationship between image datasets and BOM lines when establishing the BOM structure, if possible.

If you open the **2D Snapshot Gallery** from Multi-Structure Manager, see *Multi-Structure Management*.

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Create or add a 2D snapshot

1. Right-click an item revision with one or more attached image datasets (for example, a PDF file) and choose **Open with→2D Viewer**.

   The 2D viewer displays the first image dataset attached to the item revision.

2. If necessary, switch to the correct image dataset.

3. Navigate to the desired page if the base image contains multiple pages by selecting it from the **Page List** section of the navigation tree.

4. Zoom and pan to the region of interest.

5. Create necessary markups.

6. Click to open the **Snapshot Gallery** dialog box.

7. Click **Add** or right-click in the **Snapshot Gallery** dialog box and choose **Add**.

8. (Optional) If you have activated the **Attributes** dialog box, define attributes for the 2D snapshot.

> Note:
>
> Teamcenter opens the **Attributes** dialog box automatically each time you create a 2D snapshot when you choose **Options→Show Attributes Form on Add**.

Select an image dataset for viewing

If there are multiple image datasets attached to an item revision, you can select which one to use.

1. In the **2D Snapshots** toolbar, click .

   Teamcenter displays the **Select Dataset** dialog box.

2. Select the desired image dataset from the list and click **OK**.

Open a 2D snapshot in the Lifecycle Viewer or a standalone application viewer

1. Click to open the **Snapshot Gallery** dialog box.

2. Select a snapshot.

3. Do one of the following:

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- Select **Send to Lifecycle Viewer** in the context menu.
- Select **Open in Lifecycle Visualization** in the context menu.
- Click the **Start/Open in Lifecycle Visualization** button in the toolbar.

> Note:
>
> This button is not available when incremental change is in effect.

Apply an existing 2D snapshot

1. With an item revision selected, click in the **2D Snapshots** toolbar in the **2D Viewer** view.

   Teamcenter opens the **Snapshot Gallery** dialog box.

2. Do one of the following:

   - Double-click a 2D snapshot in the list.
   - Select the desired snapshot and click **Apply**.

   Teamcenter opens the snapshot in the **2D Viewer** view. In addition, any markups, zoom, pan, and rotation information active at the time the snapshot was created are also visible in the **2D Viewer** view.

Populate the snapshot gallery

1. With an item revision selected, click in the **2D Snapshots** toolbar in the **2D Viewer** view.

   Teamcenter opens the **Snapshot Gallery** dialog box.

2. From the shortcut menu, choose one of the following.

Choose	To
Show All	Load all 2D snapshots for the item revision of the selected BOM line into the **Snapshot Gallery** dialog box.
Search	Search all 2D snapshots for those containing specific attributes. The results of the search are added to the **Snapshot Gallery** dialog box.
Options→Show All on Open	Load all snapshots associated with the selected BOM line when the **Snapshot Gallery** is opened.

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Search for a 2D snapshot

1. With an item revision selected, click in the **2D Snapshots** toolbar in the **2D Viewer** view.

   Teamcenter opens the **Snapshot Gallery** dialog box.

2. From the shortcut menu, choose **Search**.

   Teamcenter displays the **Snapshot Search** dialog box.

3. In the form, type values to define attributes for the 2D snapshot.

4. Click **Search**.

   Teamcenter displays the results of the search in the **Snapshot Gallery** dialog box.

   > Tip:
   >
   > Display all snapshots associated with an item revision by choosing **Show All** from the shortcut menu.

Update an existing 2D snapshot

You can only update a 2D snapshot if you have checked out the selected snapshot. You can only check out a 2D snapshot if the selected snapshot was created from the currently open item revision. If you have a different item revision open, use the **Add** or **Replace** menu commands.

1. Search for the desired 2D snapshot from the current item revision.

2. Select the image by double-clicking or clicking **Apply**.

3. Choose **Check-In/Out→Check-Out** from the shortcut menu.

4. Make any necessary changes to the view such as changing the zoom, panning into a different area of the drawing, and adding or changing markups.

5. In the **Snapshot Gallery** dialog box, click **Update**.

   Teamcenter updates the 2D snapshot with the changes that you made in the viewer.

6. Check in the 2D snapshot by choosing **Check-In/Out→Check-In**.

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> Tip:
>
> Any changes you make in the 2D snapshot are not saved to the database until you check in the snapshot. If you make a mistake with the markup, choose **Check-In/Out→Cancel Check-Out** to revert the snapshot to its original state.

Replace a 2D snapshot

When you are working with multiple item revisions and the selected 2D snapshot is based on an item revision older than the one you currently have open, you can replace the selected 2D snapshot with a new one, and the old 2D snapshot remains associated with the old item revision.

1. With the snapshot that you want to replace open in the 2D viewer, and a newer item revision than the one associated with the selected snapshot open, right-click the snapshot in the **Snapshot Gallery** dialog box and choose **Replace**.

   Teamcenter associates the newly created snapshot with the currently open item revision, leaving the original snapshot associated with the original item revision.

2. (Optional) Define attributes for the 2D snapshot.

   > Note:
   >
   > Teamcenter opens the **Attributes** dialog box automatically each time you create a 2D snapshot when you choose **Options→Show Attributes Form on Add**.

Rename a 2D snapshot

1. Select a 2D snapshot in the **Snapshot Gallery**.

2. Choose **Check-In/Out→Check-Out** from the shortcut menu.

3. Choose **Rename** from the shortcut menu.

   Teamcenter opens the **Rename Snapshot** dialog box.

4. Type the new name of the snapshot and click **OK**.

5. Check the snapshot back in by choosing **Check-In/Out→Check-In** from the shortcut menu.

Delete a 2D snapshot

1. Search for the 2D snapshot that you want to delete.

2. Select the snapshot and choose **Delete** from the shortcut menu or click .

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Teamcenter deletes the selected 2D snapshot.

> Note:
>
> Teamcenter can only delete 2D snapshots that are not referenced by an existing document.

Compare a 2D snapshot to the current image

You can visually compare the current image with a 2D snapshot that was captured from a previous revision of the base image dataset.

1. Open a newer item revision that contains a reference to the 2D snapshot that you want to compare.

2. Select a 2D snapshot created from a previous revision in the **2D Snapshot Gallery**.

3. Right-click the selected snapshot and choose **Compare**.

4. Click the **Compare Layers** button.

   Teamcenter displays the **Compare Layer List** dialog box.

5. Click **OK**

   Teamcenter opens the current image dataset to the same view that was used to capture the 2D snapshot in the previous revision and applies the same markup. You can then visually compare any differences in the two image datasets.

6. Right-click the selected snapshot and choose **End Compare**.

Check out/check in a 2D snapshot

1. Search for the 2D snapshot that you want to check out.

2. Right-click the desired snapshot and choose **Check-In/Out→Check-Out**.

   Teamcenter displays the **CheckOut** dialog box.

3. Click **Yes** to check out the snapshot.

   Teamcenter automatically checks out the current version of the snapshot from the database to prevent you from unintentionally overwriting another user's changes.

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Tip:

Note that the checked-out 2D snapshot now has a green or red (if it is currently selected) border in the **Snapshot Gallery** dialog box and its name is displayed in an italic font.

Define attributes for a 2D snapshot

You can define attributes that Teamcenter uses to search the 2D snapshots in the **Attributes** dialog box.

The checkin and checkout for the snapshot attributes are independent from the checkin and checkout for the snapshot itself. You do not need to check out the snapshot to edit its attributes. Even if you have the snapshot checked out, you still need to check out the attributes form to edit it.

1. In the **2D Snapshot Gallery** dialog box, right-click the desired snapshot and select **Snapshot Attributes**.

2. In the **Attributes** dialog box, click **Check-Out and Edit**.

3. In the **CheckOut** dialog box, click **Yes**.

4. Enter values into the boxes. By default, revision ID and page number of the base image are already provided. Your administrator can configure which attributes are available by creating a custom form and setting the **VisSnapshot2DFormName** Business Modeler IDE constant.

5. Click **Save**.

   Teamcenter saves these attributes with the 2D snapshot.

6. Click **Check-In** to check in the changes or **Cancel Check Out** to discard the changes.

7. (Optional) To have Teamcenter display the **Attributes** dialog box each time you create a 2D snapshot, choose **Options→Show Attributes Form on Add**.

Create custom forms for 2D snapshots

If you want to use custom 2D snapshot forms, your administrator must do the following:

1. Create a new business object with **Vis_Snapshot_2D_Form** as the parent.

2. Define the **VisSnapshot2DFormName** business object constant.

3. Set this constant to the name of the extended form.

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Note:

When adding the new custom form, you must not modify the form storage class name that is automatically set (*name_of_custom_form***Storage**).

Create a 2D geometry asset

If you want to embed a 2D snapshot in a work instruction, you must create a 2D geometry asset for the snapshot. You can create work instructions using Teamcenter Publish.

1. Right-click a 2D snapshot in the **Snapshot Gallery** dialog box.
2. Choose **Options→Capture 2D Geometry Asset**.
3. (Optional) Modify the graphic quality of the 2D geometry asset by choosing **Options→Modify 2D Geometry Asset Settings** and adjusting the slider to the desired quality.
4. Create the 2D snapshot.

   Teamcenter creates the 2D geometry asset while creating the snapshot.

Manipulate graphics

You can use transformation tools to graphically manipulate parts or assemblies in the structure.

You can perform two types of manipulations:

- Choose **Graphics→Transformation→Temporary Transformation** to temporarily translate, rotate, or scale parts or assemblies. You cannot save temporary transformations, but you can capture images of them.
- Choose **Graphics→Transformation→Persistent Transformation** to edit the structure by permanently translating and rotating parts or assemblies. (Scale option is not available.)

  Note:

  If there are arrangements in the structure, by default persistent transformations are applied to all of them. To limit persistent transformations to the active arrangement, set the **TCVIS_reposition_all_arrangements** preference to **False**.

The differences between performing a temporary transformation and editing the structure are listed in the following table.

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Functionality	Temporary Transformation	Persistent Transformation (editing the structure)
Permanence	All changes are temporary. Teamcenter removes the modifications when you close the window.	Changes are permanent.
Repositioning options	All options are permitted.	All options are permitted except scaling.
Occurrences repositioning	Occurrences are not repositioned.	Occurrences are repositioned, potentially updating multiple BOM lines.

The **Temporary Transformation** dialog box provides the same options as the Lifecycle Viewer **Part Transformation** dialog box. The **Permanent Transformation** dialog box provides the same options, except for scaling.

Working with markups

Adding and deleting markups

When an image is loaded in the viewer, you can add markup layers to the image. You can mark up JT files that are attached to **DirectModel** datasets or schematic geometries. You can also view images in JPEG or BMP formats that are attached to a schematic geometry. To view and mark up schematics, your administrator must set the **TC_Schematic_BOMView_Types** preference to **on**.

Markups are text or graphical elements that you draw in the viewer with your model or schematic. 3D markups display on 3D layers.

Markups may include lines, rectangles, polygons, ellipses, inset images, and text.

Anchored text markups can include part information and metadata attributes.

To create or modify markups, display the relevant toolbar by right-clicking the Lifecycle Visualization base toolbar and choose the appropriate command from the shortcut menu.

> Note:
>
> If you are working with schematics, only a limited set of functions are available. The following options do not apply to schematics: edit color/translucency, insert, view control, export 3D, reposition, rotate, PMI, clearance, cross-section, navigation, and visibility.

Working with 3D and schematic markups

Create a 3D markup dataset

You need to create a **DirectModel3DMarkup** dataset to store 3D markups of structures or assemblies.

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Note:

You MUST HAVE at least the Teamcenter lifecycle visualization standard configuration installed to work with 3D markups.

1. Load the structure or assembly (**DirectModel** dataset) in the viewer.

   Teamcenter displays the model and the Lifecycle Visualization toolbar.

2. Click the **Create Markup** button.

   Teamcenter displays the **Create Markup3D Dataset** dialog box.

3. In the dialog box, type a name for the dataset in the **Dataset Name** box.

4. (Optional) Type a description of the dataset.

5. Click **OK**.

   Teamcenter creates the **DirectModel3DMarkup** dataset and attaches it to the **DirectModel** dataset.

You can create multiple **DirectModel3DMarkup** datasets under a single structure or assembly. Each **DirectModel3DMarkup** dataset can contain multiple markup layers.

Note:

Markup layers are stored as VPL files.

Draw 3D markups

Perform the following steps to draw markups on structures, assemblies, or schematics:

1. On the **3D Markup** toolbar, click **Enable Markup** .

2. (Optional) To change colors, fill styles, line and edge styles and sizes, and font styles and sizes, click **Preferences** .

3. (Optional) To draw a filled ellipse, polygon, rectangle, or text markup, click **Fill** .

4. (Optional) To attach the markup to a point on the model or schematic click **Anchor** .

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Anchored markups display, hide, and move with their attached parts. Anchored text markups are attached to parts with leader lines.

5. (Optional) Create or select a layer for the markup. If you do not have a markup layer, one is created when you add the first markup.

6. Specify the markup type by clicking the corresponding button on the **3D Markup** toolbar.

   Teamcenter changes the cursor to indicate the type of markup.

7. Place the markup in one of these ways:

To place this markup	Perform these actions
Line	a. (For an anchored markup) Select a point on the model or schematic. b. In the viewer, drag the mouse pointer to draw a line. c. (Optional) To draw a horizontal or vertical line, press and hold the shift key as you drag.
Polyline	a. (For an anchored markup) Select a point on the model or schematic. b. In the viewer, click to place one endpoint. c. (Optional) To draw horizontal or vertical polyline segments, press and hold the shift key. d. Click to place each vertex. e. Double-click to place the last vertex.
Freehand line	a. (For an anchored markup) Select a point on the model or schematic. b. In the viewer, drag the mouse pointer to draw.
Rectangle	a. (For an anchored markup) Select a point on the model or schematic. b. In the viewer, click to place one corner. c. Drag the mouse pointer, and then release to place the opposite corner.

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To place this markup	Perform these actions
	d. (Optional) To draw a square, press and hold the shift key as you drag.
Polygon	a. (For an anchored markup) Select a point on the model or schematic.
	b. In the viewer, click to place each vertex.
	c. (Optional) To draw horizontal or vertical segments, press and hold the shift key as click.
	d. Double-click to place the last vertex.
Ellipse	a. (For an anchored markup) Select a point on the model or schematic.
	b. In the viewer, drag the mouse pointer to draw.
	c. (Optional) To draw a circle, press and hold the shift key as you drag the mouse pointer.
Inset image	a. In the **Open** dialog box, select the image dataset and click **Open**.
	b. (For an anchored markup) Select a point on the model or schematic.
	c. In the viewer, drag the mouse pointer to place and size the image.
Text	a. (For an anchored text markup) Select a point on the model or schematic. Teamcenter displays the **Markup Text** dialog box.
	b. (Optional for an anchored text markup) In the **Markup Text** dialog box, click **Advanced** to add part information or metadata attributes.
	c. (For a floating text markup) Click a point in the viewer to place the text markup. Teamcenter displays the **Markup Text** dialog box.
	d. (Optional) Change the font, size, and style of the text.

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To place this markup	Perform these actions
	e. (Optional) To change the shape in which the text appears, from the **Bounding shape** list, choose the **None**, **Rectangle**, or **Circle**. f. Type the text of the markup in the **Text** box. g. Click **OK**.
URL	a. Place a text or inset image markup. b. Right-click the markup, and choose **Properties**. c. In the **Properties** dialog box, click the **Hyperlink** tab. d. In the **Link Specification** box, type the URL, or click **Browse** and browse to the appropriate file path. You can link to any type of file. The application that is associated with the file type opens and displays the file. e. Click **OK**. f. To navigate to the URL or launch the referenced file, double-click the link. Note: When you open a URL for an animation (VAN) file, the animation plays automatically. To create a URL markup that opens the default E-mail program and addresses a message, type **mailto:** in the **Address** box. When you double-click the link, the E-mail program is launched and a message is addressed to the specified address.

The markup appears in the viewer, with a list of markups under the selected markup layer. If Teamcenter displays an asterisk (*) before the markup layer name, changes were made to the markup layer since it was last saved.

Note:

If you open a 3D model that includes an anchored text markup that is anchored to an item that has been removed from the current 3D model or moved to a different structure in the same 3D model,

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when the 3D model file opens, the leader line does not appear and the text of the 3D markup appears in red.

Create a 3D markup layer

Create a 3D markup layer using one of the following methods:

Initial markup layer

1. Ensure a 3D markup is visible.
2. Click the **Save Layers** ( ) button on the Lifecycle Visualization base toolbar.

   The system displays the **Save Layer** dialog box.
3. Type a name for the new layer in the **Name** box and click **OK**.

   Teamcenter displays the new layer in the **Markup Layers** list.

Note:

The **Markup Layers** list does not display until you create a 3D layer.

Additional markup layers

1. Right-click in the **Markup Layers** list and choose **New Layer** from the shortcut menu.

   Teamcenter displays the **Save Layer** dialog box.
2. Type a name for the new layer in the **Name** box and click **OK**.

   Teamcenter displays the new layer in the **Markup Layers** list.

Note:

The **Markup Layers** list does not appear until you create a 3D layer.

Open 3D markup layers

- Select a 3D Markup dataset.

  Teamcenter opens the **Markup Layers** list containing the saved layers for the dataset.

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Save 3D markup layers

When you create or edit a 3D layer, an asterisk (*) appears before the name of the layer in the **Markup Layers** list until you save the layer. When you save the layer, the asterisk disappears until the layer is edited again.

Save 3D layers together or separately. Perform the following steps to save layers:

1. From the **Markup Layers** list, select the layer that you want to save.
2. Right-click and choose **Save Layer** from the shortcut menu.

   Teamcenter removes the asterisk next to the layer name in the list.

Delete 3D markup layers

1. Right-click the **DirectModel3DMarkup** dataset in the tree.

   Teamcenter displays the **Dataset Object** menu.
2. Choose **Named References**.

   Teamcenter displays the **Named References** dialog box.
3. In the named reference table, select the markup layer that you want to delete.
4. Click the **Cut** button.

   Teamcenter removes the layer from the named reference list.
5. Click the **Close** button.

   Teamcenter closes the **Named References** dialog box.

Control the display of 3D markup layers

To	Perform these actions
Display or hide 3D layers	Select or clear the state indicator to the left of the layer name in the **Markup Layers** list.
Save all layers	Save all the 3D layers, separately, with their current file names.
Save layer	Save the selected 3D layer.

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To	Perform these actions
Save layer as	Save the selected 3D layer with a new file name.
Capture view	Capture the orientation of the model and markup as seen in the viewer for the selected layer.
Apply view	Restore the captured view for the layer selected.
Hide view	Hide the captured view for the layer selected.

Working with 2D markups

View 2D images

1. Select the **DirectModel** dataset in the navigation tree or **Properties** table and click the **Viewer** tab.

   > Note:
   >
   > To view a named reference of the **DirectModel** dataset, right-click the dataset in the tree, choose **Visualize Named Reference** from the **Dataset Object** menu, and choose the named reference file that you want to view.

   Teamcenter displays a message indicating that you are about to view a JT assembly and verifying that you want to download all the components of the assembly.

2. Click **OK** to download the components.

3. Click the **Image Capture** button in the viewer pane. The **Create Markup Layer** dialog box appears, allowing you to create a **DirectModelMarkup** dataset and attach it to the original **DirectModel** dataset as a markup relationship. The **Viewer** pane now contains a **Markup Layers** tree to the left of the graphical display.

Compare 2D image layers

You can compare image layers when you want to:

- Display common areas and differences.
- Display the common areas of both layers, one of the comparison layers, or all of the comparison layers.
- Change the colors of one or both image layers in your comparison.

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1. Choose two 2D image datasets in the navigation tree.
2. Choose **Compare 2D Images** from the **View** menu.

   Teamcenter displays the images in the **Viewer** tab and displays the 2D Compare toolbar.
3. Perform one of the following tasks:

To	Perform these actions
Display only the compare layer (common areas of both layers)	Click the **Display Compare Layer** button on the 2D Compare toolbar. Only the compare layer is displayed in the **Viewer** tab. The information that is common to both layers is drawn in black.
Display one layer and not the other	Click the **Display 1st Layer** button or the **Display 2nd Layer** button .
Display all comparison layers	Click the **Display All Layers** button . All the comparison layers are displayed. Unless you have changed the color preferences, the first layer is green; the second layer is red; the comparison layer is black.

Create 2D markups

1. Select the 3D format (**DirectModel**) of the object that you want to revise.
2. Click the **2D Markup** button in the viewer pane.

   Teamcenter displays the **Create Markup Layer** dialog box.
3. Type the name of the markup layer that you are creating in the **Name** box.
4. Select the type of file from the **File Type** list.
5. Type a brief explanation of the markup layer's purpose and content in the **Description** box and click **OK**.

   The new markup layer can be found in the **Properties** table, or by expanding the **DirectModel** object in the tree.

Create 2D markup layers

You can use **DirectModelMarkup** and **Markup** datasets to create a new markup layer for a 2D format image, as follows:

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1. In the navigation tree, select a **DirectModelMarkup** or **Markup** dataset for the object that you want to revise and click the **Graphics** view.

2. Mark up the 2D image using the markup toolbar.

3. Save the markup layer in the new dataset component.

4. Click the **Save 2D Markup** button .

   Teamcenter displays the **Save Layer** dialog box.

5. Type the name of the layer that you are creating in the **Name** box and click **OK**.

   Teamcenter generates a 2D file, stores it in the current dataset and displays it in the **Markup Layers** tree. If multiple markup layers are created in the same session, they can all be saved simultaneously. Teamcenter displays a separate **Save Layer** dialog box for each saved layer.

Manipulating subcomponents

Viewing individual visualization components

An assembly imported into Teamcenter as a single part file without CAD models may represent an assembly of individual solid objects. Teamcenter treats such an assembly as a single line in the structure and, by default, you cannot expand it to visualize the individual components. For example, if you import an assembly from a non-NX CAD system, Teamcenter creates a single part file without the associated CAD model within the structure.

> Note:
>
> In this instance, parts files are not necessarily devoid of CAD models and structure. They may have NX or other CAD application models. However, these files may have more than one solid or subcomponent within them. A typical part file only has one subcomponent or solid in it.

To view the individual visualization components, you must specifically select the affected and unpacked structure line and choose **Show Subcomponents**. You can subsequently hide the subcomponents when you have viewed the assembly.

If the assembly node has a monolithic **DirectModel** dataset associated with it and the **JT_File_OverrideChildren_Refsets** user preference is set appropriately, Teamcenter uses the monolithic JT file to display the assembly. This icon means the assembly node has a monolithic JT file. If you use **Show Subcomponents** to expand the structure in the monolithic JT file, you can manipulate the individual subcomponents, control their visibility, and create product views capturing the current state.

View subcomponents in an assembly

1. In the structure, select the BOM line node containing an assembly of solids.

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The part file can be a root node or subassembly node. If it is a subassembly node, the **JT_File_OverrideChildren_Refsets** user preference must be set appropriately. You can also select and expand nodes containing multiple part files.

2. Do one of the following:

   - Choose **Graphics→Show Subcomponents**.
   - Right-click the node and choose **Show Subcomponents**.

   Teamcenter expands the part file to show the structure of the subcomponents.

   You can display selected subcomponents in the viewer by selecting the corresponding check boxes.

Display selected subcomponent in expanded part file

1. Unpack and select the leaf line node for the relevant subcomponent. You can select more than one node.

2. Do one of the following:

   - Choose **Graphics→Show Subcomponents**.
   - Right-click and choose **Show Subcomponents**.

   Teamcenter expands the node. If the node has a monolithic JT file, you can see the structure of the subcomponents.

   Check boxes appear in the tree for each node.

3. Select or clear the check boxes in the tree to show or hide the subcomponents in the viewer.

   You can control the solids independently, select them in the viewer or the structure tree, and use transformation tools to reposition them.

   After breaking down the solids, you cannot reload the monolithic JT file for the line node.

Merge subcomponents

After manipulating the individual subcomponents, you can merge them back into the subassembly.

1. In the structure, select the leaf node or assembly node part file.

   You can select multiple nodes.

2. Do one of the following:

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- Choose **Graphics→Hide Subcomponents**.
- Right-click and choose **Hide Subcomponents**.

Teamcenter unifies the subcomponents within the parent part and removes the tree from the structure. The subassembly behaves like a single part in the viewer.

Managing product and manufacturing information (PMI)

Using PMI objects for inspection planning

Creating and maintaining inspection documentation can be a tedious and manual task. Product and manufacturing information (PMI) is usually authored in a CAD system and saved with the part. Using the **PMI Manager** view, you can:

- Import product and manufacturing information (PMI) data into Teamcenter and use it to directly generate inspection points. PMI created in NX part (PRT) files can be imported from:
  - An XML file exported from **BCT Inspector**.
  - A Teamcenter lifecycle visualization JT file exported from NX 7.5 or later using JT Open Toolkit V7.1.5.0 or later. You can import all data from the JT file or select the data you want to import from the list or visual area of the **Graphics** view. PMI that can be imported from JT includes GD&T modifiers and feature control frames (both single and composite), upper and lower surface finish roughness values and related ISO details, linear, angular, and radial dimensions, upper and lower specification limits, nominal values, and dimensional text notes. Set the **Mci0ExtractPMISurfaceProperties** preference to **true** to retrieve surface properties that can be displayed as columns in bill of materials (BOM) or bill of process (BOP) views.

Surface location X	Surface axis K	Primary datum reference
Surface location Y	Surface radius	Secondary datum reference
Surface location Z	Surface entity	Tertiary datum reference
Surface axis I	Surface type	Characteristics type
Surface axis J	Surface name	Tolerance description

> Note:
>
> You can also import PMI created in Catia and converted to JT using NX, the official PLM translator for Catia, which provides a unique accountability ID for each PMI object. If you use other CAD translators, the accountability ID of each PMI object must be larger than 0 and unique under the part to import correctly.

Except in the **Graphics** view, GD&T is reported using readable text. No special symbols are provided.

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You can also:

- Assign PMI objects to operations so that they become inspection points.
- Create new inspection points, known as Data Collection Definitions (DCDs), on parts in a BOM and copy and paste them to processes and operations so that they are consumed in a BOP. You can also directly create DCDs on processes and operations in a BOP.
- Edit and add manufacturing parameters to PMI objects and DCDs to better support your process.
- View the acquired PMI objects per .prt (stage) file from NX.
- Indicate on some PMI objects that they are not to be inspected.
- Delete PMI objects.

Caution:

The following limitations exist:

- Assembly PMI objects are only connected to the assembly (.jt) and not to stage (.prt) parts.
- When importing PMI from a JT using JT Open Toolkit, the API must be installed externally from Teamcenter.
- Weld objects on JT are not supported.

After assigning PMI objects to operations, you can export the inspection parameters with PLM XML information in a work package to a manufacturing execution system (MES), where data can be used to assure inspection results meet PMI parameters during inspection operations.

Working with product and manufacturing information (PMI)

If you use product and manufacturing information and want to ensure that effectivity works correctly, you must set the following preferences:

- **MEStockAbleBomLinePropertyName**
- **MEValidStockAbleValues**
- **MEPostAssignIDICMaker**

To ensure that effectivity functions properly in your environment when using PMI, you can create a pre/post extension on the **BOM__line_assign_child_line** operation and implement your own business logic. This operation is used to form connections between two objects, for example, to connect (assign) a part to a process or the engineering bill of materials (EBOM) to the manufacturing bill of materials

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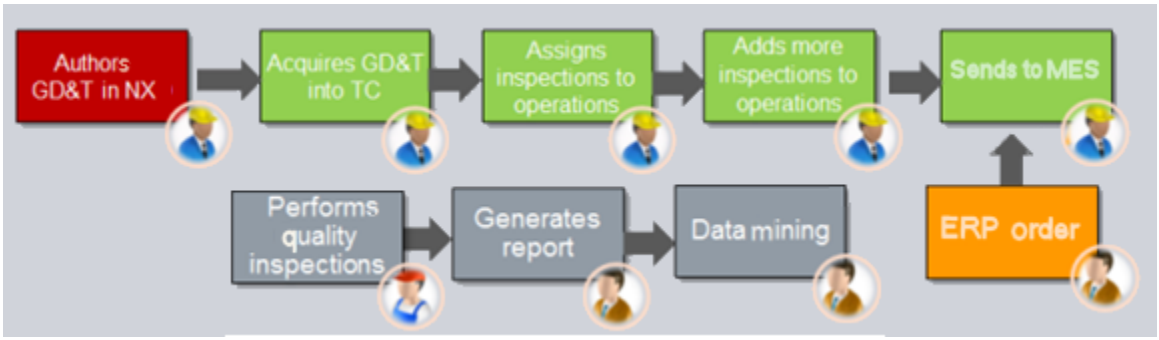
(MBOM). Additionally, this operation copies some attributes from source object to target. Your custom extension computes the effectivity of the source occurrence in the EBOM and sets it as the effectivity of the target occurrence under the PMI context.

> Note:
>
> You should not set an in-context ID manually if you are working with PMI and effectivity.

Inspection planning workflow



1. PMI annotations are authored in NX.

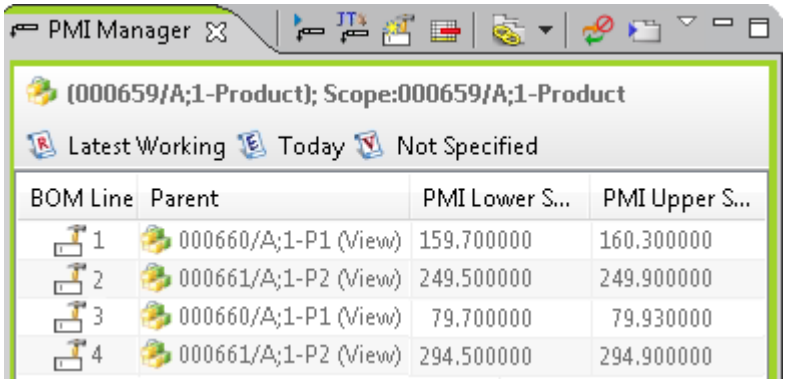
2. PMI objects are either:

   - Captured and ballooned using BCT Inspector Suite software, then exported from BCT Inspector Suite in XML format for use in Teamcenter.

   - Or exported from NX in JT format using JT Open Toolkit.

3. PMI objects are imported into Teamcenter.

   Objects appear as lines when you open them in the **PMI Manager** view.



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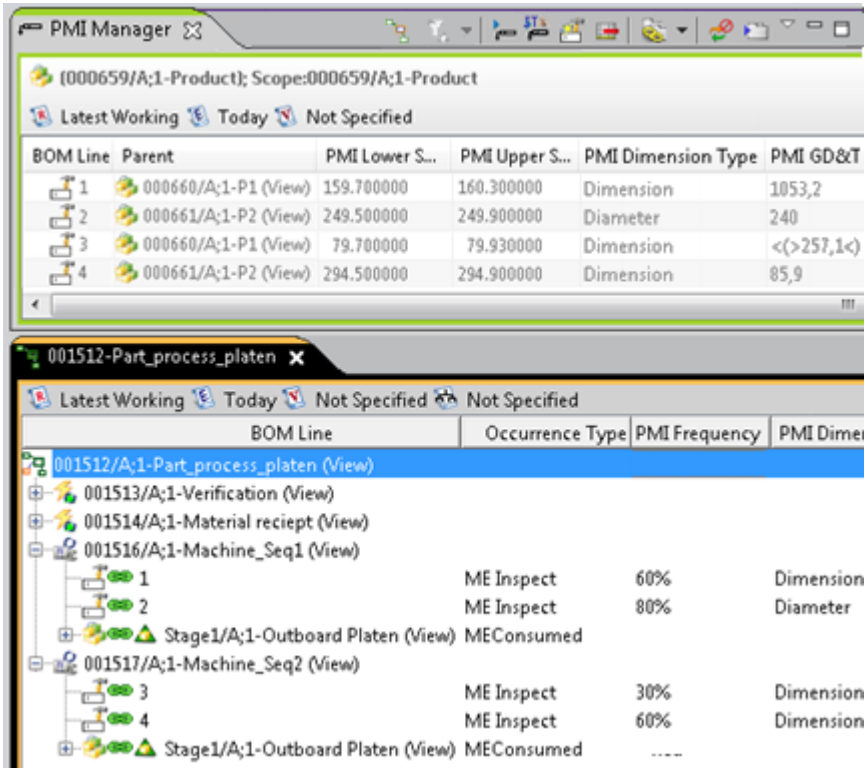
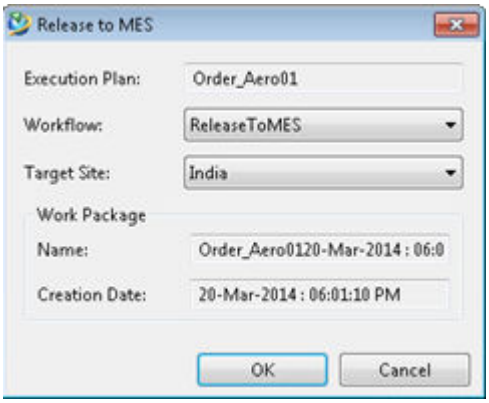
4. You assign PMI objects to operations by copying from the **PMI Manager** view and pasting to a process view so that they become inspection points.



> Tip:
>
> You can add additional inspection points in Teamcenter by creating Data Collection Definitions (DCDs). You can also edit process-specific attributes for PMI objects or DCDs, and remove any unwanted PMI objects or DCDs.

5. Finally, you release the structures to your MES system.



6. The operator can now execute work instructions and retrieve the required data collection values.

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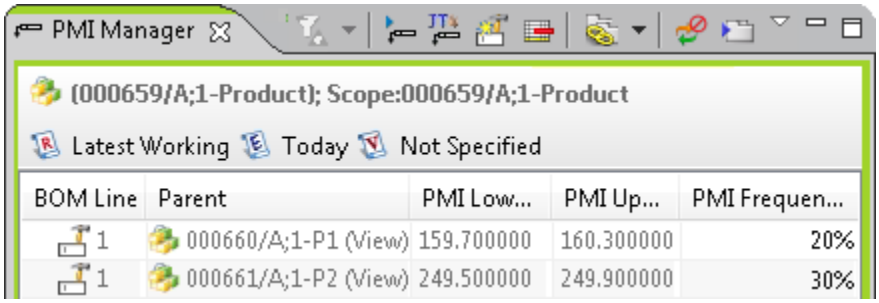
Using the PMI Manager

Customize the **PMI Manager** view to display a wide variety of PMI attributes as columns, many of which are editable and let you add process information not included in the PMI that derives from NX source data. Many PMI columns are also available from bill of material (BOM) and bill of process (BOP) views.

PMI data flows differently when you set the view scope by selecting a part in the product or process structure and choosing **Open with→PMI Manager**.



From **PMI Manager** views launched from the product structure, you can:

- Import new PMI or update PMI objects in Teamcenter from NX models using the third-party BCT Inspector Suite plug-in or exported in JT format from NX or other translators, provided unique accountability IDs exist for each PMI object .
- Remove PMI objects and Data Collection Definitions (DCDs) from the product structure.
- Filter PMI objects and DCDs that are assigned or not assigned to the process structure.

From **PMI Manager** views launched from the process structure, you can:

- Create additional DCDs not included in the NX data.
- Edit PMI attributes not defined in the NX source.

> Note:
>
> To assign PMI, you may still copy and paste structures containing DCDs from the **PMI Manager** view to the process view.

If part JT information that contains the PMI information is imported from NX to Teamcenter using the BCT Inspector Suite, a link between the BOM line PMI entities and JT PMI tags is created to synchronize the **PMI Manager** and **Graphics** views. Selecting a PMI object in the **PMI Manager** view highlights it in the **Graphics** view, and vice versa.

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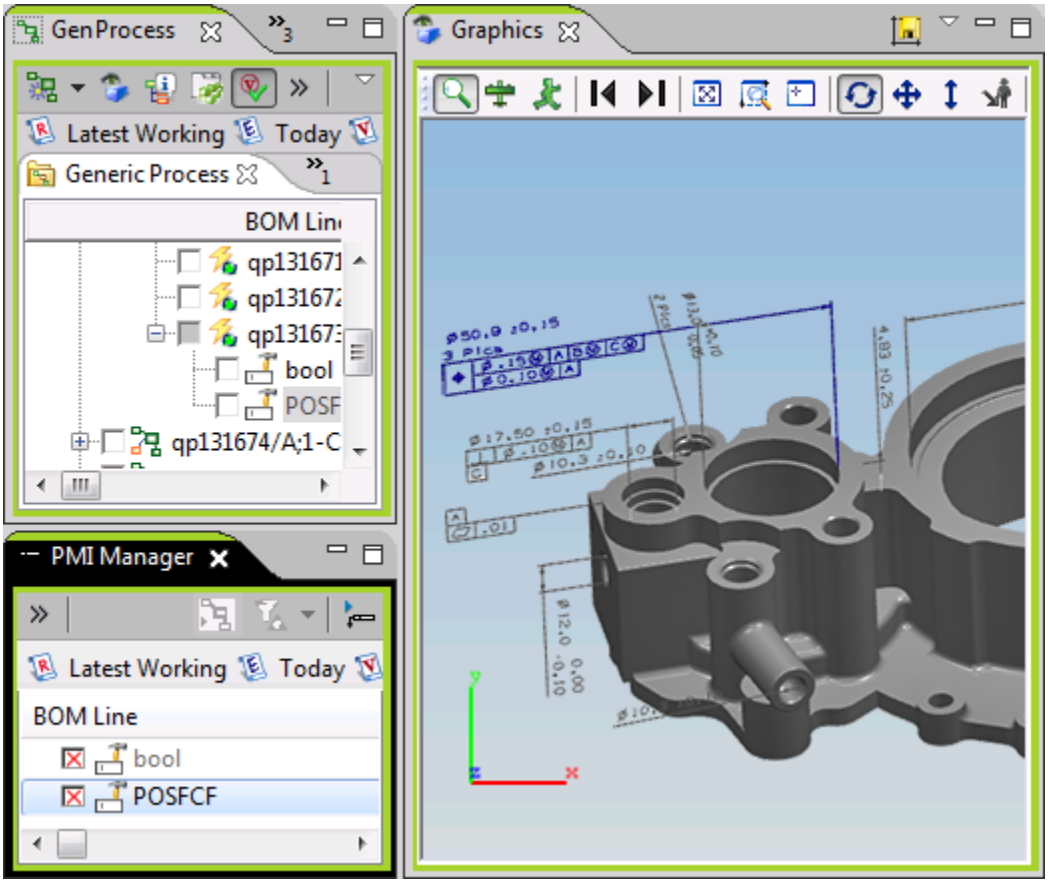

Support for GD&T composite FCFs and modifiers

Composite feature control frames (FCFs)

Composite FCFs consist of two or more feature control frames tied to a single feature, or to a pattern of multiple features of the same type. The example below applies a diameter tolerance to the positions of four holes (4X), relative to datums A, B, and C.

> Note:
>
> You or your administrator must set the value of the preference **Mci0ExtractPatternPMI** to **true** to extract a GD&T callout for multiple features associated to the same callout, as defined by a pattern (for example, 4X below). If the preference is set to the default value of **false**, only a single callout is extracted. This preference also applies to composite linear dimensions.

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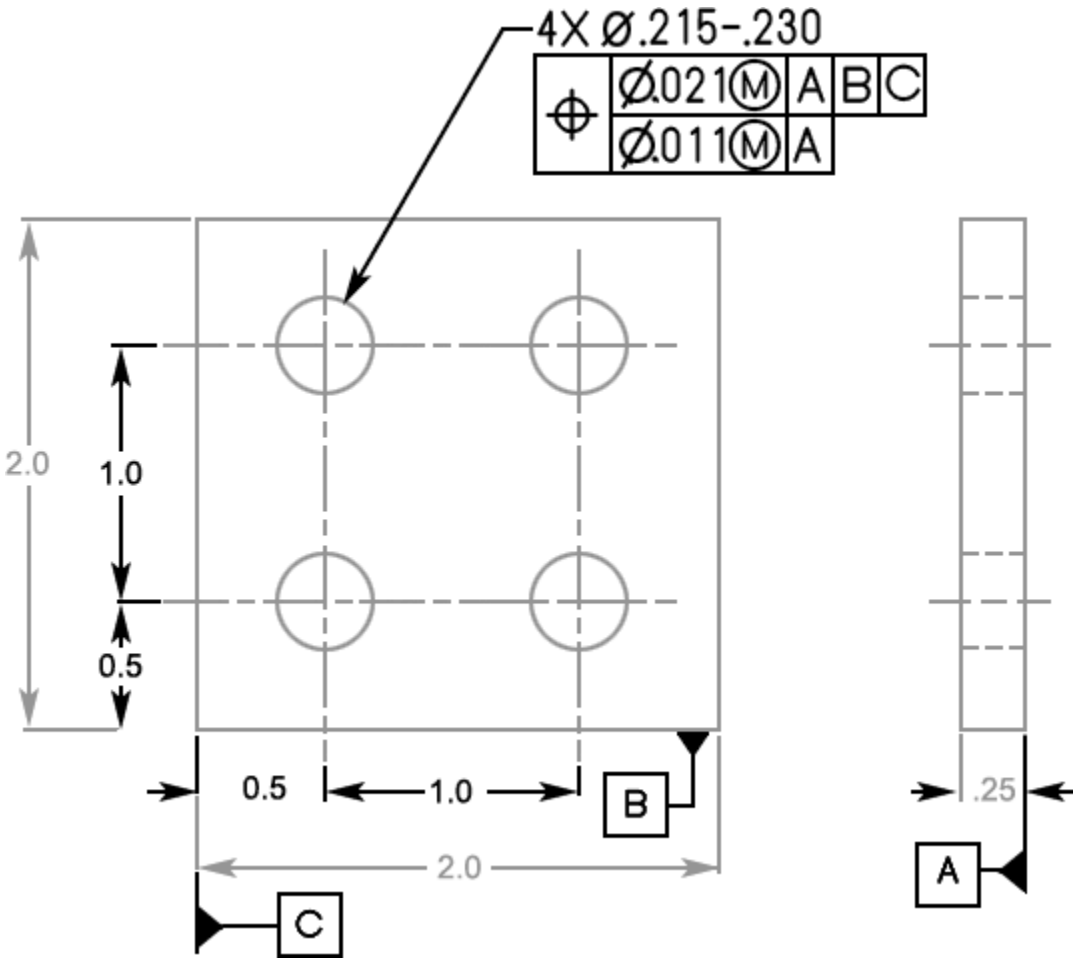
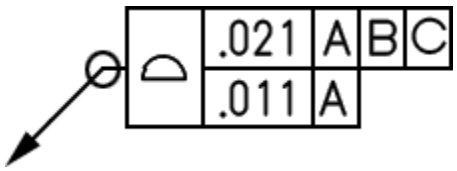


Below is an example of a composite surface profile tolerance. Many web sites contain more detailed information on GD&T and composite FCFs.



Note:

Composite FCF refinements, such as a third FCF that defines parallelism or perpendicularity tolerances for a pattern of holes, are not supported.

Like NX, Teamcenter uses a simple numbering sequence for each composite FCF. NX uses, for example, 11 and 11_1 to indicate FCFs that make up a composite FCF top to bottom, while Teamcenter uses 11 and 11.1 in the **PMI ID** column to show that these two FCFs are related to the same feature. The **PMI Is Composite FCF** column also displays a 1 to indicate that an FCF is part of a composite.

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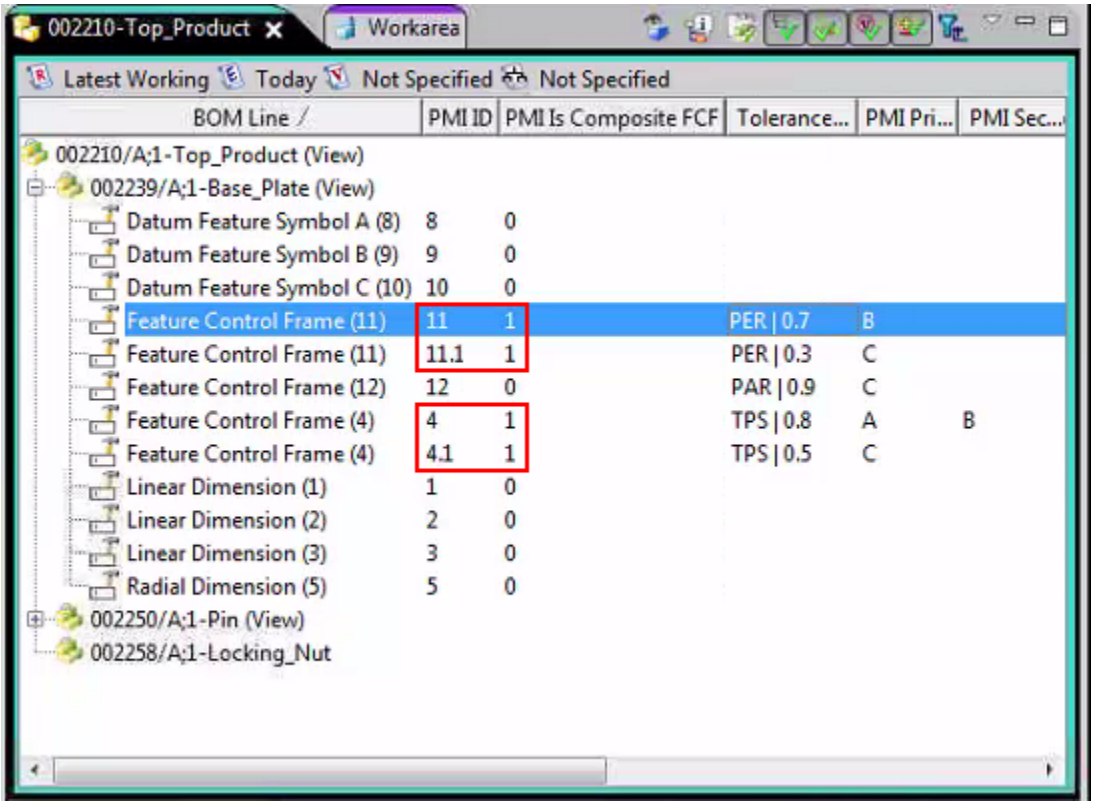

Note:

- When consuming composite FCFs in an operation—for example from a **Product** view to a **Process** view—you must press Ctrl and select all composite FCFs in the **Product** view before you copy and paste them to the **Process** view.
- To remove a composite FCF from an operation, you must also select both parts.
- You cannot assign one part of a composite FCF to one operation and the other to a different operation.

Modifiers

Modifiers added to tolerances and datums are extracted from JT files in relation to their tolerance and/or datum. The most common modifiers are Ⓜ for maximum material condition (MMC) and Ⓛ for least material condition (LMC). Supported modifiers are defined below.

Modifier symbol	Description
Ⓜ	Maximum material condition
Ⓛ	Least material condition
Ⓕ	Free state

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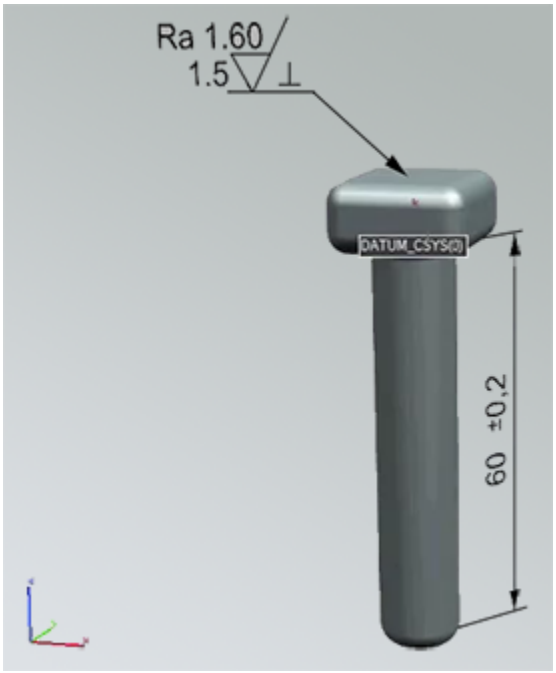
Modifier symbol	Description
Ⓣ	Tangent plane
Ⓟ	Projected
Ⓤ	Unilateral
Ⓢ	Regardless of feature size (RFS, discontinued after Y14.5, 1994)

Support for surface finish roughness

You can import upper and lower surface finish roughness values when importing PMI objects. This capability supports direct mapping of these values, as well as GD&T code properties, to system integration testing (SIT) data collection interfaces.



Once you create data collection definitions (DCDs) and assign them to operations in **PMI Manager**, you can view surface roughness values in your Manufacturing bill of materials (MBOM) and your bill of process (BOP) by enabling both the **PMI Upper Specification Limit** and the **PMI Lower Specification Limit** columns. You can view PMI GD&T code by enabling the column **PMI GDT Code**.

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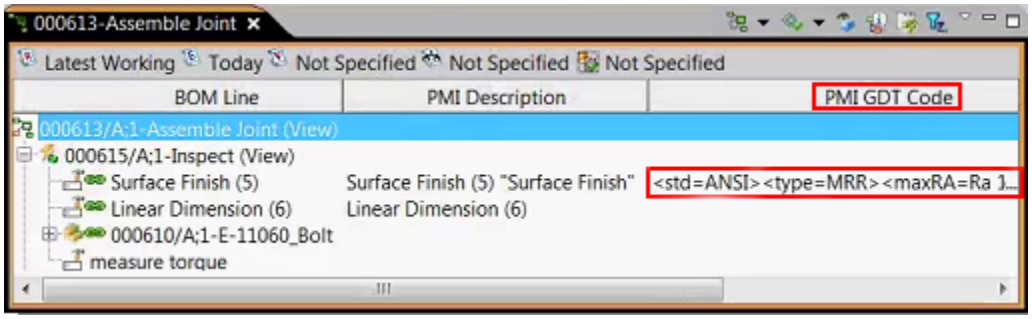

Note:

If the roughness is a simple Ra value (the value of all absolute distances of the roughness profile from the center line within the measured length), that value is applied to the **PMI Upper Specification Limit** property.

Import PMI objects from a BCT Inspector file

BCT Inspector exports PMI objects from NX in an XML format that you can subsequently import into Teamcenter.

Note:

You must use the following configuration settings:

- In the NX session, in the .ipxml file from BCT Inspector, set the PMI XML relation as a relation type to enable PMI import.
- A PMI dataset of the type **ipxml** should be attached with a PMI XML relation.
- In the BCT configuration file *bct_inspector_cfg.xml*, use the following settings:

  ```
  (<ExportProject Enable="1" DatasetType="Mci0PMIXml"
  DatasetNamedRev="Mci0ipxml" FileExtension="ipxml" batchProcessing="0"
  IgnoreBalloons="0" />)
  ```

- In Teamcenter, set the value of the preference **INSPECTOR_DATASET_RELATION_TYPE** to **Mci0PMIXmlRel**.

1. From a product structure, right-click the part to which you want to import PMI information and choose **Open with→PMI Manager**.

2. In the **PMI Manager** view, click **Import PMIs**.

   Teamcenter imports the PMI objects, places them on the appropriate parts, and extracts PMI information into the PMI property cells. You can now assign the PMI objects to operations.

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Import PMI from a JT file

You can import PMI from a Teamcenter lifecycle visualization JT file. PMI can include linear, angular, and radial dimensions, upper and lower specification limits, nominal values, dimensional text notes, upper and lower surface finish roughness values and ISO details, and both regular and composite GD&T feature control frames (FCFs) derived from JT. Set the **Mci0ExtractPMISurfaceProperties** preference to **true** to retrieve surface properties such as position X, Y, and Z, and direction I, J, and K.

You can import all data from a product structure or specific data from the part table or 3D window of the **Graphics** view.

1. If you have not already done so:

   a. Install JT Open Toolkit *that is supplied with Teamcenter* externally from Teamcenter.

   > Note:
   >
   > The JT Open Toolkit supplied with Teamcenter is stamped with a Manufacturing license, and any other toolkit package will fail to work.

   b. In NX 7.5 or greater, define the PMI information—for example, features, datums, tolerances, and FCFs—to be imported.

   Use the JTTK Inspector to verify which properties can be extracted.

   c. In NX, use JT Open Toolkit to export the JT file as documented in the NX help.

   d. In Teamcenter, create a product structure and apply the JT file to a Direct Model dataset.

2. In Manufacturing Process Planner, from the product structure, select a BOM line containing child lines as well as the directModel dataset.

3. From the product structure, right-click a BOM line containing child lines as well as the directModel dataset to which you want to import PMI information and choose **Open with→PMI Manager**.

4. Click to open the **Graphics** view.

5. From the product structure, show the JT image, right-click the image, and in the **Graphics** view, choose **Show PMI**.

6. Do one of the following.

   - To import all PMI data, in the **Graphics** view, right-click the part and choose **PMIs→Import PMI from JT**.

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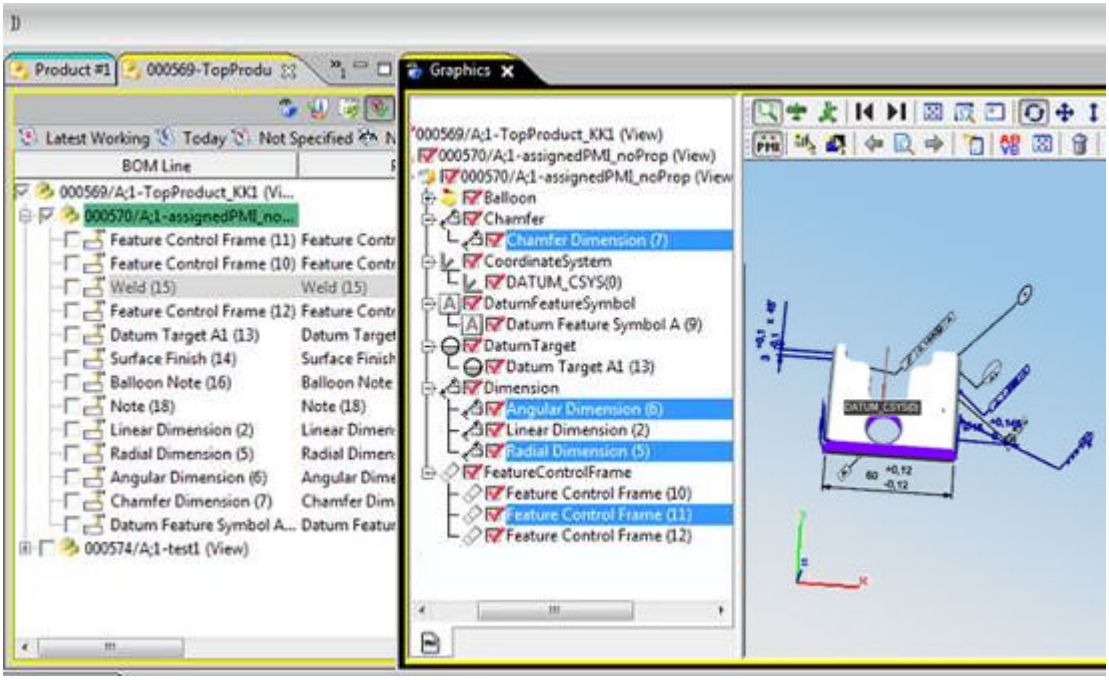
> Tip:
>
> You can also import PMI from the **PMI Manager** toolbar.

- a. To import specific PMI data, in the list or 3D viewer of the **Graphics** view, press Ctrl and select each PMI element you want to import.



- b. In the product structure, right-click the part and choose **PMIs→Import selected PMI from JT**.

Because the JT toolkit provides different ways to store information on JT files (assembly, part, monolithic), PMI objects are imported under the part the JT was created with, without any validation that those objects are attached to the part in the **Graphics** view. You can move, update, and delete PMI objects as necessary after import. The information is read from the JT and no changes are applied to the JT file. You can now assign the PMI objects to operations.

> Note:
>
> If the JT is updated and you reimport PMI, new PMI objects are added, existing PMI objects are updated, and missing PMI objects are deleted.

Assign a PMI object to an operation

1. In the **PMI Manager** view, assign PMI objects to operations by doing one of the following.

   - Use the **Copy** and **Paste** commands.

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a. Right-click a PMI object and choose **Copy**.

> Note:
>
> To assign composite feature control frames (FCFs) to an operation, press Ctrl and click all FCFs that make up that composite.

b. In the process pane, select the appropriate operation and choose **Paste**.

- Drag the part to the appropriate operation.

Assigning the PMI to an operation shares the values of specified properties with the operation. Any changes in these values in the structure automatically changes the values in the process.

2. Edit PMI object information.

Create data collection definitions (DCDs)

In addition to assigning PMI objects imported from CAD to operations, you can add your own DCDs to items such as parts, or to a process or operation, to better define the inspection plan. These DCDs share the same behavior as those that were generated from the PMI objects.

1. From a part or process structure, right-click a part, process, or operation and choose **Open with→PMI Manager**.

> Note:
>
> You can also create a DCD from a part in a bill of materials (BOM) structure, or a process or operation in a bill of process (BOP) structure, by right-clicking the element and choosing **PMIs→Create DCD**.

2. In the **PMI Manager** view, click **Create DCD** .

3. Select the type of data collection definition (DCD) you want to create.

You can choose from:

- **Boolean**
- **Buyoff**
- **Duration**
- **Image**
- **Integer**

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- **Procedure Completion**
- **Real Number**
- **String Data**
- **Time Stamp**
- **List of Values**

4. Click **Next**.
5. Add the properties required by the DCD type you are creating and click **Finish**.
6. If necessary, assign the DCD to an operation.

Edit PMI object information

You can add additional information to a PMI object to define attributes that pertain specifically to your process. This information, which does not exist in the CAD model, is saved only in the context of your process.

1. In the **PMI Manager** view, select **View Menu→Columns**.
2. In the **Available Columns** box, type **PMI**, and then add the columns for which you want to add information.
3. Click **Apply**, and then click **Close**.
4. Review or add PMI information.

Note:

You can edit the following columns.

Property	Description
Key Characteristic	Supports aerospace and defense enterprises that must adhere to the SAE AS9103 standard. You can identify features that must be controlled during production and that when changed, require a first article inspection. You can select the values **DKC** (Design Key Characteristic) or **PKC** (Process Key Characteristic).

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Property	Description
Occurrence Effectivity	Lets you hide or show assembly parts and PMI objects associated with those parts based upon occurrence effectivity settings.
PMI Criticality	Allows you to select values such as **Critical**, **Major**, **Minor**, or **Documentation Only** to indicate each PMI object's degree of importance when you are defining inspection operations.
PMI Description	Specifies a description that can be presented in the work instructions.
PMI Dimension Type	Specifies the type of the dimension, such as radius or diameter.
PMI Frequency	Specifies information for the MES system representing the frequency of the inspection, for example, whether it applies to every instance, once in a lot, first and last, and so on. The precise semantics of this property are project-specific.
PMI GD&T Code	Specifies XML code representing geometric dimension and tolerancing information.
PMI Marked As Deleted	Indicates whether the PMI object is deleted in NX.
PMI Not For Inspection	Prevents the PMI object from being included in the accountability check and also from being exported to MES.

Filter assigned and unassigned PMI objects

If you have a large number of PMI objects in the product view and want to verify which are or are not assigned in the process view, you can filter them in the **PMI Manager** view.

1. Open the **PMI Manager** view from the product structure by right-clicking the line that includes the PMI objects shared with the process structure and choosing **Open with→PMI Manager**.

   Tip:

   If you already have a different **PMI Manager** view open, you can change to the product view by clicking in the **PMI Manager** view.

2. In the process structure, select the structure that includes the same PMI objects.

3. In the **PMI Manager** view, click **Set selected process/operation as target process** .

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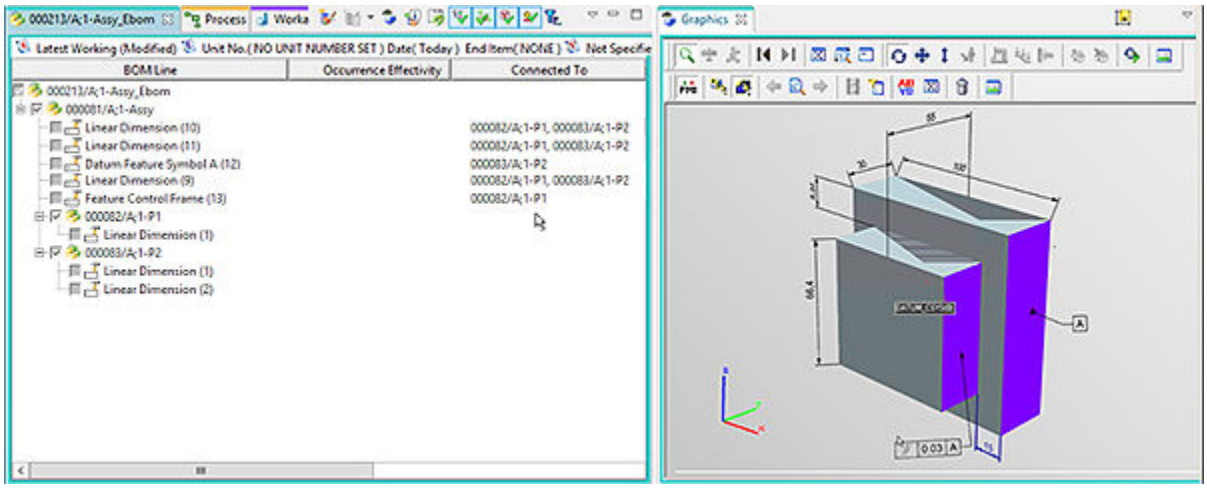
The process structure sets the scope of the command.

4. Select **Filter data based on assignment indication** and choose **Assigned** or **Unassigned**.

Hide or show PMI assembly parts and objects using occurrence effectivity

In Teamcenter Visualization, you can use **All Associated Parts are Configured** date-based or unit-based effectivity settings to hide or show assembly parts and PMI data. When you define this global setting in Teamcenter and apply occurrence effectivity, parts can be configured out and all assembly-level PMI associated to those parts are no longer displayed in the **Graphics** view. Additionally, if the assembly PMI is consumed in an operation, it is configured out as well.

In this example, some PMI objects are associated with multiple parts in an assembly, some are associated with a single part, and some are associated with no parts. Associations are reflected in the **Connected To** column in the assembly EBOM.



When you define occurrence effectivity settings for the part or parts you want to hide or show, those parts are hidden as well as any PMI specific only to those parts. In this example, part 000082/A-P1 is configured to be excluded from viewing on the current date. The PMI objects specific to this part are also excluded. Any PMI objects not connected to a specific part remain displayed. If a dimension is also connected to another part, it remains in the **Graphics** view.

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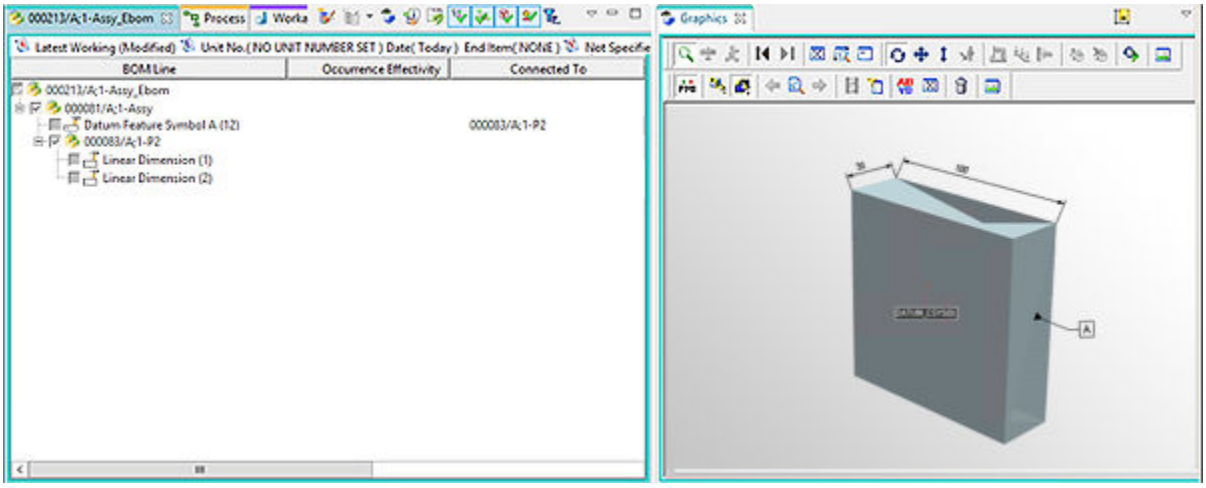

Remove PMI objects

To avoid data loss during synchronization, PMI objects that are removed in NX are not deleted in Teamcenter. They are marked for deletion in the **PMI Marked As Deleted** property, and you can then remove them manually.

1. In the **PMI Manager** view, select the PMI object or DCD to be removed and click **Remove** .

2. Remove the PMI line from the manufacturing BOM.

When you run an accountability check, you can include the **PMI Marked As Deleted** property in the partial match criteria. Teamcenter then displays the removed PMI objects as a partial match, and you can delete them manually.

Run an accountability check on PMI objects

You can run an accountability check to validate completeness (whether all PMI objects are part of an inspection plan) and to discern changes to them.

- If a part is revised and corresponding PMI objects change, the accountability check highlights all changes (additions, modifications, deletion) by comparing two revisions of the part (MBOM-MBOM compare). The MBOM must be configured differently for the two revisions (for example, **working** and **released**).

- If a part is modified without revising it, the accountability check detects all modifications for the PMI objects that are assigned to operations in the plan (using MBOM-BOP compare).

> Note:
>
> Changes done in operation-level properties are not reported by the accountability check.

1. **Run an advanced accountability check.**

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2. Select the **AccountabilitySkipPMINotforInsp** as the source filtering rule.

3. When you reach the step where you are choosing comparison properties in the **Partial Match** tab, add the desired properties.

> Note:
>
> If you want to prevent a PMI object from being included in the accountability check and also from being exported to MES, use the **Not For Inspection** property to exclude it from consideration.

Working with drafting symbols and GD&T symbols

Your administrator may permit the use of drafting symbols and geometric dimensioning and tolerance (GD&T) symbols in any of the fields of a form.

To add or edit symbols in a form, display the form in the **Viewer** view and click the **Edit** button. Teamcenter displays the **Change GD&T Symbols** dialog box.

To add or edit drafting symbols, click the **Drafting Symbols** tab and click one or more of the predefined symbol buttons. To add or edit GD&T symbols, click the **GDT Symbols** tab and click one or more of the predefined symbol buttons.

To format rich text, use the following buttons that are available in the **Drafting Symbols** tab and the **GDT Symbols** tab:

Manually refresh the editing box.

Add a frame around the selected characters.

Bold the selected text.

Italicize the selected text.

Underline the selected text.

Set the color of the selected text.

Decrease the size of the selected text.

Increase the size of the selected text.

Subscript the selected text.

Superscript the selected text.

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	Align the selected text.
	Center align the selected text.
	Right align the selected text.
	Insert the text you typed in the two boxes to the left of this button.
	Insert a control frame around the selected characters.

Additions and changes are reflected in the editing box of **Change GD&T Symbols** dialog box. To save changes and exit, click the **Edit** button again.

Performing in-context editing

Managing absolute occurrences (in-context editing)

An *absolute occurrence* is a specific instance of a component or assembly in a structure. It may be independent of the top-level assembly and only meaningful in the context of a lower level assembly. For example, you may have four occurrences of a wheel in the design of a vehicle; you can label one of those occurrences as **left rear wheel**, which is an absolute occurrence of the wheel. When you open a window containing the structure, each absolute occurrence is represented by a single line.

To create an absolute occurrence, you edit the occurrence line *in context* with respect to the assembly in which the absolute occurrence data is meaningful. Hence, the creation of absolute occurrences is sometimes referred to as *editing in context*.

> Note:
>
> Absolute occurrences are not the same as *appearances*. Absolute occurrences are generated when you build the structure (edit in context) and do not have associated spatial information.

A component or subassembly that appears in more than one product structure can have the same absolute occurrence in each structure.

You cannot create absolute occurrences directly, only by converting a relative occurrence and editing its properties. Similarly, you cannot delete absolute occurrences directly. You cannot create absolute occurrences on substitutes.

An absolute occurrence may appear more than once in the structure, depending on the context in which you created it.

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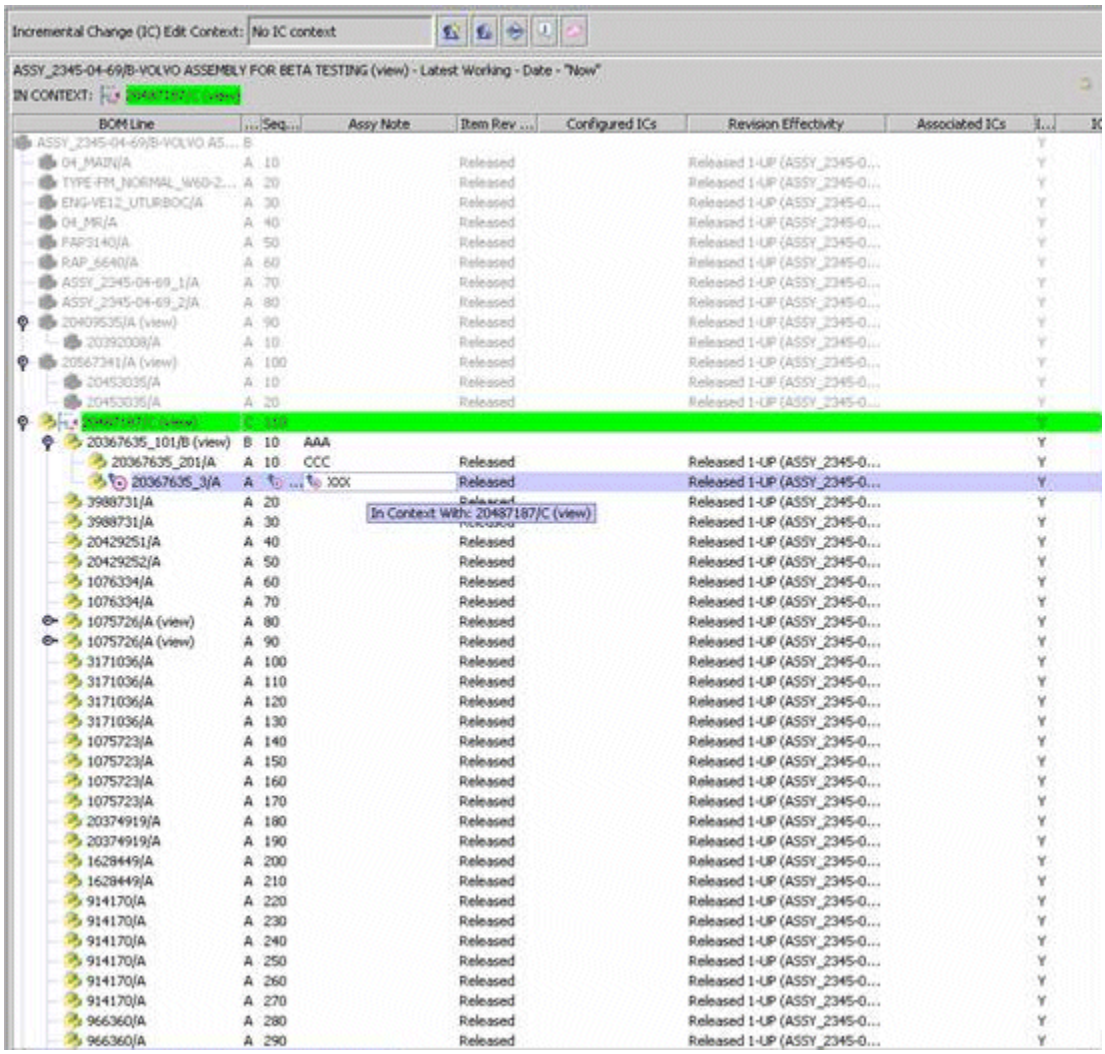
Interpreting absolute occurrence data

The following figure shows how absolute occurrences appear in the structure when in context editing is enabled.



Absolute occurrences in a structure

Note the following lines in this structure:

Line	Purpose
20487187/C (view)	The immediate parent that is in context for absolute occurrence edits. The line is also color-coded in the structure and in the title bar of the pane where the current context is shown. The

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Line	Purpose
	color is green in this example but may be changed by your administrator. Lines that are *not* in the current context are grayed out. Similarly, the out-of-context parts corresponding to the grayed out lines may also be grayed-out in the viewer. You cannot create absolute occurrences from grayed-out lines in the current context and you cannot edit an existing property value on such lines. Lines below **20487187/C (view)** are generally not grayed out and *are* in context.
20367635_101/B (view)	This is a standard occurrence note. It is in context and may be edited.
20367635_201/A	This occurrence note is *not* in context because it is not in all occurrences of the immediate parent assembly.
20367635_3/A	The overriding note value in the context of **20487187** only for this specific occurrence of the parent. To obtain more information about edited absolute occurrence data, place the cursor over any cell containing the icon. The tool tip banner shows the context in which the edited data is valid.

By default, the assembly viewer highlights only those items in the assembly that are in scope in the selected context; items that are not in context are shown grayed out. The administrator may optionally change this behavior so that all items are shown.

The structure contains icons that indicate the status of the structure lines as follows:

Icon	Indicates
	A line containing this icon is the context for the creation of certain absolute occurrences. The line is also color-coded in the structure and in the title bar of the pane where the current context is shown.
	A line that contains this icon has one or more of the absolute occurrences edited in a context but not necessarily the current context.
	A property cell containing this icon is already edited in a context; the current absolute occurrence data is shown in the cell. Each cell that contains data for a specific absolute occurrence includes this icon.

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Icon	Indicates
	A line that contains this icon before its name is a target for editing data in the current context. Look for a icon in one or more properties cells of the same line to identify if the necessary edits are already made. Note: This icon identifies a target in the current context. It may not appear in the same line if you select a different context.
	A line that contains this icon has an in-context edit made by an incremental change. The edit may be an add, remove, or both.
	A cell that contains this icon has an in-context edit removed by an incremental change.
	A cell that contains this icon has an in-context edit added by an incremental change.
	A cell that contains this icon has in-context edits added and removed by an incremental change.

Showing and hiding the in-context line

You can show or hide the line that is the context of a particular in-context edit.

To show the line:

1. Click in a property cell, then click outside the same property cell. Ensure you do not select *another* property cell.

   Note:

   Right-clicking when editing the value in a cell has no effect.

2. Hover the cursor over the same property cell, right-click, and then choose **Show/Hide In-Context BOM Line** from the menu.

   Structure Manager shows the in-context line highlighted in yellow and the editable property cells are highlighted similarly.

To hide the line, click outside the property cell you edited, right-click, and then choose **Show/Hide In-Context BOM Line** from the menu.

Structure Manager hides the previously highlighted in-context line.

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Create absolute occurrences

To create an absolute occurrence, you must enable in-context editing mode and edit the properties of an occurrence, as follows:

1. If necessary, expand the structure by choosing **View→Expand Options→Expand Below** or choosing **Expand Below** from the shortcut menu.

2. Right-click the top line that is the context of this edit and choose **Set In-Context** from the shortcut menu.

   If a line in the displayed structure is marked with a icon and colored green, it is the item that is the context for the creation of absolute occurrences. if a line is grayed out, it is not in the selected context and you cannot create absolute occurrences for these lines. The in-context item is also identified in the title bar of the structure tree.

   - You cannot enable in-context editing mode for a line that has no children.
   - You cannot create an absolute occurrence in the context of its immediate parent.
   - You cannot change the value of a property that is already overridden at a higher level.

3. Click the cell in the lower line containing the property you want to enter or edit. You must select one of the following supported properties:

   - Suppressed
   - Position constrained
   - Suppression constrained
   - Any GRM relation impacted by preferences
   - Any occurrence note
   - Quantity
   - Find number
   - Occurrence type
   - Variant conditions
   - Variant formula
   - Absolute transformation matrix
   - Unit of measure
   - Is designed in place
   - Requires positioned design

   Caution:

   Ensure you have selected in-context editing mode. If this mode is not selected, the change is made to *every* instance of the selected item anywhere in the assembly.

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4. Type the required new value and press the Enter key. A icon on the line indicates one of its property cells has an absolute occurrence override.

> Note:
>
> If you create an absolute occurrence override of a property and the same property is already overridden at a lower level in the structure, the new, higher level value replaces the existing value. Conversely, you cannot edit an individual property value if the same property is overridden at a higher level in the structure.

Identify absolute occurrences

You can assign identifiers to absolute occurrences and these identifiers are displayed in two columns in the property table, as follows:

- **ID In Context (Top Level)**

  Shows only the identifier assigned to the line in the context of the loaded top-level line. You can add or edit an identifier by double-clicking in this cell and typing the necessary value.

  > Note:
  >
  > Any absolute occurrence identifiers defined at a lower level than the currently selected top-level line are not visible.
  >
  > If in-context editing mode is disabled, the top-level line is always considered the in-context line.

- **ID In Context (All Levels)**

  Shows the identifiers assigned to the line in all contexts. You cannot edit this column.

Change absolute occurrence override data

You can change the override data for an existing absolute occurrence at any time. For example, you may want to change the quantity assigned to a structure line to correct a previous error. It is not necessary to enable context editing to make such changes, ensure only the correct context is selected, then double-click the property cell and edit the value.

> Note:
>
> If you want to define relative occurrence data for a property that is already defined in context, remove the absolute occurrence data from the property first.

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Remove absolute occurrence override data

You can remove override data from an absolute occurrence without entering replacement data. To do this, right-click the property to remove (that is, select the relevant cell) and choose the **Remove In Context Override** command.

Deselect in-context editing mode

When you are not creating or editing absolute occurrence data, consider deselecting in-context editing mode to avoid inadvertent changes.

- Right-click the green context line and choose **Set in Context**.

Associating data with absolute occurrences

About associating data with absolute occurrences

During the design process, an engineer may attach data such as a CAD design file, viewer (JT) file, classification information, and specifications to an item revision. The actual usage of the item revision in the structure, including its transformation, is tied to an occurrence.

You can attach data to a specific instance of an item revision in the structure, which is represented by an absolute occurrence. You can attach data that is unique to the absolute occurrence, or information that is already attached to the associated item revision or occurrence. Examples of data that you may want to attach to a specific absolute occurrence include:

- Cost data
- Transformations
- Quantity
- Variant conditions (not modular variant expressions)
- Viewer information
- Name and ID
- Occurrence note, type, or find number
- Instance number
- Find number
- Occurrence position constrained

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- Occurrence suppressed

For example, you may want to attach a different occurrence note to each absolute occurrence to specify additional assembly work instructions.

The level of the absolute occurrence in the structure determines the precedence of data you attach to it. Data attached at a high or mid-level in the structure override the corresponding data at lower levels; data attached to an absolute occurrence at the lowest level does not override data elsewhere.

Associate a dataset or form with an absolute occurrence

1. Ensure you have selected in-context editing mode by right-clicking the structure line and choosing **Set In Context**.

2. Select the line containing the absolute occurrence with which you want to associate a new instance-specific dataset or form and open it in the **Attachments** view.

3. If you are associating a new dataset or form, create it by choosing **File→New→Dataset** or **File→New→Form**, respectively.

   If you are replacing an existing dataset or form, select it in the **Attachments** view. You can then search for and insert a replacement dataset or form.

Associate a transformation with an absolute occurrence

> Note:
>
> You cannot associate a transformation (positioning information) with an absolute occurrence in Teamcenter manufacturing process management; you can only make the initial association in Structure Manager.

1. Ensure you have selected in-context editing mode by right-clicking the structure line and choosing **Set In Context**.

2. Select the line containing the absolute occurrence for which you want to change the transformation.

3. Select the **Graphics** view and choose **Graphics→Transformation→Persistent Transformation**.

4. Change the position of the affected component and save the changes.

Associate an occurrence note with an absolute occurrence

1. Ensure you have selected in-context editing mode by right-clicking the structure line and choosing **Set In Context**.

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2. Select the line containing the absolute occurrence with which you want to associate an occurrence note.

3. Choose **Edit→Notes**, or click the **Notes** button on the toolbar.

   Teamcenter displays the **Notes** dialog box.

4. Type the properties of the note and click **OK**.

Apply a variant condition to an absolute occurrence

1. Ensure you have selected in-context editing mode by right-clicking the structure line and choosing **Set In Context**.

2. Select the line containing the absolute occurrence with which you want to associate a variant condition.

3. Choose **Edit→Variant Condition**.

   Teamcenter displays the **Variant Condition** dialog box.

4. Add a new variant condition to the absolute occurrence or edit the existing variant condition.

View attachments associated with an absolute occurrence

To view all the attachments associated with an absolute occurrence, select the line containing the absolute occurrence and open the **Attachments** view. All the attachments to the absolute occurrence are shown below the absolute occurrence.

> Note:
>
> If incremental change orders are used at your site, attachments associated with unconfigured changes may be hidden. To view all absolute occurrence data, choose **Show Unconfigured Changes** from the view menu or click in the view toolbar.

Associating occurrence data in the context of a composition

A composition is a structure that comprises components from different top lines, in the context of a configured top-level assembly. It is represented by a single line in the structure. It can contain a set of occurrences, absolute occurrences, occurrence group and filtered occurrences (a filtered occurrence references occurrence groups from the item it instantiates). For example, a composition may contain the design view and the process view of the same assembly.

When you view a composition, the revision rule and variant conditions for the referenced window configure the occurrences, if they are linked to a referring window by a corresponding absolute

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occurrence for the relevant top level. The occurrence groups are configured according to the configuration of absolute occurrences in the top level.

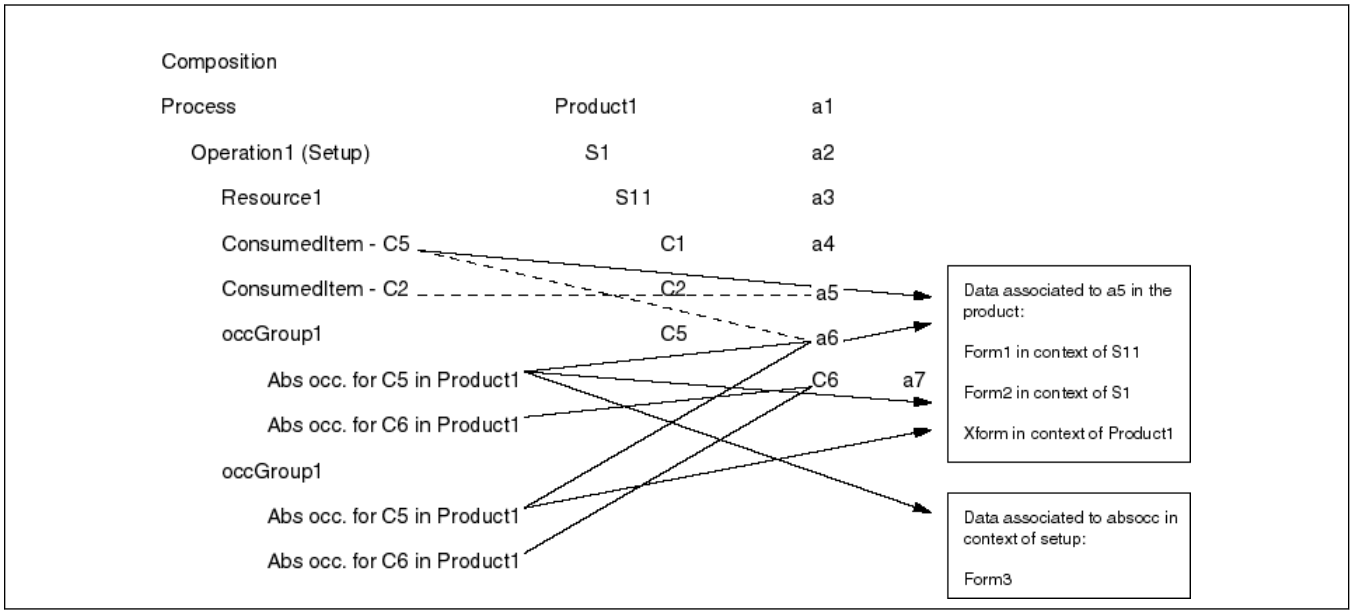
You can associate data to any of the absolute occurrences in the occurrence group, in the context of the composition. You can subsequently view the data associated with absolute occurrences included in occurrence groups in the structure.

If the content (members) of an occurrence group in the composition is changed in another location, your view of the occurrence group is refreshed. Such changes may be made in the source or in another instance of the group that is referenced in a composition.

You can change an occurrence group in the composition (for example, adding or removing members) without having to return to the source view. Any changes you make to the composition are proliferated to all other instances of the occurrence group.

Create occurrence groups in a composition

You can create occurrence groups containing absolute occurrences in a composition, as shown in the following figure.



Occurrence groups in a composition

The absolute occurrences for this composition are as follows:

Component	Absolute occurrence	Parent
Process	A1	None
Operation 1	A2	A1

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Component	Absolute occurrence	Parent
Resource 1	A3	A2
Consumed Item C1	A4	A2
Consumed Item C2	A5	A2
Occurrence group 1	A6	A2
Occurrence for S1	A7	A6
Occurrence for S11	A8	A7
Occurrence for C5	A9	A8
Occurrence group 1 (2)	A10	A2
Occurrence for C5	A12	A8

The absolute occurrence of **C5** in occurrence group 1 contains a copy of the entire path to the referring occurrence. This is necessary to map this instance of **C5** to the corresponding instance in the product. If the path is already copied for another absolute occurrence, it is reused and not recopied.

You can configure a structure in a composition by associating a configurator context with it. You can paste or drag the configurator context onto the referenced structure, and the configurator context object appears as an attachment to the top line of the structure. Alternatively, you can right-click the configurator context and choose **Attach Configurator Context** to send it to the referenced structure.

Add components in a context

You can add components to a structure in the context of the top level. These components are then visible when you select the top line of the structure. The following examples show how resources may be attached to a structure:

Welding_Cell 1		
	Robot from Classification	
		Standard Definition
		Welding Gun 1→Added in context of cell 1
Welding_Cell 2	Robot from Classification	
		Standard Definition
		Welding Gun 1→Added in context of cell 2

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Factory 1

Welding Cell 1

Robot

Support Column 1→Added in context of Factory1

Welding Cell 2

When you open factory 1, you see welding gun 1 in the context of cell 1 and support column 1 in the context of factory 1. If you view the same robot in My Teamcenter, none of these components are visible as they are not part of a standard robot.

To do this, you can create an absolute occurrence in the context of a top-level item. Add welding gun 1 in the context of cell 1 by adding an absolute occurrence to cell 1 under the robot.

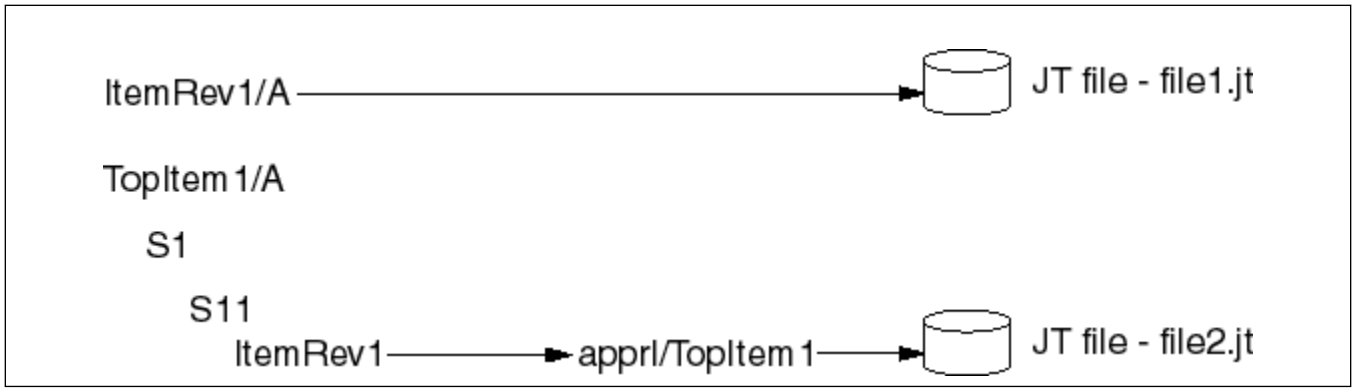
> Note:
>
> When you create an absolute occurrence for a top-level item, you also create absolute occurrences for all children of a parent under which you add the component.

Understanding how data precedence works with absolute occurrences

About data precedence

You can associate data with an item revision or absolute occurrence. You can create the absolute occurrence in the context of a top-level item.

The following figure shows how visualization (JT) files may be attached to items.



Attaching visualization files to items

In this example, you can see **file1.jt** in the viewer in My Teamcenter without any context. However, when you view the same item revision (**ItemRev1**) in the context of **TopItem1**, you see the JT file

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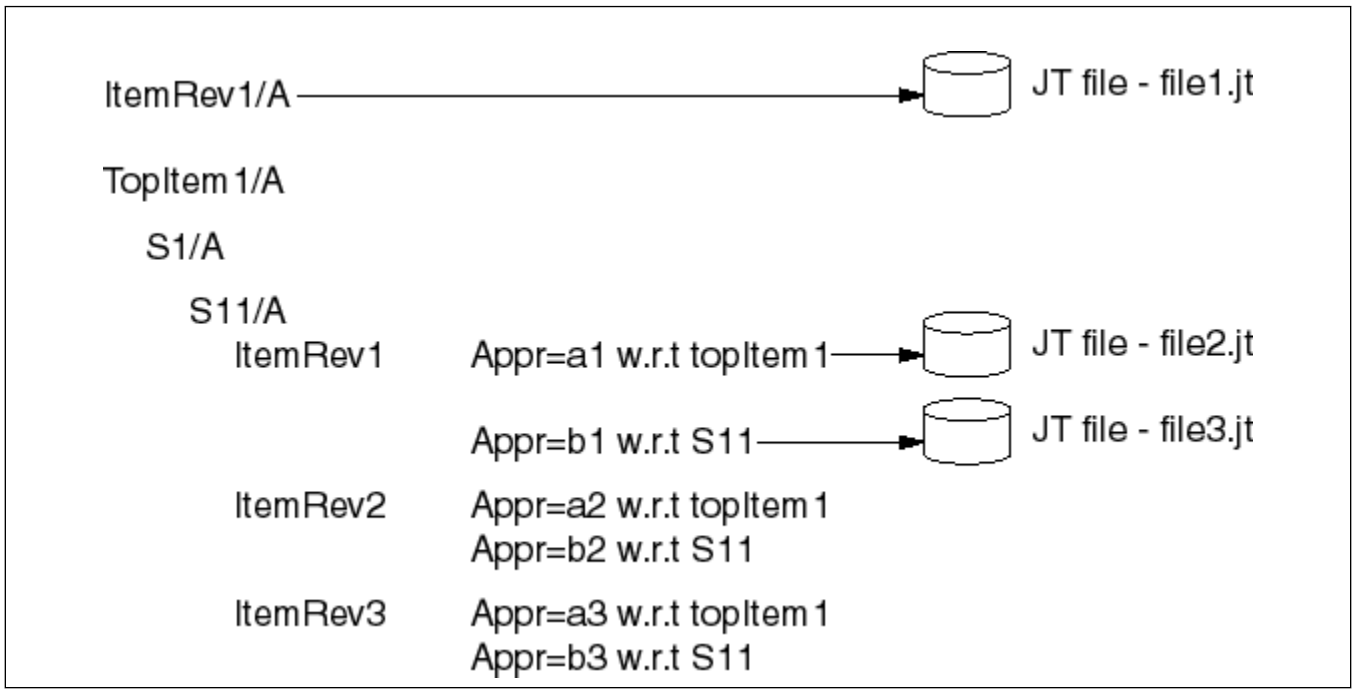
(**file2.jt**) that is associated with the corresponding absolute occurrence (**appr1**) in the context of item **TopItem1/A**.

You can associate a different JT file as an override if **TopItem1** is revised from revision A to revision B.

Data is associated with an absolute occurrence in the context of a specified revision. When you revise an item, the data associated with the previous revision is copied and you can change it as necessary.

Propagate override data

You can associate data to absolute occurrences in the context of an intermediate level, as well as in the context of the top level, as shown in the following figure.



Propagate override data

In this example, **ItemRev1** has two override JT files, **file2.jt** and **file3.jt**. The **file2.jt** file is added in the context of **TopItem1/A**, while the **file3.jt** file is added in the context of **S11/A**. Consequently, if you view **ItemRev1** in the context of **TopItem1/A**, you see the **file2.jt** file.

Override data in the context of a composition

You can associate data to a composition in the context of an operation or process setup. The following figure shows how you may override data in the context of a setup.

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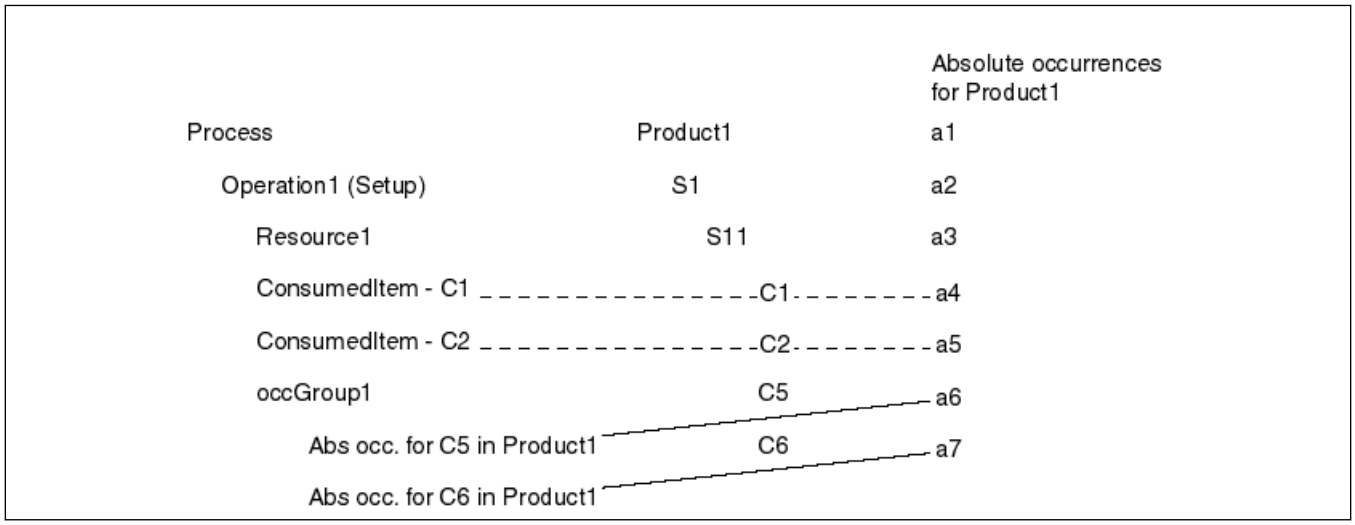

Override occurrence data in the context of a composition

This structure contains occurrences (**Resource 1**, and consumed items **C1** and **C2**) and a collection of absolute occurrences (**occGroup1**). This collection consists of absolute occurrences **a6** and **a7** which Teamcenter configures if you load **Product 1**. Thus, **a6** and **a7** in the process structure are absolute occurrences in the context of **occGroup1**. The consumed item **C1** is an occurrence in the setup for **Operation 1** and is linked to absolute occurrence **a4** in **Product 1**.

> Note:
>
> The process structure may also have its own absolute occurrences.

You can override data in the context of the process. You can also override data in the context of **Product 1** through the absolute occurrences in the occurrence groups. The override data is controlled by a rule that allows you to attach JT files at a top level and at an intermediate level. Consequently, a JT file attached to **c5** under **Occurrence Group 1** in the context of the **Operation 1** BOM view revision (BVR) overrides the default file, and also the file associated with **a6** in the product 1 BVR.

If you create absolute occurrences for the process structure and (assuming **P6** is the occurrence for **C5**), the data attached to **P6** in the context of **Process** overrides data attached to **a6** in the context of the **Product 1** BVR.

Override data in multiple contexts

You can create absolute occurrence data on a single line in more than one context. For example, you may want to override the find number in the context of the top-level assembly and the quantity in the context of a lower level assembly. Make these in-context edits in turn, ensuring you have selected the correct context (line) each time. The system shows the relevant absolute occurrence data for the current context and consequently data that applies to other contexts is hidden.

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Note:

You cannot change the value of a property that is already overridden in a higher level context.

Understanding ID in context and assigned products

When assigning a product to a process or copying processes or operations from one process structure to another, Teamcenter can assign the same ID in context (IDIC) to the structure lines in the source and target structure. Doing so provides a method for Teamcenter to find the assigned objects in the other structure, for instance, when using the **Find in All Visible Views** menu command or running an accountability check.

This mechanism is controlled by two preferences:

- **MECopyIdInContextToAssignedLine**

  If set to **True**, Teamcenter copies any existing in-context IDs to the target structure when assigning a product to a process or copying a process or operation from one structure to another. If an in-context ID does not exist, Teamcenter creates one on the source and copies it to the target object. Any generated IDs are unique within the source and target structures.

  If set to **False**, no in-context ID is copied.

- **MECopyIdInContextLowerLevels**

  If set to **True**, Teamcenter copies any existing in-context IDs of consumed items under subprocesses and suboperations to the target structure when copying a process or operation from one structure to another. If an in-context ID does not exist, Teamcenter does *not* create one.

  If set to **False**, no in-context ID gets copied for the consumed items under subprocesses and suboperations, even if one is present.

  Note:

  The **MECopyIdInContextLowerLevels** preference is considered only if **MECopyIdInContextToAssignedLine** is set to **True**.

In the following example, if you copy process **P1.1** from **Proc1** in the upper pane to **Proc4** in the lower pane:

- Teamcenter only generates an in-context ID for the process that is being copied. It never generates an in-context ID for subprocesses, suboperations, or their consumed items, regardless of the settings for these preferences.

- If **MECopyIdInContextToAssignedLine** = **false** and **MECopyIdInContextLowerLevels** = **false**, Teamcenter does not copy any in-context ID.

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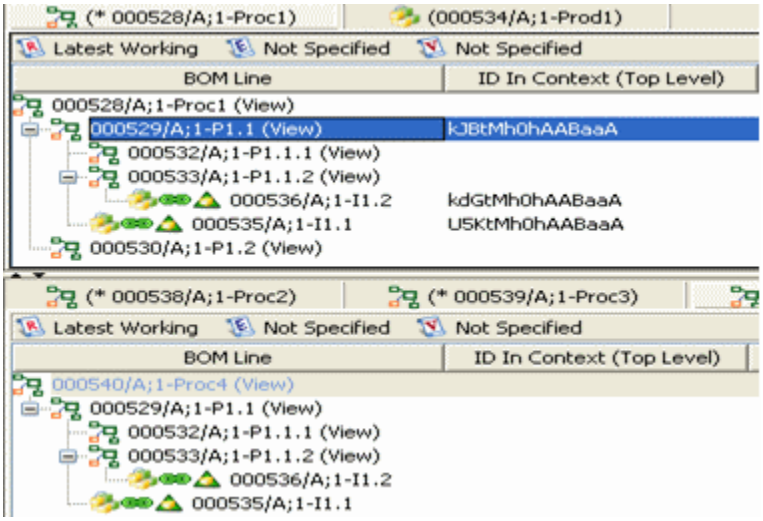
Note:

For **P1.1**, the ID is not generated at the source if it is not present (in the following example, it is already generated).



After copying, under the **Proc4** process, note that there are no in-context IDs in the **ID In Context (Top Level)** column.

- If **MECopyIdInContextToAssignedLine** = **true** and **MECopyIdInContextLowerLevels** = **false**, the in-context ID for **P1.1** and **I1.1** only are copied. The existing in-context ID for **I1.2** is not copied because **I1.2** is the consumed item of a lower level.

  Note:

  For **P1.1**, the in-context ID is generated at the source if it is not present and then copied. For **I1.1**, the ID is not generated if it is not present.

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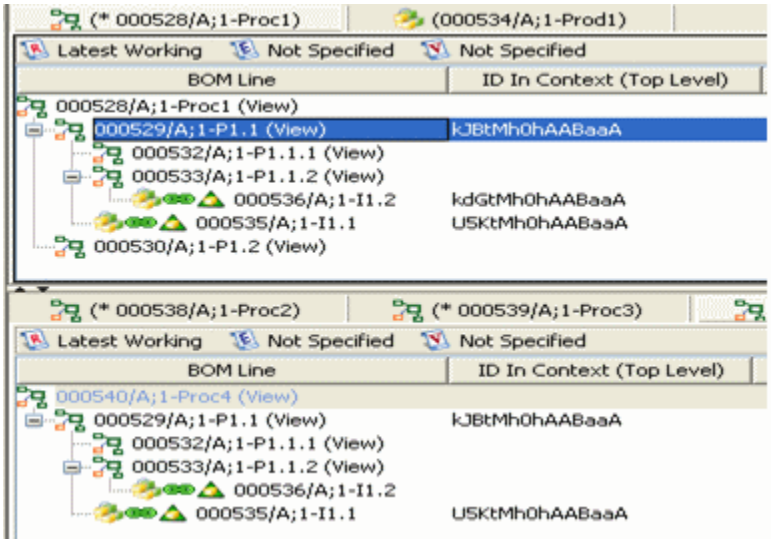
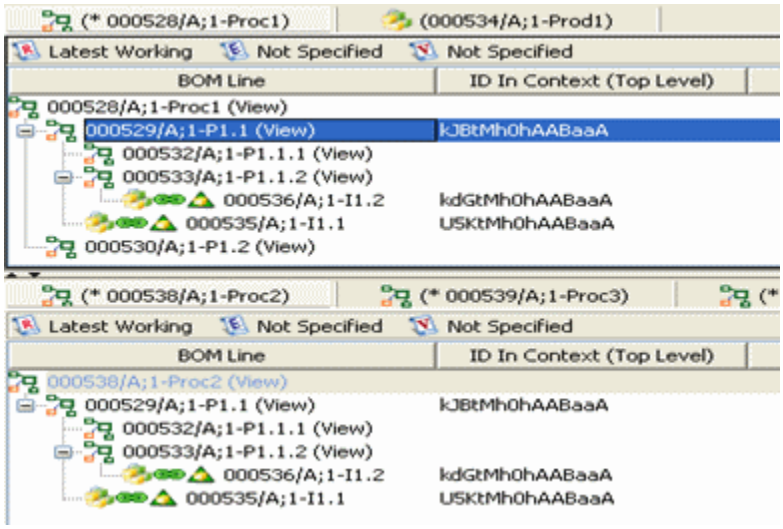


- If **MECopyIdInContextToAssignedLine** = **true** and **MECopyIdInContextLowerLevels** = **true**, the IDs for **P1.1**, **I1.1**, and **I1.2** are all copied.

> Note:
>
> For **P1.1** the ID is generated at the source if it is not present and then copied. For **I1.1** and **I1.2**, if the ID is not present, it is not generated, but if it is present, it is copied.



Performing advanced structure searches

About advanced structure searches

The **Structure Search** view helps you perform a multitude of searches. The search mechanism searches a structure using various properties of the structure's lines. The search is not limited to the loaded lines

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of the structure and can search an entire structure without loading it. It then reports the results in the **Structure Search Results** view and partially expands the structure to the found lines.

> Note:
>
> A partial expand occurs only if the **Expand to Selection** option in the **Manufacturing** section of the **Options** dialog box (**Edit→Options**) is selected.

You can:

- Search large process, product, plant, or occurrence group structures with spatial criteria, or with a combination of spatial and attribute criteria. Spatial searches are particularly useful for end items that represent large processes containing a large number of lines, allowing you to focus quickly on the manufacturing needs of a particular area or part of the product.

  > Note:
  >
  > The search does not return matches found in occurrence groups that are assigned to an occurrence group.

- Search for features in a structure based on different search criteria such as searching for weld points assigned to specific processes or arc welds connected to specific parts.

- Perform a search for objects found in a specific classification class or containing a specific classification attribute value.

- Store the search criteria and search results in the **Structure Search** view. These can then be reloaded or shared by different users.

Making attribute searches

You can search structures for all objects that contain the following:

- Item and item revision attributes

  You can refine the search by including attributes of the item or item revision. Typically, this is the item ID, but you can use any attributes stored on the item master or revision master forms.

- Occurrence notes

  You can refine the search with values for occurrence attributes (occurrence notes).

- Attributes of forms

  You can refine the search with the attributes of forms that are attached to an item, item revision, in-context form, or their subclasses.

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Making feature searches

When you manage features in the body in white environment, you frequently deal with large amounts of features within a product structure. The **Structure Search** view helps you to find the features you seek, and narrow down the list of matches to a manageable number of search results. You can search for the following features:

- Weld points
- Arc welds
- Datums

The starting point for a feature query is an item in a product structure. Using the feature search you can:

- Find all features in the search scope that are assigned or not assigned to specified operations.
- Find all features in the search scope that are connected to specified parts.
- Find all features in the search scope that are connected to parts assigned to specified operations.
- Find all features in the search scope that are connected to parts in the incoming IPA of specified processes.
- Find all datums that were assigned to previous stations.

You can combine a feature search with other search criteria.

- Use the spatial search to find all features in the search scope of a specific type by bounding box or in the proximity of a given part.
- Use the attribute search to find all features in the search scope of a specific type that contain a specified attribute value. These attributes can be defined on:
  - The feature occurrence (occurrence notes).
  - The feature attribute form on the **PSOccurence** or the item revision.
  - Any other form on the **PSOccurence** or the item revision.
  - The feature item or item revision.

Making spatial searches

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A spatial search, also referred to as a *cacheless* search, allows you to enter search criteria as numerical values or by dragging a search box in the viewer to find those objects that are within these spatial boundaries. Teamcenter displays the results of the search as a list of matching occurrences (structure lines). Selecting an entry in the list highlights the occurrence in the structure tree pane and in the embedded viewer.

You can refine spatial searches with other attribute searches.

You must complete certain installation and configuration steps before you can run spatial searches.

Making classification searches

You can extend your search to include classification attributes. This is called a *classification ad hoc* search. You can search through classified data and find objects contained within a class you specify and containing attribute values that you specify.

Making Enterprise BOP searches

Use the **Enterprise BOP** search to search for processes or operations within an enterprise bill of process structure that contains a specific logical designator. You can combine this search with any of the other searches, for example, an attribute search or a spatial search.

Perform a structure search

1. Open the structure and select the top line against which you want to search.

   You can select a process, operation, product, plant or occurrence group. You can also select multiple top lines in the same structure or substructure.

   > Note:
   >
   > To perform a feature search, you must select one line in a product structure.

2. Do one of the following:

   - Choose **Tools→Structure Search**.
   - Choose **Structure Search** from the shortcut menu.

   Teamcenter displays the **Structure Search** view.

   The structure line you select represents the scope of the search and is listed in the **Scopes** box.

3. (Optional) Click ••• to add more lines to the search scope or clear the scope.

   - Select a line in the structure and click + in the **Scopes** dialog box to add a scope.

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- Select a line in the **Scopes** dialog box and click — to remove the line from the scope.
- Click **Clear** in the **Scopes** dialog box to clear all scopes.

The columns names and widths that are initially displayed in the scope list are configured by the **MEAdvancedSearchResultsViewColumnsShownPref** and **MEAdvancedSearchResultsViewColumnsShownWidthPref** preferences.

4. (Optional) Load an existing search by clicking **Open Search** to load a saved search.
5. Define a query.

   You can choose from the following search types, depending on which type of structure you selected:

   - **General**
   - **Weld Points**
   - **Arc Welds**
   - **Datum Points**
   - **Enterprise BOP**

6. Use the criteria sections to specify the search criteria pertaining to the type of search you selected. For example, use the **Weld Points Criteria** section to specify the criteria for a weld point search.

   Click the **...** button to the right of each individual search criteria box and enter search criteria in the resulting dialog box. All the criteria you enter are combined so that you can, for example, search for all bolts whose name starts with **bo** and are within 3 centimeters of another part.

7. Select **Show results in a new tab** if you want to display each set of results in its own tab in the **Structure Search Results** view. If this check box is not selected, Teamcenter overwrites the results of the last search in the same pane.

   > Note:
   >
   > The **Show results in a new tab** check box is not visible on the **Structure Search** view until after the first structure search is performed.

8. Click **Search** to begin the search.

   Teamcenter starts the search and loads the lines into the **Structure Search Results** view.

   You can manage the search results in the **Structure Search Results** view.

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9. (Optional) Select a line in the **Structure Search Results** view to highlight the corresponding item or item revision in the structure tree and the embedded viewer.

> Tip:
>
> The **Display** and **Blank** commands in the shortcut menu control the visibility of the search results in the embedded viewer.

10. (Optional) Click **Clear** to clear individual search criteria from the search, or click **Clear All** to clear all criteria from the **Structure Search** view.

11. (Optional) Save the structure search.

Save a structure search

You can store a search and, optionally, its results for future reuse. You can also allow other users access to this search.

Teamcenter saves the search in a **SearchStructureContext** object that includes a saved configuration. If you reload a saved search, the configuration in effect at the time of storage is also loaded.

Teamcenter saves the following configuration information at the time of storage:

- Current revision rule (with the effective date, end item, or unit number)
- Variant rule
- Effectivity group objects
- Closure rule
- State of the **Show Unconfigured** buttons
- If the search is performed on a process structure and any part of the search contains lines from a composition structure, the configuration of those related composition structures

1. After entering search criteria and running a search, do one of the following:

   - Click on the toolbar of the **Structure Search** view, or choose **Save** from the **View Menu** to save a new search, or update a loaded search with new criteria and results.
   - Choose **Save As** from the **View Menu** to save the search under another name. This may be necessary if, for example, you do not have write access to the original saved search but still want to modify it.

2. Enter a name and, optionally, a description for the search.

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3. Select one of the following.

Option	Action
Search definitions	Saves the entries in the **Structure Search** view.
Search definitions and consistent results	Saves the entries in the **Structure Search** view and additionally, all results that are compatible with the current scope of the search.

4. To grant read-only access to other users for this search, select the **Is shared?** check box.

   This allows other users to select and run this saved search when they load saved searches. Other users cannot modify this search. They must use the **Save As** command to save any modifications.

5. Specify the location in the database to store the search by clicking **Create in** and selecting a folder.

   By default, Teamcenter stores the search in the **My Saved Searches** folder in My Teamcenter. You can create other folders to organize your searches by clicking **New Folder**.

6. Click **OK**.

Rename an existing search

1. With a search open in the **Structure Search** view, choose **Save As** from the **View Menu**.

2. Click **Create in** to expand the **Save Search** dialog box.

3. Select the search that you want to rename from the **Existing Saved Searches** list and click **Rename**.

4. Type a new name for the search and click **OK**.

Assign access rights to a saved search

1. With a search open in the **Structure Search** view, choose **Save As** from the **View Menu**.

2. Click **Create in** to expand the **Save Search** dialog box.

3. Select the search for which you want to modify access rights from the **Existing Saved Searches** list and click **Access**.

4. Click the **Get access control list.** button in the lower-right corner of the **Access** dialog box.

   The system displays the **ACL Control List** dialog box.

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5. In the **ACL Control List** dialog box, choose the entry that you want to modify.

> Note:
>
> You can only change entries you have created or entries you have been given permission to change by the Teamcenter administrator.

6. Grant or deny privileges for the type of accessor by double-clicking in the column corresponding to the privilege you want to modify.

   - Select the check mark to grant a privilege.
   - Select to deny the privilege.

> Note:
>
> To clear a privilege box, double-click in the box and choose the blank entry from the list.

7. Click **OK** to save the list.

Load a saved search

Teamcenter saves the search in a **SearchStructureContext** object that includes a saved configuration. If you load a saved search, the configuration in effect at the time of storage is also loaded.

1. Do one of the following:

   a. Load a recently used search.

      - In the **Structure Search** view, click the down arrow beside the **Open Search**.

        Teamcenter displays the most recently used searches.

      - Select one of the searches listed.

        Teamcenter displays the **Open Saved Search** dialog box where you can specify load options.

   b. Load a search not recently used.

      A. In the **Structure Search** view, click **Open Search**.

         Teamcenter opens the **Open Saved Search** dialog box listing all the saved search objects belonging to you. The **Revision Rule**, **Variant Rule** and **Effectivity Group** columns show

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the information of the primary structure (for example, in the case of a process structure where configurations of composition structures are also stored).

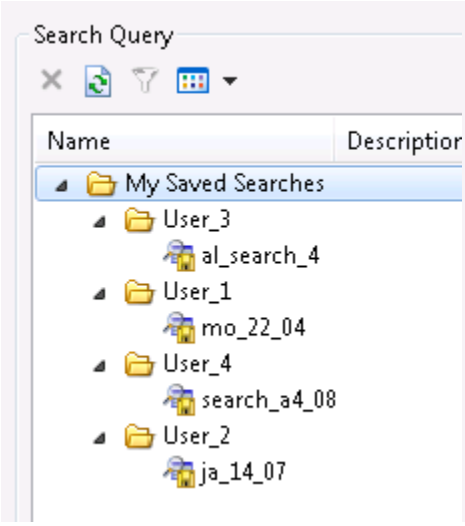
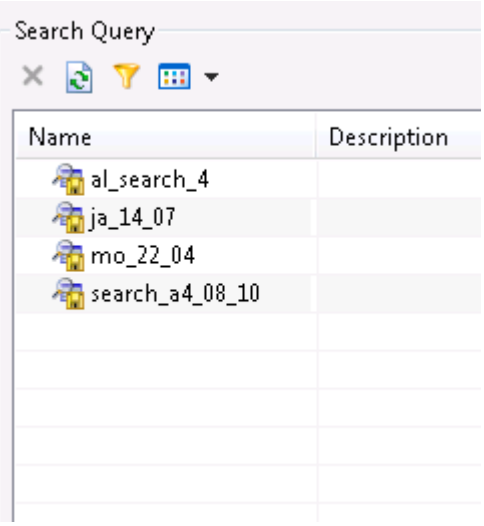
If you want to see the saved searches belonging to other users, select **Show searches shared by other users**.

B. (Optional) View the detailed configuration of a search object by right-clicking it in the list of searches and choosing **Show Configuration**.

The resulting **Configuration** dialog box shows the configuration of all composition structures associated with the primary structure.

C. (Optional) Filter the list of searches by clicking .

D. (Optional) Click the arrow beside the **Change your view** button and select the format in which you want to display the saved searches. The tree view allows you to display the folders that you create in the **Save Search** dialog box, and the table view displays all the searches in list form.

Tree view	Table view
	

2. Select a load option.

- **Load search criteria only**

  Loads only search definitions so you can reuse a complex definition on a different structure or scope. If the criteria includes the proximity search (and, therefore, a proximity part, which is structure dependent), you must have the same structure open to load the proximity part; otherwise, Teamcenter ignores the proximity criteria.

- **Load search criteria and scope**

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Loads the search definitions and the original search scope so you can re-execute the search and to display refreshed results.

- **Load search criteria, scope and results**

  Loads everything that is available in the saved search (scopes, definitions, and results). This option is selected by default. If the object selected in the table does not have results stored, Teamcenter loads only the search criteria and scope by default.

3. Click **OK**.

Teamcenter loads the object including those parameters that you specified. The loaded structure lines represent the current state of the structure. These may differ from the lines that were saved with the object. Consider these situations:

- If structure line properties or occurrence notes were changed after saving, the new values of the properties or occurrence notes are displayed in the loaded results. You do not receive any indication about changed values or inconsistent results.
- If the item revision was changed after saving the results and the **Latest Working** revision rule is set, the new revision is displayed. You do not receive any indication about changed item revision or inconsistent results.
- If the structure line was deleted or moved to other place after saving, the saved BOM line is loaded in the results. Teamcenter displays information about inconsistent results in a tooltip on the result tab. You must then update the saved search.
- If changes include a later revision of the top-line item,Teamcenter considers the structure to be the same structure and tries to find all the search result lines in the structure.

Change the structure of the saved searches tree

1. Right-click the folder or the search that you want to move and choose **Cut**.
2. Right-click the parent folder and choose **Paste** to place the folder or search object inside the parent folder.

Open a copied search

When you save a search, by default, Teamcenter stores it in the **My Saved Searches** folder in My Teamcenter. You can copy this search and open it in Manufacturing Process Planner, Multi-Structure Manager, or Multi-BOM Management. You can also add the saved search to the **Favorites** list and copy it from there.

1. Find the desired search in My Teamcenter and copy it.

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2. In the **Structure Search** view, click **Open the copied search object** .

   Teamcenter displays the **Load Search** dialog box asking if you want to apply the saved configuration to the search.

3. Choose **Yes** to run the copied search or **No** to select a new search.

Change the properties of a saved search

1. In the saved search table, right-click a search and choose **Edit Properties**.

2. In the **Check-Out** dialog box, click **Yes** to check out the properties form.

   Teamcenter displays the **Edit Properties** dialog box where you can edit a variety of properties. The properties most pertinent to the saved search are:

   - **Name**
   - **Description**
   - **Is Shared?**

3. Edit the desired property and click **Save and Check-In**.

Filter data in the Auto Filter dialog box

The **Auto Filter** dialog box narrows down the search results according to conditions that you create in the **Filter Condition Editor**.

- The **ALL** option displays properties for all the children of the object currently selected in the component view.
- You can use the **Filter Condition Editor** to create condition expressions for filtering the display.
- Expressions cannot be edited after they are listed in the **Auto Filter** dialog box, but they can be deleted.
- Teamcenter retains your filter condition expressions until you delete them.

To create conditions, click **Add a new search condition** to display the **Filter Condition Editor**.

- To create an initial condition expression, select a property column value and a logical operator, and then enter an object value or select one from the list of objects displayed in the table, and then click **Add a new search condition** .

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> Note:
>
> The = = operator tests for an exact match. The = operator tests for a match but is not case sensitive.

- To expand the expression with additional conditions, use the **ADD** and **OR** operators.
- Click **Remove the selected condition(s)** to delete the selected condition line.
- Click **Clean all the conditions** to delete the entire expression.
- Click **...not meet the condition(s)** to negate the selected condition.
- Click **OK** to add the condition expression to the **Auto Filter** dialog box.

Update a saved search

After loading a search, do one of the following:

- Rerun the search to get the latest results.
- Modify the search definitions and click to update the same saved object with new data. If you loaded a shared search belonging to another user, you must have write access to update the search.
- If you load both search definitions and results and modify the search definition, rerun the search to update the saved search object.
- Save the modified search as a new object by using the **Save As** menu command.
- Change whether the search is shared.

  1. In My Teamcenter, find the search in the **My Saved Searches** folder.
  2. Edit the **Is Shared?** search object property.

Delete a saved search

Do one of the following:

- In My Teamcenter:

  1. Expand the **My Saved Searches** folder.
  2. Select the search object you want to delete.

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3. Click ✕ in the toolbar.

- In the **Structure Search** view:

  1. Open the **Save Search** dialog box.
  2. Click **Create In**.
  3. Select the search object you want to delete.
  4. Click **Delete** on the right.

- In the **Structure Search** view:

  1. Open the **Load Search** dialog box.
  2. Select the search object you want to delete.
  3. Click ✕ in the **Load Search** dialog box.

     If you delete the search object currently loaded in the **Structure Search** view, the search context is cleared from the view.

Entering search criteria

About search criteria

Each type of query that you select has its own criteria that you can use to define a search. You can always refine your search by combining it with one or more of the criteria in the general criteria section.

Alternatively, you can load a saved search which populates the search criteria from the data stored in the search.

Enter item ID or item attributes search criteria

To search for items whose identifiers, names, attributes, or types match a specific pattern:

1. Type an item ID or item name directly into the boxes. For example, you can type **57h*** into the **Item ID** box to find all items whose ID starts with **57h**.

   When you click outside the box, Teamcenter enters the search criteria into the **Item attributes** box.

2. Click **...** beside the **Item attributes** box to specify additional attributes to be taken into consideration for the search. The search result must fulfill all specified search criteria.

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You can also immediately open the **Item Attributes** dialog box without previously specifying an item ID or name.

3. (Optional) Filter the search with saved search criteria by clicking **Change**.

   Teamcenter displays the **Change Search** dialog box. You can choose any of your saved searches or system-defined searches to filter the basic search results.

> Note:
>
> The **Search** and the **Clear All** buttons are available only after entering criteria in the **Item attributes** box. You cannot perform a search or save one until this box is populated.

Enter Enterprise BOP search criteria

If you work with enterprise bill of process structures, you can you can search by a logical designator.

1. In the **Query Type** box, select **Logical Designator**.

2. In the **Result Type** box, select the type of result for which you want to search. You can search for a process or an operation.

3. In the **Logical designator** box, do one of the following:

   - Type a logical designator. You must follow the convention of serializing the logical designator.

     - You must specify the searched values of the fields in the order they appear in the logical designator form.

     - You must separate the searched values by the logical designator delimiter, defined by the **MELogicalDesignatorDelimiter** preference (**;** by default). Do not use leading or trailing blanks. For example, if the logical designator consists of four fields, and the search should find logical designators whose first field (a string) equals **SubsystemX** and whose third field (a number) equals five, the serialized filter is **SubsystemX;;5;**.

     When you type the filter value, Teamcenter does not check for validity (for example, compatibility with the types of the fields or conformance with LOVs).

   - Click **...**.

     Teamcenter displays the **Logical Designator** dialog box. This dialog box includes all the fields that comprise the logical designator class that is related to the object type you chose in the scopes section.

     a. Enter search criteria in the available boxes.

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Boxes that are defined as mandatory in the logical designator form are marked with an asterisk but they are not mandatory in this dialog box.

b. Click **OK**.

4. Click **Search**.

Enter occurrence note search criteria

- Click the **...** button to the right of the **Occurrence Notes** box to search for specific occurrence note values.

  Your administrator can define occurrence notes and associate them with particular structure lines. You can use these mapped occurrence notes as search criteria.

  For example, a mapped occurrence note may contain an interior/exterior flag that indicates if a given part is used on the interior or exterior of the product. You could then search for all parts on the exterior of the product or, by refining the search with other criteria, for all exterior brackets.

  Similarly, a mapped occurrence note may contain a number that references an illustration in the work instruction manual that describes how to assemble the part. You can search for all parts illustrated in the appropriate section of the manual.

Enter spatial filter search criteria

Enter the spatial search criteria

1. Click the **...** button to the right of the **Spatial Filter** box.

   Teamcenter displays the **Spatial Criteria** dialog box, allowing you to define one of two types of spatial filters and optional target parts.

   > Note:
   >
   > The spatial filter option is disabled if Teamcenter is not configured for cacheless searches or if the necessary NX or JT files are not available.

2. (Optional) Select the **Use selections from table** check box above the **Target Parts** table if you want to search against specified target parts.

3. Use the **Proximity** and **3D box** radio buttons in the **Spatial Criteria** dialog box to select a search type, and then click **OK** to save the selections.

   - Proximity

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Limits the search to parts within a specified proximity distance, for example, all parts within 10 centimeters of part X.

- 3D box

  Allows you to define a three dimensional box in the embedded viewer and search for parts completely inside, completely outside or intersecting the box. Use the **Spatial Criteria** dialog box to define the coordinates and size of the box.

  > Note:
  >
  > If you are making appearance searches, you can only search inside and intersecting the box when TruShape filtering is selected.

> Note:
>
> You can use *altreps* (alternative representations) to define different physical configurations or shapes of a flexible part such as a tube or hose. Spatial searching takes into account an alternate geometric shape of a flexible part by searching the dataset that corresponds to the altrep defined on the occurrence object.

Define a proximity filter

1. In the **Spatial Criteria** dialog box, select the **Proximity** button.

2. (Optional) Select **True Shape filtering** if you want to test items with intersecting bounding boxes to identify if they have TruShape volumes that intersect the TruShape volumes of the selected objects. Depending on the TruShape parameters configured, Teamcenter displays the geometry of each object as regular cubes (voxels) to provide a simplified representation of the actual shape. TruShape searches return more accurate results but may take longer to complete.

3. Define a proximity value in the **Distance** box in the **Spatial Criteria** dialog box and click **OK**.

Teamcenter limits the search to those parts within the defined proximity of the parts selected in the viewer or structure tree. A part is considered within the proximity if any portion of it is within the specified distance; the part may not be completely within the specified distance.

Define a spatial filter with a 3D box

> Note:
>
> This procedure requires a mockup license for the viewer and is not available with the base license.

1. In the **Spatial Criteria** dialog box, select the **3D box** button.

   Teamcenter displays a brown bounding box at a default location in the viewer.

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2. (Optional) Select **True Shape Filtering** if you want to test items with intersecting bounding boxes to identify if they have TruShape volumes that intersect the TruShape volumes of the selected objects. Depending on the TruShape parameters configured, Teamcenter displays the geometry of each object as regular cubes (voxels) to provide a simplified representation of the actual shape. TruShape searches return more accurate results but may take longer to complete.

3. Make the following selections to define the location and size of the 3D box:

   - **Slider increment**

     Specifies the actual distance equivalent to one increment of the **Maximum** and **Minimum** sliders and spinners.

   - **Extents**

     Determines how Teamcenter constructs the bounding box from the values you specify, as follows:

     - **Centroid and size**

       Allows you to specify the bounding box with coordinates of the centroid and lengths in X, Y, and Z directions. It is oriented with respect to the global axes of the end item.

     - **Origin and size**

       Allows you to specify the bounding box with coordinates of the origin and lengths in X, Y, and Z directions.

     - **Minimum and Maximum**

       Allows you to specify the bounding box with minimum and maximum coordinates. This is the default selection.

   - **Maximum** and **Minimum** sliders and spinners

     Allow you to manually define the maximum and minimum extents of the bounding box.

   - **Find Parts**

     Allows you to specify if parts returned by the search are fully contained inside or fully outside the bounding box.

   - **Include parts intersecting the box**

     If checked, the search returns parts that intersect the bounding box, as well as parts that are fully inside or outside it. This option is enabled only if you select the **True Shape filtering** option.

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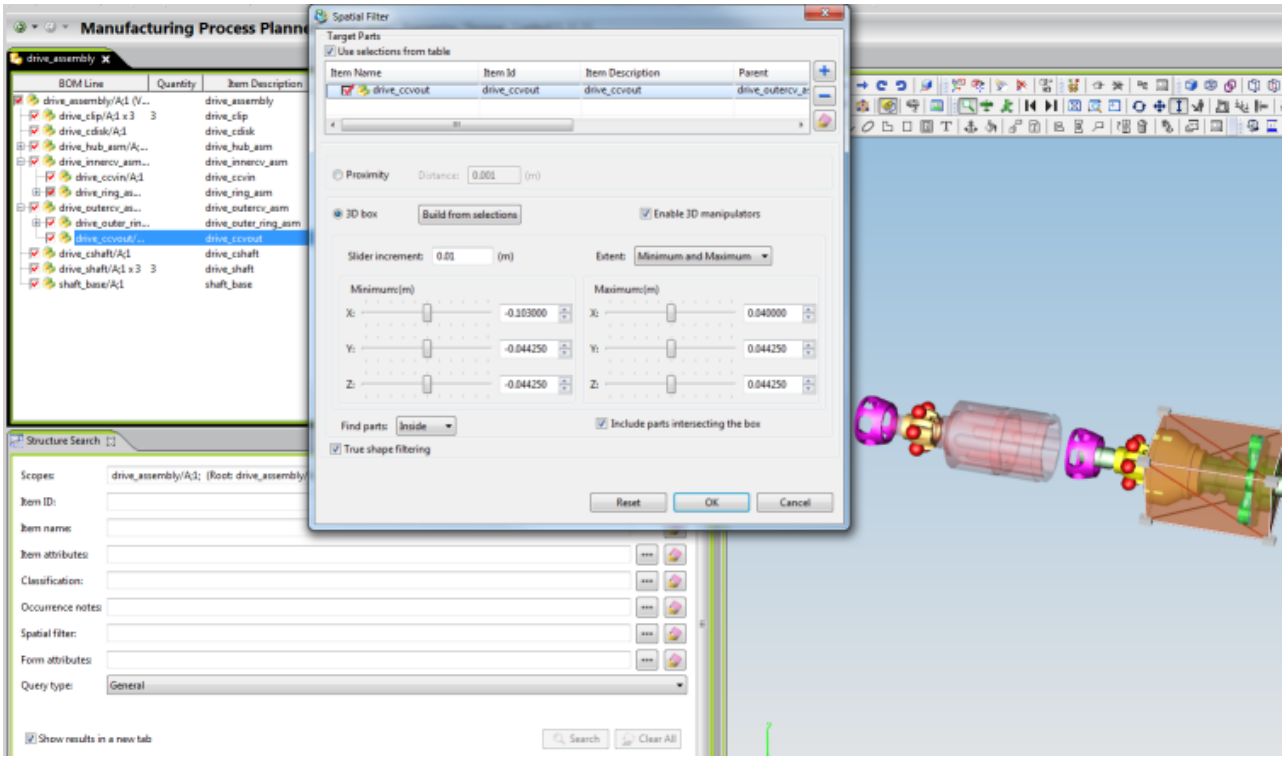
Note:

If you use appearance searches, this option is always checked.

- **Enable 3D manipulators**

  If checked, drag handles are displayed on the bounding box, allowing you to move and resize it manually. You can then drag the 3D manipulator to resize or reposition the bounding box.



4. (Optional) Do any of the following to move and resize the bounding box with the manipulators:

To	Do this
Move the manipulator parallel to a face.	Drag the face of the manipulator.
Move the manipulator perpendicular to a face.	Press Ctrl as you drag the face.
Constrain the move to one axis.	Press Shift as you drag a face.
Resize the manipulator uniformly.	Drag a corner of the manipulator.
Resize the manipulator along one axis.	Press Ctrl as you drag a corner of the manipulator.

5. (Optional) Click **Build from selections** to construct a bounding box containing all target parts specified in the **Target Parts** table, or selected in the tree or viewer.

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6. Click **OK** to save the search criteria.

   The 3D box remains visible while the search is active, even if the **Spatial Criteria** dialog box is not open.

> Note:
>
> You can visualize mixed unit assemblies in the **Spatial Search** dialog box, that is, assemblies composed of parts defined in both Imperial (English) and metric units. The dialog box uses the appropriate units when you type in dimensional values, for example, spatial distance in the **Spatial Criteria** dialog box.

Use target parts

As an alternative to manually generating the spatial search bounding box with the spinner and slider controls, you can construct a bounding box quickly and accurately from a table of target parts. You can use this method for proximity or 3D bounding box searches.

> Note:
>
> Generic objects such as GDE elements, GDE link lines, interface definitions, and processes are not valid participants in spatial searches. Consequently, they are not added to the target parts table. If you try to add a generic object to the target parts table, Teamcenter displays an error message indicating the BOM line is invalid.
>
> However, you can add valid generic objects such as signals and designs to the target parts table. If you select these objects in the table or perform a search on them, Teamcenter displays a warning message indicating that they do not have associated bounding boxes.

> Note:
>
> The target parts table is not available if you are making appearance-based searches.

1. Select the **Use selections from table** check box.

   Teamcenter enables the **Target Parts** table and its associated buttons.

   > Note:
   >
   > If you select **Use selections from table**, any selections in the tree or viewer are ignored.

2. Select the view that is the current scope for the structure search, select a product line in the structure, and click the **+** button to add selected part in the **Target Parts** table.

   To remove a target part, select it in the table and click the **–** button.

   To clear the table of all entries, click .

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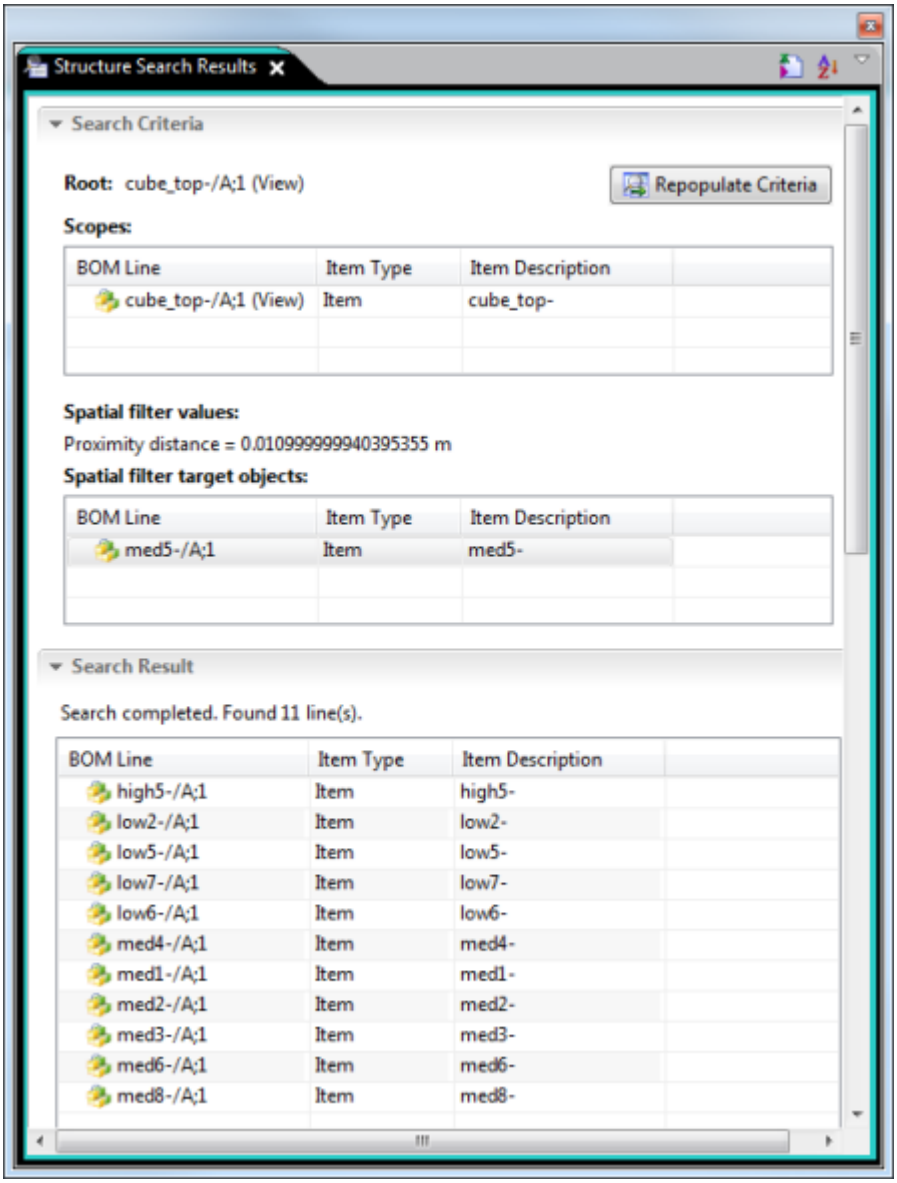
3. Once all the required target parts are listed to the table, click **OK**. Alternatively, if you are defined a 3D box search, click **Build from selections**.

   Teamcenter draws a bounding box enclosing all the target parts in the viewer.

4. Perform a spatial search.

   Teamcenter displays the **Search Results** pane containing the results of the spatial search.



Enter classification search criteria

1. Click the **...** button to the right of the **Classification** box.

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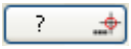
Teamcenter displays the **Classification** dialog box.

2. Click  to open the classification hierarchy.

3. Double-click a class name to select it from the tree.

   Teamcenter adds a line to the table containing the name of the class you select.

4. Specify the system of measurement.

   The systems available here (metric, nonmetric, or both) depend on the system in which the class is stored in the Classification Admin application.

5. In the **Property Name** column, click the cell containing the name of the class.

   Teamcenter displays a list of all the attributes within the class.

6. Select the class and attribute with which you want to search.

7. Click the cell containing the **=** sign and select an operator.

8. In the **Searching Value** column, select the cell and type a value for the attribute for which you want to search.

9. (Optional) Click + to create an additional search parameter.

   The lines of the table, each representing an individual search parameter, are joined by the **AND** operator.

10. Click **OK**.

    Teamcenter displays the classification search parameters in the main section of the **Search** view.

Filter search with form attributes

You can filter searches using the criteria of forms attached to the items or item revisions.

1. Click the **...** button to the right of the **Form Attributes** box.

   Teamcenter displays the **Form Attributes** dialog box.

2. Enter the form attributes for the search, including any mathematical operators.

   a. Select the relation, parent, and form type for which you want to search.

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b. Click + to add a line.

c. Enter or modify the property name, operator, or searching value by clicking in those cells in the table.

Teamcenter displays the form type and search values as a string in the format similar to the following example:

```
“ItemRev:BVRSyncInfo:last_struct_mod=value1 AND ItemRev:BVRSyncInfo:
last_Sync_date=value2”
```

Enter feature criteria

Feature criteria comprise a selection of conditions that you create, and then join by **AND** or **OR** logical operators to form a search query. You can refine this search by combining it with criteria from the **General** search. These are combined using an **AND** operator.

1. Open the appropriate search criteria section of the **Structure Search** view. For example, open the **Weld Points Criteria** section to perform a weld point search, or the **Arc Weld Criteria** section to perform an arc weld search.

2. Click the **Add** button.

3. Select one of the conditions and click **Add**.

   Teamcenter opens a dialog box where you can specify the processes, operations or parts on which to perform the search. This dialog box is modeless so that you can select the appropriate object for the search. The add button on the dialog box is enabled only when you select the appropriate object for the condition. Also, at the time of adding the condition, if Teamcenter already has valid objects selected, those get added to the list automatically.

4. Enter the condition data for each of the conditions by clicking **Add**.

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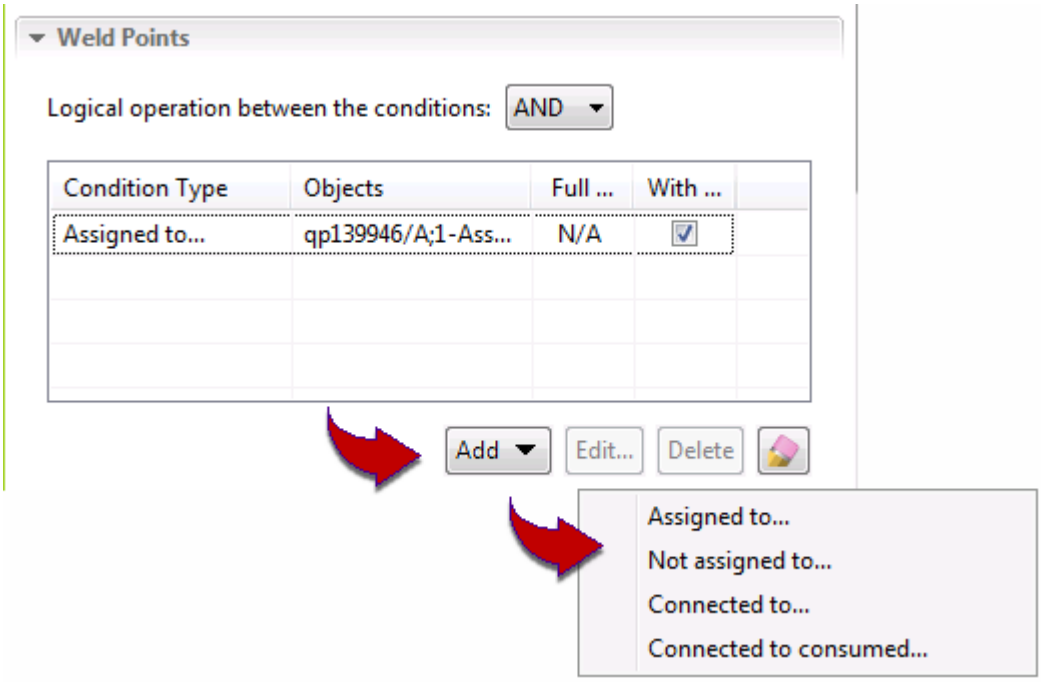
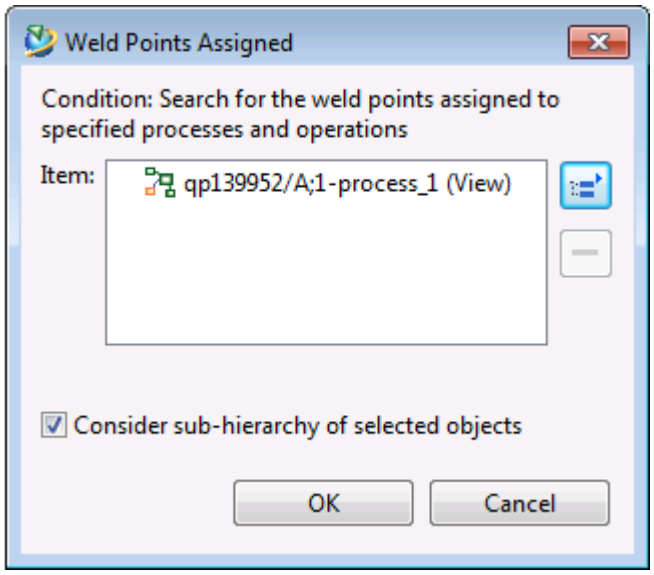


In each of these condition dialog boxes, you specify the scope by selecting an appropriate structure line and clicking the **Add** button .



You can remove the line, if necessary, by clicking **Remove** —. Select the **Consider sub hierarchy of selected objects** option to expand the search to include all children of the specified process or operation.

- **Assigned to**

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Teamcenter searches for all the features assigned to specific processes and operations. The scope for this condition is a process or operation.

- **Not assigned to**

  Teamcenter searches for all features *not* assigned to the specified processes or operations.

- **Connected to**

  Teamcenter searches for all features connected to specified parts. The scope for this condition is an item in a product structure. You can only select parts from the same product structure from which the search is initiated. Select **Full Match** to return features that are connected only to the specified parts (or to several of the specified parts, if multiple parts are listed).

- **Connected to consumed**

  Teamcenter searches for features connected to parts that are consumed by the specified processes and operations. The scope for this condition is a process or operation.

  - Select **Consider In Process Assembly in addition to consumed parts** to find all features in the search scope that are connected to parts in the incoming in-process assembly of a given process.

  - Select **Consider Dynamic In Process Assembly** to find all features in the search scope that are connected to parts in the incoming dynamic in-process assembly of a given process.

  - Select **Full Match** to return features that are connected only to the consumed parts.

- **Assigned to Previous Station** (available only for datum points).

  Teamcenter searches for all datums assigned to the previous stations of the given process or operation, as defined by the process flow in the **PERT** view. It also searches for datum points assigned to the root process or operation directly.

5. Select a logical operator.

   - **AND**

     Each condition (row) in the condition table must be fulfilled by the search result.

   - **OR**

     One or more of the conditions (rows) in the condition table must be fulfilled by the search result.

   You can only specify one logical operator for the entire condition table.

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6. Click **OK**.

   Teamcenter adds the condition type to the condition table and completes the column entries.

7. (Optional) Perform one of these actions:

   - Edit columns that are applicable to the chosen condition in the table cell.
   - Edit a row in the table by selecting it and clicking **Edit**.

     Teamcenter opens the condition dialog box.

   - Delete a row in the table by selecting it and clicking **Delete**.

8. Click **Search**.

   Teamcenter runs the search and displays the results in the **Structure Search Results** view. If you selected **Show results in a new tab**, Teamcenter creates a new **Result** tab for each time you run the search.

Manage the search results

About search results

Search results are displayed in the **Structure Search Results** view. This view has two sections:

- **Search Criteria** section

  This section displays the scope and the search criteria that you specified in the **Structure Search** view. The contents of this section vary depending on which type of search you ran and which criteria you entered.

- **Search Result** section

  This section contains a table of individual lines representing the search results. Teamcenter displays the search results as individual lines without indication of any structure.

Each time you run a new search in the **Structure Search** view, you can specify whether you want the search results to open in a new tab in the **Structure Search Results** view or replace the contents of the current tab. If you move from result to result (tab to tab), you can update the search criteria displayed in the **Structure Search** view using the **Repopulate Criteria** button.

When Teamcenter displays the result of a search, the selection in the search results table is synchronized with the selection in the structure view. When you select an object in the **Structure Search Results** view:

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- If the object is expanded in the structure that is being searched, Teamcenter automatically selects and shows the object in the originating structure.

- If the object is not expanded, the synchronization depends on the **MEExpandToSelection** preference. If the value is **true**, the application partially expands the object and shows it in the originating tree. Otherwise, the selection is not synchronized in the originating structure.

The same part may be listed many times in the search results if it has multiple occurrences in the end item that match the search criteria. For example, the same bolt may be used seven times in the end item and, if all seven usages satisfy the defined proximity filter, the bolt appears seven times in the search results.

Lines in the search results table are actual BOM lines, and you can use the same shortcut menu commands for these objects as you do for any structure line in the structure pane.

The **Structure Search** view is dependent on the configuration changes applied to the originating tree structure, such as showing configured or unconfigured, revision rules, or configuration by occurrence group. Changing the configuration of the structure pane causes the **Structure Search Results** view to clear all relevant tabs.

Removing a line from the originating structure removes only this line from the results list. Unloading the originating tree structure from the application causes the **Structure Search** view to clear all relevant tabs.

If you unload the originating tree structure from the application, causes the **Structure Search** view to close all associated tabs. The same thing happens if you change the configuration of the originating structure.

View and manage the search results

In the **Structure Search Results** view, do one of the following:

- View search result lines in original structure.

  In the context menu, use the **Find** menu commands to find the search result line in the structures loaded in the structure view.

- Copy or drag lines from the search results table.

  You can copy and paste lines from the search results table to structures in the structure view. In addition, you can drag lines from the search results table to structures in the structure view. When doing this, the behavior is the same as if you drag the line from the searched structure itself. If you drag the search result line to a structure other than the searched structure, it is as though you copied the line in the searched structure and pasted it into a new structure.

- In the **Search Criteria** section, click **Repopulate Criteria**. This is useful if you navigate between several search result tabs. As only one **Structure Search** view is available, you can use the

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Repopulate Criteria button to update the **Structure Search** view with the search criteria active for the current **Structure Search Results** tab.

- Customize the column display.

  1. Click the **View Menu** button ▾ and choose **Columns** from the view menu commands located in the top-right corner of the **Structure Search Results** view.

     Teamcenter displays the **Column Management** dialog box.

  2. Select the desired columns from the **Available Properties** list and move them to the **Displayed Columns** with the right arrow.

  3. (Optional) Modify the order the columns appear in the search results table using the up and down arrows.

  4. Click **Save**.

     The columns names and widths that are initially displayed in the search results list are configured by the **MEAdvancedSearchResultsViewColumnsShownPref** and **MEAdvancedSearchResultsViewColumnsShownWidthPref** preferences.

  5. (Optional) Save the column layout by choosing **Save Column Configuration** in the view menu commands. You can restore a saved column layout by choosing **Apply Column Configuration** and selecting the saved configuration from the list.

- Find individual search results.

  Choose the **Find in Display** command from the view menu commands to define criteria and apply them to the results list. Objects fulfilling those criteria are selected in the results list.

- Copy selected table data to the operating system clipboard. You can then paste this into any document, for example a Word or Excel document.

- Export to Word and Excel.

  Choose the **Objects to Word** or **Objects to Excel View Menu** commands to export search results to Microsoft Word or Excel.

- Sort the search results.

  You can sort the search results by clicking on the column header or by clicking the **Sort** button to open the **Sort** dialog box to define a more advanced sort. You can specify a primary, secondary, and tertiary sort order for the columns.

- Hide the display of an object in the viewer.

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You can hide or display a search result line in the assembly viewer. Select an object from the results list, and choose **Display** option from the shortcut menu. If the assembly viewer is open, the user sees the selected object in the graphical viewer beside the originating tree.

Comparing structures and propagating changes

Visually compare EBOM to MBOM or BOM to BOP part assignments

You can use a quick 3D visual confirmation of which parts are and are not assigned from a source to a target structure rather than compare structure names and IDs. When aligning EBOM to MBOM or BOM to BOP, you can visually identify which parts are unassigned in the source graphic view, and which are already assigned in the target graphic view. You can also review the target and source assignments from the **Advanced Accountability Check** dialog box or more quickly from the **Manufacturing Process Planner** toolbar.

> Note:
>
> Your administrator can also hide those parts assigned to the target in the source graphics view, and hide unassigned parts in the target graphics view, using the **MEDisplayOnAssign** preference.

1. Load EBOM and MBOM, or BOM and BOP, and link both the structures. To link:

   - An MBOM to an EBOM, right-click on the MBOM top node and choose **Link/Associate** → **Link structures**.
   - A BOM to a BOP, right-click on the BOM top node and choose **Link/Associate** → **Associate Product as Target**.

2. If you want to compare part assignments using an advanced accountability check, create an advanced accountability check favorite for BOM-BOM or BOM-BOP compare and apply that favorite name as the value of the **MEAssignmentIndicationDefault** preference.

   > Tip:
   >
   > While running an advanced accountability check, you can save it as a favorite by clicking on the **Scope** tab of the **Advanced Accountability Check** dialog box.

3. If you have not already done so, assign EBOM parts to the MBOM, or BOM parts to the BOP.

4. In both structure views, load graphics views by clicking .

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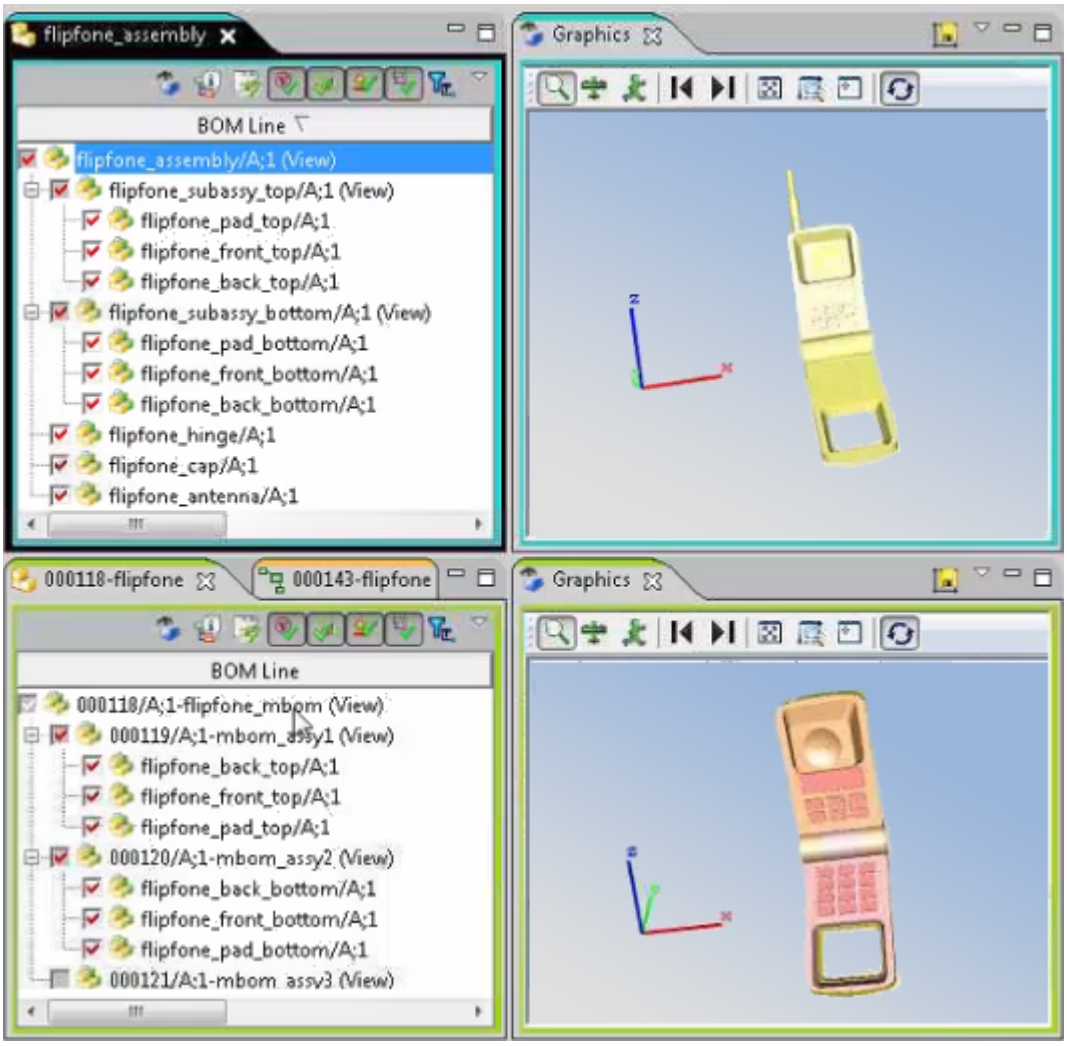

5. Select the top BOM lines in the source and target views.

6. If you want to compare assignments:

   - Using an advanced accountability check:

     a. Choose **Tools** → **Advanced Accountability Check**.

     b. In the **Advanced Accountability Check** dialog box, click **OK**.

        In the structure views, parts that are:

        - Shared by both structures are highlighted in green in the structure views.
        - Only in the source structure view are highlighted in red in the source structure and source accountability check views.

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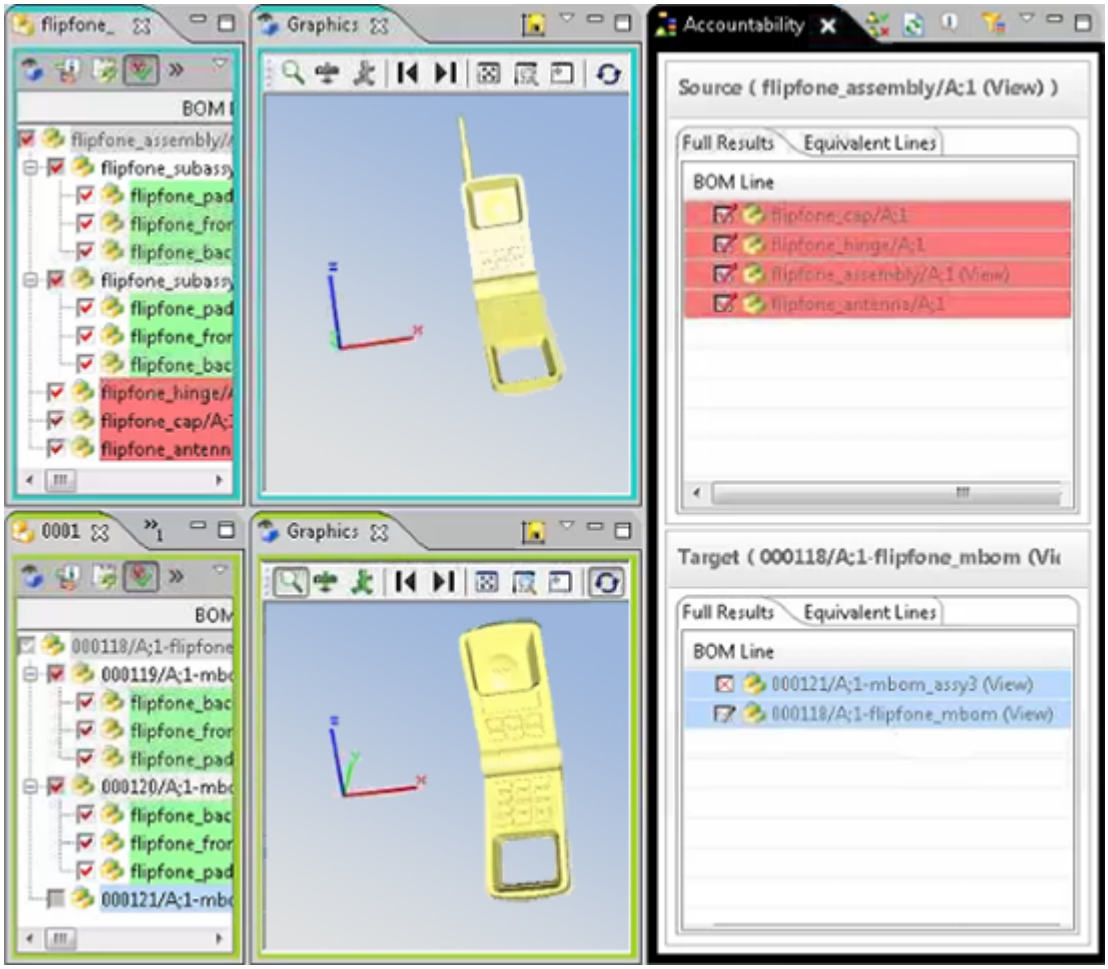
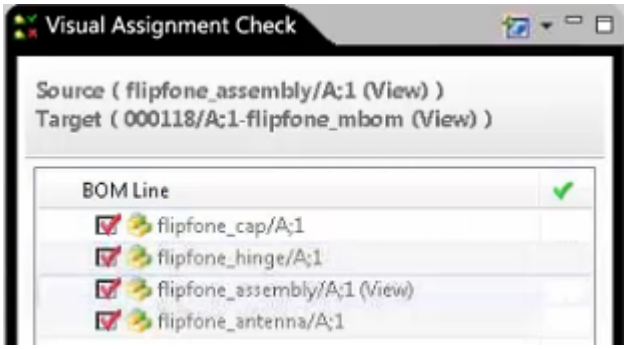
- Only in the target structure view are highlighted in cyan in the target accountability check view.



c. In the **Advanced Accountability Check** toolbar, click **Visual Assignment Check**.

The **Visual Assignment Check** view is displayed, showing all items not assigned to the target.



- Without running an advanced accountability check:

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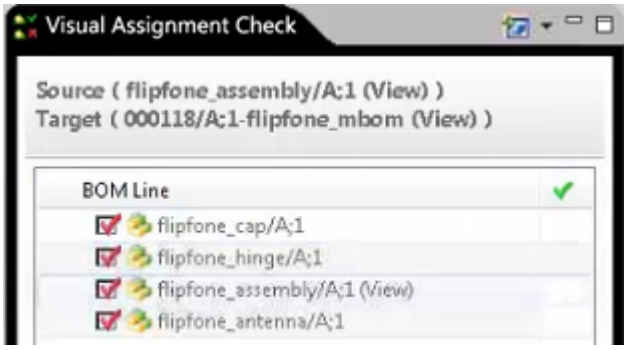
a. In the **Manufacturing Process Planner** toolbar, click **Visual Assignment Check**.

b. In the **Check Alignment Completion** dialog box, click **OK**.

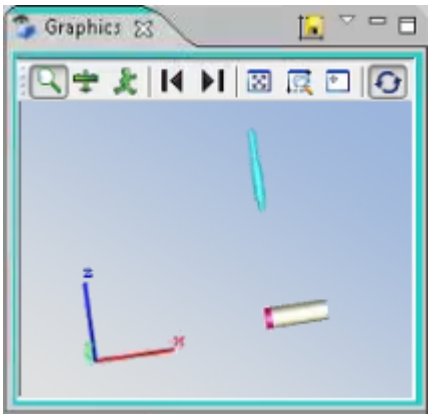
In the structure views, parts do not display highlighted colors as they do after running an advanced accountability check. However, the **Visual Assignment Check** view identifies all items not assigned to the target.



c.

> Note:
>
> If there is an accountability check results view already open, it will get cleared while running **Visual Assignment Check** without accountability check.

7. To see only those graphics assigned to the target in the source's **Graphics** view, in the **Visual Assignment Check** toolbar, click , and then select **Blank**.



> Note:
>
> You can also select **Transparent**. The **MEAssignmentIndicationTransparencyValue** preference determines how transparent the unassigned parts are in the source.

8. Assign parts from the source to the graphic window.

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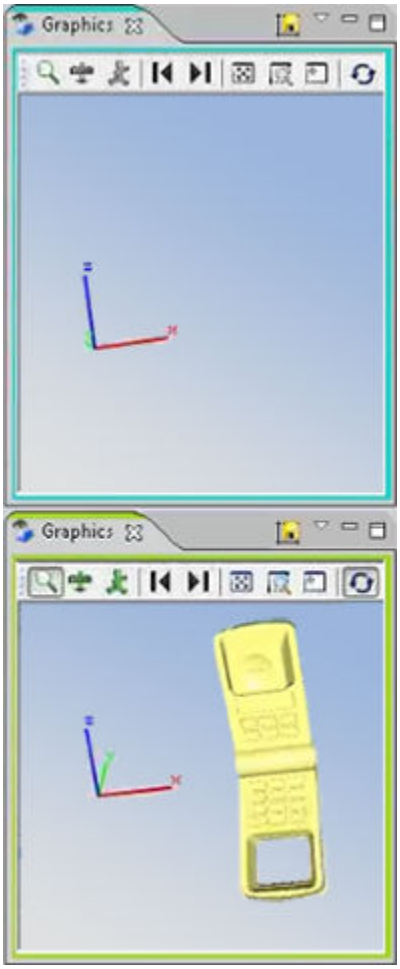
Once all parts are assigned to the target, no parts are visible in the source graphics view and all parts are visible in the target graphics view.



Recognizing revision mismatches on BOP lines

In some cases, bill of materials (BOM) items that are consumed in a bill of process (BOP) do not immediately indicate revision mismatches. If you or your administrator set the value of the preference **MECompositionMismatchPropertyName** to **fnd0CompositionRevMismatch**, an icon is displayed to indicate the mismatch.

> Note:
>
> By default, the preference value is empty. The preference is at the site location but you can create your own copy and modify the value since the protection scope is set to user. You must restart Teamcenter after setting the above value.

The icon can indicate a revision mismatch in the BOP because:

- The BOP's lines of operation and parent process are set as precise.

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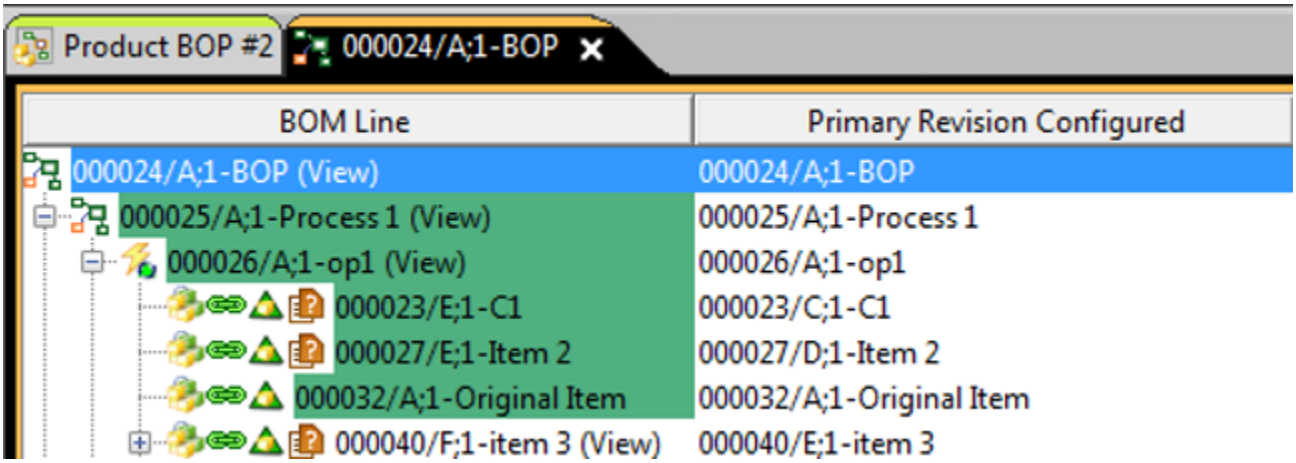
For example, you assign an item (revision A) from the BOM to the BOP operation, then someone revises the item in the BOM (revision B). The new revision (B) is displayed in both the BOM and the BOP, but results in a revision mismatch because the first revision was precisely consumed in the BOP.

- An item in the BOM is replaced with a different item.

  For example, you assign item A from a BOM to an arbitrary operation in the BOP. In the BOM, someone replaces item A with item B. The BOP shows the replacement (item B), but this item does not match the originally consumed item A.

The BOP's **Primary Revision Configured** column displays the assigned revision.



> Note:
>
> If an item is revised in the BOM, the BOP still shows the old revision of that item until you reload or reconfigure the structure. The mismatch icon is only displayed after the structure is reloaded or reconfigured.

Use colors to identify unassigned objects in an MBOM and BOP

You can easily identify product and manufacturing features in a manufacturing bill of materials (MBOM) that have been consumed in a bill of process (BOP), and thereby verify what objects still need to be assigned, using assignment indication mode. The **Assignment Indication** command lets you view assigned and unassigned features and parts in semi-transparent colors in both the MBOM and BOP views to see structural relationships. In the 3D graphic viewer, the same semi-transparent colors indicate physical relationships, such as mating surfaces. You can also hide any assigned parts in the graphic viewer and view unassigned objects without coloration.

1. Open your linked MBOM and BOP so that you can compare them.

2. Apply any necessary **configurations**, such as effectivity, occurrence types, or variants, to the structures.

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> Note:
>
> If you apply configuration to a structure while in assignment indication mode, the colors disappear, and assigned parts and features disappear in the graphic viewer.

3. If the structures are not linked, do the following.

   a. Right-click the top line in the BOP and choose **Link/Associate→Associate Product as Target**.

      In the **Associate Product as Target** dialog box, the BOP is selected in the **Process** group.

   b. Select the top line in the MBOM, and in the **Targets** group, click **Add Selected**.

   c. Click **OK**.

4. In the MBOM, select the area for which you want to identify assignments, and then click **Assignment Indication**.

   The command generates colors identical to those used in advanced accountability checks to help you identify process assignment statuses. Whatever lines are expanded in the MBOM are displayed with assignment statuses in the MBOM and BOP. By default, in the graphics view, parts that are assigned, parts assigned multiple times, and parts unassigned are displayed in the same semi-transparent colors.

   Assigned Assigned multiple times Unassigned

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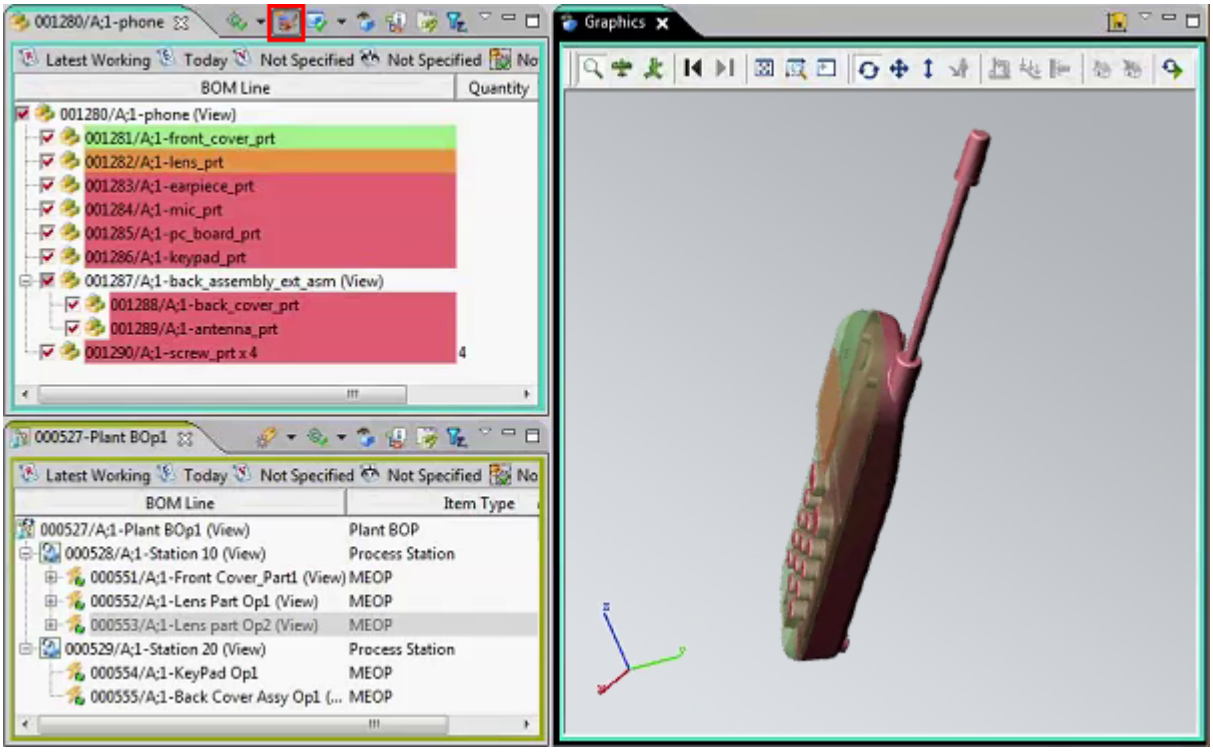
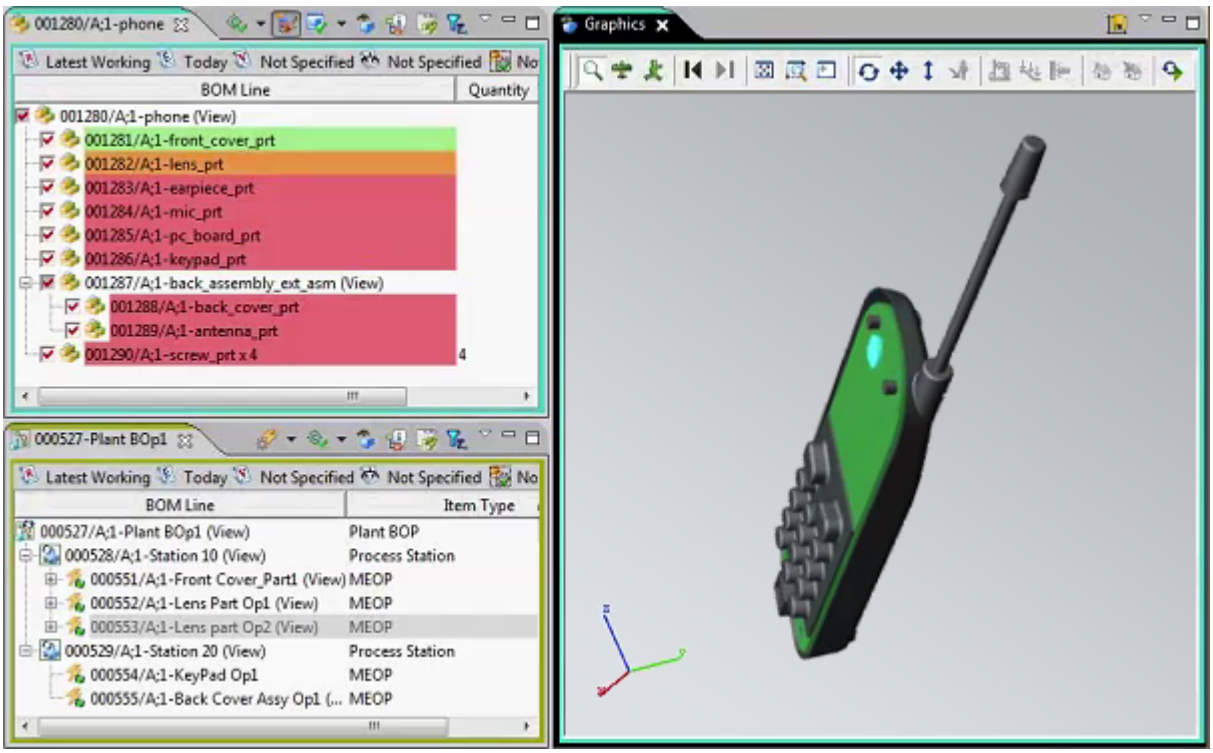


5. To hide single and multiple assignments in the graphics view, press Ctrl+G, or click ▼ next to the **Assignment Indication** command and then choose **Blank**. Only unassigned objects are displayed.



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> Tip:
>
> Press Ctrl+G again to change back to semi-transparent colors.

6. Assign or unassign product and manufacturing features from MBOM to BOP as necessary.

   The colors change as features are assigned or unassigned.

7. When finished, click **Assignment Indication** to turn assignment indication mode off.

Running an accountability check

About comparing structures and propagating changes

You can compare two structures to ensure all lines in the source structure are accounted for in the target structure. For example, you can compare the EBOM structure to the MBOM structure to ensure all parts and assemblies are assigned or compare the product structure and the process structure to ensure that all occurrences of product components and features are used in the process structure as consumed items. You can compare the entire assembly or only a subassembly to the process structure. These types of comparison are performed using an *accountability check*.

Any differences found during the comparison are reported, as they may indicate problems in manufacturing the product to its specification. However, an imbalance between the structures may not necessarily indicate a problem with the structure itself.

An accountability check or comparison:

1. Traverses the source structure.

2. For each line in the source, finds one or more matching lines in the target structure, according to defined equivalence criteria.

3. For each pair of equivalent lines, identifies if there is a full match or a partial match. A partial match exists if one or more aspects of the structures that you compare are not equal.

4. Colors each line in the structures and, if you have the correct license, opens the **Accountability Check Result** view displaying the full matches, partial matches, and unmatched lines.

The following differences are reported:

- Lines in the source structure that do not have counterparts in the target
- Lines in the source that have more than one counterpart in the target
- Lines in the target that do not have counterparts in the source

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- Lines in the source whose counterparts in the target have some significant difference, for example, a different quantity

The analysis is done on the structures as they are configured in the rich client. You can run the analysis with any combination of configuration options on both structures.

If you compare enterprise bill of process structures, you can propagate differences found from a generic BOP to a product BOP, or from a product BOP to a plant BOP.

When setting up the accountability check feature, a power user generally creates favorites—a collection of typical options and settings for different situations. An administrator can publish these favorites for different groups or roles so that regular users can then select one of them to quickly run the comparison.

Run an accountability check with saved settings

1. With the two structures that you want to compare open in structure views, select the appropriate levels and choose **Tools→Accountability Check→Accountability Check**.

2. Verify that the correct structures are listed in the **Source objects** and **Target objects** boxes. If necessary, add structures by selecting them and clicking .

3. In the **Available Settings** box, select the entry that includes the appropriate settings for the accountability check.

   Only the settings applicable to the types of structures that you selected as source and target are displayed in the **Available Settings** list.

4. Click **OK**.

   Teamcenter runs the accountability check and lists the results in the **Accountability Check** view.

5. Examine the results and make the necessary modifications to the structures.

6. Rerun the check using the same settings by clicking in the **Accountability Check** view.

Note:

- How far you need to expand the structure depends on the settings in place when the saved setting was created. Ask your administrator for information about how far to expand the selected structures.

- When running an accountability check based on saved settings or rerunning an accountability check, you cannot report the results in occurrence groups or create a printable report. Consider **running an asynchronous accountability check**.

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About the Accountability Check view

When you run the accountability check, Teamcenter displays the results in the **Accountability Check** view. This view lists the problematic lines in the source and target and provides a list of conflict details. Lines that are colored in the source and target structures are also colored in the view. Fully matched lines are not listed by default.

> Note:
>
> Displaying fully matched lines in large structures can clutter the view

Lines in the **Accountability Check** view behave in the same fashion as lines in the source and target structures. If you remove a line in the view, Teamcenter removes the line from the source or target. You can copy lines from the view into the clipboard, drag them to another structure, or send them to another application.

When you select a source or target line that is marked as having net effectivity or being a partial match, Teamcenter displays the conflicts in a third pane at the bottom of the view. The tabs shown in the **Partial Match** section of the view are dependent on which partial match criteria you selected in the **Partial Match** pane during the check. The table can display information about:

- Properties
- Predecessors (enterprise BOP structures only)
- Assignments (enterprise BOP structures only)
- Hierarchy (enterprise BOP structures only)

When you select a line in the source section of the **Accountability Check** view, you can click the **Equivalent Lines** tab in the target section of the view to find the lines in the target structure that match the selected source line, and vice versa. These lines are then selected in the visible structure views.

When you work through the accountability check results, resolving conflicts, the accountability check results are not updated—the lines remain highlighted in the original check colors. To update the lines, you must rerun the accountability check. You can do this using the same settings by clicking in the **Accountability Check** view.

> Note:
>
> The **Accountability Check** view is not displayed when one or both of the structures being compared is an intermediate data capture.

Display the partial compare results

After running an accountability check, you can view the partial compare results. Do one of the following:

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- Select a partial match line in either the **Source** or **Target** section of the **Accountability Check** view.

  Teamcenter displays the partial compare results in the **Partial Match** section at the bottom of the view.

- Right-click a partial match line in the structure pane and choose **Partial Compare Results**, or choose **Tools→Accountability Check→Partial Compare Results**.

  Teamcenter displays the **Partial Compare Results** dialog box.

View settings used to run the accountability check

You can display a read-only listing of the settings in force when you ran the accountability check report.

- Click .

  Teamcenter opens the **Accountability Check Settings** dialog box displaying the scope and configuration in effect at the time the check was made. This is not necessarily the same as the currently active configuration.

Filter accountability check results

When you run the accountability check, you can select check criteria in the **Accountability Check** dialog box. After running the report, you may find that the **Accountability Check** view shows too many results and the display is cluttered. You can filter out some of the check criteria in the view to make it more readable without having to rerun the accountability check.

1. Click **Filter**.

2. Clear the categories that you want to hide in the view and click **OK**.

Teamcenter displays only those categories that are selected in the **Filter** dialog box. The filter button is turned on when you remove the check mark from any categories to indicate that filtering is applied.

Using the Accountability Check view options

The **Accountability Check** view provides a multitude of options that are common to many views.

Do any of the following:

- Find individual objects in the view.

- Customize the column display.

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Mark broken links

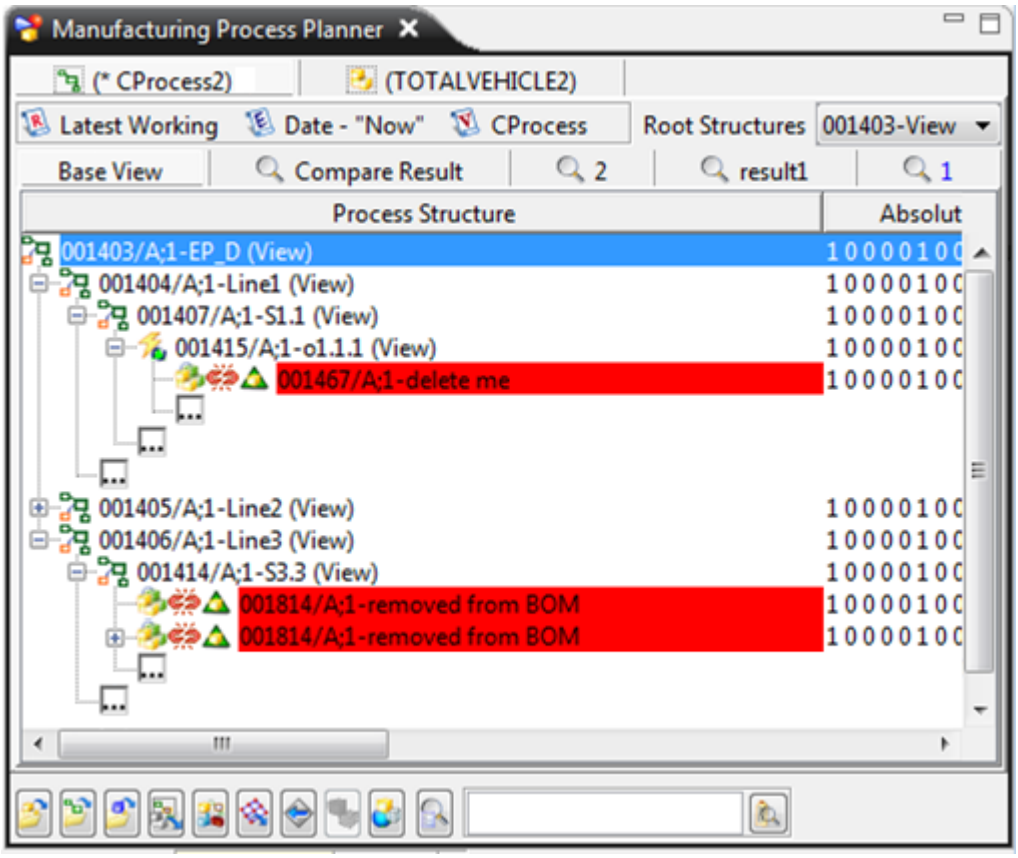
The accountability check can help you find all the lines with broken links below a selected process.

1. Make sure the associated product structure is loaded.

2. Select one or multiple processes or operations and choose **Accountability Check→Mark Broken Links**.

   Teamcenter finds all broken link lines below the selected process or processes, partially expands the structure to display them, and colors the background red. Each time you run the **Mark Broken Links** command, the marking of broken link lines is additive. The display is not cleared before the command is run.

   You can modify the color of the marking in the **MEAccountabilityMarkBrokenLinksColor** preference.



3. (Optional) Reconcile the broken links.

4. (Optional) Clear the background colors by choosing **Accountability Check→Clear Accountability Check Display**.

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Tip:

If you use this feature often, you can add the **Mark in Broken Links** button to the menu bar.

Mark lines in the base view

If you run an accountability check and report the results in occurrence groups, you can mark a selected line in the occurrence group in the base view.

1. Select a child line that is directly under an occurrence group and choose **Accountability Check→Mark in Base View**.

   Teamcenter selects the base view tab, partially expands the structure to the marked lines, and colors the background light green. Each time you run the **Mark in Base View** command, the marking of lines is additive. The display is not cleared before the command is run.

   You can modify the color of the marking in the **MEAccountabilityMarkInBaseViewColor** preference.

2. (Optional) Clear the background colors by choosing **Accountability Check→Clear Accountability Check Display**.

Tip:

If you use this feature often, you can add the **Mark in Base View** button to the menu bar.

Clear display

You can reset all background colors on objects in the active window and their corresponding objects in the process window to the default colors.

- Choose **Tools→Accountability Check→Clear Accountability Check Display**.

Note:

The command works only if either the source view or the target view is the active window.

Running an advanced accountability check

Understanding line equivalence

When comparing product and process, the standard accountability check comparison is based on the assignments between the structures. When comparing two process structures, Teamcenter additionally uses the in-context ID and any common assignments to the same product to determine equivalence.

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Because the accountability check is based on the assign action, it does not compare by item ID and does not recognize if a line is copied from another structure or from the **Newstuff** folder.

Understanding equivalence in enterprise BOP structures

In addition to the standard equivalence checks, two lines are considered equivalent if one or more of the following criteria match. (Some of the criteria may not match, but the lines are still considered to be equivalent.)

- Origin link equivalence for enterprise BOP structures

  A process, operation, or partition in one enterprise BOP structure is considered equivalent to its counterpart in another enterprise BOP structure by origin link if the source BOP's process, operation, or partition was used as a template for creation of the target BOP's process, operation, or partition. This occurs if the generic BOP was used as a template for creating a new product BOP or if the process or operation was allocated from a product BOP to a plant BOP.

  A process, operation, or partition in a product BOP is considered equivalent to a process, operation, or partition in another product BOP by origin link if both product BOPs are created from the same generic BOP. It is not necessary for the product BOPs to be created directly from the generic BOP because origin links are carried over each time a product BOP is cloned. The same holds true when cloning a plant BOP from an existing plant BOP. Allocated processes or operations remain linked to the original product BOP. The allocation process clones the structure, but the origin links remain the same.

  This criterion is always checked when comparing any combination of enterprise BOP structures.

- Process logical designator equivalence for enterprise BOP structures

  A process, operation, or partition in a generic BOP or product BOP is considered equivalent to a process, operation, or partition in another generic BOP or product BOP by process logical designator if both lines have the same process logical designator property values. Two process logical designators are considered equivalent if all fields in the logical designator form match.

  This criterion is optional. It can be useful when comparing two structures of the same type that do not necessarily have the same origin (for example, plant BOP to plant BOP).

- Process ID equivalence

  A process, operation, or partition in an enterprise BOP structure is considered equivalent to the same process, operation, or partition in another configuration of the same structure.

  This criterion is checked when comparing two configurations of the same structure.

Types of structures you can compare and propagate

Using an accountability check, you can compare the following pairs of source and target structures:

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- EBOM and MBOM to see which of the EBOM parts are aligned to the MBOM
- Product and product
- Process and product to see if all parts are consumed
- Process and process
- Process and plant
- Generic BOP and product BOP
- Product BOP and plant BOP to see which of the product BOP processes and operations are already allocated. It is also possible to see if any data was changed in the product BOP processes and operations after these were allocated to the plant BOP.
- Product BOP and product BOP
- Plant BOP and plant BOP to see any differences when they have a common product BOP as origin.

After comparison, you can propagate changes between the compared structures.

> Note:
>
> BOM-BOP propagation depends on the properties mentioned in the **MEAssignProperties** preference.

The following is an overview of the types of structures you can compare.

		Target							
		BOM	**BOP**	**Generic BOP**	**Product BOP**	**Plant BOP**	**Part BOM**	**IDC**	**4GD**
Source	**BOM**	X	X		X	X		X	
	Design BOM						X		
	BOP	X	X					X	
	Generic BOP			X	X			X	
	Product BOP				X	X		X	
	Plant BOP					X		X	

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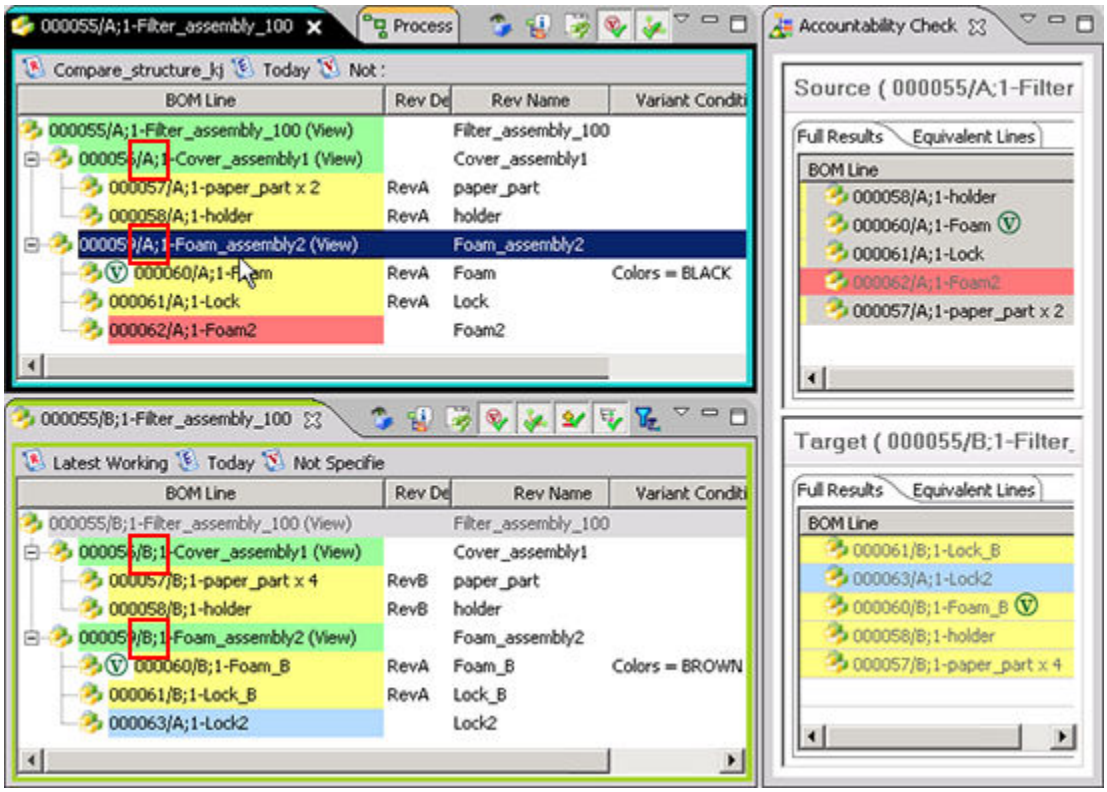
	Target							
	BOM	BOP	Generic BOP	Product BOP	Plant BOP	Part BOM	IDC	4GD
IDC							X	
4GD	X							

Note:

You can compare two revisions of the same BOM, BOP, or plant BOP structure. You can compare item IDs, item revisions, item revision and BOM line attributes and properties, and quantity for pack/unpack lines. This provides a better understanding of what has changed from one structure event to another, including which objects were added or changed, which were updated, and which remain the same. To compare two revisions of the same structure, open each in its own structure and run an advanced accountability check using the top lines as source and target.



Run an advanced accountability check

As an advanced user, you can set a variety of options before you run an advanced accountability check. If you save these options as favorites, you can repeat the advanced accountability check using the same options.

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Note:

To run an advanced accountability check, you must have two linked source and target structures to compare. These are typically a source engineering bill of materials (EBOM) generated from a design BOM that is exported from a CAD application such as NX or CATIA, and a target manufacturing BOM (MBOM) created for specific manufacturing needs from the EBOM. When the EBOM is updated, the MBOM must be compared and updated as well. This is the purpose of an advanced accountability check: the two structures must be examined to ensure that they share equivalent BOM lines.

1. Select source and target objects in structure views and open the **Advanced Accountability Check** dialog box by choosing **Tools→Accountability Check→Advanced Accountability Check**. Use one of the following methods:

   - Select a source line, open the dialog box, and then select a target line and click **Set/add current selection** beside the **Selected target objects** box.

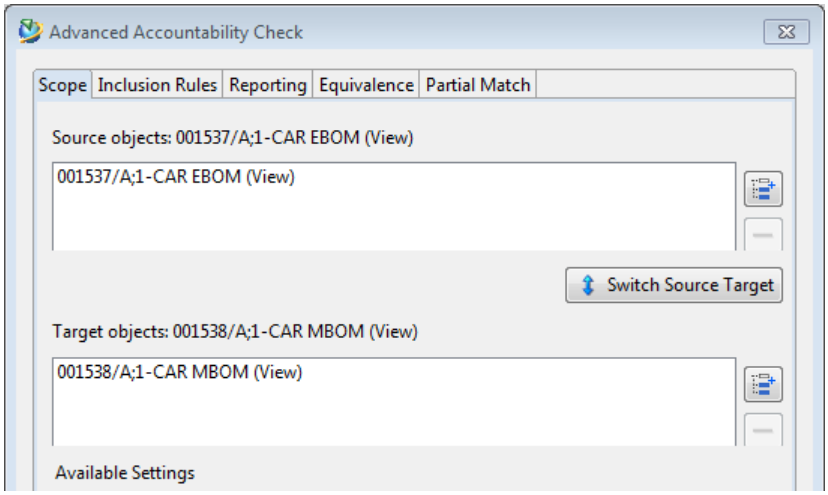
   - Select the source and target lines in the structure views, and then open the **Advanced Accountability Check** dialog box.

     Tip:

     As long as only the source and target views are open, Manufacturing Process Planner autodetects and adds the correct source and target lines to the **Source objects** and **Target objects** boxes.

   Note:

   You must select at least one line before you can open the **Advanced Accountability Check** dialog box.



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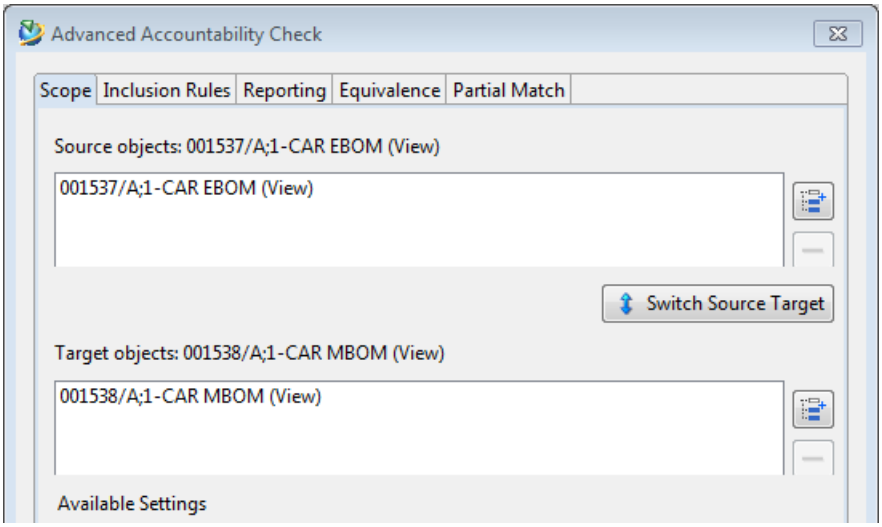
2. (Optional) Change the source or target object at any time by selecting the desired line in the structure and clicking the respective **Set/add current selection** button. You can add multiple scope lines from the same structure or remove a scope line by selecting it and clicking −.



3. Ensure that you correctly selected the source and target objects. If not, switch the source and target by clicking the **Switch Source Target** button.

4. Click the **Inclusion Rules** tab, and do one of the following:

   - Select **Search currently expanded source lines** to run the accountability check on the selected lines and all visible lines below the selected lines. Additionally, you can choose to run the accountability check on all the lowest visible (expanded) lines under the selected scope line by selecting **Compare lowest visible level of source**.

   - a. Select **Search lines per filtering rule** to expand the source and target structures and only consider a subset of the lines during the accountability check.

     b. Select the **Source filtering rule**. For a description of the filtering rules, move your mouse over the list. The rules along with their short descriptions are displayed.

   You can specify to which level in a structure you want the check to consider by selecting **Limit search in source/target to first** *x* **levels** and typing a value for *x*.

   > Note:
   >
   > For information about filtering rules, see Managing filter rules in the Tc XML and PLM XML Configuration for Data Import and Export.

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> Note:
>
> When you set these options, the values take effect in all applications that support accountability checks.

5. (Optional) If you know the source and target scope lines to be different because these lines are source and target specific, select the **Do not compare selected lines** check box.

   In the advanced accountability check results, the selected scope lines do not appear as missing in target and missing in source.

6. Click the **Reporting** tab and set the result reporting options.

7. Click the **Equivalence** tab and set the equivalence options.

8. Click the **Partial Match** tab and specify the partial match criteria.

9. Click **OK** to run the accountability check.

   Teamcenter displays the **Accountability Check** view.

> Note:
>
> The number of lines returned in the accountability check is limited by the value of the **MEAccountabilityCheckAllowableReturnedLines** preference. If the number of lines to return exceeds the preference value, a message will be displayed notifying you that there are more lines to be returned, and that an Accountability Check Excel report has been created and stored, thus saving the work.

10. After running the accountability check, examine the results and make any necessary modifications to the structure.

11. Rerun the check using the same settings by clicking in the **Accountability Check** view.

> Note:
>
> - Rerunning an accountability check does not recreate an accountability check report or a result reported in an occurrence group.
> - For information about narrowing the scope of the accountability check, see the *PLMXML Export Import Administration Guide*.

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Run an MBOM assessment repair

After running an advanced accountability check on a linked MBOM and EBOM, you can search and compare nonequivalent lines using BOM line properties, and synchronize those lines in the MBOM with lines and properties from the EBOM.

1. Run an advanced accountability check on a linked EBOM (source) and MBOM (target) structure with nonequivalent line problems.

2. Choose **Tools→Accountability Check→MBOM Assessment Repair**.

   In the **MBOM Assessment Repair** view, the **Structure for Repair** list displays MBOM scopes in need of repair, while the **Structure for Candidates** list displays EBOM scopes that are candidates that can potentially repair the MBOM scopes

3. From the **Stored Criteria** list, select criteria relevant to the synchronization.

   The list may contain mandatory and optional properties relevant to repairing nonequivalent lines, such as the ability to compare or match a property such as an absolute transformation matrix. An administrator can define this list using the **MEMBOMAssessmentRepairDefaultSearchCriteria** and **MEMBOMAssessmentRepairSearchCriteriaList** preferences. Other relevant preferences include:

   MEMBOMAssessmentRepairAbsXformAngularTolerance

   Defines the proximity value (in degrees) under which variations in the rotation section of a transform are seen as equal. The default value is 0.1 degree.

   MEMBOMAssessmentRepairAbsXformTranslationTolerance

   Defines the proximity value (in millimeters) under which variations in the translation section of a transform are seen as equal. The default value is 0.001 millimeters.

   MEMBOMAssessmentRepairClosureRule

   The name of the closure rule used by the MBOM assessment search when **Missing in Target** in the advanced accountability check is not specified.

4. To define criteria relevant to your repair process:

   a. In the MBOM, add columns containing relevant criteria.

   b. Click **Edit** and add the property (column) names and relevant values to the criteria table.

5. Click **Search**.

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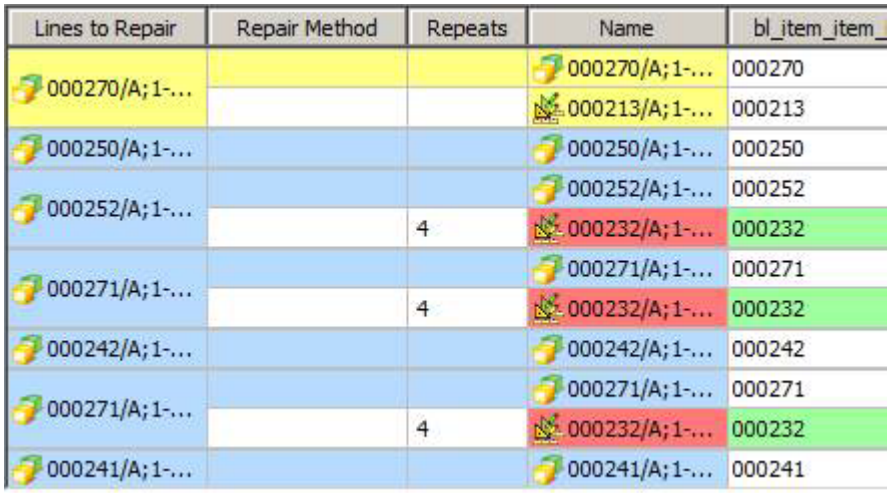
Based on your criteria, in the **Search Result** section (04:31), the **Lines to Repair** column displays misaligned MBOM lines, color-coded using the same display options as those used in the advanced accountability check (= full match, = missing in target, = missing in source, = partial match). If matches are found, the **Name** column displays the MBOM line at the top of the line and the EBOM lines below it. The **Repeats** column displays the number of repair lines for which the line is a candidate if that count is larger than 1.



Lines to Repair	Repair Method	Repeats	Name	bl_item_item_
000270/A;1-...			000270/A;1-...	000270
			000213/A;1-...	000213
000250/A;1-...			000250/A;1-...	000250
000252/A;1-...			000252/A;1-...	000252
		4	000232/A;1-...	000232
000271/A;1-...			000271/A;1-...	000271
		4	000232/A;1-...	000232
000242/A;1-...			000242/A;1-...	000242
000271/A;1-...			000271/A;1-...	000271
		4	000232/A;1-...	000232
000241/A;1-...			000241/A;1-...	000241

6. If your administrator has not removed the functionality, to automatically preselect a repair method on one-candidate MBOM lines:

   - With a partial match in the EBOM, select the **Partial Match** check box.
   - That are missing in the EBOM, select the **Missing in Source** check box.

     Missing in Source applies only to lines with no number in the **Repeats** column.

   Methods are preselected but not yet executed on all MBOM lines that do not have multiple numbers of repair lines.

   Note:

   - If you select a repair method before selecting either check box, that repair method is not overridden by the automatic repair method. However, if you select and then deselect either checkbox, your manual repair method is cleared.
   - An administrator can define the automatic repair methods for these two options using the **MEMBOMAssessmentRepairPartialMatchQuickAction** and **MEMBOMAssessmentRepairMissingInSourceQuickAction** preferences.

7. For each line to be repaired, click in the **Repair Method** column and select a method.

   - **Replace** replaces the MBOM line with the EBOM line.

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- **Propagate** updates the MBOM line properties with those of the EBOM line properties.
- (Missing in source lines with no repair candidates only) **Remove** removes the MBOM line.

8. Click **Repair**.

> Tip:
>
> You do not have to apply repair methods to all lines at once. You can apply methods a few lines at a time and observe their effect on the MBOM after which the repaired lines are grayed-out to indicate that the repair has executed. You can then make additional repairs or repeat the search as many times as you like before closing the **MBOM Assessment Repair** view.

A message reports how many of the selected repair methods were applied to the MBOM. If you elected to remove any MBOM lines, in the **MBOM Assessment Repair** view, those lines are grayed-out to indicate that the MBOM lines no longer exist. If you repeat the search, removed lines are no longer displayed.

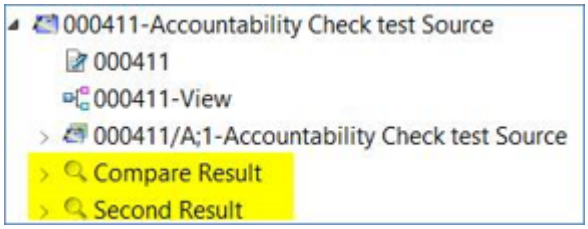
Set the result reporting options

The accountability check displays its results by highlighting the checked objects in the structure pane in a variety of colors that you can change, if desired. To help users who cannot differentiate colors well, a tool tip shows the name of the color. If the name is not available, the tooltip displays the RGB value.

1. Open the accountability check dialog box.
2. Click the **Reporting** tab.
3. Select one of the following:

- **Report in occurrence groups**

  Teamcenter can store and display the result of the accountability check in an additional tab in the structure pane grouped by anomaly. This result is only computed for the source item and is stored in the database as a structure of **UsageCompareResultView** objects related to the item of the source revision. You can specify the name for the result of the check. By default, it is named **Compare Result**.



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- **Report the selected check criteria**

  Teamcenter offers you two methods to visualize the results of the accountability check. You can select one or both of the following:

  - Select **Color the compared objects** to color the line and the matching lines according to the match results and color scheme that you set in the **Reporting** section.
  - Select **Printable report** to capture the results of the accountability check in an Excel spreadsheet.

4. Check the display options you require:

Option	Description
Full Match	If the object (occurrence) in the source structure has one and only one equivalent in the target structure, both objects are set to the same background color. If you also selected the **Partial Match** option, a full match also means that all partial match criteria of the equivalent objects match, for example, properties or relations, if you use enterprise BOP structures. The default color is green.
Partial Match	For equivalent objects (occurrences), if one or more partial match criteria are not identical, both objects are set to the same background color. The default color is yellow.
Multiple Match	If objects have more than a single equivalent in either structure and all properties of the source objects are identical to the properties of target objects, all objects are set to the same background color. The default color is orange. Only available when you do not use net effectivity.
Multiple Partial Match	If objects have more than a single equivalent in either structure and in addition, one or more properties are not identical, all objects are set to the same background color. The default color is pink. Only available when you do not use net effectivity.
Effectivity mismatch	Only available when you use net effectivity. For equivalent objects (occurrences), if the net effectivities differ, both objects are set to the same background color. The default color is orange.
Partial & effectivity mismatch	Only available when you use net effectivity.

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Option	Description
	For equivalent objects (occurrences), if one or more properties are not identical and the net effectivities differ, both objects are set to the same background color. The default color is pink.
Missing Target	If occurrences of the source structure are not found in the target, the source objects are set to this color. The default color is red.
Missing Source	If occurrences of the target structure are not found in the source structure, the target objects are set to this color. The default color is light blue.

5. (Optional) Change the default color by clicking ••• next to the color.

6. Set the colors by choosing a color swatch, and setting HSB (hue, saturation, brilliance) or RGB (red, green, blue) values.

Set the equivalence options

1. Open the accountability check dialog box.

2. Click the **Equivalence** tab.

3. Select the comparison options you require:

Option	Description
Equivalent Logical Designator	If you use enterprise BOP structures, the accountability check takes process logical designators into consideration as an additional comparison criteria when checking the process, operation, or partition lines for equivalence.

Note:

- This check box is available only when both structures are enterprise BOP structures.

- Propagating changes from a product BOP with logical designators used in multiple operations and a generic BOP using cloning can result in accountability errors. After running an advanced accountability check, operations that should display partial matches are sometimes reported

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Option	Description
	as missing in target and missing in source. Use the **Copy** and **Paste** commands between generic and product BOPs rather than cloning.
Equivalent PublishLink Connection	If you use publish links, the accountability check highlights occurrences that are mapped using publish links. If a part occurrence is set to not require positioned design, it is also taken into consideration.

Note:

When checking accountability between structures, the direction of tracelinks is not considered.

Specify partial match criteria

You can specify which data to compare between equivalent lines. You can choose to compare a specific set of properties or, if you are comparing enterprise BOP structures, you can additionally compare any relation type of these lines to other lines. For example, you can compare assignment or predecessor relations.

1. Click the **Partial Match** tab.

2. On the **Properties** tab, select **Consider values of properties when searching for a partial match**.

3. To manually show or hide processing of rolled-up variant conditions when comparing an engineering BOM to a manufacturing BOM, select **Consider values of rolled up variant condition when searching for a partial match**.

   Note:

   The **Consider values of rolled up variant condition when searching for a partial match** check box is disabled if you are comparing a BOM and a BOP.

   You can hide the consideration of rolled up variant conditions even if the **Rollup_Variant_Feature** is set to **true**.

4. Choose the properties that you want included in the accountability check by selecting them in the **Available Properties** list and clicking + to move them to the **Selected Properties** list.

   The accountability check matches lines in the source and target that have the same properties as those you select in the **Selected Properties** list. Your administrator determines which properties are available for selection in the **AdditionalAccountabilityCheckProperties** preference. Any differences in the selected properties are identified as differences between the structures.

   The values of the **DefaultAccountabilityCheckProperties** preference are ignored.

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5. If you are comparing enterprise BOP structures, click the **General** tab and specify the object relation criteria for partial match.

6. If you are running an advanced accountability check after allocating operations or processes from a product to a plant BOP, but then create plant BOP- specific operations or processes that do not have origin links and therefore do not want them to appear as missing in source in the accountability check, click the **General** tab and select the **Ignore mismatches caused by creation of objects in the derived structure** check box.

   The selected check box ensures that plant BOP- specific operations or processes are ignored while comparing both the structures. Only partial matches for allocated operations and\or processes between the product and plant BOP are displayed.

7. If you are comparing manufacturing features, click the **General** tab and click **Consider connected objects for partial match** to include features in the comparison.

Specifying partial match criteria for enterprise BOP structures

In addition to comparing properties, when you compare processes, operations, and partitions in enterprise BOP structures, Teamcenter can check the following criteria:

- Product assignment

  Teamcenter applies product assignment match criteria only to process and operation lines. It compares:

  - Logical assignment definitions

    Teamcenter identifies a match if, for each logical assignment of the first process or operation, it finds a distinct logical assignment of the second process or operation. That is, both logical assignments contain the same definition for the product logical designator they use. This assessment can take into account if the compared logical assignments are resolved or if the resolved assignments match.

  - Manual product assignments

    The identification of a product assignment is based on occurrence type and a match is identified if, for each line under the source process or operation, a distinct equivalent line is found under the target process or operation. They are equivalent if both lines have the same occurrence type and the same absolute occurrence.

    The product assignment of the matching processes or operations are checked and must completely match to qualify as a full match. If the product assignments do not match, Teamcenter identifies a partial match.

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> Note:
>
> For product assignment lines to match by either of the criteria described, they must be assigned from a structure and not from a library or other resource. Consequently, even if the BOP structure uses product items that are not represented in the BOM structure, you must collect them into another structure (for example, the MBOM) before assigning them. If you assign them directly to the BOP as items, the processes or operations to which they are assigned will never qualify for a full match by product assignment.

If one structure's process or operation has more assignments of a particular product than the other, this also qualifies as a partial match. Packed lines are taken into account when determining if the same number of product instances is present.

- Resource (tool) assignment

  Teamcenter applies resource or tool assignment match criteria only to process and operation lines. It identifies a resource mismatch by comparing the immediate children of equivalent processes or operations and their respective resource assignments. A resource assignment is identified by its specific occurrence type.

  It identifies a match if, for each resource assignment under the first process or operation, it finds an equivalent resource assignment under the second process or operation. It determines equivalence according to the item ID of the assigned resource. As the item ID is the same for different revisions of the same resource, different revisions are considered equivalent and do not cause the resource assignment to qualify as a partial match.

  All resource assignments of the equivalent processes or operations must completely match or the processes or operations are considered as a partial match. If the processes or operations have different quantities of a particular resource, it is considered as a partial match. Packed lines are taken into account when determining if the same number of resource assignments is present. However, a difference in the order of the resource assignments does not constitute a mismatch.

- Parent partitions

  Teamcenter applies parent partition match criteria to lines directly under partitions. In generic BOPs and product BOPs, these are partition lines and process lines. It identifies a match if the compared lines have equivalent partitions as parents, based on the internal partition ID, origin link, or logical designator.

- Predecessors

  Teamcenter uses predecessors to determine the flow in the PERT chart. Equivalent lines that have different predecessors qualify as a partial match.

  Teamcenter can optionally compare structure-specific operations. When structure-specific operations are not included in the comparison, Teamcenter checks if an operation is structure-specific. If it is, Teamcenter compares with the operation’s predecessor.

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- Descendants

  Equivalent lines that have different child operations or processes qualify as a mismatch.

Specify object relation partial match criteria for enterprise BOP structures

When comparing enterprise BOP structures, you can compare various types of relations for the two structures.

1. On the **Partial Match** tab of the **Accountability Check** dialog box, click the **Assignments** tab.
2. Select **Consider product assignment when searching for a partial match**.
3. Select the type of product assignment mismatch to compare.
   - Select the types of consumptions you want the comparison to take into consideration.
   - Select **Logical assignment mismatch** to compare logical assignments.

     You can choose to compare only the definitions or the definitions and their resolved assignments.
   - Select **Check manual assignment partial match** to compare manual part assignments.
4. Select **Consider tool assignment when searching for a partial match**.
5. Select the types of tool assignments to compare.

   You can select which types of assignments the comparison should take into consideration.

Roll up equivalent line quantities in accountability checks

If quantities in a set of source and target lines are different across those lines but add up to the same total, you can make them equivalent (a full match) in your final accountability check results.

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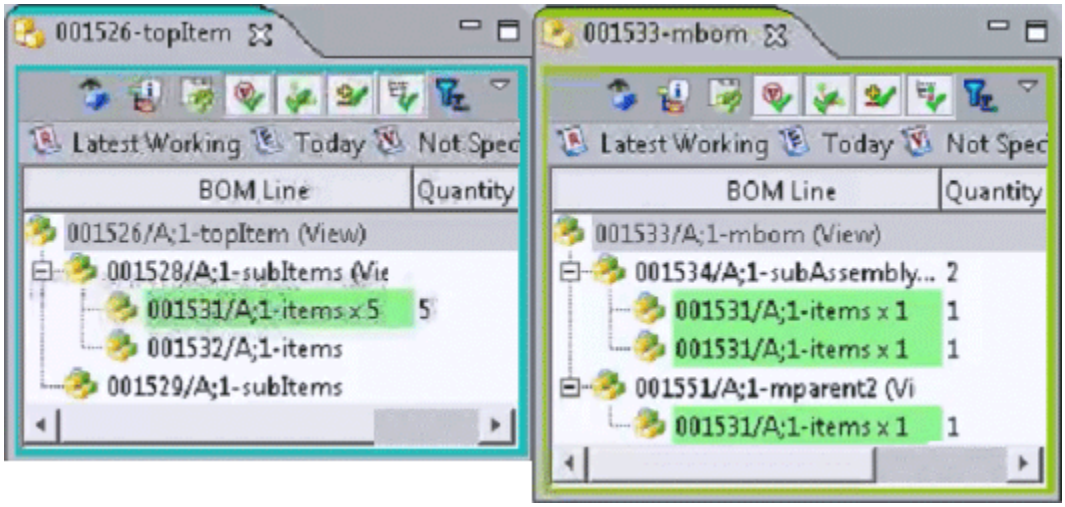

1. Choose **Tools→Accountability Check→Advanced Accountability Check**.

2. In the **Advanced Accountability Check** dialog box, click the **Reporting** tab.

3. If it is not already enabled, select **Report the selected check criteria**.

4. In the **Display Options** group, select the **Multiple Match** ☑ check box.

   The **Consider quantity rollup for multiple match** check box is enabled.

5. Select the **Consider quantity rollup for multiple match** check box ☑.

   The **Multiple Match** ☑ check box is disabled and quantities in the set of source and target lines that add up to the same total will now appear equivalent (a full match) when you run an advanced accountability check.

   > Note:
   >
   > Deselect **Consider quantity rollup for multiple match** to reenable the **Multiple Match** ☑ check box.

Save accountability check settings

Saving accountability check settings is a task that should be performed by an administrator or power user.

1. Open the **Accountability Check** dialog box and select the desired options to run the check as described in *Run an advanced accountability check*.

2. When you have defined all the settings, click 💾 at the bottom of the **Accountability Check** dialog box.

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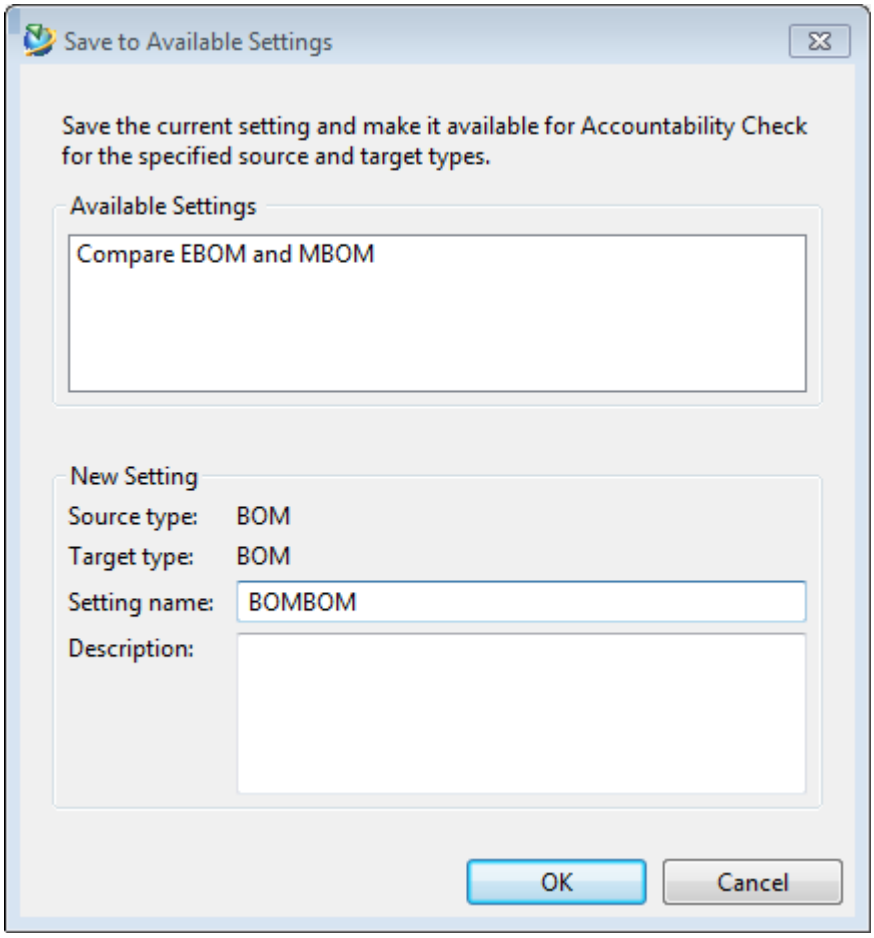
3. Add a name and description for the favorite and click **OK**.



You can select the settings the next time you run an accountability check and it is run with the same settings that you save. An administrator can publish these settings for use by other users or for members of a specific group or role.

> Note:
>
> When an accountability check is rerun based on a saved setting, Teamcenter does not recreate a printable report or occurrence group results.

Modify and delete saved accountability check settings

To	Do this
Modify an existing saved setting	1. Open the **Advanced Accountability Check** dialog box and select the source and target structures. 2. In the **Available Settings** section, select a setting.

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To	Do this
	3. Click **Load Settings** and modify the settings to suit your needs. 4. Do any of the following: • Run the accountability check with the modified settings. • Save the modifications to an existing saved setting. • Save the modifications to a new setting.
Delete a saved setting	1. In the **Advanced Accountability Check** dialog box, click **Manage Available Settings** . 2. Select the setting from the list and click **Delete**.

Running the accountability check when using the Quantity attribute with packed lines

When viewing quantity in packed lines, you see an accumulated quantity of all packed lines. However, when you choose to compare the **Quantity** attribute, the accountability check uses the quantity that is actually typed in per packed line. For example, there is one line in the source structure for which you type in a quantity of 3. Additionally, you have two target equivalent lines, each with a quantity of 3. After packing the two target lines, you see a quantity of 6 in the **Quantity** column. Running an accountability check on these lines produces a multiple match instead of a multiple partial match because the quantity is 3 on each source and target line.

Narrowing the scope of the accountability check

Filtering and expanding source and target structures

You can narrow the scope of the accountability check by limiting it to only the lines pertinent to your use case.

The filter mechanism is based on closure rules that traverse the structures and take only those objects specified in the closure rules into consideration. The closure rules that are used in the accountability check are referred to as *inclusion rules* and are not available to use for importing and exporting.

By default, Teamcenter presents you with a set of inclusion rules. Your administrator can modify these inclusion rules or create new ones to suit your business needs.

> Note:
>
> When running the accountability check based on inclusion rules, there is no need to expand or unpack any of the structures. This improves the performance of the check.

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When running the accountability check without inclusion rules, you must first expand and unpack the compared lines in the source structure.

Expanding a structure based on closure rules also plays a role in which objects are taken into consideration in the accountability check. If you expand using an appropriate closure rule, you may not have to set an inclusion rule when running an accountability check.

Inclusion rules

Inclusion rule	Description
AccountabilityAll	Includes all lines.
AccountabilityLeavesOnly	Includes only leaf nodes; excludes all hierarchy nodes.
AccountabilityLinkedAssmOrLeaves	Includes assigned assembly nodes but excludes their children. If an assembly is not assigned, includes its leaf nodes.
AccountabilityProcessConsumption	Includes assigned nodes under a process or operation that are of occurrence type **MEConsumed**. Excludes all process and operation nodes.
AccountabilityProcessAssignments	Includes assigned nodes (including work areas, parts, and tools) under processes and operations. Excludes all processes and operations nodes. If the assigned-from structure is not loaded, those nodes are also excluded.
AccountabilityProcessAllNoAssign	Include process and operation nodes.
AccountabilityProcessAll	Include process and operation nodes and all of their assigned nodes. If the assigned structure is not loaded, their nodes are excluded.
AccountabilityProcessOnlyWithPA	Includes processes, operations, and process areas only.
ACPlantBOPDerivedProcessesAndOps	Includes only operations and processes that are linked to the source (for example, in a product BOP). This rule is used when comparing a product BOP to a plant BOP and skips plant-specific operations.

Note:

None of the inclusion rules include occurrence group nodes, but they can include the children under those nodes.

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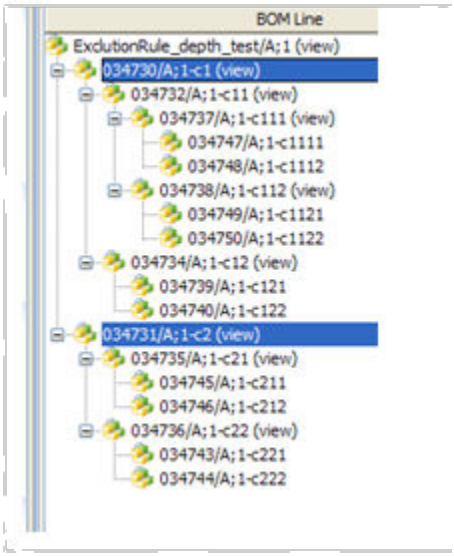
Specifying levels for comparison

If you use inclusion rules, you can limit the number of levels that the accountability check considers for comparison. In the following figure, processes **C1** (ID = **034730**) and **C2** (ID = **034731**) are selected as the source in an accountability check. To specify a level, run an advanced accountability check.



If you specify a level of **1**, the accountability check considers the following items for comparison:

c11, c12

c21, c22

If you specify a level of **2**, the accountability check considers the following items:

c11, c12, c21, c22

c111, c112, c121, c122, c211, c212, c221, c222

Accountability check of variant structure

If you optionally propagate rolled-up variant conditions from the EBOM to the MBOM or from the product BOP to the plant BOP, the accountability check recalculates the rolled-up variant condition on the source line and compares it with any occurrence variant condition already stored on the associated target line. It then reports any partial match discrepancies between the variant conditions. To allow this check, you must add the **Variant Formula** (**bl_formula**) property to the list of properties in the partial match criteria in the **MEAdditionalPropagatableProperties** preference. The comparison is based on logical equivalence and is not a string comparison, for example:

- If you compare **Color=red & Size=medium** with **Size=medium & Color=red**, these variant conditions are logically equivalent.

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- If you compare **Color=red & Size=medium** with **Color=red & Size=medium & Color=red**, these variant conditions are logically equivalent.

In the following example, you assign the EBOM to the MBOM and roll up the variants:

EBOM:

```
EGen1.1  Load if Option A = “abc”
    EGen 1.1.1  Load if Option B = “fgh”
      Part 1
      Part 2
    EGen 1.1.2  Load if Option B = “ijk”
      Part 3
      Part 4
EGen1.2  Load if Option A = “cde”
    EGen 1.2.1  Load if Option B = “fgh”
      Part 5
      Part 6
    Part 7  Load if Option B = “ijk”
```

MBOM:

```
Part 1  Load if Option A = “abc” AND Option B = “fgh”
Part 2  Load if Option A = “abc” AND Option B = “fgh”
Part 4  Load if Option A = “abc” AND Option B = “ijk”
Part 5  Load if Option A = “cde” AND Option B = “fgh”
MGen 1.1
  Part 3  Load if Option A = “abc” AND Option B = “ijk”
  Part 4  Load if Option A = “abc” AND Option B = “ijk”
  Part 7  Load if Option A = “cde” AND Option B = “ijk”
```

If you perform an accountability check and specify parts only, all colors except full match, and rolled up variant condition as a partial match option, the result shows no differences.

You then modify the parts under **EGen 1.1.2** in the EBOM as follows:

```
Egen 1.1.2  Load if Option B = “lmn” – changed the variant condition
  Part 3  Load if Option C = “opq” –added the variant condition
  Part 4 – no change
  Part 8 – added the line
```

(You changed the variant condition to line 1, added the variant condition to part 3, made no changes to part 4, and added part 8.)

If you now perform an accountability check, it identifies that **Part 3** is a partial match, **Part 4** is also a partial match, and **Part 8** is missing in the target. A tabular report shows the following results for the checked objects.

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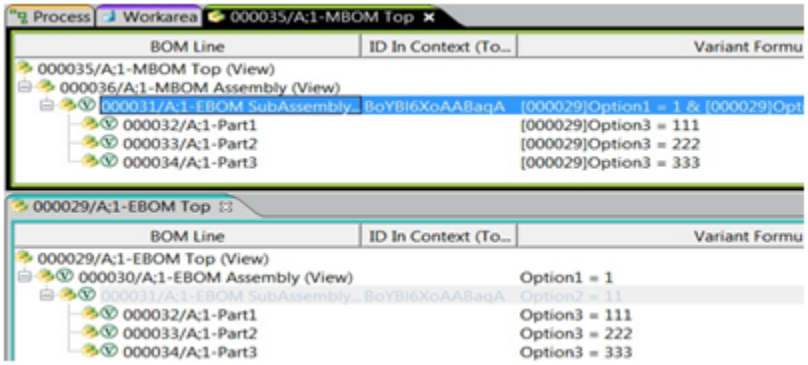
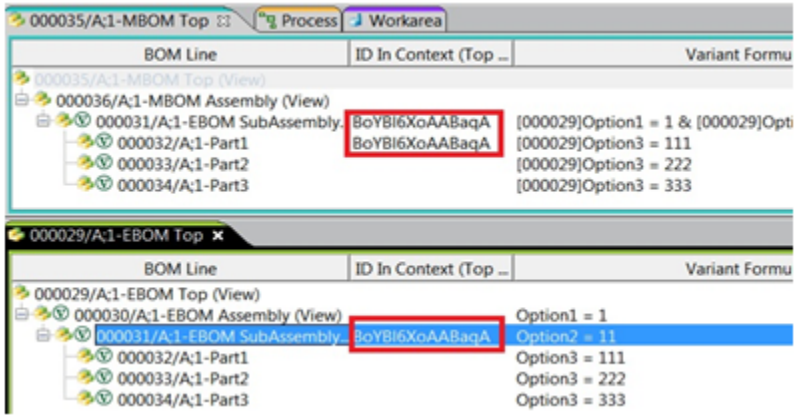
Source	Target	Match	Variant condition rollup
123456/A;1-Part 3	123456/A;1-Part 3	X	X
123457/A 1-Part 4	123457/A 1-Part 4	X	X
1234569/A 1-Part 8	*** Not Found	X	

The check assumes lines are equivalent due to a user performing an assign action (that is linking them) and not simply by having the same in-context ID. When you run an accountability check on equivalent lines with the same in-context ID, it considers rolled up variant conditions on the source line and compares them with the occurrence variant condition on the target line. This may give unexpected results when comparing the **Variant Formula** property, and you should take care when propagating such differences.

For example, **EBOM Top (000029)** and **MBOM Top (000035)** are linked. The assigned line **EBOM Sub Assembly (000031)** has a rolled-up variant condition.



If you change the in-context ID of **Part1** in the MBOM to make it equivalent to **SubAssembly** in the EBOM, the accountability check shows **Part1** as a mismatched line, even though it is not assigned. This occurs because the rolled up variant condition on the source line is compared with occurrence variant condition on the target line. As the target line is not assigned, it does not have a rolled-up variant condition.



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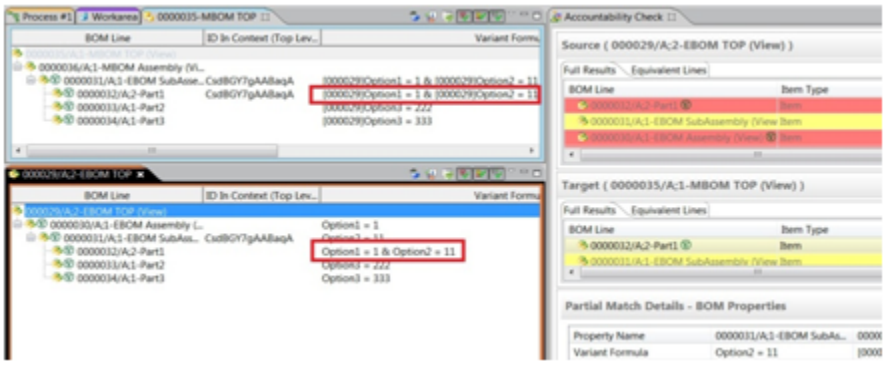
If you select **Part1** and choose to propagate differences from the source to the target, **Part1** receives the rolled-up variant condition of the source. This occurs because, although the line is not assigned, it has the same underlying occurrence. **Part1** is now configured but not with the variant configuration you originally intended.



When Teamcenter calculates the variant condition when allocating from a product BOP to a generic BOP, it only calculates for the line being allocated. Therefore, if you allocate a process with child processes or operations, it does not calculate the rolled-up variant condition for any children of the process being allocated. This results in a mismatch if you run an accountability check between the product BOP and the plant BOP. You have two choices in this case:

- Do not run the accountability check for a level lower than the one you allocate.
- Propagate the mismatch between the children of the process from the product BOP to the plant BOP.

Running an accountability check without using inclusion rules

Whether or not you need to expand a target structure before running an accountability check depends on the settings of the following two preferences:

MECopyIdInContextToAssignedLine

MECopyIdInContextLowerLevels

> Note:
>
> If there are packed lines in the source window, the accountability check may report incorrect results for the quantity of an absolute occurrence of a component that is packed to a sibling. To avoid this situation, always unpack all lines before starting an accountability check.

Expanding a structure based on closure rules also plays a role in which objects are taken into consideration in the accountability check. If you expand using a closure rule, it may have the same effect as setting an inclusion rule.

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Match nonequivalent lines using dynamic equivalence criteria

In some cases, you may want to locate matching lines in an engineering bill of materials (EBOM) and manufacturing bill of materials (MBOM) that have different properties and therefore are not reported as equivalent when you run an advanced accountability check. For example, the lines may have different item ID in context values, but you want to find them to ensure that they have the same material quantity, and later address the difference in their ID in context values.

To enable dynamic equivalence when running an accountability check:

- In the **Advanced Accountability Check** dialog box, on the **Equivalence** tab, select the **Dynamic Equivalence** ☑ check box.

  Note:

  Selecting the **Dynamic Equivalence** ☑ check box automatically selects the **Multiple Match** ☑ checkbox in the **Display Options** group on the **Reporting** tab of the **Advanced Accountability Check** dialog box. When **Dynamic Equivalence** is deselected, check boxes in the **Display Options** group return to their previous selections.

Note:

Your administrator must configure the **MEAccountabilityCheckDynamicIDICProperties** preference to list those line properties you want to use as dynamic equivalence criteria when you search for equivalent lines between EBOM and MBOM. If your administrator defines no values for this preference, item ID is the default attribute for comparison.

Understanding net effectivity

You can use net effectivity during the accountability check if the following is true:

- Defining unit effectivity on an occurrence is enabled.
- The ability to configure structures to show multiple units on multiple end items at once is configured.
- The net effectivity compare extension is registered.

When these points are fulfilled, you can compare the effectivity of matching source/target objects. However, the effectivity that you define on each object is not necessarily the actual effectivity. The actual effectivity is the intersection of all effectivities set on the path from the root node to the selected object. This intersection is referred to as *net effectivity*. In addition, when you compare two structures, the net effectivity includes the intersection of the effectivities of these two structures.

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Create a printable Excel report

Teamcenter can create a printable Excel report containing the results of an accountability check. If you have write access to the target structure, Teamcenter stores the Excel file as a dataset on the top-level item revision of the target structure. If you do not have write access, Teamcenter stores the Excel file in the **Newstuff** folder.

1. Open the **Accountability Check** dialog box.

2. Select all necessary options to create the accountability report.

3. Click the **Reporting** tab and select **Report the selected check criteria**.

4. Select **Printable report**.

5. Assign a name for the new dataset.

   If a dataset of this name and type already exists in the item revision, Teamcenter opens a dialog box where you can change the name or replace the dataset with the new one. You can change this behavior in the **TC_CRF_overwrite_existing_dataset_content** preference. If this preference is set to **1** (true), Teamcenter does not remove the dataset but replaces the content.

6. Click **OK**.

   Teamcenter creates a report containing:

   - General information such as the date and time of the check and the user ID and name.
   - Compare options.
   - Context data such as the source top level item, the target top level item, incremental change, and revision and variant rules.
   - Accountability check results such as the source name, target name, match status, and all the checked properties. Multiple matched objects and missing source objects are displayed in separate sections.

   Teamcenter adds the Excel file to a dataset attached to the target structure.

   > Note:
   >
   > If you use the **MEAccountabilityCheckEnableNetEffectivity** preference to report net effectivity mismatches, the Excel report also reports those mismatches.

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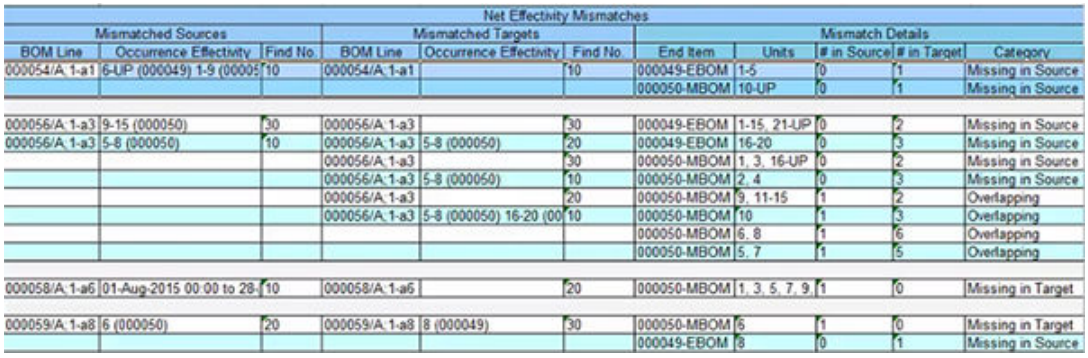

Net Effectivity Mismatches

Mismatched Sources			Mismatched Targets			Mismatch Details				
BOM Line	Occurrence Effectivity	Find No.	BOM Line	Occurrence Effectivity	Find No.	End Item	Units	# in Source	# in Target	Category
000054/A 1-a1	6-UP (000049) 1-9 (00005	10	000054/A 1-a1		10	000049-EBOM	1-5	0	1	Missing in Source
						000050-MBOM	10-UP	0	1	Missing in Source
000056/A 1-a3	9-15 (000050)	30	000056/A 1-a3		30	000049-EBOM	1-15, 21-UP	0	2	Missing in Source
000056/A 1-a3	5-8 (000050)	10	000056/A 1-a3	5-8 (000050)	20	000049-EBOM	16-20	0	3	Missing in Source
			000056/A 1-a3		30	000050-MBOM	1, 3, 16-UP	0	2	Missing in Source
			000056/A 1-a3	5-8 (000050)	10	000050-MBOM	2, 4	0	3	Missing in Source
			000056/A 1-a3		20	000050-MBOM	9, 11-15	1	2	Overlapping
			000056/A 1-a3	5-8 (000050) 16-20 (00	10	000050-MBOM	10	1	3	Overlapping
						000050-MBOM	6, 8	1	6	Overlapping
						000050-MBOM	5, 7	1	5	Overlapping
000058/A 1-a6	01-Aug-2015 00:00 to 28-	10	000058/A 1-a6		20	000050-MBOM	1, 3, 5, 7, 9	1	0	Missing in Target
000059/A 1-a8	6 (000050)	20	000059/A 1-a8	8 (000049)	30	000050-MBOM	6	1	0	Missing in Target
						000049-EBOM	8	0	1	Missing in Source

Customize the Excel report

1. Create your own XSL style sheet.

2. Add it to the **Accountability Check Report** (**TC_2007_00_CUS_RPT_0002**) report in the Report Builder application.

3. Modify the **AccountabilityCheckReportStylesheetName** preference to contain the name of the new style sheet.

> Note:
>
> If you created a custom style sheet prior to upgrading to Teamcenter 11.4 or greater, by default, the Excel report uses a new style sheet called **acc_chk_rpt_excel.xsl**. Your customized stylesheet must have a different, unique name (for example, **my_acc_chk_rpt_excel.xsl**). When the value of the preference **MEAccountabilityCheckReportCombineLines** is true (default), the generated xml file will not support legacy stylesheets. To generate legacy data xml files, change the preference value to **false**.

Displaying the check result in occurrence groups

Reporting the check result in occurrence groups

Alternatively to reporting the accountability check results in colors, Teamcenter can report anomalies in occurrence groups that are displayed in an additional tab in the structure pane. These occurrence groups are stored as persistent objects in the database.

If you compare the base view of the entire product structure or a subassembly, the accountability check searches for every BOM line in the process plan. If you compare the manufacturing view of the product or a subassembly, the check only searches for a line in the process plan if the line's direct parent is an occurrence group. In the manufacturing view, if the BOM line's direct parent is not an occurrence group, you must allocate it to the view as a component of a subassembly in the original EBOM. For example, component **C** is part of subassembly **A** in the EBOM, while subassembly **A** is assigned to the manufacturing view under occurrence group **G**. Consequently, **C** also appears in the manufacturing view under **A**, then under **G**. The direct parent of **A** is an occurrence group, while the direct parent of **C** is **A**,

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which is not an occurrence group. When you compare structures, the utility searches for **A** but not for **C**. Typically, if you did not allocate to the manufacturing view, you would not expect to consume it in the process.

The scope of the comparison depends on the selections you made in the **Accountability Check** dialog box, as described in *Run an advanced accountability check*.

> Note:
>
> You cannot display the accountability check results in occurrence groups if you are using the enterprise BOP feature.

Generate the results grouped by anomaly

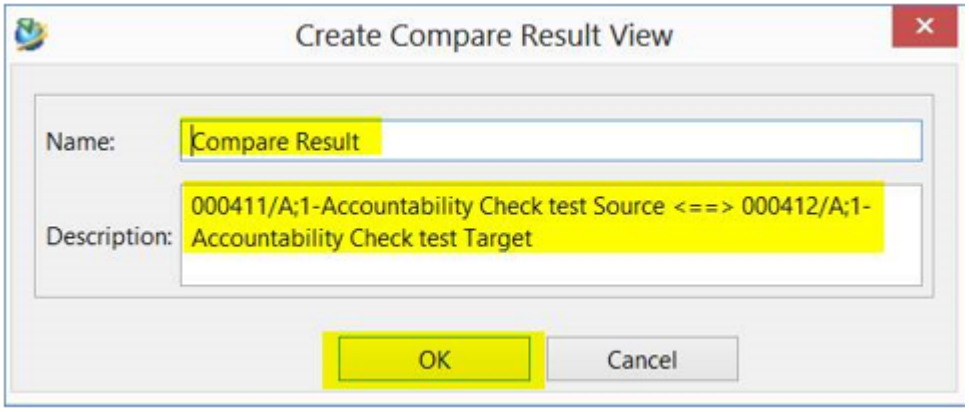
1. To generate the report:

   a. Open the **Accountability Check** dialog box.

   b. On the **Reporting** tab, click **Report in occurrence group**.

   c. Click **OK**.

      The **Create Compare Result View** dialog is displayed.



   d. Modify the system generated **Name** and **Description** as required.

      The **Name** of the result view is displayed as the name of the additional tab. Multiple result views can be displayed at a time. If a view with the same name exists, the system displays a message asking if the result view should be overwritten or renamed. In this case, you must have write access to overwrite the existing view.

   e. Click **OK**.

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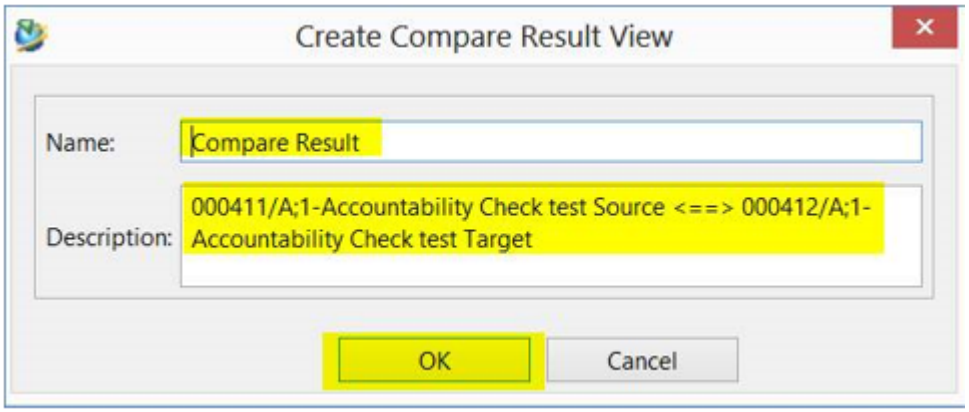
Teamcenter creates **UsageCompareResultView** objects for each type of anomaly and displays them in the **Compare Result** tab.



Teamcenter creates occurrence groups for each type of anomaly and displays them in the **Compare Result** tab (an occurrence group tab). The names of the anomalies are fixed and are as follows:

- **Unused/Under-used**

  Contains all occurrences in the source pane that do not match an occurrence in the target pane.

- **Completely Used**

  Contains all occurrences in the source pane that match a corresponding occurrence in the target pane.

- **Over-used**

  Contains all occurrences in the source pane that match more than one occurrence in the target pane.

- **Partial Match**

  Contains all occurrences in the source pane that have mismatched properties compared to their corresponding occurrence in the target pane.

2. (Optional) Expand the subgroups to view the items contained in these groups and take appropriate action.

You must rerun the accountability check to view any changed results.

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Propagating changes

Propagating changes in compared structures

After running an accountability check, you can propagate reported changes from the source structure to the target structure. For the following enterprise BOP structures, you can propagate all the criteria that you compared in the accountability check, except for parent partitions:

- From generic BOP to product BOP
- From product BOP to plant BOP

Propagating is possible in enterprise bill of process structures as Teamcenter retains a link to the original structures when cloning a product BOP from a generic BOP or allocating processes or operations from a product BOP to a plant BOP.

You can choose to propagate the following:

- Properties

  If the property value on the target line is different from its value on the source line, the target value is set to equal the source value. If a property to be compared does not exist on a given line, the property is ignored for propagation.

- Manual part assignments and tool assignments

  - If the source assignment is missing in the target line, Teamcenter clones the source assignment under the target line with the same occurrence type as in the source.
  - If the target assignment is missing in the source, Teamcenter removes this assignment from the target. The plant-specific assignments are not removed.
  - If the same assignment has different occurrence types in the source and in the target, Teamcenter sets the target occurrence type to be the same as in the source.
  - If the same assignment appears a different number of times in the source and in the target, a warning is written to the log and this assignment is not propagated.

- Logical assignments

  You can choose to propagate just the logical assignment definition or the definition and the resolved assignment.

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> Note:
>
> Propagating changes from a product BOP with logical designators used in multiple operations and a generic BOP using cloning can result in accountability errors. After running an advanced accountability check, operations that should display partial matches are sometimes reported as missing in target and missing in source. Use the **Copy** and **Paste** commands between generic and product BOPs rather than **cloning**.

- Predecessors
  - If the source predecessor is missing in the target line, Teamcenter finds the equivalent of the source predecessor and adds it to the list of target predecessors.
  - If the target predecessor is missing in the source line, Teamcenter deletes this predecessor from the target.
  - If the same predecessor appears a different number of times in the source and in the target, Teamcenter writes a warning to the log and does not propagate this predecessor.
  - If at least one of the predecessors is a structure-specific operation, Teamcenter writes a warning to the log and does not propagate any of the predecessors.
  - Implicit flows are not be propagated.
- Hierarchy

  If the source child is missing in the target line, Teamcenter allocates the source child under the target line and sets the equivalents of the source predecessors as its predecessors. Teamcenter allocates all children that are missing in the target structure together so that the internal flows between the newly allocated children are preserved.
  - If the target child is missing in the source, the child is removed from the target, unless the target is a plant-specific operation. In other words, only a child that is allocated from the source and then deleted in the source is aligned.
  - If a child appears a different number of times in the source and target, the child is not propagated.
  - If the child is a packed line and its quantity is different in the source and in the target, Teamcenter adds the additional lines or removes the extra lines without affecting the packed state of the lines.

Teamcenter creates a log listing any problems during propagation and stores it in your local **temp** directory, for example:

C:\Users*your-name***\AppData\Local\Temp**

Structure-specific processes and operations are not considered for propagation.

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Tip:

Always perform propagation on unconfigured structures. Teamcenter cannot discern if a line is absent because it is configured out, or because is does not exist. Because of this, you may end up with lines appearing twice in the target after propagation as they were not actually missing in the source but only configured out.

Propagate properties from a source to a target structure

1. Run an accountability check.

   When running the accountability check prior to propagating, you can choose multiple targets, but only one source.

2. (Optional) Change the propagation settings.

   a. Choose **Tools→Accountability Check→Propagation Settings**.

      Teamcenter displays the **Propagation Settings** dialog box with the **Properties** tab open. The list of properties displayed in this pane is comprised of all the properties that you selected in the accountability check but with the read-only properties removed.

      Your administrator can add additional properties to the list, even if they are not writable, by modifying the **MEAdditionalPropagatableProperties** preference.

      Note:

      The **Propagation Settings** menu command is available only if the accountability check contains a partial match.

   b. On the **Properties** tab, remove any properties you do not want to propagate.

   c. To manually hide or show the propagation of rolled-up variant conditions when comparing an engineering BOM to a manufacturing BOM, select **Consider values of rolled up variant condition when searching for a partial match**.

      You can hide the propagation of rolled up variant conditions even if the **Rollup_Variant_Feature** is set to **true**.

   d. On the **Relations** tab, modify the relations to be propagated.

3. Do one of the following:

   - Select a partial match in the **Target** section of the **Accountability Check** view and choose **Tools→Accountability Check→Propagate**.

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- Right-click a partial match in the **Target** section of the **Accountability Check** view and choose **Propagate**.

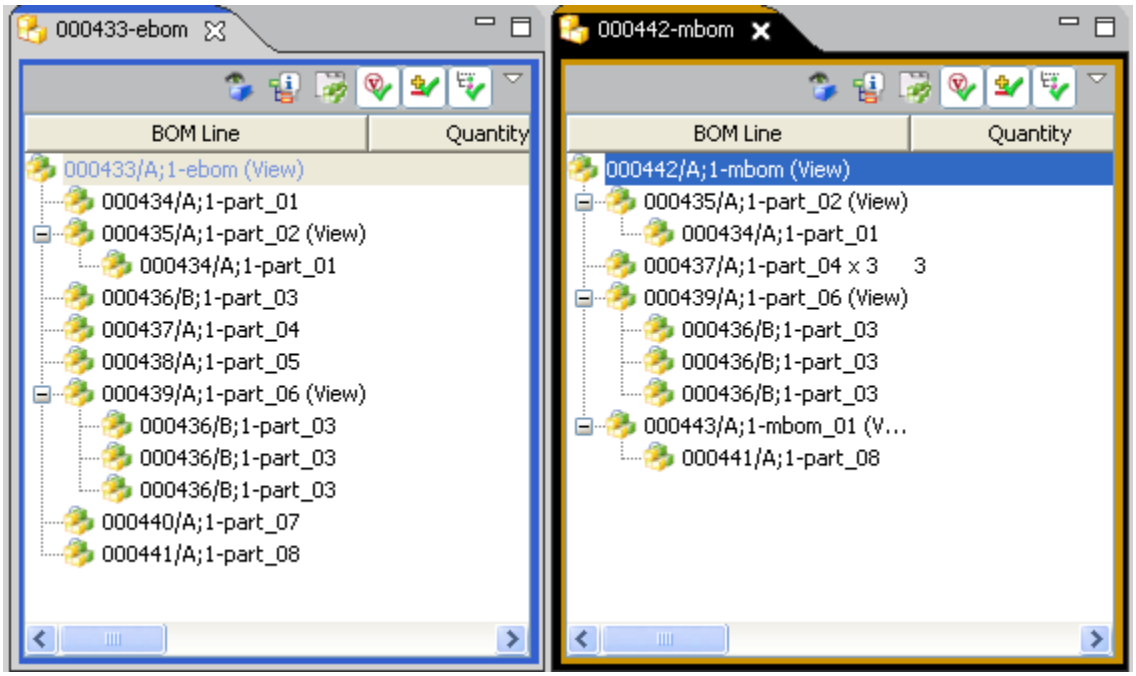
To propagate a line that is missing in the source or target, you must run the propagation on the parent line with the hierarchy option turned on.

When propagating quantity in packed lines, Teamcenter propagates the quantity that is actually typed in per packed line.

Accountability check examples

Example: viewing a property mismatch

In the following structure, an engineering BOM is compared to a manufacturing BOM.



An accountability check is performed with the following criteria.

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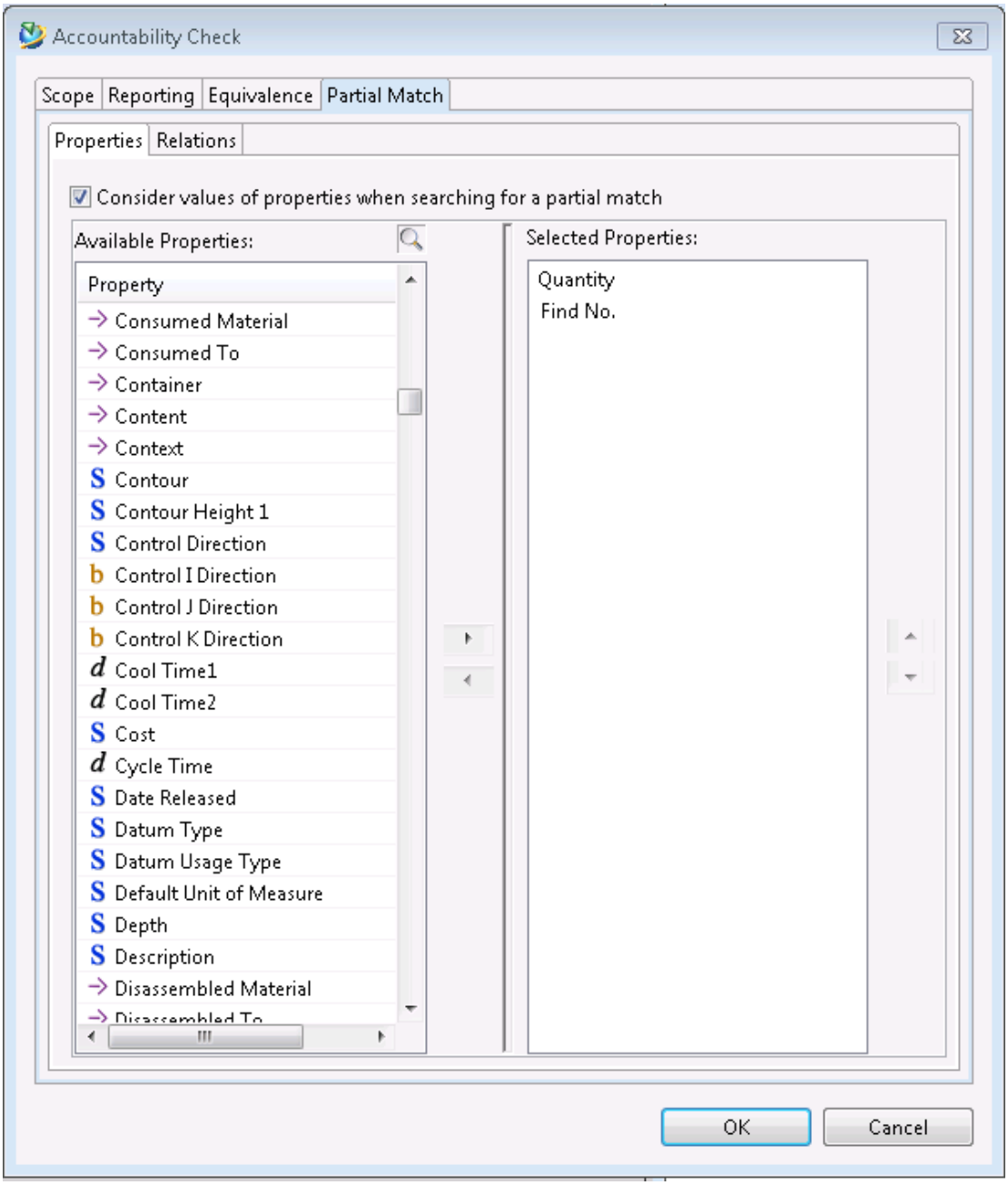

The **Quantity** and **Find No.** properties are selected to be compared.

The results are as follows.

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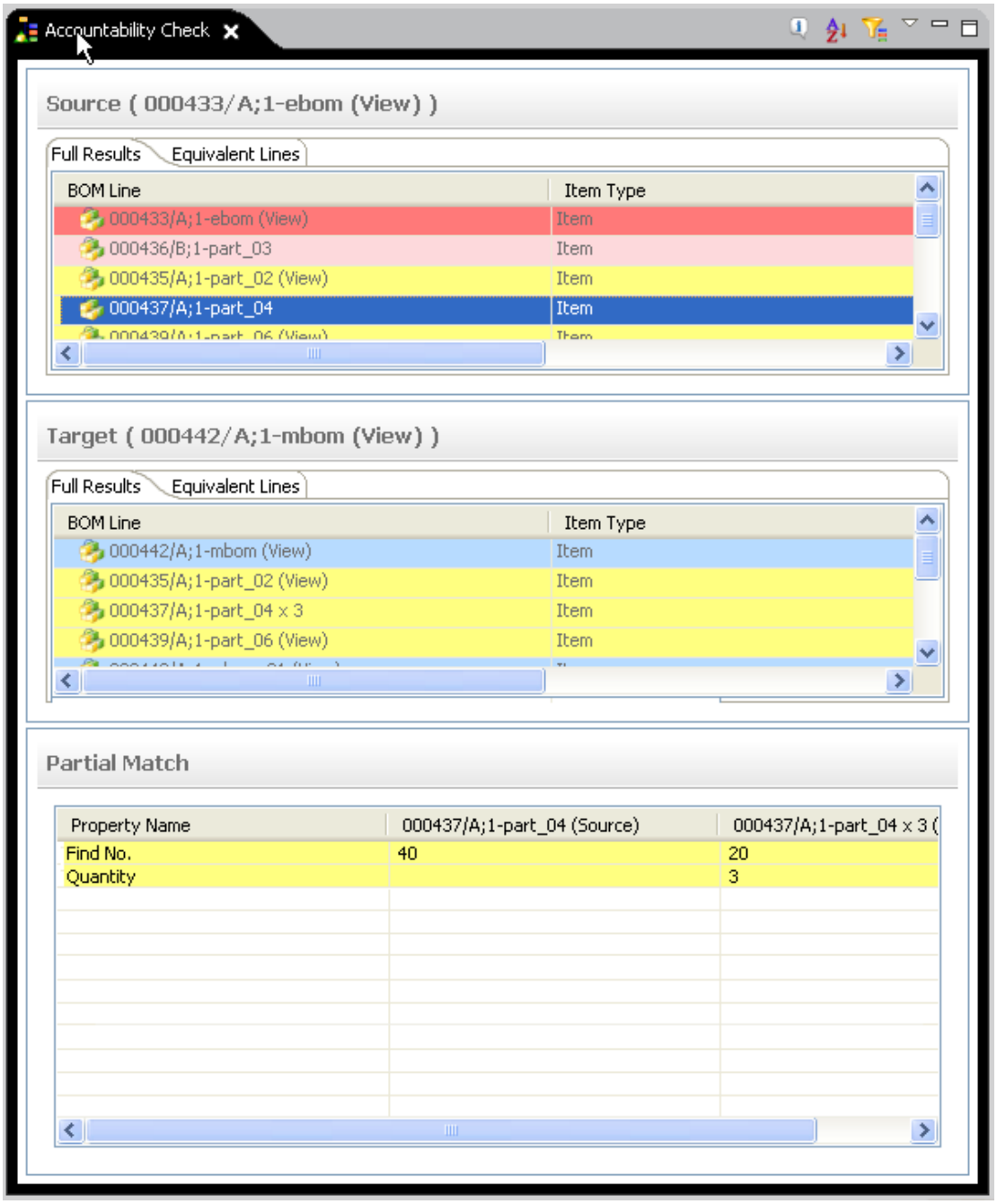

The **Find No.** and **Quantity** lines are marked in yellow as they differ. The quantity in the target is **3**, but there is no quantity entered for the source. Similarly, the find numbers are marked in yellow as they have differing values.

Example: viewing an assignment mismatch

The following product BOP is linked to a plant BOP. After allocating processes and operations, a new part is assigned to the product BOP by logical designator, **top;pos_05**.

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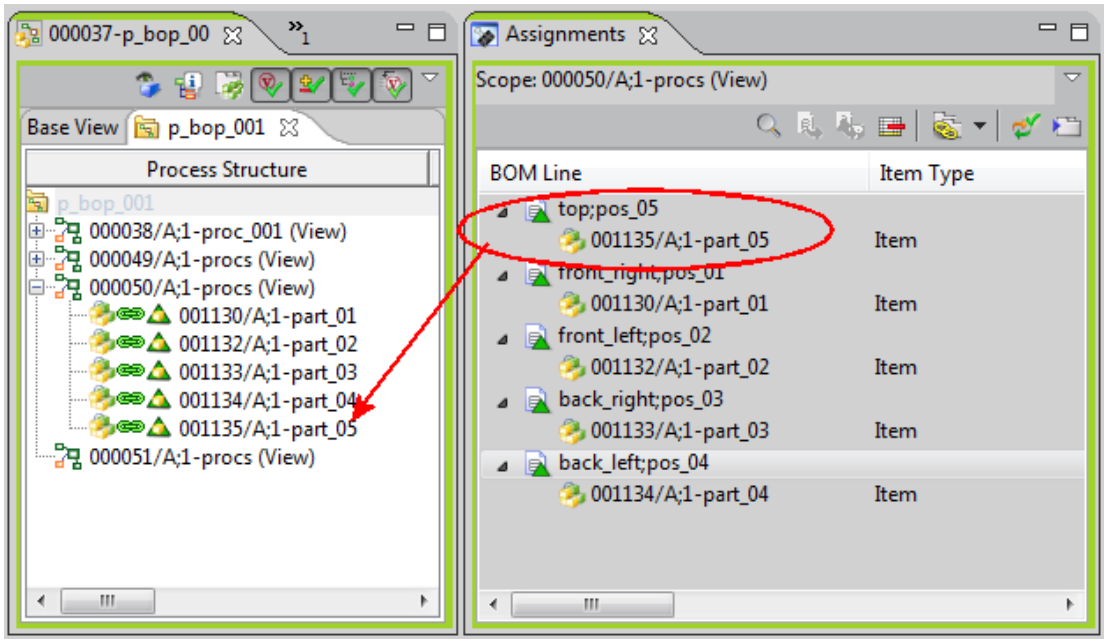

An accountability check is run between the product BOP and its associated plant BOP with the following settings.

- Source inclusion rule: **AccountabilityProcessAllNoAssign**
- Target inclusion rule: **ACPlantBOPDerivedProcessesAndOps**

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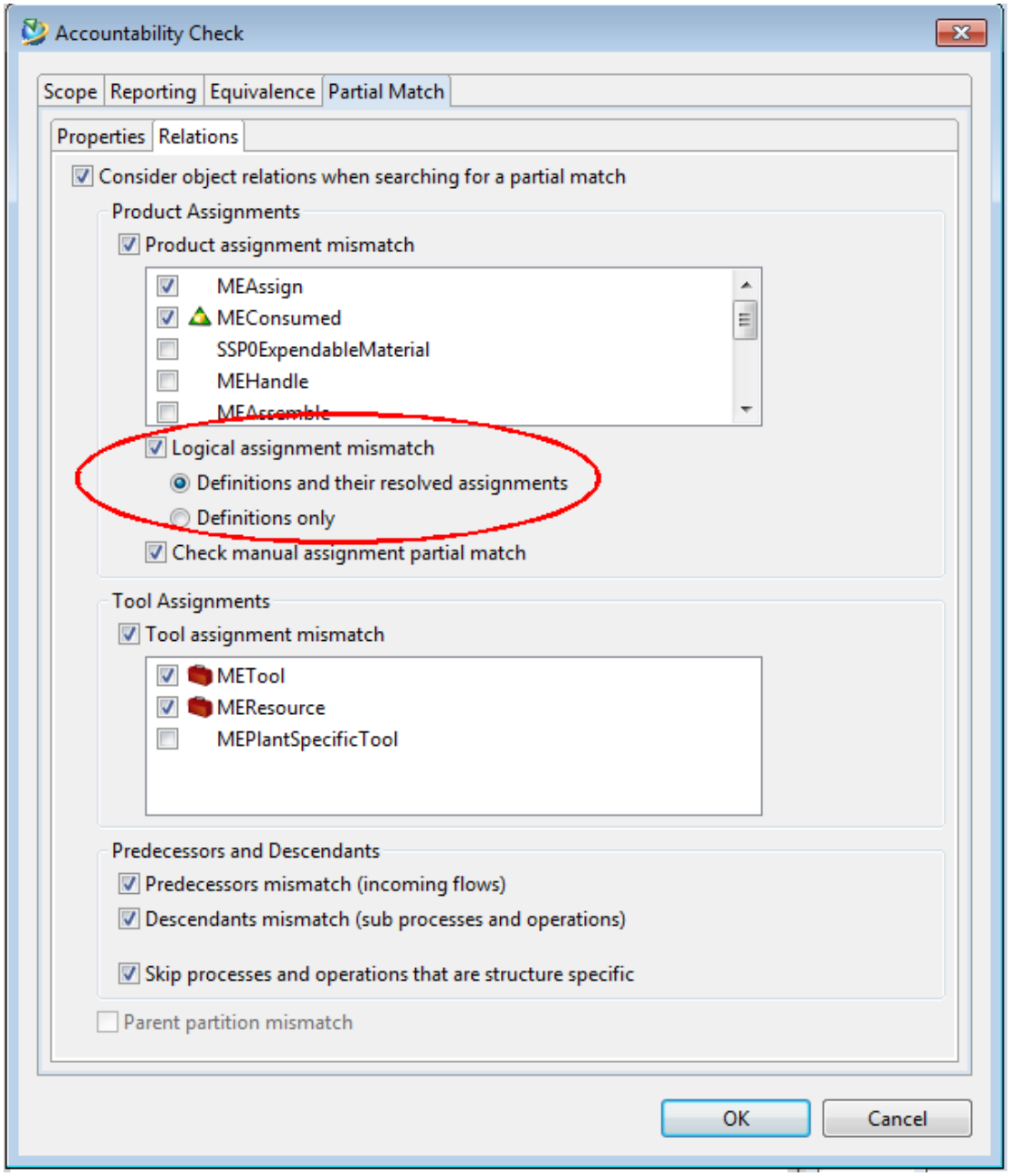

The results are as follows.

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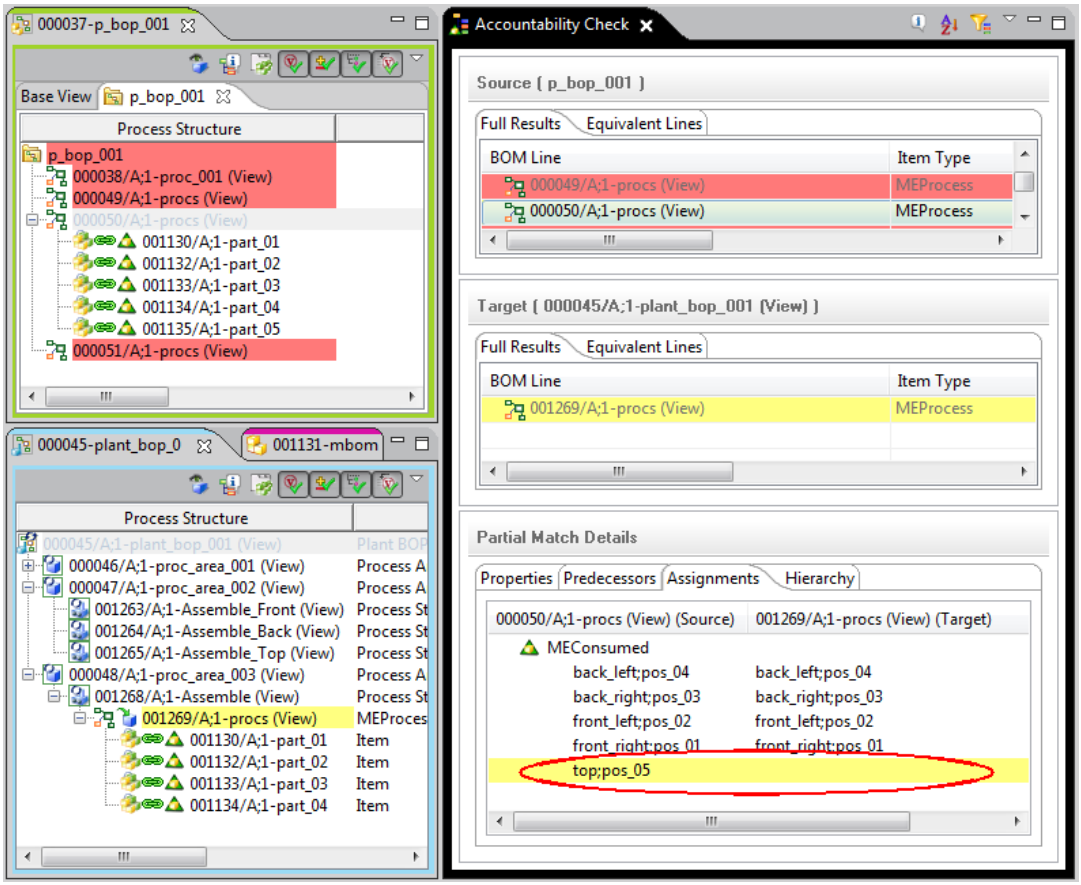

By selecting the partial match line **000050** in the source and clicking the **Equivalent Lines** tab in the target, you can see that line **001269** is the equivalent allocated line in the plant BOP.

In the **Partial Match** section, on the **Assignment** tab, the logical assignments are listed under the source but there is one assignment missing under the target: the **top;pos_05** logical assignment.

Example: viewing a hierarchy mismatch

A product BOP containing a process with three operations is created, and the process is allocated to the plant BOP. After allocation, a new operation, **new_operation_04**, is added to the product BOP. In addition, a new operation, **station-specific_operation_05**, is added to the plant BOP only.

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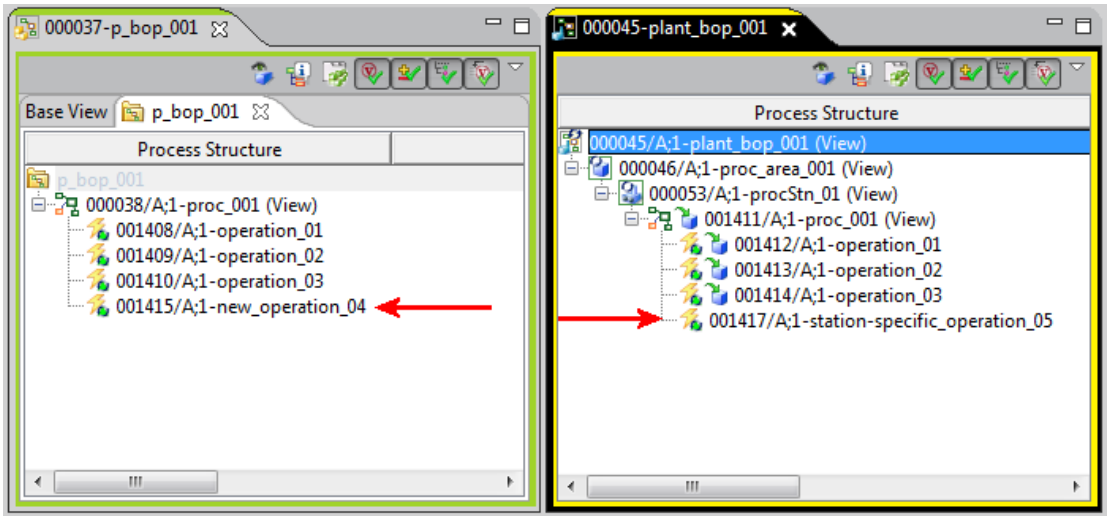

An accountability check is run with the following options.

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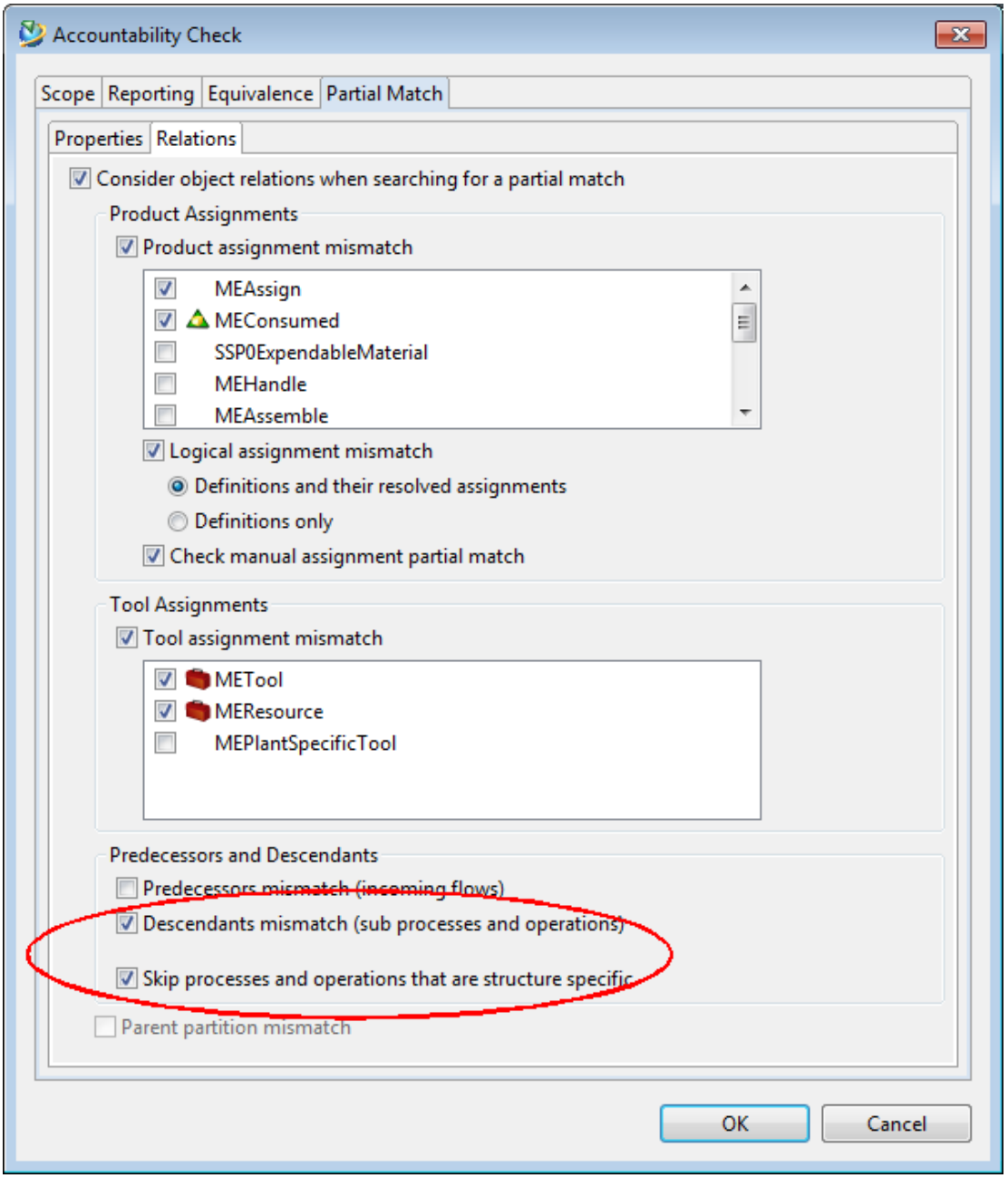

This produces the following results.

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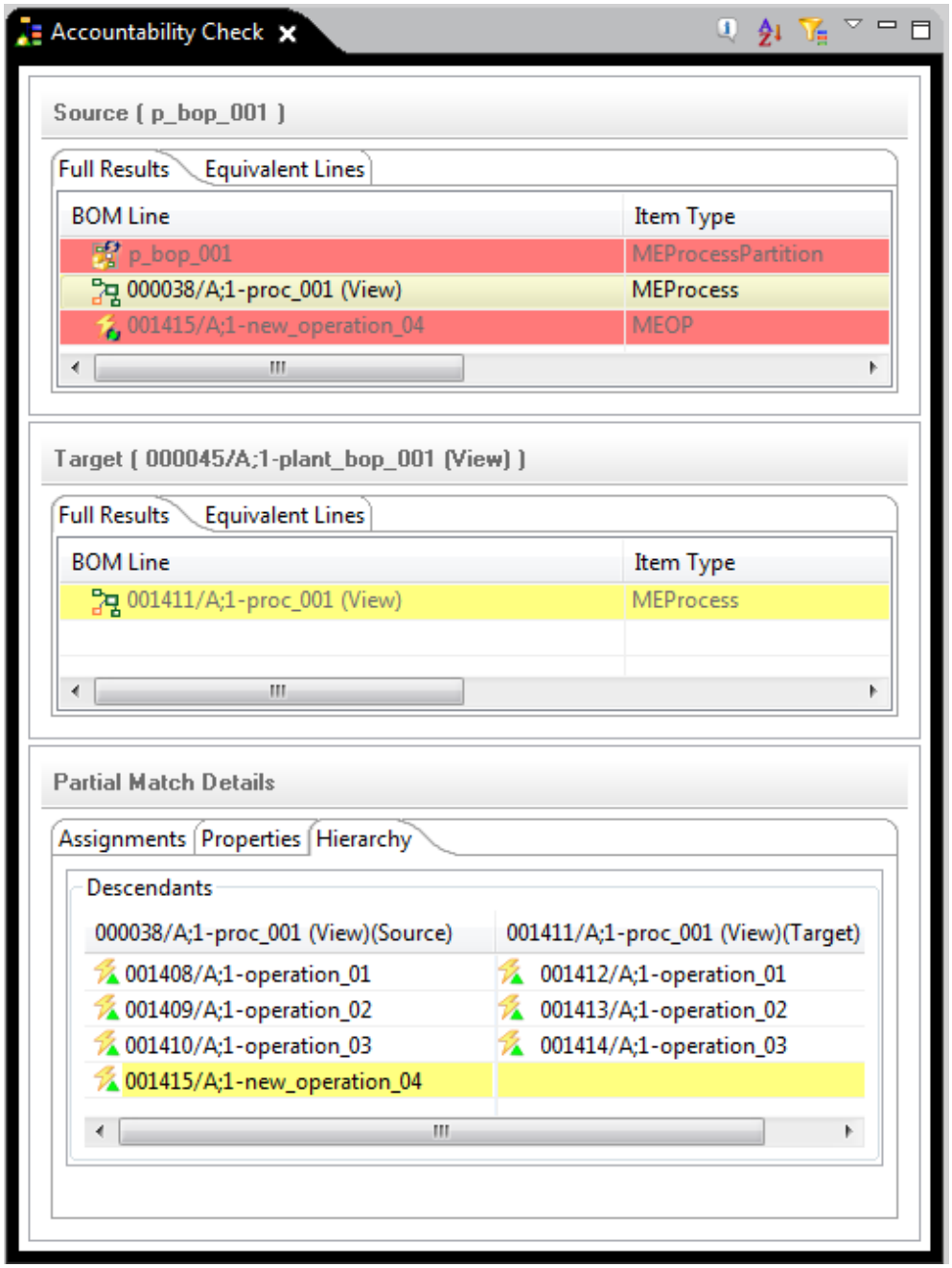

The new operation in the product BOP, **new_operation_04**, is listed under the source in the **Partial Match Details** section, but the target is empty. In addition, the new operation that was added to the plant BOP, **station-specific_operation_05** does not appear at all in the results, as the **Skip processes and operations that are structure specific** option was selected in the **General** tab when running the check.

Example: viewing a predecessor mismatch

The following flows are created in the **PERT** view for the processes belonging to a product BOP.

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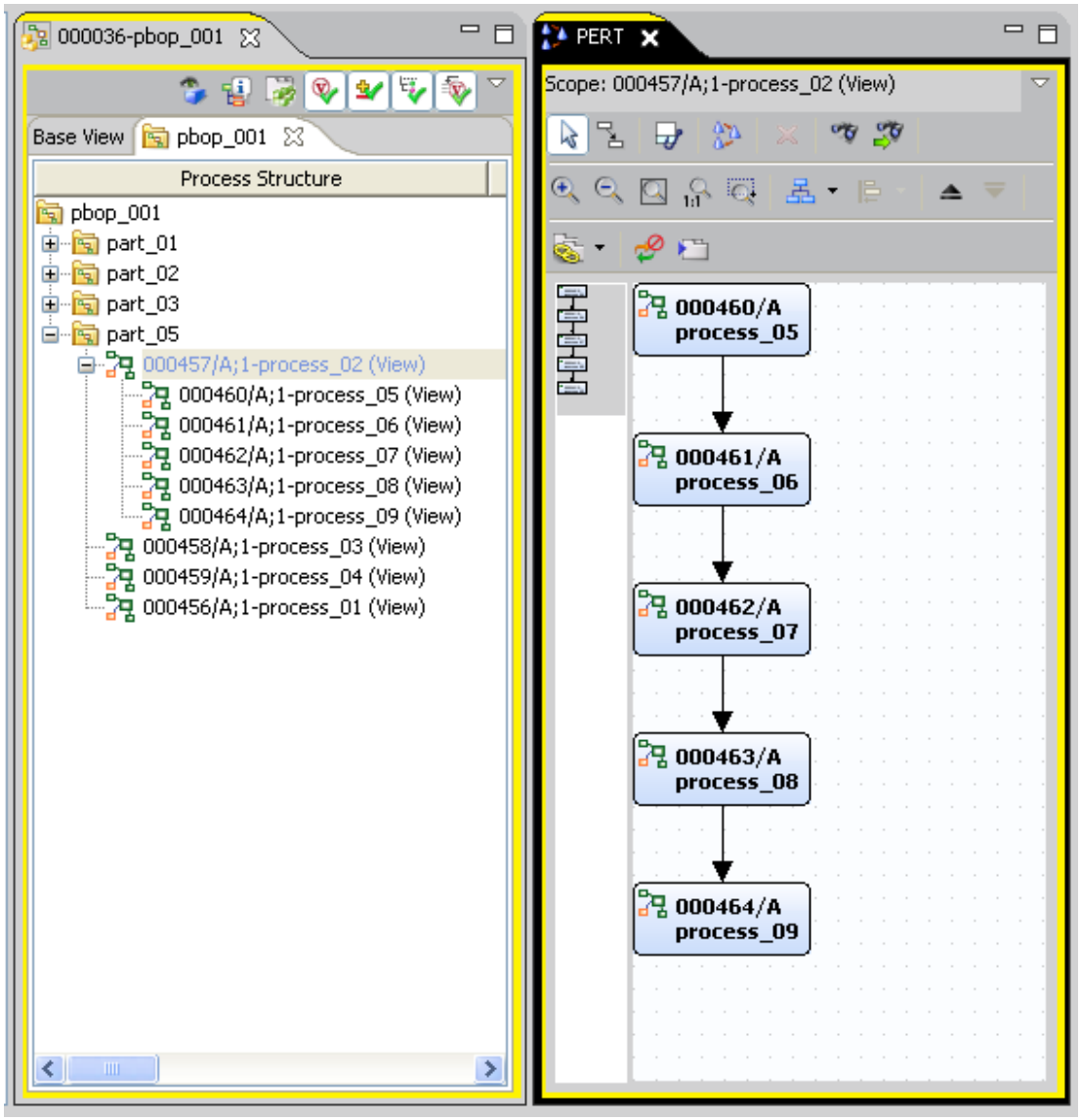

The top level process, **process_02**, is allocated to a plant BOP, and then the flows in the product BOP are subsequently changed.

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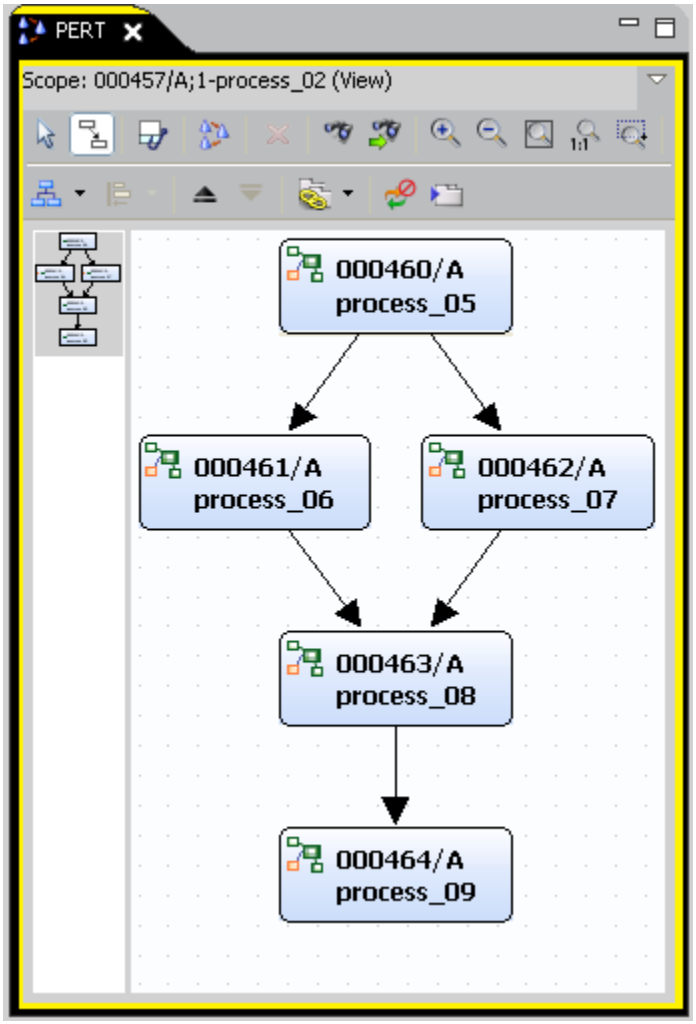

Now there is a discrepancy in the sequence of processes between the product BOP and the associated plant BOP. An accountability check is run between these two structures with the following options.

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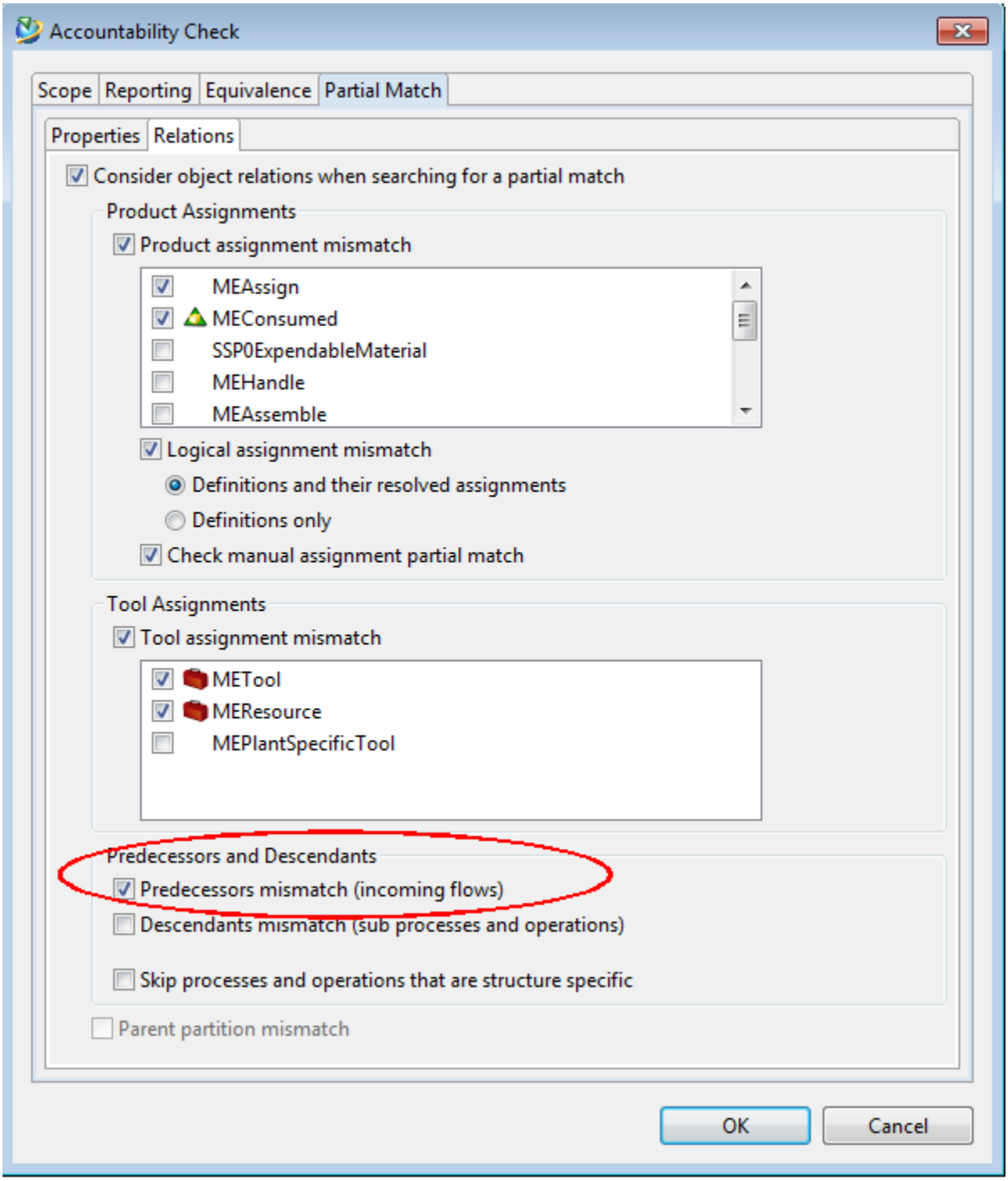

The check produces the following results.

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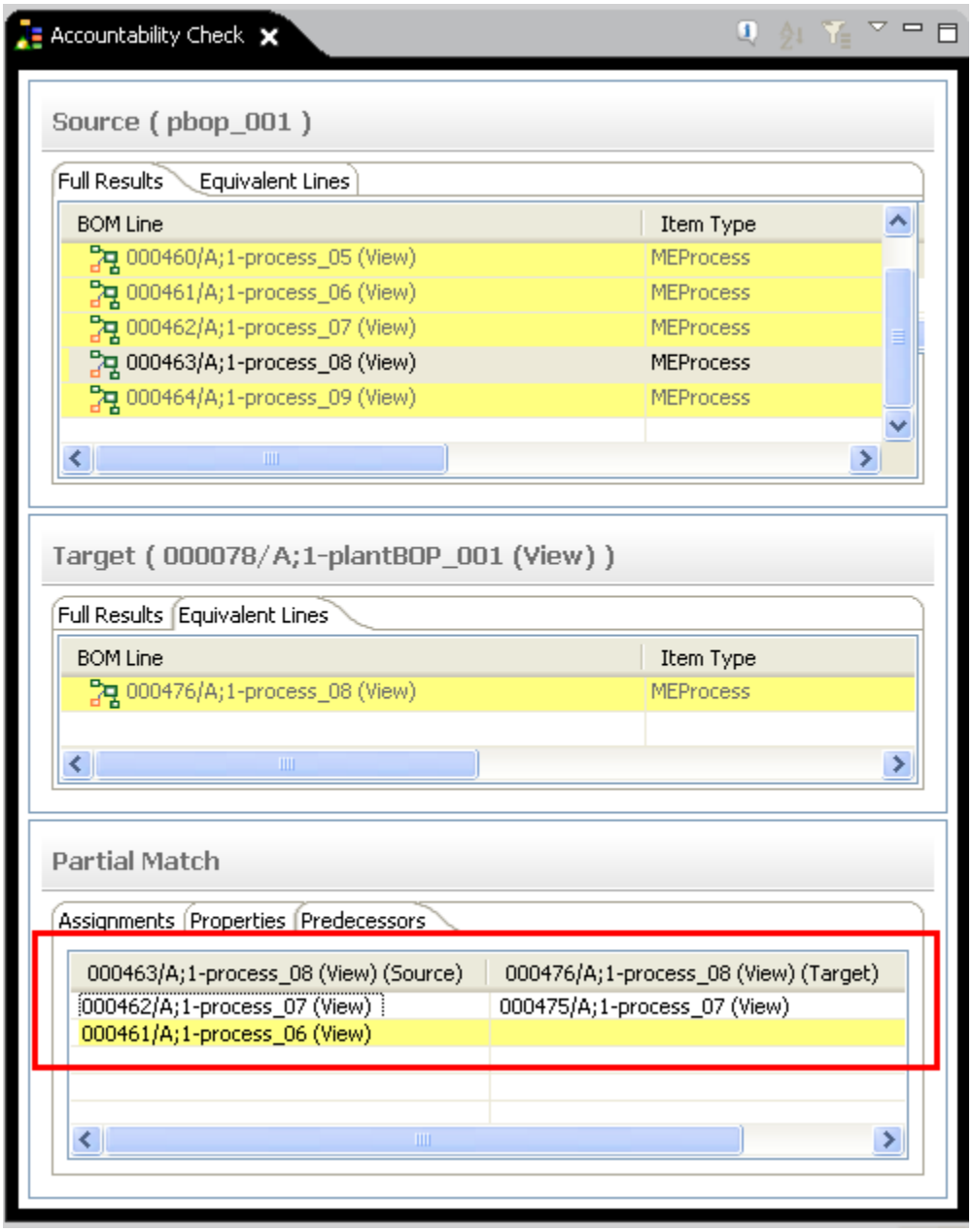

In the partial match results, the source (product BOP) shows two predecessors for **process_08** whereas in the target (the plant BOP), **process_08** has only one predecessor, **process_07**.

Running an accountability check or propagation in batch mode

Running an accountability check in batch mode

Teamcenter offers you two separate methods for running an accountability check in batch mode.

- Run an accountability check in the rich client using the **Accountability Check→Schedule Accountability Check** and **Accountability Check→Schedule Structure Propagation** commands.

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Use this method if:

- You want an easy way to schedule an accountability check at a specific time.
- You do not have administrative privileges.

- Run an accountability check using a command line utility, **acc_check_client**.

  Use this method if:

  - You want to output to both Microsoft Excel and occurrence groups simultaneously.
  - You want to output occurrence groups to both the source and target structures. For example, you can get **Missing in Source** results that you cannot get with the rich client commands or with a regular accountability check.
  - You have administrative privileges.

Configuring batch accountability check and propagation

You can schedule an accountability check or structure propagation to run at a later date or time or at a specific recurring time. This is helpful if you are comparing large structures where the action is time-consuming or if you require comparison results on a regular basis. Teamcenter uses the Dispatcher application to run the comparison and propagation at a time you specify.

Your administrator must configure this feature before you can use it.

Schedule an accountability check report

1. Select the structures that you want to compare and choose **Tools→Accountability Check→Schedule Accountability Check Report**.

   This dialog box is very similar to the regular **Accountability Check** dialog box with the exception of the **Reporting** tab and an additional **Scheduling** tab.

   If you want to add structures you can do so within this dialog box.

2. Enter the comparison criteria in the **Scope**, **Equivalence**, and **Partial Match** tabs of the **Schedule Accountability Check Report** dialog box.

3. On the **Reporting** tab, type the name of the report.

   The default report name prefix is **Accountability Check Report**. The final report dataset has a date timestamp appended to the report name prefix. The timestamp represents the time at the server. If your Teamcenter server is in another country, this time may be different than your own.

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4. Select the types of results you want in the report.

5. On the **Scheduling** tab, schedule the time that you want the report to run. You can also choose to execute the task immediately.

6. Click **OK**.

   Teamcenter sends the request to the Dispatcher and the user interface is immediately available for further work. If you choose to generate a report on a recurring basis, Teamcenter creates a request for each recurrence day. For example, if you choose to have a report generated on Mondays and Wednesdays, Teamcenter creates two Dispatcher requests. You can monitor the status of the Dispatcher request using the **Dispatcher Request Administration Console**.

   If you create a request with multiple occurrences, the **Dispatcher Request Administration Console** displays the following:

   - Start time

     The time that the you submitted the request.

   - End time

     The time that the request ends. This can be:

     - Determined by Teamcenter. If you schedule a daily or weekly accountability check with a specific number of occurrences, Teamcenter calculates the end date.

     - Determined by you. If you schedule a daily or weekly accountability check with a specific end date, Teamcenter displays the end time that you enter.

   - Time interval

     This is the time that the Dispatcher waits between jobs assuming they are within the start time and end time range. If you select **Execute immediately**, the time interval is **0**.

When the report is generated, it is attached as a dataset to the target structure. If you do not have write access to the target structure, it is stored in the **Newstuff** folder in your **Home** folder.

Schedule structure propagation

You can propagate differences from a source structure to a target structure and schedule this propagation to take place at a specific time or at specific recurring times.

1. Select the source and target structures for the propagation and choose **Tools→Accountability Check→Schedule Structure Propagation**.

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This dialog box is very similar to the **Schedule Accountability Check Report** dialog box with the exception of the **Reporting** tab.

2. Enter the comparison criteria in the **Scope**, **Equivalence**, and **Partial Match** tabs of the **Schedule Accountability Check Report** dialog box.

3. On the **Reporting** tab, click to search for an existing folder in which Teamcenter should store the log file.

4. On the **Scheduling** tab, schedule the time that you want the propagation to take place. You can also choose to execute the task immediately.

5. Click **OK**.

   Teamcenter sends the request to the Dispatcher and the user interface is immediately available for further work. If you choose to schedule the propagation to occur on a recurring basis, Teamcenter creates a request for each recurrence day. For example, if you choose to propagate the differences on Mondays and Wednesdays, Teamcenter creates two Dispatcher requests. You can monitor the status of the Dispatcher request using the **Dispatcher Request Administration Console**.

   If you create a request with multiple occurrences, the **Dispatcher Request Administration Console** displays the following:

   - Start time

     The time that the you submitted the request.

   - End time

     The time that the request ends. This can be:

     - Determined by Teamcenter. If you schedule a daily or weekly propagation with a specific number of occurrences, Teamcenter calculates the end date.

     - Determined by you. If you schedule a daily or weekly propagation with a specific end date, Teamcenter displays the end time that you enter.

   - Time interval

     This is the time that the Dispatcher waits between jobs assuming they are within the start time and end time range. If you select **Execute immediately**, the time interval is **0**.

When the propagation is complete, Teamcenter creates a **PropagationLogs_Date_Time** dataset and stores it in the folder that you specified on the **Reporting** tab. This dataset holds a text file containing all the information written into the accountability check report such as the scopes of the source and target structures and propagated data types.

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Managing intermediate data captures

About intermediate data captures

An intermediate data capture (IDC) is a PLM XML file that contains an exported structure with the configuration in effect at the time the IDC is created. An IDC may contain any configured structure including a collaboration context, structure context, or group of BOM lines. You can manage the PLM XML file in the same way as any other workspace object, including assigning it to a workflow, assigning it a release status, running accountability checks, and controlling access privileges with Access Manager.

After you create an IDC, it appears as a separate structure view and an entry for it appears in the **Collaboration Context Tree** view.

After creation, you can compare an IDC to existing structures. For example, if you create an IDC from a product structure, and then make modifications in that product structure, you can run an accountability check that compares the IDC to the modified structure to see the modifications.

To compare IDCs with each other or another structure, each line being compared must contain an in-context ID. Your administrator can run the **bom_expand** utility to ensure that each relevant line in the structure is stamped with an in-context ID.

When you create an IDC, Teamcenter uses transfer modes to export the structure and alias files to determine what to include in the IDC viewer. If you want to export custom objects or properties to the IDC, you must ensure that a transfer mode exists that contains clauses that includes these objects. You must also ensure that the alias files are modified to include the desired objects. If you want to see these objects or properties in the IDC viewer in the rich client, you must modify the alias files so that the viewer can extract them from the request object's XML. The location of the various alias files is found in the following preferences:

- **Structure_Alias_File**
- **Attachment_Alias_File**
- **Dataset_Alias_File**

For more information about using transfer modes, see *Tc XML and PLM XML Configuration for Data Import and Export*.

An intermediate data capture structure is view-only. You cannot make changes to this structure.

There are various views available when working with an IDC, such as the **Attachments** view and the **Graphics** view.

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Capture structures in an IDC

1. Select the root object in the structure and choose **Tools→Intermediate Data Capture**. You can capture BOM lines, an occurrence group, a structure context with multiple roots, or a collaboration context containing multiple structures.

   Teamcenter displays the **New Intermediate Data Capture** dialog box.

2. Select the type of IDC you want to create in the list on the left.

3. Type the name and optional description of the intermediate data capture, and select the appropriate transfer mode name from the list.

4. To open the IDC in Manufacturing Process Planner, select **Open on Create**. If you do not select this option, you can find the IDC in the **Newstuff** folder in My Teamcenter.

5. Click **OK** or **Apply**.

   Teamcenter validates the objects you selected. If any of the objects cannot be captured, Teamcenter displays an error message, otherwise it creates the PLM XML file containing the IDC and displays it in a structure view.

6. (Optional) Open the IDC in the **Viewer** view in My Teamcenter or in the **Object View** tab in Multi-Structure Manager to see a list of the captured states, including their descriptions and creation dates.

7. (Optional) If you make changes to the originally captured structure, create a new captured state in My Teamcenter or Multi-Structure Manager by clicking **Add State**.

Administering process template rules

Working with copy action rules

Copy action rules define how process structures and their individual processes, operations, and activities are duplicated when you use a process template to create a new process structure. These copy actions are defined by your administrator as preferences.

The available copy actions include:

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Copy action	Result
Ignore	No copy action is taken. Neither the database object nor any references to it are duplicated in the new structure.
Copy by Reference	The duplicated process structure references the original object in the database. Any changes to the database object are reflected in the duplicated structure.
Clone and Reference	The database object is cloned and the duplicated process structure references the newly cloned object. Any changes made to the original database object are not reflected in the duplicated structure because it references the cloned database object, not the original database object.

Determining copy action candidates

Copy action candidates are the objects considered for duplication into the new structure when a process template is used.

When you create a new process structure from a template, the template process is opened behind the scenes as the root in a temporary BOM window. The process is expanded, and each child of the process becomes a copy action candidate.

Rules defined as preferences by your administrator determine the copy action to take for each child item. Each child item chosen for a **Clone** copy action is expanded and its children also become copy action candidates. This process occurs recursively until every branch in the BOM window is either exhausted or not cloned.

Copy action candidate	Copy actions available
Objects found in structures	• **Ignore** • **Copy by Reference** • **Clone and Reference**
Items found by relation	• **Ignore** • **Copy by Reference** • **Clone and Reference**
Objects found in folders	Copy actions available for objects found in folders are processed following the set of rules and specifying a relation of attribute equal to **contents**.

Creating copy action rules

When an object is a copy action candidate, the copy action is determined by a series of rules that are identified by preferences. For each rule, the system administrator indicates specifications for the parent object, the child object, and the relation. The administrator also specifies the copy action.

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Relation specifications

Relation specifications can be by:

- Teamcenter relation type
- BOM structure occurrence type
- Folder content

The Teamcenter relation type may be a wildcard character or a Teamcenter relation type name.

The structure occurrence type may be an asterisk, null (for no occurrence type), or the occurrence type name.

Folder contents are specified with the string *contents*.

Occurrences in cloned structures

Any occurrence in the BOM view revision of a cloned item, process, or revision is considered a cloned occurrence, regardless of whether the loaded child object is cloned or referenced. Quantities, occurrence types, notes, find numbers, and user interface locations of cloned occurrences match those in the template occurrence.

Each occurrence predecessor is processed according to the following rules:

- If the predecessor sibling was ignored during the copy action and is not represented in the clone, the predecessor is not set.
- If the predecessor sibling is cloned, the predecessor is the clone.
- If the predecessor sibling is referenced, the predecessor is the same as in the template.

Applying copy action rules

When a new structure is created from a template, the first copy action rule specified by the preference that applies to an object determines the copy action. This lets you specify general copy rules using wildcards that can be overridden with more specific rules.

For example, to apply a specific copy action rule to a child item, you could use a wildcard to specify a general rule for the parent item but have a specific rule in place for the child. When the template is used to duplicate a structure, the general parent specification is overridden by the specific rule for the child.

The default copy action rule is **Copy by Reference**, where the duplicated process structure references the original object in the database.

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Working with collaborative designs

About collaborative designs in manufacturing

When you use 4th Generation Design (4GD) to author design data, you can assign or consume this data in a manufacturing representation of the data that is based on a BOM view revision structure. Teamcenter can bridge the gap between the two data models to allow you to perform accountability checks and propagate attributes from a collaborative design to a manufacturing structure (MBOM).

> Note:
>
> The term *MBOM* refers to a structure that is based on BOM view revisions and not on a collaborative design.

When developing the MBOM, the manufacturing planner performs some of the following tasks:

- Authors manufacturing assemblies in the BVR structure, while consuming design elements from the collaborative design.
- Adds provisional elements (placeholders) for parts not yet defined in the collaborative design.
- Adds nongeometrical elements to assemblies, for example, consumable raw material not modeled in CAD such as glue, oil, or water.
- Restructures assemblies by moving parts from one manufacturing assembly to another.
- Decomposes assemblies into subassemblies for creating kits.

Manufacturing Process Planner includes the Content Explorer as well as supports secondary views to view 4GD data without leaving the application. You can only load a subset definition as root into this view. You cannot load a collaborative design, a design element, or a workset as root. Loading a subset definition allows you to logically and flexibly slice the product (the collaborative design) into manageable sections (the recipe) and to use this definition to assign into the MBOM. At any point, you can view which parts (design elements) and manufacturing features (design features) have not been assigned or updated by activating the accountability check between the subset definition and the MBOM. The rich recipe query in a subset definition enables you to specify the logical representation of the product subset which dynamically displays the most updated product subset.

The general workflow for working with collaborative design data in manufacturing is as follows:

1. Create a 4GD subset definition in the Content Explorer that represents the scope of the design elements that must be included in the manufacturing BOM.
2. Open the subset definition in the Manufacturing Process Planner application.
3. Create a BOM structure to represent the manufacturing BOM.

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4. Assign design elements from the subset definition to the MBOM with the goal of assigning all relevant design elements to the MBOM.

   > Note:
   >
   > You can only assign design elements to precise BOM view revisions.

5. Use the MBOM to support process structures and downstream integrations.

6. After changes are made to the design, compare the design structure to the MBOM using an accountability check to find differences and propagate these differences to the MBOM where necessary.

Install and configure 4GD for manufacturing

1. Install and configure 4GD.

2. Install additional software components using Teamcenter Environment Manager (TEM) **Manufacturing support for 4th Generation Design** options.

3. Set the following Business Modeler IDE global constants:

Mpd0CpdBomPartialMatchProperties	Specifies a list of properties available for the partial match comparison.
Mpd0CpdBomPropagableProperties	Specifies a list of properties available for propagation from a design element to a BOM line.

4. Set the following preferences:

CCObject_Mdl0SubsetDefinition_-default_relation	Specifies the relation that is created when a subset definition is pasted under a collaboration context. The paste action looks at this preference to get the proper relation type to create according to the parent and child types. This is similar to the existing **CCObject_StructureContext_-default_relation** preference.
CCObject_DefaultChildProperties	Specifies a list of properties that can be used as children of a collaboration context.

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4GD user interface elements within Manufacturing Process Planner

In Manufacturing Process Planner, 4GD collaborative designs are hosted in the **Content Explorer** view. When hosted in Manufacturing Process Planner, you can open only a subset definition as a root structure. The **Content Explorer** view then displays 4GD objects contained within this subset definition.

Load 4GD objects in Manufacturing Process Planner

You can load subset definitions in Manufacturing Process Planner. When you open a subset definition, it is opened in the Content Explorer and Teamcenter adds a node for it in the **Collaboration Context Tree** view. The name of the subset definition is also added to the **Open Items** list.

Although you can open other types of collaborative design objects in the Content Explorer in Manufacturing Process Planner, these are for reference purposes only. Manufacturing Process Planner does not recognize them. You can load multiple subset definitions simultaneously. You can also load the same subset definition multiple times. Any changes made in a Content Explorer view are then reflected in the other views containing the same subset definition.

Do one of the following:

- Open the subset definition by name.

  1. In the toolbar, click **Open by Name** .
  2. Click the **Open Subset by name** button.
  3. Type the name of the subset definition.

     You can use wildcard characters to facilitate your search.
  4. Click **Search** or press the Enter key.

     All subset definitions that match your search criteria are listed in the table.
  5. Double-click a subset definition in the table.

     The subset definition is opened in the Content Explorer.

- Send a subset definition to Manufacturing Process Planner.

  You can load a subset definition as part of a collaboration context or as a stand-alone object.

- Open a subset definition from within the Content Explorer by doing one of the following.

  - Click the name in the link in the header.

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- Right-click the subset definition and choose **Open With→Content Explorer**.
- Select the subset definition from the list of recently viewed objects in an empty Content Explorer.

Opening Manufacturing Process Planner-specific secondary views

You cannot open Manufacturing Process Planner-specific secondary views (such as the **PERT**, **Gantt**, or **Work Instructions** views) from within the Content Explorer. Once you assign a design element to a line in a BOM structure, you can open the secondary views on the BOM line representing the design element.

Using the Collaboration Context Tree view with 4GD

When you load a subset definition into the Content Explorer in Manufacturing Process Planner, it is listed in the Collaboration Context Tree.

The following points are noteworthy when working with subset definitions in the Collaboration Context Tree.

- Because the Content Explorer saves the configuration of the subset definition immediately if it changes, including the revision rule, effectivity rule, and recipe, the following configuration commands in the Collaboration Context Tree are blocked:
  - **Save as New Configuration Context**
  - **Apply Configuration Context**
  - **Restore View Configuration**
- If you have a collaboration context that contains both a structure context and a subset definition, the **Save Configuration** command saves the configuration of the structure context but ignores the configuration of the subset definition.

Using subset definitions in collaboration contexts

You can save subset definitions in collaboration contexts. The behavior is similar to saving structure contexts to a collaboration context.

If you use the **Save As** command, Teamcenter clones the subset definition (not the design elements themselves) and pastes the new subset definition to the collaboration context. When you move a subset definition into an existing collaboration context, the collaboration context references that subset definition directly.

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Viewing objects in 4GD

When working with 4GD objects within Manufacturing Process Planner, there are two types of viewers with which you work. The 4GD 3D viewer is embedded in the Content Explorer. This viewer allows you to view all objects associated with 4GD data.

For all other structures with which you work in manufacturing, you can continue to use the **Graphic** view that you open from a primary structure view. When you open this view, Teamcenter adds a **Graphics** menu to the toolbar.

You can open both of these viewers simultaneously.

Modifying 4GD data in Manufacturing Process Planner

Manufacturing users can perform a limited number of editing tasks on 4GD data within Manufacturing Process Planner. If that is not desirable for your use case, your administrator can block access to 4GD data by defining appropriate access rules.

Assigning from a collaborative design to an MBOM

Assigning a design component from a product design into an MBOM structure

To help you build a manufacturing bill of materials, you can assign design components from a product design into a product structure representing the MBOM. To help you with this process, there is a dedicated **4GD-MBOM Reconciliation** perspective. You can open this perspective using all the usual methods.

You can only assign in one direction (from a product design into an MBOM) within a collaboration context or a subset definition to MBOM lines representing parts in a BOM view revision-based product structure. The source object can only be one of the following:

- Shape design component
- Reuse design component
- Subordinate design component

You cannot assign a promissory design component (that does not yet have a shape design or item underneath) to an MBOM.

> Caution:
>
> Although Teamcenter allows you to assign a subordinate design component that is not contained in the subset definition recipe to an MBOM, do not do so as this subordinate design component displays as **Missing in source** when running an accountability check.

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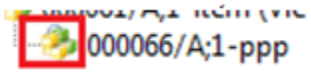
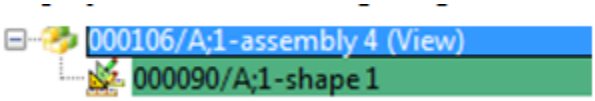
After assigning, the BOM lines containing design components function as any BOM lines in Manufacturing Process Planner with regards to secondary views that you can open or commands that may be run on them. For reuse or subordinate design components, the assigned BOM lines display the item revision symbol.



Shape design components assigned to BOM lines display the shape item symbol.



You can assign using any of the following methods.

- Drag and drop or copy and paste

  Teamcenter creates a new BOM line for the assigned design component, as well as for any subordinate design component that the design component has.

- **Paste As** menu command

  The behavior of the **Paste As** command is similar to the drag and drop behavior but additionally allows you to specify an occurrence type.

- **Paste Special** menu command

  You can paste a design component only as a component of a selected assembly. You can use the **Paste Special** command to specify the number of occurrences, quantity per occurrence, and the find number, as well as the occurrence type.

You can assign the same design components several times within an MBOM structure. Each assignment creates a separate BOM line that is linked to the original design component.

> Note:
>
> You cannot assign design components that are checked out.

Assigning design features to an MBOM

If you work with design features in 4GD, you can assign these features to the MBOM when working in Manufacturing Process Planner. The design features are stored in design container elements in 4GD. During the assignment action, Teamcenter copies the mapped property values from the design feature to the corresponding properties on the BOM line of the manufacturing feature. Attribute groups can be mapped to a form either on the occurrence or on revision, depending on the mapping.

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The types of features supported is limited to the weld types that NX supports. Beginning with NX 9, **Arc Fillet Weld**, **Arc Groove Weld**, and **Surface Weld** types are supported.

For more information about weld types that are supported by NX, see the NX documentation.

Design features are connected to two or more parts. On assignment, the relations are preserved. If you assign a design feature together with the related design elements (or the design elements are already assigned), the relations between the them are mapped to relations between the parts and the manufacturing features in the MBOM structure.

Once you assign design features, you can run an accountability check of the subset definition against the MBOM to ensure that all welds are assigned and to compare properties. You can propagate any differences you find.

The following constants affect the behavior of the assignment process:

- **Cpd0DFToBOMPropertyMapping** global constant

  Specifies the design feature properties that are mapped to form properties on a BOM line.

- **Cpd0DFPropertiesForMBOM** global constant

  Specifies the initial set of properties carried over during assignment. Your administrator can define a different set of properties for assignment based on a feature type.

- **CPD0AttachToItemRevision** business constant

  Specifies whether attachments are associated to the item revision or BOM line in the context of the root level.

- **Cpd0ItemTypeForDesignFeature** business constant

  Specifies what type of item is automatically created when the corresponding design feature is assigned to the MBOM.

Assign design features to an MBOM

1. In the **Content Explorer** view, right-click the design feature that you want to assign and choose **View Properties**.

2. Find and note the parts listed under the **Connected Elements** property.

3. Close the **Properties** dialog box and select the parts and the weld.

4. Copy these and paste them under the appropriate part in the MBOM.

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Teamcenter creates a manufacturing feature and copies over the properties from the design feature as described in *Manufacturing Process Planning — Deployment and Administration*.

Comparing collaborative designs to manufacturing structures

Running an accountability check between a collaborative design and an MBOM

You can compare collaborative designs to BOM view revision-based MBOM structures using the accountability check. The accountability check:

- Finds BOM lines that are equivalent to design elements.
- Qualifies equivalent lines in the two structures as partial matches by comparing properties.
- Displays the results in the 4GD Content Explorer, in the MBOM structure view, and in the **Accountability Check Results** view.
- Displays the results of the check in a report.
- Shows details about why a set of lines is marked as a partial match.
- Propagates differences from the design structure to the manufacturing structure.

You can only run the accountability check in one direction—from the design structure to the manufacturing BOM.

Considerations when running an accountability check with collaborative designs

- You can select individual design elements, partitions, or the entire subset definition as a source for the accountability check.
- Teamcenter cannot report the results in occurrence groups when comparing with a collaborative design.
- When you select a 4GD structure as the source of an accountability check, the **Partial Match** tab displays an additional tab, the **Design Element Properties** tab, from which you can select properties to compare. The list of available properties is contained in the **Mpd0CpdBomPartialMatchProperties** global constant.

Compare effectivity when running an accountability check

In 4GD, effectivity is represented with multiple properties, meaning it is a complex property. In manufacturing, occurrence effectivity is stored in one property only. When these effectivities are compared, only one of the complex values is mapped to the effectivity BOM line property and is displayed as part of the comparison details.

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1. While running an accountability check, select the **Consider Effectivity for Partial Match** check box in the **Design Element Properties** pane.

2. Specify the properties that you want to compare by selecting them in the **Available Properties** list and moving them to the **Selected Properties** list.

   The list of properties available for comparison is contained in the **Mpd0CpdBomPartialMatchProperties** global constant.

3. Click **OK** to run the accountability check.

   The **Effectivity** tab is displayed in the **Partial Match Details** section.

Propagating properties from a collaborative design to an MBOM

An accountability check compares the properties on individual lines in the source and target structures. If, after assignment, the source or target structures are changed, the property values on these lines can differ, and the lines are flagged as partial matches. You can propagate the source property values to the target properties or, in this case, from the design elements to the BOM lines to which they are assigned. The list of the properties that you can propagate is contained in the **Mpd0CpdBomPropagableProperties** global constant. This list of properties is a subset of the properties that are compared in the accountability check and that are specified in the **Mpd0CpdBomPartialMatchProperties** global constant.

Note:

- You cannot propagate effectivity from a subset definition or design elements to an MBOM.
- Although you can see the results of the propagation immediately in the structure view and the **Accountability Check Results** view, you cannot see them in the details. You must update the details by selecting another line and then reselecting the original line.

Comparing design features with manufacturing features

When performing an accountability check between design and manufacturing features, you can compare the following:

- Connected parts

  Only the **connected-to** relationship is compared between design and manufacturing features. The parts themselves are not compared. A multiple match occurs if a connected part is assigned multiple times.

- The properties specified in the **Mpd0CpdBomPartialMatchProperties** global constant
- The attribute groups specified in the **MEAccountabilityCheckMappedAttrGrpsForComparison** preference

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If one property within an attribute group differs from its mapped property in the manufacturing feature form, the accountability check marks the attribute group/form as a mismatch.

You can propagate the following:

- The **connected-to** relationships providing the connected parts already exist in the MBOM
- The properties specified in the **Mpd0CpdBomPropagableProperties** global constant
- The attribute groups specified in the **MEAccountabilityCheckMappedAttrGrpsForPropagation** preference

If the target weld is released, propagation of this weld is blocked and results in an error in the propagation log file.

If the parent of the weld in the MBOM is blocked for change (released, remote, or no permission), propagation of connected objects of this weld is blocked and results in an error in the propagation log file.

Run an accountability check as described in *Run an advanced accountability check*. Additionally note the following:

- You can only run an accountability check using the subset definition as source and the MBOM as target.
- When you compare connected parts, select the **Consider connected objects for partial match** option on the **General** tab of the **Partial Match** tab.
- You can select the properties to be compared and propagated on the **DE/DF Properties** tab.
- You can compare and propagate attribute groups on the **Attribute Groups** tab.

Managing variant information when assigning and comparing

If the collaborative design contains variant information, this information is copied to the item revision to which you assign the design element or design feature. You can see this information by enabling the **Variant Formula** column in the structure view. When you compare the two structures, the accountability check compares the variant information on a logical basis. For example, **Option1 = A AND Option2 = B** is logically equivalent to **Option2 = B AND Option1 = A**.

Your administrator can affect the behavior of variant assignment in the following global constants:

Cpd0DEToBOMPropertyMapping and Cpd0DFToBOMPropertyMapping	Describe the mapping of variant formulas between the manufacturing bill of material and a design element or feature.

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Cpd0DEPropertiesForMBOM and Cpd0DFPropertiesForMBOM	Specify the variant condition that is copied to the MBOM when assigning design elements or features.

The behavior for the comparison and propagation of variant information is determined by the values of the **Mpd0CpdBomPartialMatchProperties** and **Mpd0CpdBomPropagableProperties** global constants.

Performing time way planning

Time way planning overview

Using the **Time Way Plan** view you can identify where in the physical product (line) an operation is performed (the execution position) and whether predecessors and successors of an operation are done at the same location or at a different location. Using time way planning, you can identify where long walk times occur and optimize the sequence of operations to reduce these. You can visualize a station as a physical layout with a length and a width. A station has a direction (left to right or right to left) and each operation is represented as a row inside the station. You can display a 2D image of the product as a background for the station.

The general process for performing time way planning is:

1. Assign the execution positions in the product BOP (bill of process).

2. Allocate operations from the product BOP to stations in the plant BOP. You can do this using line balancing.

3. Open the plant BOP in the **Time Way Plan** view.

4. Visualize the operations in the station according to their sequence and execution position. The length of the operations is determined by the allocated time of each operation, the cycle time of the station, and the length of the station.

Define execution positions

An execution position is the physical location on the product where an operation is carried out. By associating operations to specific physical areas in the product where they are carried out, you can identify structures that cause long walks between operations.

Use the Execution Position wizard to lead you through the steps necessary to define a position diagram and select the points on it representing where the operations occur.

1. In the structure view, right-click the product bill of process (BOP) and choose **Define Execution Positions**.

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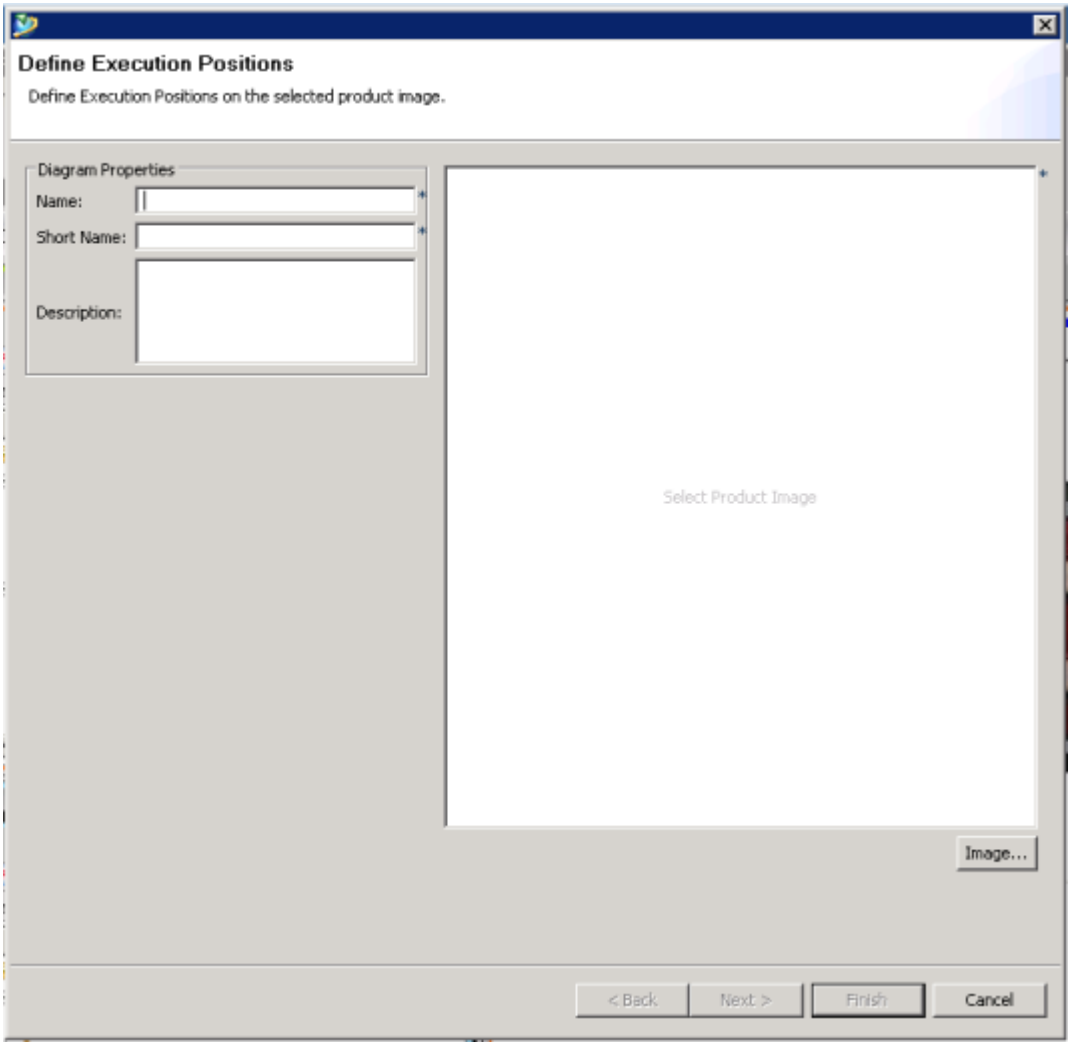
Teamcenter displays the Define Execution Positions wizard. You can open this wizard on a partition as well.



2. Type a name, short name, and description for the execution position diagram.

   You can specify in the **Time Way Plan** view settings whether to display the full name or an acronym (**Short Name**), or modify the view appearance in other ways.

3. Click **Image** and select an image from the operating system that represents your product.

   This image should portray your product in such a way that you can meaningfully select locations on it to represent where operations are taking place.

4. Click **Next**.

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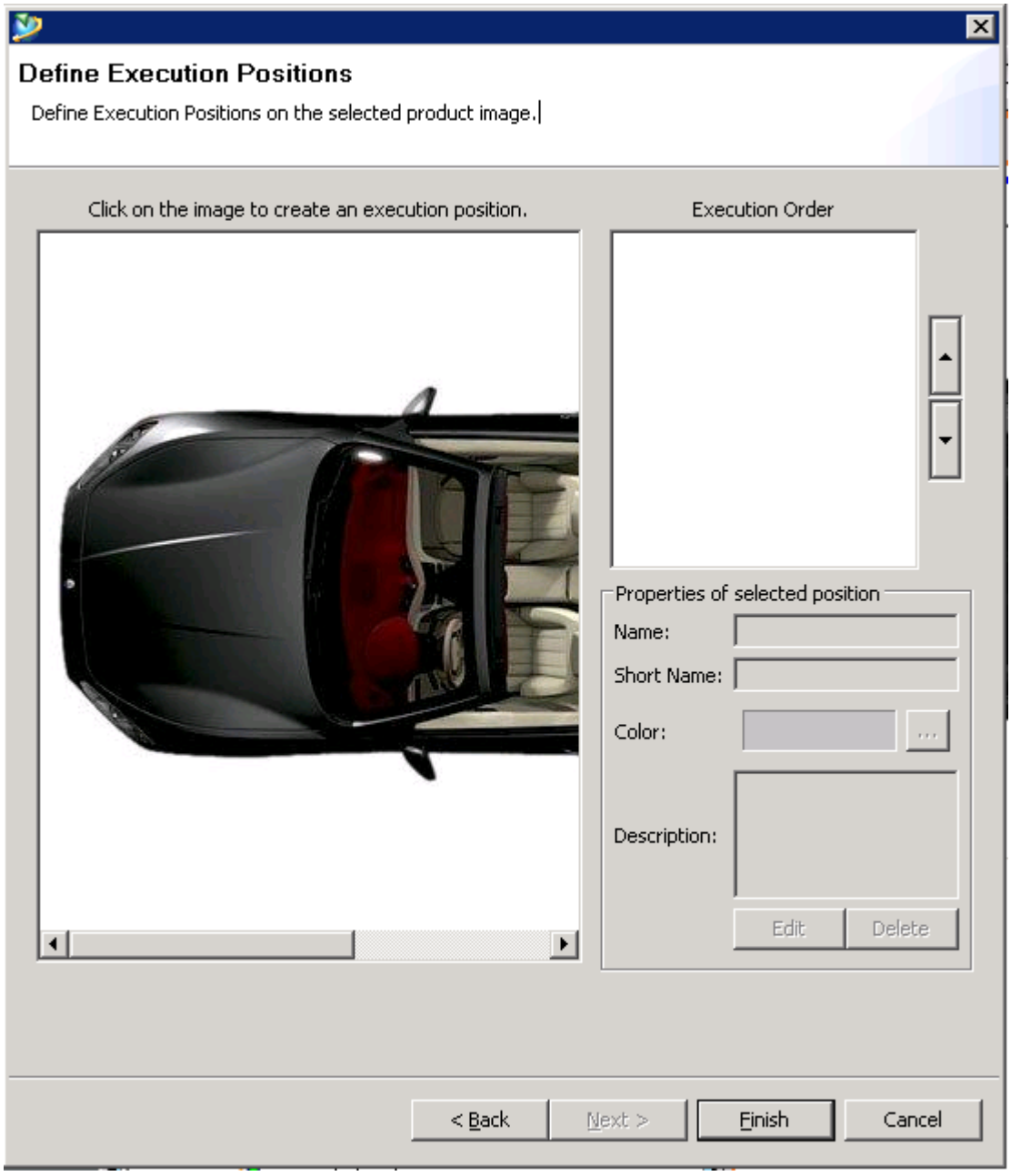

5. Click the area on the image that represents an execution position and enter a name, short name, and description for the execution position.

6. Select a color to represent the execution position.

7. Click **Create**.

   Teamcenter creates the execution position on the image.

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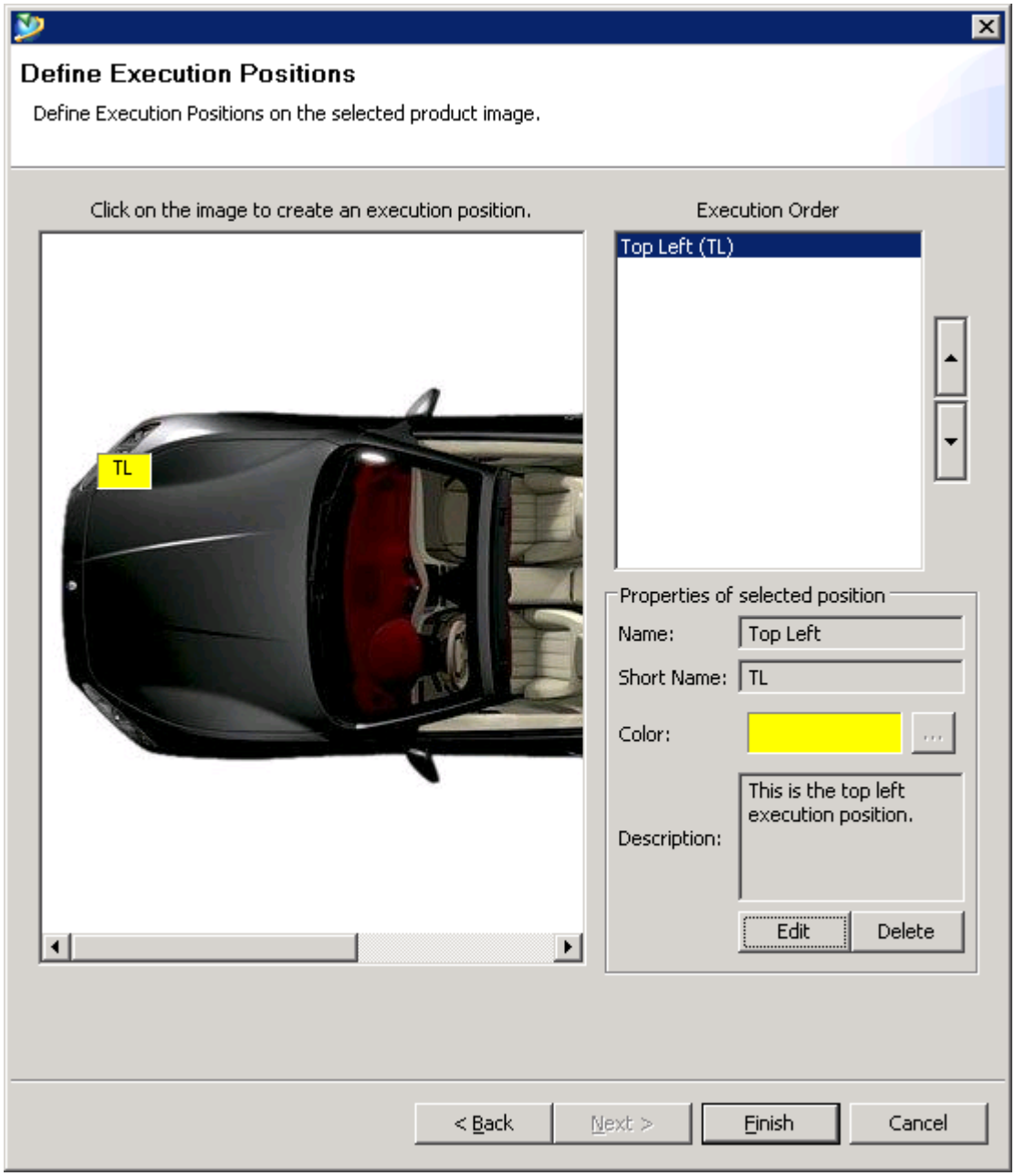

8. Repeat the preceding steps until all execution positions are defined.

9. (Optional) Modify the execution position order using the up and down arrows beside the **Execution Order** list.

   The execution order is the order in which the execution positions are displayed on the station.

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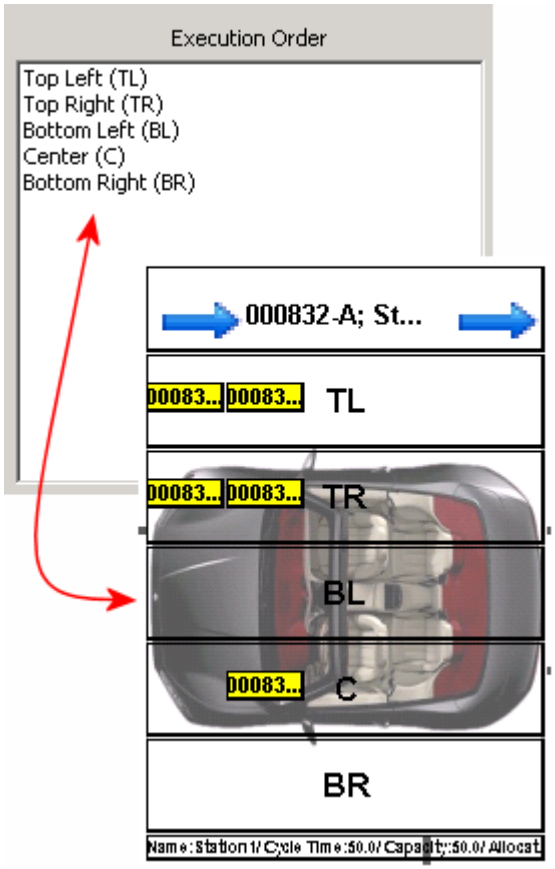

10. (Optional) Modify the name, short name, description, or color of an execution position by selecting it in the **Execution Order** list and clicking **Edit**.

Assign execution positions

1. Right-click an operation in the product BOP (bill of process) and choose **Assign Execution Positions**.

   Teamcenter displays the **Assign Execution Position** view.

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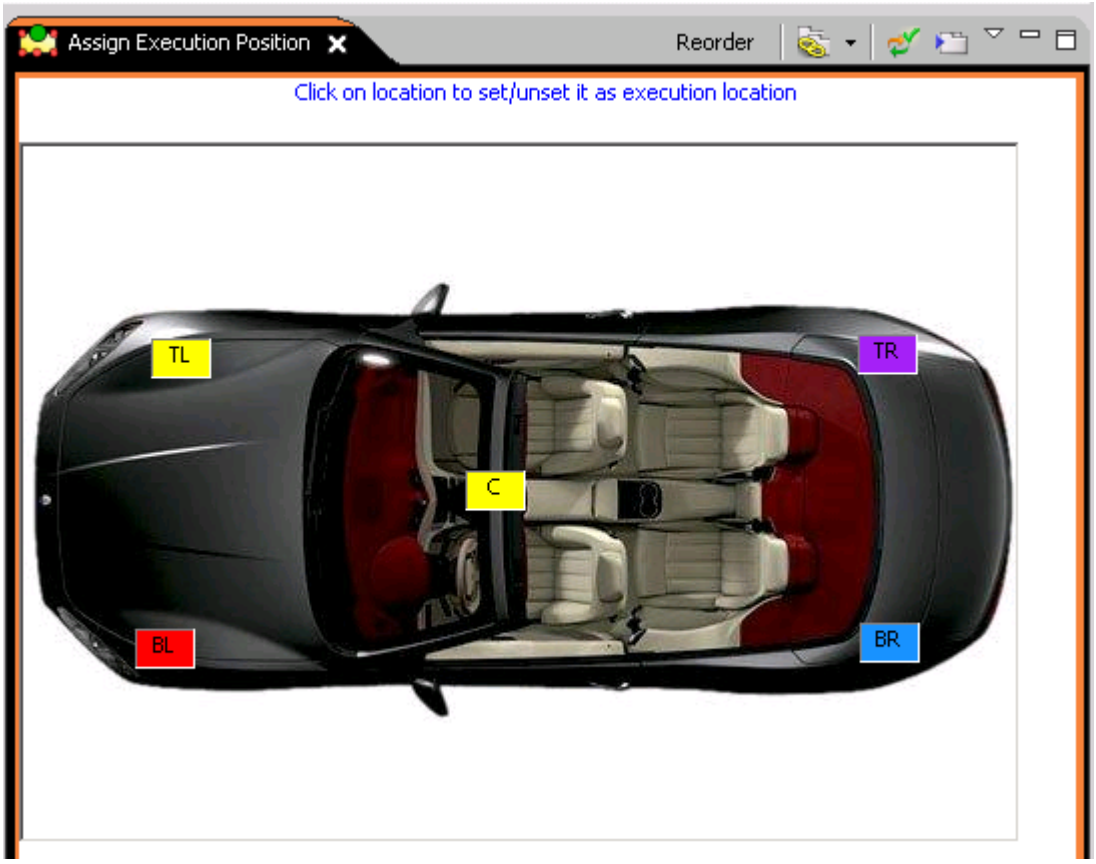

2. Select an operation, and then click on an execution position.

   You can select multiple execution positions if the operation is performed at more than one position.

   Teamcenter displays a number on the execution position indicating the order in which the execution positions are addressed within the operation.

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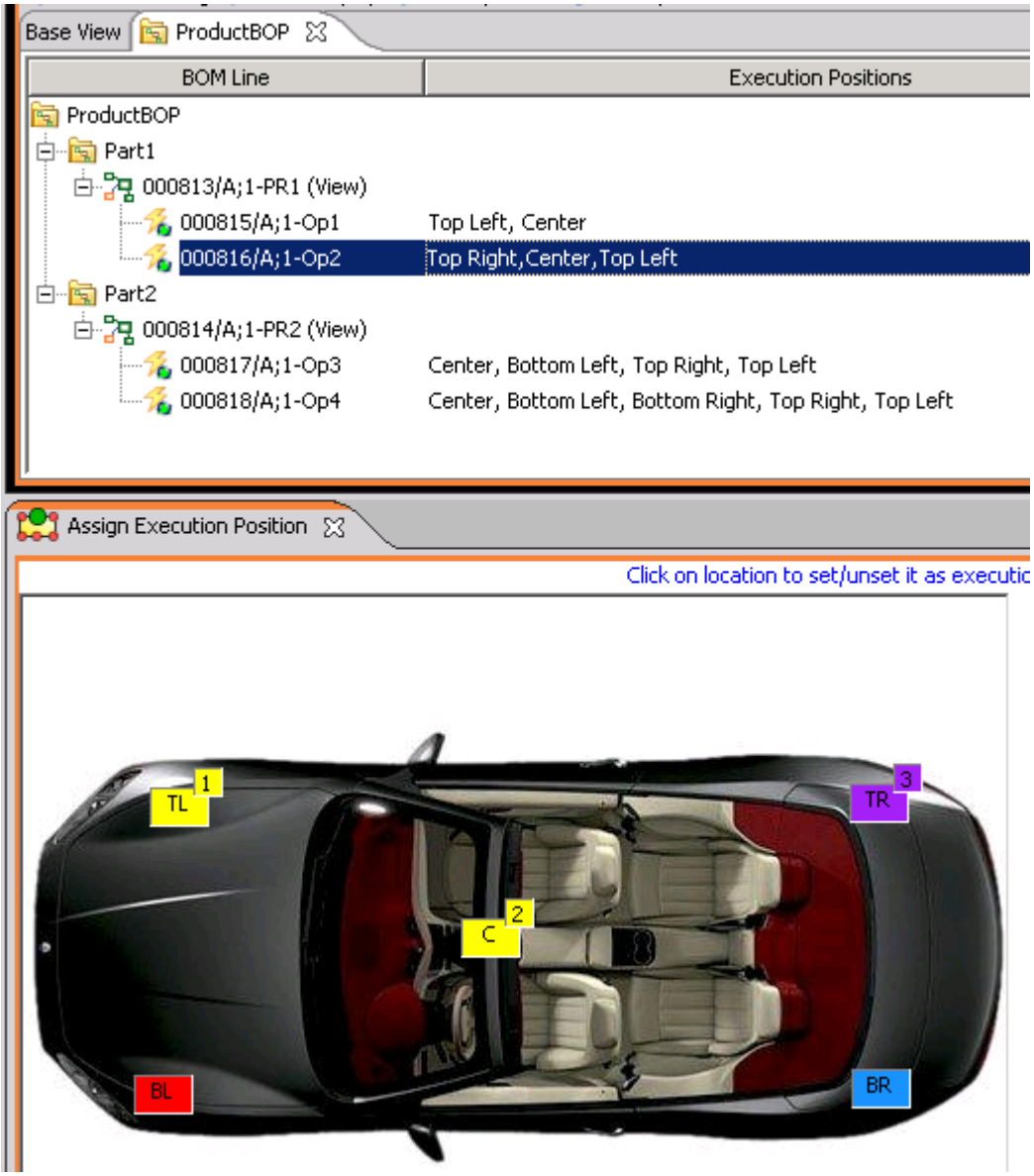

Tip:

Add the **Execution Positions** column to the product BOP structure view to see whether the operations are assigned to execution positions and if so, and to which positions.

3. (Optional) To unassign an operation from an execution position, click the execution position again.

Examine station flow in the Time Way Planner view

Using the **Time Way Plan** view you can visualize a station as a physical layout with a length and a width. A station has a direction (left to right or right to left) and an orientation (clockwise or counterclockwise, with a possible rotation of 0, 90, 180, and 270 degrees). Each operation is represented as a row inside the station. You can display a 2D image of the product as a background for the station.

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You can open the **Time Way Plan** view on a plant BOP (bill of process), a process area, or a station.

This procedure assumes you have a plant BOP containing an assigned product BOP. The operations within this product BOP already have execution positions defined.

1. Select the plant BOP root line and choose **Open With→Time Way Planner**.

2. In the **Time Way Planner** view, perform any of the following:

   - Change the direction of the station flow by selecting the station and clicking **Right to Left** ← or **Left to Right** → in the view menu bar.

   - Rotate the layout of the station by selecting it and clicking or .

     Use the direction and orientation to fit stations to the process line layout. For example, if the process line is C-shaped, orient the stations so that they reflect this shape.

   - Add a product image to one or multiple stations by selecting the stations, clicking , and selecting the image.

     > Note:
     >
     > You cannot remove a product image but you can exchange it for another.

   - Add an image of the plant as a background by selecting the plant BOP, clicking , and selecting the image.

Set a carpet image

You can display a 2D image of the plant as a background for the **Time Way Planner** view. This image is called a *carpet image*. By placing stations directly on their corresponding locations on the carpet, you can identify if there are barriers to the station flow in the plant. For example, if a worker must walk between Station 2 and Station 3, you can place these stations at their physical location on the carpet, thereby identifying that there is a barrier between these two stations that makes walking between them impossible.

1. Add a 2D carpet image to the **Time Way Planner** view.

   a. Select the plant BOP and click .

   b. Select the image and click **OK**.

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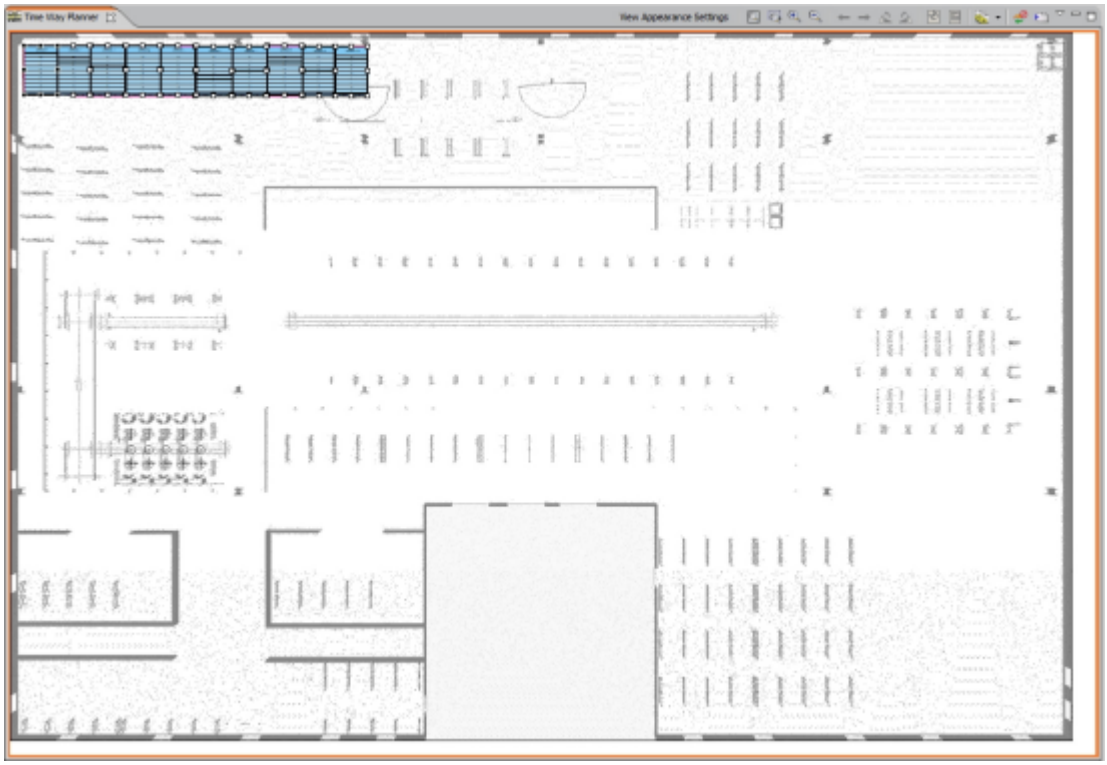

For best performance, the image size should not exceed 5 MB. Images larger than this can result in slow loading times.

2. Select one or more stations in the upper left of the view and drag them to the appropriate physical location on the image.

   Depending on the size of the image that you insert, the stations can be very small. Use the zoom buttons to make selection easier.

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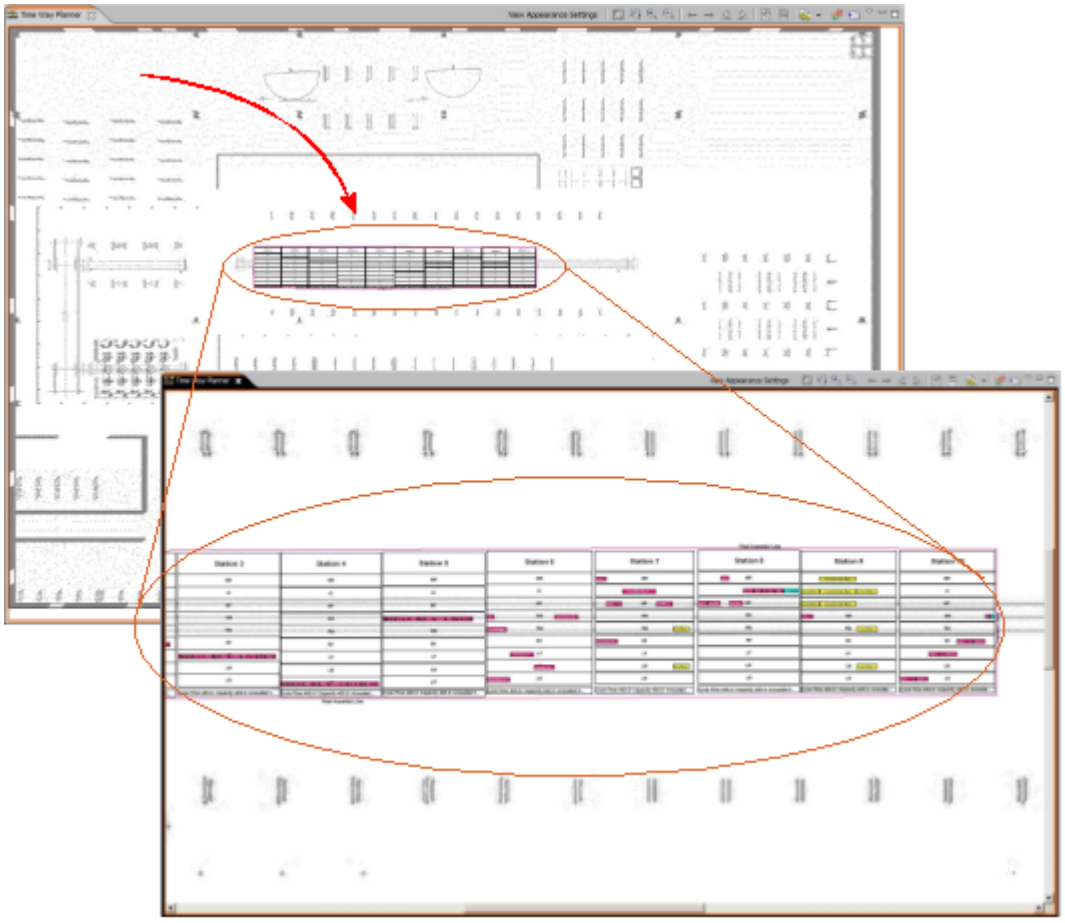

3. Examine the position and flow of the stations to ensure that there are no obstacles and that the paths between the station are minimized.

4. Examine the operation's color code to identify duplicate operations that are performed at multiple locations, conflict with other operations, or exceed the cycle time of station.

5. If necessary, modify the appearance of the **Time Way Planner** view.

Modify the appearance of the Time Way Planner view

1. In the **Time Way Planner** view, click ⚙.

   Teamcenter displays the **Time Way Plan Settings** dialog box.

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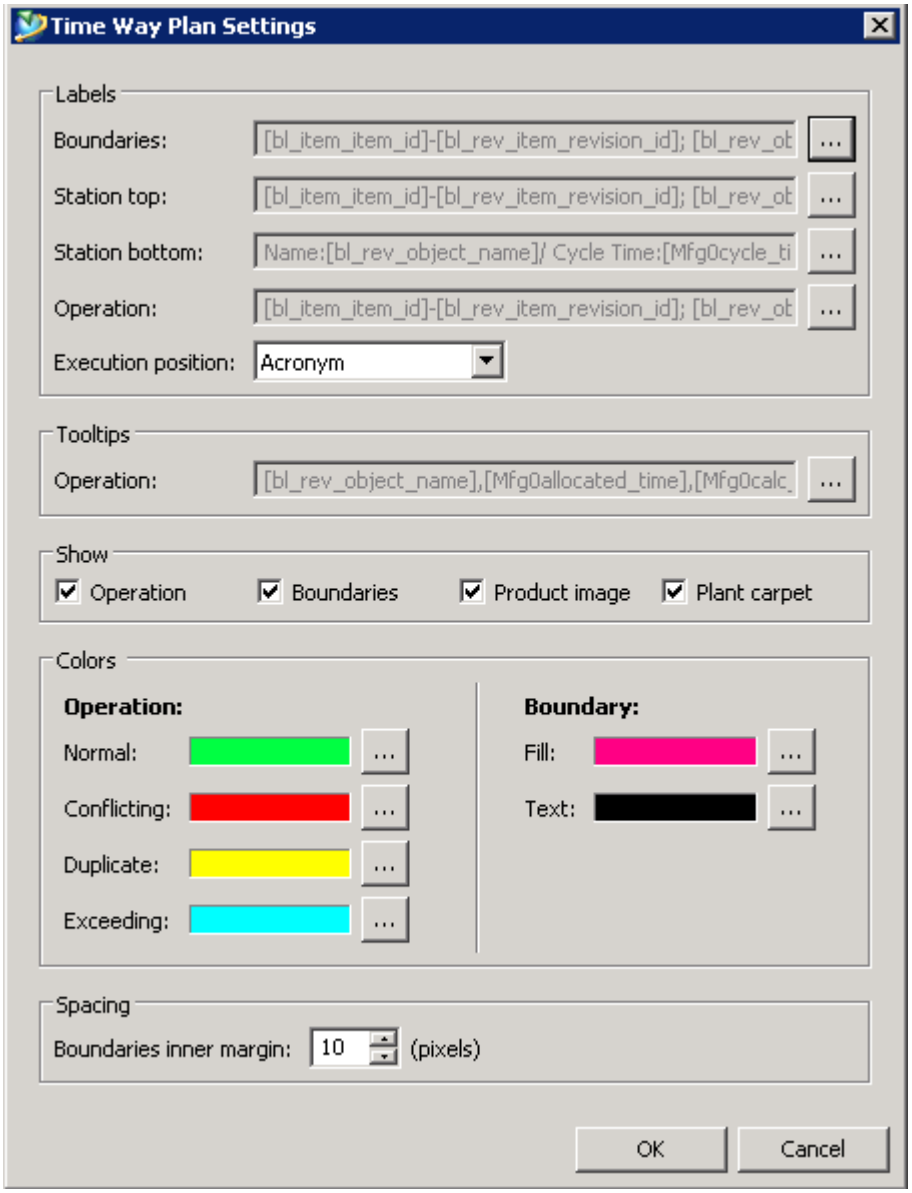

2. Do any of the following:

   - Modify the labels shown on the elements in the view by modifying the properties listed in the **Labels** section of the dialog box as follows:

     a. Click the **...** beside the label name.

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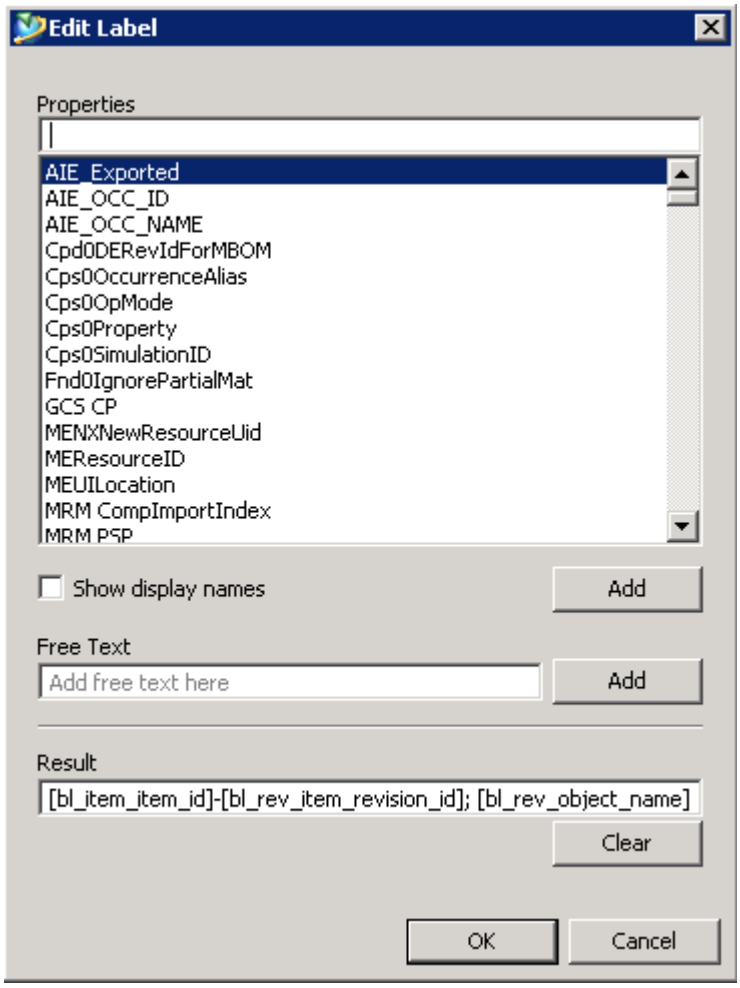

b. In the **Edit Label** dialog box, select the desired property and click **Add**.

c. Add any free text to the box and review the string in the **Result** box and click **OK**.

3. Modify the properties shown in the tooltip on the operations in the **Tooltips** section.

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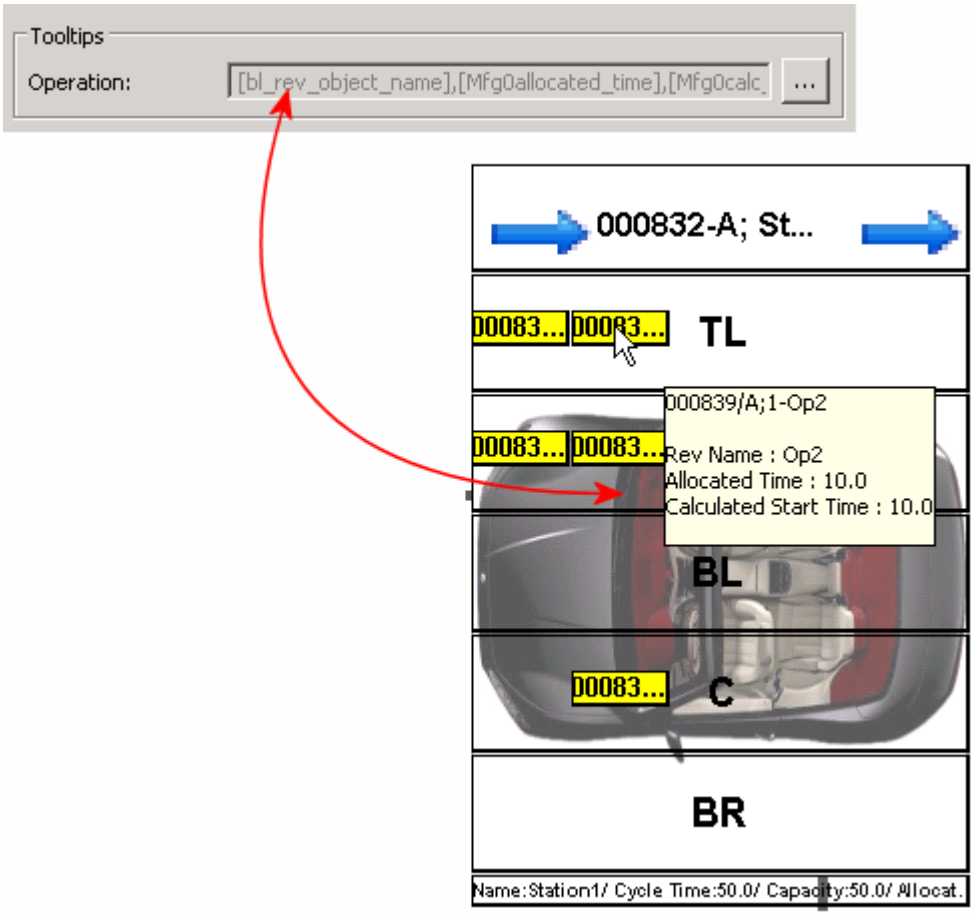

4. Select the colors used to display the operations and boundaries.

5. Modify the margins of the process area boundary in the **Spacing** section of the dialog box.

6. Click **OK**.

   Teamcenter displays the changes to the settings immediately in the **Time Way Planner** view.

Print the Time Way Planner view

In the **Time Way Planner** view, open the view menu and do the following:

- Choose **Print all** to print the contents of the view.
- Choose **Print visible area** to print only the section of the **Time Way Planner** view that is currently visible.

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Working with projects

About projects

Projects represent and control access to a particular piece of work that may be accessible to multiple organizations, such as project teams, development teams, suppliers, and customers.

Objects, such as items, item revisions, datasets, and forms can be assigned to projects. Additionally, folders, or folders and their contents can be assigned to projects. Items, item revisions, and engineering change objects can be assigned to projects during the creation process. All other workspace objects can only be assigned to projects after the object has been created. Objects can be selected from search results and assigned to a project or projects.

When an object is assigned to a project, attachment objects, as defined by the propagation rules, are also assigned to the project. Propagation rules are determined by include and exclude relations lists. By default, the include relation list contains the following relation types:

- **Specification**
- **Manifestation**
- **AltRep**
- **EC_affected_item_rel**
- **EC_solution_item_rel**

You can only assign objects to projects if you are a privileged project team member.

If you are a Teamcenter administrator or a project administrator, you can assign multiple objects in a structure to a project by running the **update_project_bom** utility. You can also use this utility to remove multiple objects from a structure.

Assigning objects to projects

Objects can be assigned to projects either during the creation process or after they are created. Items, item revisions, and engineering change objects can be assigned to a project during the creation process, all other objects must be assigned after they are created.

Objects can be assigned to projects by making selections from the tree or **Properties** table or by selecting from the search results display.

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Note:

You can select from different lists of values (LOVs) for a property, depending on which project the object is assigned to.

Assign objects to projects from the tree or Properties table

1. Select one or more objects in the tree display or **Properties** table.

2. Right-click and choose **Project→Assign**, or choose **Tools→Project→Assign** from the main menu.

   If multiple objects were selected in step 1, the system displays the **Assign Objects to Projects** dialog box. If a single object was selected, the system displays the **Assign an Object to Projects** dialog box. The projects of which you are a privileged member are displayed in the **Projects for Selection** list.

   Caution:

   The objects you selected in step 1 may already be assigned to one or more projects. However, this is not reflected in the selection list.

3. Select the project or projects to which the objects will be assigned and move them to the **Selected Projects** list using the right-arrow button. To select all projects in the list, click the double-arrow button.

4. Click **Apply** to assign the objects to the projects and retain the dialog box. Click **OK** to assign the projects and dismiss the dialog box.

Note:

You can also assign a selected object to a project by dragging it onto the project icon.

Assign objects to projects by search results page

1. Right-click a search results tab.

   Teamcenter displays the Explorer shortcut menu.

2. Choose **Project→Assign**.

   Teamcenter displays the **Assign Object to Projects** dialog box.

3. Select the project or projects to which the objects will be assigned and move them to the **Selected Projects** list using the right-arrow button. To select all projects in the list, click the double-arrow button.

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4. Select the objects to be assigned by selecting either the **Current Page** or **All Found Objects** button.

5. Click **Apply** to assign the objects to the projects and retain the dialog box. Click **OK** to assign the projects and dismiss the dialog box.

To selectively assign objects displayed in the search results tab, select the search results tab and perform the steps described in *Assign objects to projects from the tree or Properties table*.

Remove objects from projects

1. Select one or more objects in the tree display or **Properties** table. You can also select the objects from the results of a search.

   > Note:
   >
   > Two standard search forms, the **Projects Search** form and **Objects in Projects** form can be used to locate objects for removal from a project.

2. Right-click and choose **Project→Remove**, or choose **Tools→Project→Remove** from the main menu.

   If multiple objects were selected in step 1, the system displays the **Remove Objects From Projects** dialog box. If a single object was selected, the system displays the **Remove an Object from Projects** dialog box. The projects of which you are a privileged member are displayed in the **Projects for Selection** list.

3. Select the project or projects from which the objects will be removed and move them to the **Selected Projects** list using the right-arrow button. To select all projects in the list, click the double-arrow button.

4. Click **Apply** to remove the objects from the projects and retain the dialog box. Click **OK** to remove the projects and dismiss the dialog box.

Using Multi-Site Collaboration

About using Multi-Site Collaboration in manufacturing

You can use Multi-Site Collaboration to share structures with other sites. If you use it to share collaboration context objects, take the following into consideration:

- Export all revision rules at the original site using **plmxml_export –xml_file=file_name –class=revisionrule** and use **plmxml_import –xml_file=file_name** at the importing site before using Multi-Site Collaboration with collaboration or structure context objects.

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- Export individual structures prior to exporting a collaboration or structure context in order to get the proper revisions of the objects in the structures.
- The configuration context does not affect which revisions are exported if you export a BOM with a collaboration or structure context.
- To be able to consume exported objects at the remote site when you do not have write access to the product item, create a new item at the remote site that acts as the local product root, and copy the product under it.

Sharing compositions

If you create a process in site B and import it to site A using the following procedure, the assigned product/plant information is not displayed in the structure:

1. Create process in site B and assign a product/plant.
2. Close and restart Manufacturing Process Planner.
3. Create a top-level process in site A.
4. Open My Teamcenter and copy the process created in step 1.
5. Paste the process under top-level process created in step 3.

When you create a root process and paste in another process, the product and plant are not displayed. Pasting the process does not automatically populate these structures. You can work around this problem as follows:

- Load the old product and plant structures into Manufacturing Process Planner.

  The assignments appear in the process structure.
- Ensure that the product and plant load automatically the next time you open the new process in Manufacturing Process Planner. To do this:
  - Use the **Associate** commands to link the roots.

Integrating with a manufacturing execution system

A manufacturing execution system (MES) is designed to help companies more effectively and efficiently execute manufacturing operations from the product order through each step of the manufacturing process to its final point of delivery. Equally important, an MES is a dynamic information system that is key to collaborative manufacturing strategies by providing mission-critical information about production activities to managers across an organization and its supply chain.

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The integration between the definition process in product lifecycle management (PLM) and the control and execution process in an MES generates tremendous value for both processes. As part of the PLM process, the bills of process (BOPs) can be fully simulated in digital replications of the factory. These BOPs can be created, tuned, potentially optimized, validated, and then sent as a technical work package to an MES that automatically generates a work plan for the shopfloor. The MES also controls and monitors the execution of this work plan on the factory floor. Therefore, the interoperability between the MES and PLM is critical in closing the gap between simulation in the engineering environment and reality on the factory floor. As production ramps up, information collected by the MES is essential in adjusting the bills of process. This information is fed back to engineering to improve their knowledge of the actual BOPs needed to produce desired results. Continuous improvement initiatives can benefit from the collection of data when the MES is monitoring and reporting what actually occurred on the physical factory floor.

The Manufacturing Execution System Integration collects the bill of process, the bill of materials, and any relevant work instructions into a work package that is released to the MES. The operator can use this information to machine the desired product. If there is a problem with the data, the planner can modify the contents of the work package and release it again.

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4. Creating manufacturing BOMs

Creating product structures

About product structures

A *product structure* is a hierarchy of each of the product component items arranged in parent-child relationships and is the basis for the process definitions. The products contained within the product structure may contain manufacturing features such as holes, pockets, and weld points to be manufactured using manufacturing processes. *Notes* or *occurrence notes* containing manufacturing values or parameters may also be attached to the structure.

A product structure can have various configurations, also known as product revisions, to capture the variations in a product.

Manufacturing Process Planner opens each product as a separate structure view. You can also view product structures using Structure Manager.

If the product structure contains an assembly that is owned by another site, it is initially labeled as **REMOTE OBJECT** (this is sometimes called a *stub*). To import the associated CAD data and attachments, select the assembly and choose the **Tools→Import→Import Remote** menu command. If the import request is successful, you see the full properties and attachments of the assembly, rather than the stub. You can import individual components and part family members in this way. To configure the import of part family members, choose the **Tools→Import→Import Remote Options** option and click the **NX Part Families** tab.

You can create product structures with CAD systems within Manufacturing Process Planner or Structure Manager.

Restructuring the product structure

Restructuring and editing the product structure

You can restructure a representation, including a BOM view, occurrence group, structure context, or composition. You must revise a frozen product structure before restructuring. Restructuring edits the product structure in downstream views (for example, manufacturing) while preserving the derived occurrence structure and data related to specific occurrences of parts and assemblies. Restructuring is disabled for product structures that contain CAD designs because it can make the CAD data invalid.

During restructuring operations, Teamcenter maintains the integrity of incremental changes, classic or modular variants, and structure relationships. Teamcenter displays warnings when it encounters absolute occurrences attributes and data.

If you have edits pending to a product structure, you must save the edits before you open the structure in another application.

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In addition to restructuring, you can edit individual properties on any line, subject to the following limitations:

- Restructuring is not permitted on lines that have pending edits.
- Property edits are associated with a relative occurrence and are marked as pending until they are saved to the database.
- Property edits are highlighted only if you use the column editor. If you use other methods of changing properties (for example, the **Properties** dialog box), these edits are not visually highlighted in the properties table. However, Teamcenter still retains the details of such edits until you save or revert them.
- Use the **PS_structure_change_condition** preference to specify actions as structure edits. For example, by default, changing a reference designator is not considered as a structure edit, but you can add this action to the preference. NX requires reference designator changes to be considered as structure edits.
- If any note in the list of notes is edited, the **All Notes** field shows a **...** icon with a red strike-through. It does not show the exact original value.
- Edits to the absolute or relative transformation matrix are not highlighted.
- You cannot edit the first property column (**BOM Line**).
- If you cut more than one BOM line to the clipboard and then modify the BOM lines on the clipboard, this action changes the ownership of the remaining BOM lines. For example, if you cut two BOM lines and then remove one of these lines from the clipboard, the status of the remaining line changes from *pending cut* to *pending copy*. If you want to modify the BOM lines that are the subject of a cut action, repeat the cut action on the required BOM lines, rather than modifying the contents of the clipboard.
- If you remove a line that contains one or more unsaved changes to its substructure, the system does not automatically save those changes.
- By default, if you cut or copy a line and then paste it to a new location, incremental change elements (ICEs) are not copied. This may necessitate significant manual recreation of data if you are cutting or copying many lines together. To automatically copy ICEs, the administrator must set two Business Modeler IDE constants:

  - **Fnd0EnableIceCarryOver** business object constant

    When moving, copying, or assigning a line from one location to another, this constant determines if the ICEs are carried forward. You must set this constant to **true** on both the source location's parent and the target location's parent.

  - **Fnd0AttrICEsToExclude** property constant

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Defines the occurrence attributes that Teamcenter does not copy to the target location for occurrence attribute changes.

These settings apply to in-context changes made to structure lines, their attachments, and their occurrence attributes.

Note:

Restructuring primitive actions include:

- Removing a level (removing a line and keeping child lines)
- Inserting a level (including pasting a line as a parent of selected lines)
- Moving a line to a new location (for example, cut and paste actions)
- Splitting an occurrence
- Replacing data in context

Only the last two actions make copies of the absolute occurrence data; the other actions share the existing absolute occurrence data.

In certain cases, restructuring may cause valid reports of broken links, as shown in the following examples:

Example 1:

```
A
+-----------B
            +-----------C (APN1 in context of A)
                        +-------------D
```

If you remove level **C**, the structure becomes:

```
A
+-----------B
            +-----------D
```

The link to **C** is lost. This is correctly reported as a broken link.

Example 2:

```
A
+---------E
+---------B
```


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```
            +---------C
                      +-----------D(APN1 in context of B)
```

If you move **D** to **E**, it is outside of the context of **B** and **APN1** is lost. This is correctly reported as a broken link.

Example 3:

```
A
+-----------B
|           +-----------C
|                       +-------------D(APN2 in context of A)
+-----------B
|           +-----------C
|                       +-------------D(APN1 in context of A)
+-----------D
+-----------D
```

If you move **C** to **D**, the system cannot determine which **D** to move the APN to without user interaction. It skips the APN and logs an error message.

Example 4:

```
A
+-----------B
            +-----------C
                        +-------------D(APN1 in context of B)
```

If you remove level **B**, it becomes:

```
A
+-----------C
            +-----------D
```

The link to **D** is lost. This is correctly reported as a broken link.

Insert a level in the structure

You can create an item and insert it in the current structure as a new level below the selected line. The number of relative occurrences of the children is preserved. If you select more than one line, they must share the same parent.

1. Select the parent line of the new level and choose **Edit→Insert Level**.

   Teamcenter displays the **Insert Level** dialog box.

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2. Enter the item identifier and other attributes of the new item. If the inserted item is new, you must insert it with a quantity of **1**.

3. On completion, click **OK** or **Apply**.

   Teamcenter creates the new item and inserts it as a new level. The selected branches become children of the inserted level, while the inserted level becomes a branch of the original parent. All existing variant conditions, notes, absolute occurrences, and other data is moved down with the selected branches. The default quantity of the new level is **1**, meaning that no quantity change occurs.

> Note:
>
> You can only insert a level if the line represents a standard business object type. If the line represents a custom type, copy it to the clipboard and choose **Paste Special**. Teamcenter pastes it as a new level above the currently selected line.

Remove a level from the structure

1. Select the affected line and choose **Edit→Remove** or click **Remove** .

   Teamcenter displays the **Remove** dialog box.

2. Click **Yes** to confirm removal of the line. The total number of instances is preserved at the end of this action. Any options of the removed lines are moved up and variant conditions are merged.

If you try to remove a level that would result in option definitions becoming inconsistent (for example, options that are referenced by a parent line), Teamcenter displays an error message.

Move a node to another branch

You can move a selected node from one branch to another. All substructure and occurrence data moves with the node.

1. Move a node using any of the following methods:

   - Cut and paste using the **Edit→Cut** and **Edit→Paste** menu commands.
   - Cut and paste using the Ctrl+X and Ctrl+V shortcut keys.

   > Caution:
   >
   > Do not try to move a node by dragging the line to its new position. Teamcenter performs a copy action when you drag a line.

   Teamcenter displays the **Paste** dialog box.

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2. Do one or more of the following:

   - Change the item ID and revision ID.
   - Change the view type, if applicable.
   - Select if the line should be pasted as a component of the selected assembly line, as a substitute for the selected line, or as a new level above the selected line.
   - Specify the number of occurrences, quantity per occurrence, and find number.

3. Click **OK** or **Apply** to complete moving the line.

> Caution:
>
> If you cut a line and edit tracking is enabled, the line is displayed in red with a strike-through until you commit the edits. Do not attempt to edit or work with this line, or you may obtain unpredictable results. If you want to edit or work with a line that is marked as cut, revert changes to the line by choosing **Edit→Revert Edit** first.
>
> Similarly, do not edit or work with a marked line in another structure editor such as Multi-Structure Manager. Always complete and save your work on the structure before you open it in another structure editor.

Replace a node

You can replace an item representing a node in the structure with another item. All data associated with the original node is preserved.

> Note:
>
> Your system administrator sets the **PS_replace_with_substructure** preference to determine if any substructure below the node is replaced. If this preference is **true**, the node and its entire substructure (if any) are replaced without prompting. If it is **false**, Teamcenter displays an error message and does not complete the replacement action.

You cannot use the **Replace** feature on any type of process or consumed line in manufacturing structures.

1. Select the line to replace and choose **Edit→Replace Node** or click .

   Teamcenter displays the **Replace Node** dialog box.

2. Enter the item identifier and other attributes of the item that replaces the existing item.

3. Click **OK** or **Apply**.

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Teamcenter replaces the existing item.

If you have edit highlighting turned on, the number of the original part is shown in red, strike-through text.

Split an occurrence

You can split a line that represents several occurrences into two branches. The new branch and the original (changed) branch initially have the same notes, variant conditions, and other data, but you can subsequently modify them independently. The quantity on the original line before the split must be greater than 1.

1. Select the occurrence line and choose **Edit→Split Occurrence**.

   Teamcenter displays the **Split Occurrence** dialog box.

2. Enter the quantity for the new line that results from the split and click **OK** or **Apply**.

Working with global alternates

Global alternates overview

A *global alternate* part is interchangeable with another part in *all* circumstances, regardless of where the other part is used in the product structure. A global alternate applies to any revision of the part and is independent of any views.

> Note:
>
> If the parts are interchangeable only in specific products or assemblies, use *substitutes* rather than global alternates.

Parts and their global alternates are related only in a single direction. For example, if part **A** has three global alternates (parts **B**, **C**, and **D**), then **B**, **C**, and **D** are each a global alternate of A. However, part A is not an alternate of **B**, **C**, or **D**, as shown next.

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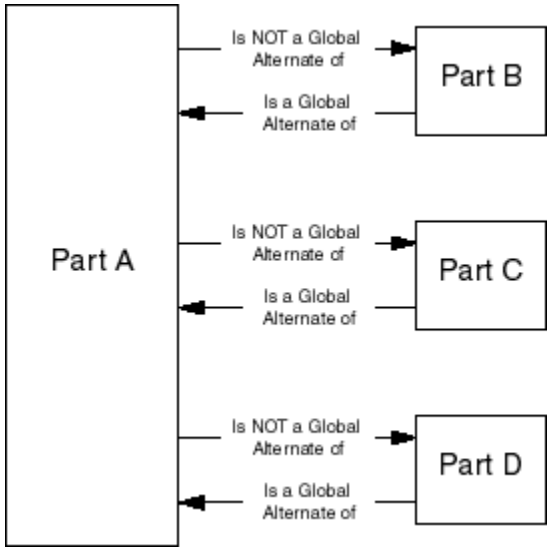
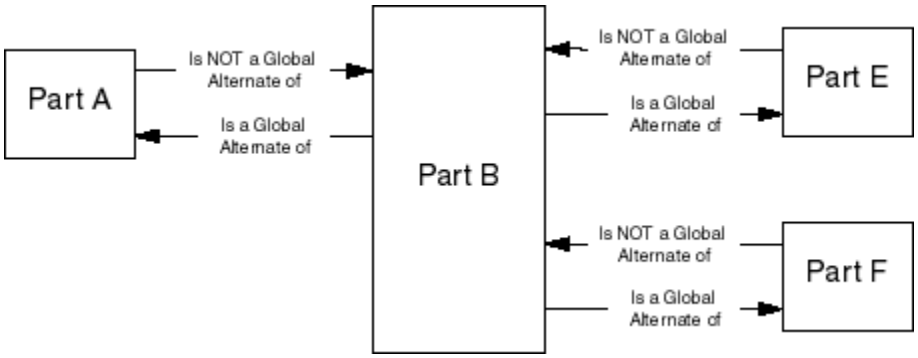


Global alternates – single direction

One part can be a global alternate of more than one other part. For example, part **B** may be a global alternate of parts **E** and **F**, as well as a global alternate of part **A**, as shown next.



Global alternates – multiple alternates

Global alternate relationships are not shared. For example, part **C** is not a global alternate of part **B**, even though they are both global alternates of part **A**, as shown next.

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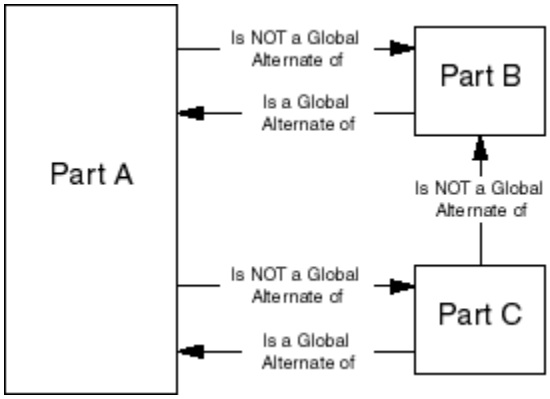
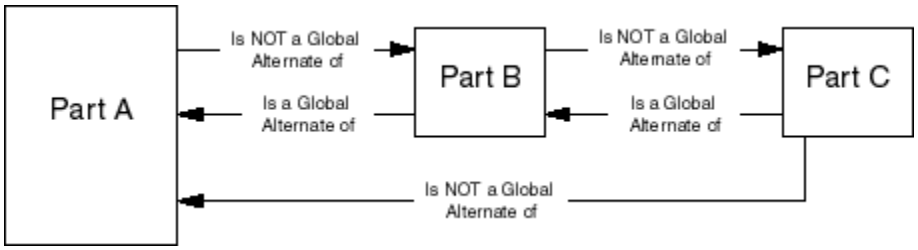


Global alternates – nonsharing

Likewise, global alternate relationships are not chained. For example, if part **B** is a global alternate of part **A**, and part **C** is a global alternate of part **B**, part **C** is not a global alternate of part **A**, as shown next.



Global alternates – chaining

List global alternates

1. Select a line in the product structure. If it has global alternates, this is indicated by the icon.

2. Click **Global Alternates**.

   Teamcenter displays the **Global Alternate** dialog box, which lists all the global alternatives of the selected item. The preferred global alternate (if any) is marked with a check mark.

> Note:
>
> You can also list global alternates in My Teamcenter.

Add global alternates

1. List the global alternates (if any) of the item for which you want to add one or more global alternates.

2. In the **Global Alternate** dialog box, click **Open**.

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Teamcenter displays the **Open by Name** dialog box.

3. Search for the item that you want to define as a global alternate of the selected item.

4. If you want to define more than one global alternate of the selected item, repeat the previous step for each global alternate.

> Note:
>
> You cannot add the same item as the global alternate more than once. Teamcenter displays a **Cannot create duplicate alternates of same item** message if you attempt this action.

Remove global alternates

1. List the global alternates of the item from which you want to remove one or more global alternates.

2. In the **Global Alternate** dialog box, select one or more global alternates to remove and click **Remove**.

   Teamcenter removes the selected global alternates from the list.

> Note:
>
> If you remove all the global alternates from an item, the corresponding line in the product structure no longer shows the icon.

Set or unset preferred global alternate

1. List the global alternates of the item from which you want to remove one or more global alternates.

2. In the **Manage Global Alternates** dialog box, select a global alternate and click **Prefer**.

   Teamcenter designates the selected global alternate as preferred and places a check mark next to it in the list.

To remove the preferred designation from a global alternate, select it and click **Prefer** again. Teamcenter removes the check mark next to it in the list of global alternates.

Open an existing product revision

When you open a product, the first BOM view revision (BVR) of that product opens by default. Your administrator can set the **MEManufacturingDefaultBVR** preference at your site to open another BVR if necessary.

Use one of the following methods to open a product:

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- Find the product item in My Teamcenter. Using the mouse, drag the item or its revision to the Manufacturing Process Planner application button in the navigation pane.
- Find the product item in My Teamcenter. Choose **Send To→Manufacturing Process Planner** from the shortcut menu.
- Open a process revision in Manufacturing Process Planner. The product revision that has been most recently assigned as a target item by this process is opened by default.
- Open a product revision in Manufacturing Process Planner using the **Open Product** dialog box.

Create a new structure using Manufacturing Process Planner

1. Choose **File→New→Item**, or click **Create New Item** .
2. In the **New Item** dialog box, select one of the item types from the list.

   > Note:
   >
   > You cannot add a resource item type to an item in Manufacturing Process Planner.

   For more information on creating additional item types, see *BMIDE for Data Model Design*.
3. Click **Next**.
4. Enter the ID number to be assigned to this new product. If this new product is a revision of an existing one, type the ID of the existing product. You can assign a unique revision number in the **Revision** field.

   To let the system automatically assign a unique ID, click **Assign**.
5. Type a name for the new product. Make it unique so you can search the database using this term.
6. Select **Show as new root** to specify that the newly created item is opened as a root object. It is not pasted to the selected item. If you do not select this option, the new item is pasted as a child of the selected item.

   If the **Show as new root** option is selected but unavailable, Teamcenter does not allow you to create a new object under the selected object, for example, if you try to create a work area under a process.
7. Type a product description.

   At this point, you have all the information required to create a new item.

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8. (Optional) Select a unit of measure from the **Unit of Measure** list.

9. (Optional) Click **Next** to add optional information, such as filling out the item's forms, or checking the item out.

10. (Optional) Click **Define Options** to specify the following:

    - Select **Use item identifier as default display** or **Use revision identifier as default display** if you created an alternate identifier for the item and want to use it as the default display object.

    - Select **Check Out Item Revision on Create** to check the newly created item out of the database immediately upon creation.

11. Click **Finish** to create the new product.

12. Click **Close** to close the **New Item** dialog box.

Creating a new structure using a CAD system

Importing the product from a CAD system is the primary method for populating the database with a new product. The CAD system lets you design the product structure and the detailed geometry of each component before you import the structure into Manufacturing Process Planner.

Authoring MBOM

Reasons for creating an MBOM

When working in the manufacturing environment, Siemens Digital Industries Software recommends that you create a manufacturing bill of materials (MBOM) from your engineering bill of materials (EBOM). There are several reasons for this:

- Generally, manufacturing engineers do not have write privileges on the EBOM and cannot modify it. For example, a design engineer may specify that a part is going to be purchased and sets a property value to **buy**. Subsequently, the manufacturing department determines that it is more economical for them to make this part. They want to change that property to **make** but do not have the privilege to do so.

- Assembling a part requires a structure that is different from the EBOM structure. For example, in the BOM, the exhaust manifold is part of the engine compartment. During assembly, however, the exhaust manifold must be added after the body is built onto the chassis as the exhaust pipe must be put through the bumper. This type of regrouping and adding of manufacturing-specific parts is most efficiently performed in a separate manufacturing BOM structure.

- Especially for final assembly, companies often have manufacturing parts that they consume in different MBOMs. These can only be created in a structure to which you have write access.

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- There may be changes to an EBOM that should not immediately be reflected in the process structure. For example, you may want to continue manufacturing using the current parts to use up existing inventory. By using an MBOM, the manufacturing engineers have control over when the changes to the EBOM are reflected in the manufacturing process.

- Some companies do not author the EBOM in Teamcenter. It is imported from another system so that the EBOM in Teamcenter is a replication of the status of the EBOM in another system. Using an MBOM provides you with a buffer for these changes so that you can monitor and process them in a controlled manner.

> Note:
>
> You cannot open an MBOM in Siemens Digital Industries Software NX.

Automatically creating an MBOM from an EBOM

Teamcenter provides you with several automatic methods to create a manufacturing bill of materials (MBOM) from an EBOM (engineering bill of materials).

- **Create an MBOM from a recipe**

  Create an MBOM from a template that contains a recipe for searching the EBOM for required parts. The recipe can contain a variety of search attributes such as an attribute search, spatial search, ID search, or combinations of search criteria.

  This type of creation mechanism works well for *make to shelf* industries where the products are standardized such as the automotive or home appliance industries.

- **Use the me_create_mbom utility**

  The **me_create_mbom** utility creates an MBOM based on a specific EBOM but replaces make parts or phantom levels in the EBOM with manufacturing-specific parts and directly copies over buy parts.

  Your administrator can take advantage of user exits in this utility that allow you to embed your own logic into the utility.

  Your administrator can take advantage of user exits in this utility that allow you to embed your own logic into the utility that specify:

  - What constitutes a make part using the **USER_create_or_ref_item** user exit (exposed in Business Modeler IDE using the **BMF_ITEM_create_or_ref_id** operation on an **Item** object).

  - How to synchronize equivalent lines and align properties using the **USER_synch_item** user exit (exposed in Business Modeler IDE using the **BMF_ITEM_sync** operation on an **Item** object).

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- What constitutes equivalent lines if there is no in-context ID or occurrence thread using the **USER_item_find_equivalent_line** user exit (exposed in Business Modeler IDE using the **BMF_ITEM_find_eqv_line** operation on an **Item** object).

- Which action to take on a released MBOM **Item Revision** object during update using the **USER_item_action_on_release** user exit (exposed in Business Modeler IDE using the **BMF_ITEM_action_on_release** operation on an **Item** object).

For more information, see *Integration Toolkit Function Reference*.

Your administrator can create a workflow to run this utility using the **ME-create-mirror-AH** and the **ME-update-mirror-mbom-A** action handlers.

This type of MBOM creation method works well for *configure to order* customers such as heavy machinery.

> Note:
>
> Neither of the methods to create MBOMs supports part replacement through propagation.

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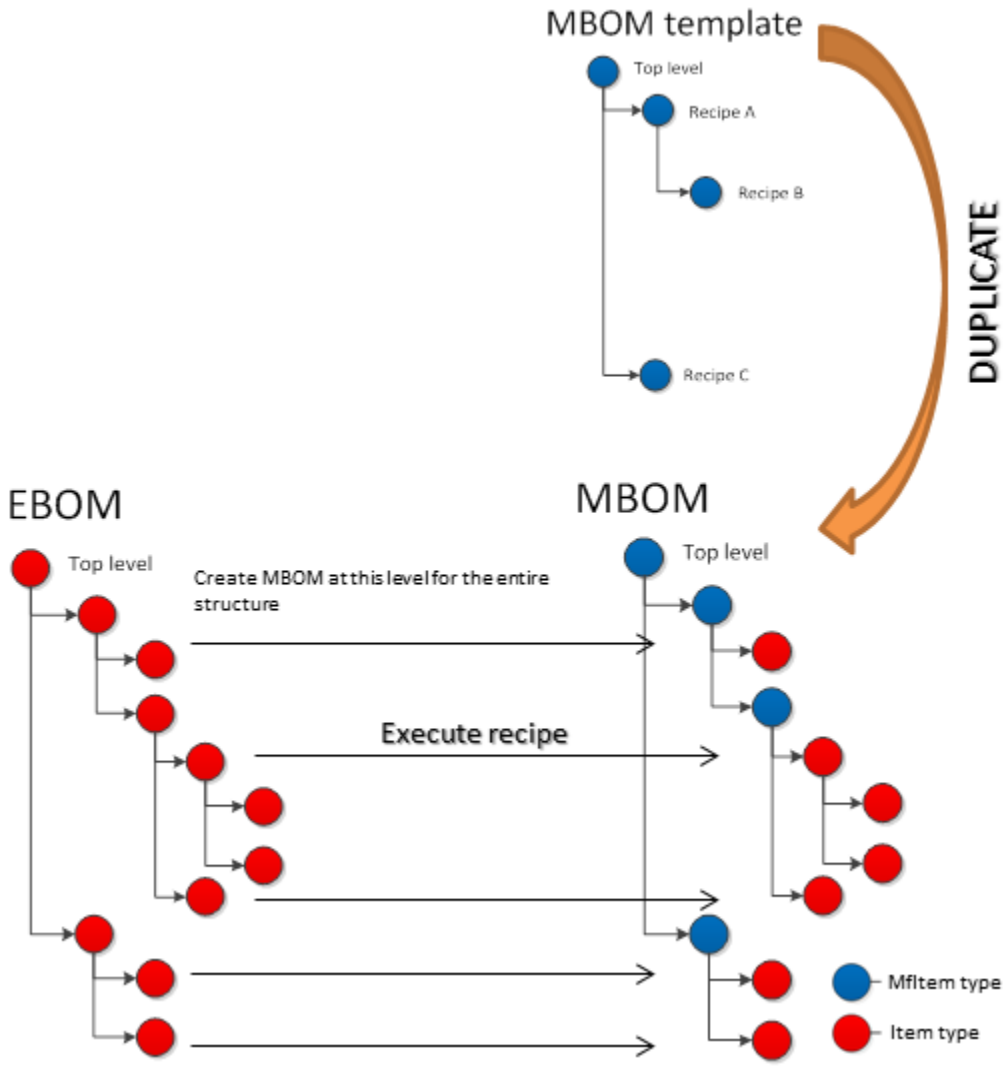
Create an MBOM from a recipe

You can automatically create an MBOM based on a recipe. A recipe consists of search criteria saved on each node of an MBOM template that define the parts to assign to that specific node.



Beginning with an MBOM template that contains phantom levels, you define a recipe for each part that is to be manufactured. When you run the search, Teamcenter searches in the specified EBOM for parts that fulfill the criteria and assigns them to the MBOM.

Unless a cloning rule is set up to ignore MBOM recipes, when you clone an MBOM that contains recipes, Teamcenter clones the recipes as well.

1. Open the MBOM template on which you want to save recipes.

   This MBOM must already be linked to an EBOM structure.

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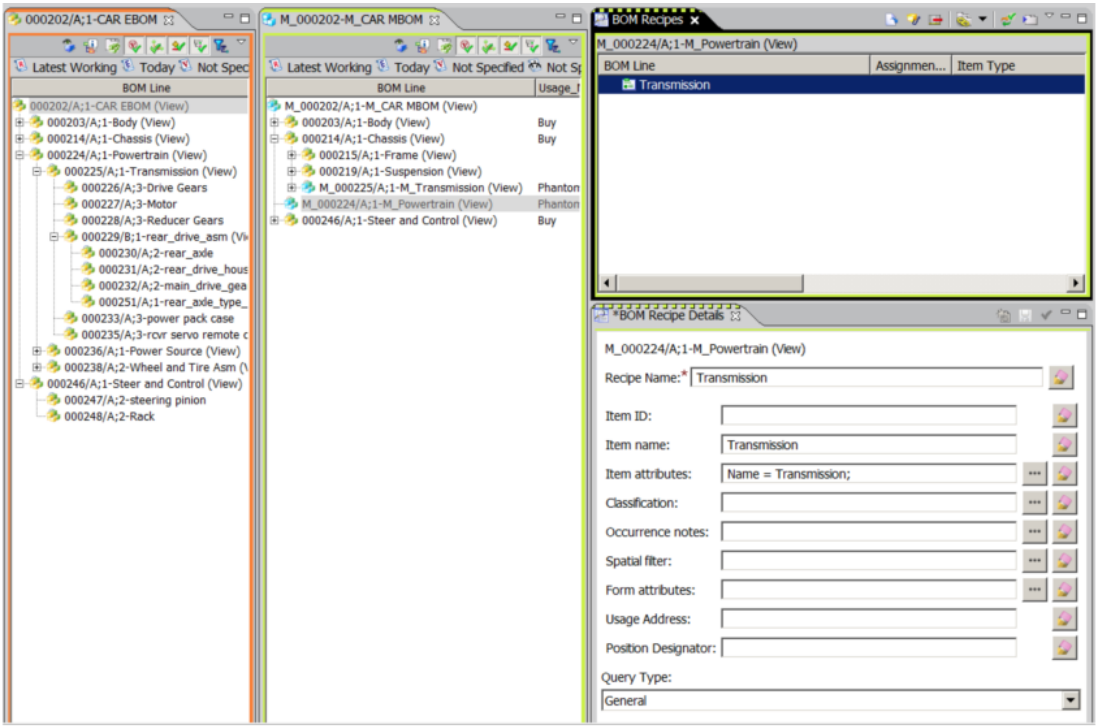
2. Right-click a node on which you want to save a search criteria and choose **Open With→BOM Recipes**.

3. In the **BOM Recipes** view, click **Create/Update Recipe** .

4. In the **BOM Recipe Details** view, enter a name for the search and the search criteria that describe the parts that you want to add to the MBOM at the selected node.

   What you enter as search criteria is company-specific but may include usage address, position designator, or a function-based numbering scheme making up the ID.



   You can add multiple criteria to one search box by separating them with a semicolon.

5. Click **Validate BOM Recipe** .

   Teamcenter runs the search on the EBOM and lists the parts that fulfill the search criteria in the **BOM Recipe Validation Results** view. Use this step to verify that you have entered the correct criteria.

6. In the **BOM Recipe Details** view, click **Create New Recipe** .

   Teamcenter lists the new recipe in the **BOM Recipes** view. You can save multiple recipes on an MBOM node.

7. Do one of the following:

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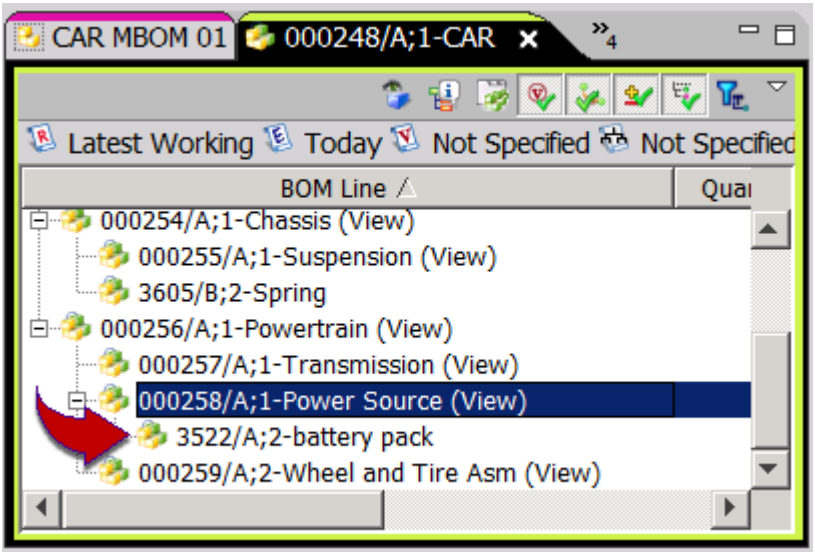
- To resolve one node of the MBOM template, select the recipe in the **BOM Recipes** view and click **Resolve BOM Recipe**.

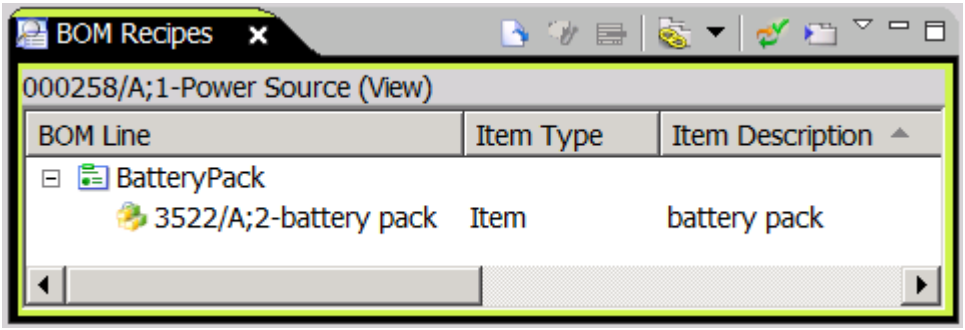
- To resolve multiple nodes of the MBOM template, select a node in the MBOM template and choose **Tools→Resolve BOM Recipe**.

8. In the **Resolve BOM Recipe** dialog box, select whether to remove the previously assigned parts and click **OK**. If you open the dialog box from the **Tools** menu, you can choose to resolve all nodes underneath the selected node by selecting **Resolve recipe recursively**.

   Teamcenter adds the parts from the EBOM that fulfill the search criteria to the MBOM.



   Additionally, the resolved parts are listed under the recipe in the **BOM Recipes** view.



You cannot directly copy a BOM recipe. You can, however, select a recipe in the **BOM Recipes** view, and then select a different node in the MBOM. The search criteria are still visible in the **BOM Recipe Details** view where you can save them as a new recipe on a different MBOM node.

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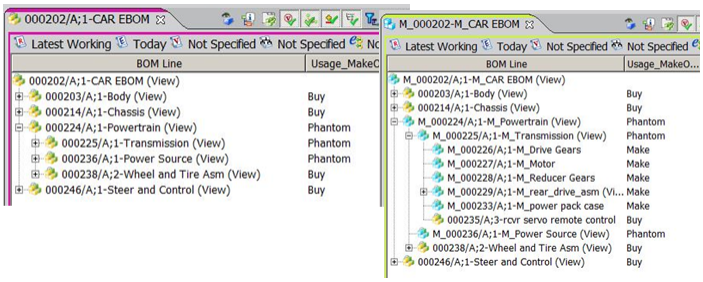
Creating an MBOM using the me_create_mbom utility

The **me_create_mbom** utility creates an MBOM based on a specific EBOM, but replaces *make* parts or phantom levels in the EBOM with manufacturing-specific parts and directly copies over *buy* parts.



Except in specific cases (see preferences below), do not use this utility to update the MBOM. To update an MBOM, use an accountability check or an advanced accountability check.

You can create a manufacturing bill of materials (MBOM) from an engineering bill of materials (EBOM) automatically using the **me_create_mbom** utility. This utility creates a new MBOM root node, and then either:

- Copies over engineering parts that are designated as **Buy** or **Phantom**.
- Replaces the parts designated as **Make** with new manufacturing parts containing the same in-context ID (IDIC) as the engineering part for future comparison.

Example:

```
me_create_mbom -u=kj -p=kj -g=Engineering
-key="item_id=000159,object_type=Item" -revrule="Latest Working"
-mrevrule="Latest Working" -log=D:\workdir\create3.csv -usemfk
```

Caution:

Log off any interactive session that uses the same structures as the structures you update with the utility before you use the utility to avoid failures due to locking of objects in that user session.

The utility is affected by the values of these preferences:

- **MEMBOM_Mirror_MakeRules**

  This preference specifies a BOM Line property, such as **bl_item_object_type**, and property value pair that serve as input for the decision as to whether to create a manufacturing-specific part.

  There are two ways to view defined BOM Line property names:

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1. In the BMIDE, you can check the properties defined for the object BOM Line.

2. In Structure Manager, if you right-click on the column title line and choose Insert Column(s)..., you get a list of the defined BOM Line properties.

> Note:
>
> This preference accepts only a string value.
>
> If you require a boolean or other attribute, you should write your own Business Modeler Framework extension to control a make or buy decision.

Preference syntax

KEY:<BOMLinePropertyInternalName>,VALUE:<PropertyValue>,ACTION:<ActionValue>

- <BOMLinePropertyInternalName> is the property on which the value criterion will apply (e.g. "GCS CP").

- <PropertyValue> is the value used by the criterion.

- <ActionValue> is the action to undertake on the BOM node.

  Valid values are **PartLink** (links a Design node to Part node) and **PartAssign** (links and assigns a Design node Under a Part node).

  > Note:
  >
  > ACTION is only meant for Design/Part like structures. If more than one value for a given property can determine the action, the operator OR ('|') can be used as follows: "KEY:<BOMLinePropertyInternalName>,VALUE:<PropertyValue1>,ACTION:<ActionValue1>|VALUE:<PropertyValue2>,ACTION:< ActionValue2>" (e.g. "KEY:GCS CP,VALUE:Make|VALUE:MakePart,ACTION:PartAssign|VALUE:MakeLink,ACTION:PartLink"). If there is no preference value, the item is shared between Engineering BOM (EBOM) and Manufacturing BOM (MBOM) structures.

A common criteria may be, for example, whether you make or buy a part. Any parts designated as **Make** or **Phantom** (for organizational purposes) in the EBOM are replaced by manufacturing-specific parts in the MBOM. In this case, the value of this preference may look like this:

```
KEY:Usage_MakeOrPurchase,VALUE:Make|VALUE:Phantom
```

You can use a custom property in this preference. If you do not assign any value, the utility carries over the parts from the EBOM directly.

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> Note:
>
> You should write your own Business Modeler Framework extension to control a make or buy decision.

- **MEMBOM_Mirror_TypePrefixSuffix**

  This preference specifies the item type for the new manufacturing-specific item and any prefix or suffix to add to the item ID of the part in the EBOM that is being replaced by a new part in the MBOM. If you use custom manufacturing business object types, you can add this type to the value of this preference.

  The default value of `-usemfk` is false. If true, and only the object type is present in **MEMBOM_Mirror_TypePrefixSuffix**, use that type and the ebom item id for MFK value. If you set the command line option `-usemfk` to `true` and specify *only* the item type, you can enter multifield keys.

  If your company uses naming rules for new items, you must ensure that the prefix that you assign in this preference corresponds to the naming rules for the manufacturing item. Alternatively, you can remove all naming rules for manufacturing items. A conflict with item naming rules leads to this error message:

```
ERROR on line:250 creating mbom
     74006: Valid  pattern is aannnnnn. creating mbom
     74007: Supplied item_id value "M_qp130410" is invalid. creating mbom
      7007: Invalid Tag  - the requested object does not exist creating mbom
```

- **MEMBOM_Mirror_ReplaceMakeOnChange**

  This preference specifies the behavior when, after creation of an MBOM, you change a make/buy property value from **Make** to **Buy**. At update, by default, Teamcenter simply appends the buy part to the existing structure without removing the make part already in the MBOM. If you set this preference to **TRUE**, at update, Teamcenter replaces the make part in the MBOM with the buy part from the EBOM, avoiding duplication of parts.

- **MEMBOM_Mirror_RemoveLineWithIDIC**

  This preference is applicable to updating an MBOM with the utility. It specifies that if the in-context ID (IDIC) of a line in the MBOM is not found in the EBOM, or if a line in the MBOM has no IDIC, it is not removed at update if it is already stamped with an IDIC.

- **MEMBOM_Mirror_IDICOnChildren**

  This preference determines whether the IDIC is retained on a make part in the MBOM when updating it using the utility after changing a make part to a buy part in the EBOM. When updating, if the **MEMBOM_Mirror_ReplaceMakeOnChange** preference is set to **FALSE**, both the original make part

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and the buy part exist in the MBOM after updating. This causes the accountability check to display multiple matches. Removing the IDIC on the make part ensures that there is only one match in an accountability check. If the **MEMBOM_Mirror_ReplaceMakeOnChange** preference is set to **TRUE**, the make line is replaced with the buy line from the EBOM so this preference is irrelevant.

- **MEMBOM_Mirror_IgnoreRules**

  This preference uses the keyword **ACTION** to skip an EBOM node or to traverse below an EBOM node while ignoring that EBOM node. The children of the traversed EBOM node become the children of the corresponding MBOM parent.

- **MEMBOM_Mirror_AlignProperties**

  This preference controls which properties and attachments are copied from the EBOM to the MBOM by enabling the alignment of properties on **Make** items and revisions. The **Make** nodes are of different types than the original EBOM nodes.

The following examples of running the utility demonstrate its use and the differences in output caused by changing the utility arguments. The initial values of the preferences are as follows.

```
MEMBOM_MakeRules=KEY:Usage_Product,VALUE:Make|VALUE:Phantom

MEMBOM_RemoveLineWithIDIC=FALSE

MEMBOM_TypePrefixSuffix=Company,,
```

> Note:
>
> No prefix is used in this course due to the naming rule conflict.

Creating an MBOM

For the following EBOM:

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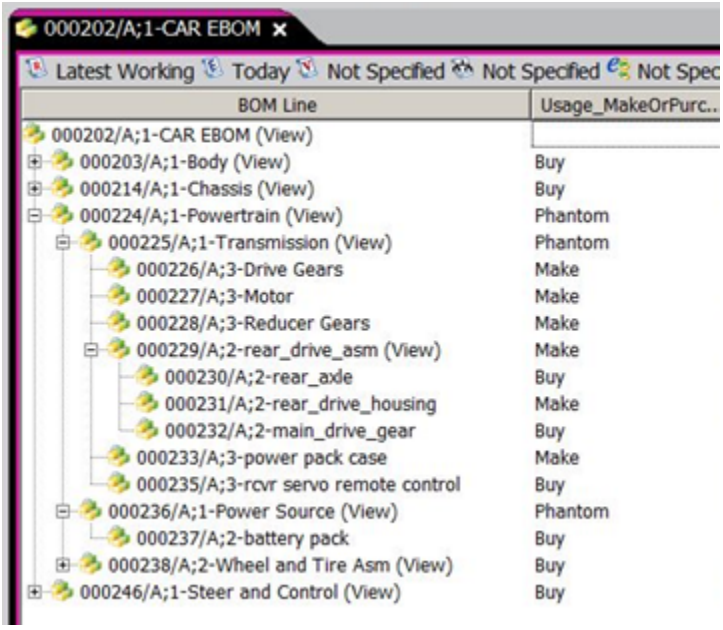
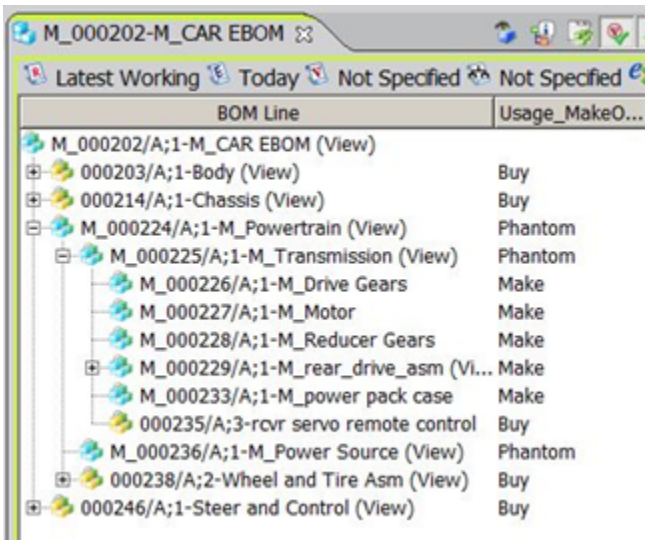


Run the utility:

```
me_create_mbom -u=user-name -p=password -g=group -ebomroot=000202
-revrule="Latest Working" -mrevrule="Latest Working"
```

Produces the following MBOM:



Note the following:

- The top-level node is replaced with a manufacturing-specific part.
- The make and phantom parts are replaced with new manufacturing-specific parts.

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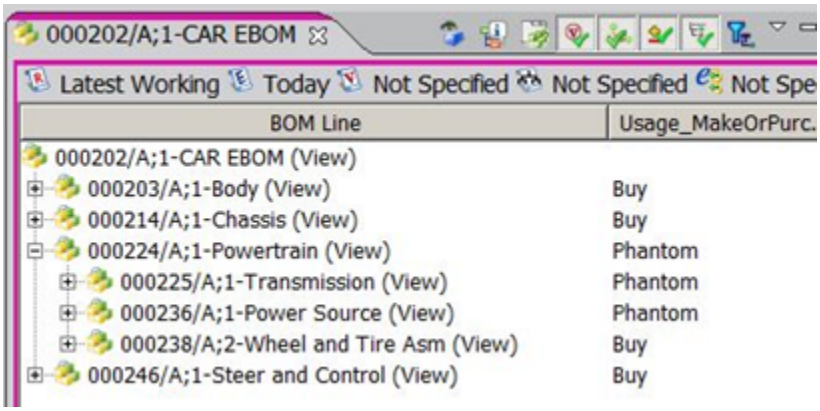
- The buy parts of the EBOM are directly copied over to the MBOM.
- An IDIC is generated for all parts except for those below a buy part.
- The in-context ID (IDIC) of the new parts is the same as the original part in the EBOM. This is true if the IDIC is already present in the EBOM part.
- When you right-click the top node of the EBOM or MBOM and choose **Link/Associate→Link Structures**, you can see that the utility has linked the two structures.

Creating the MBOM to a specific level

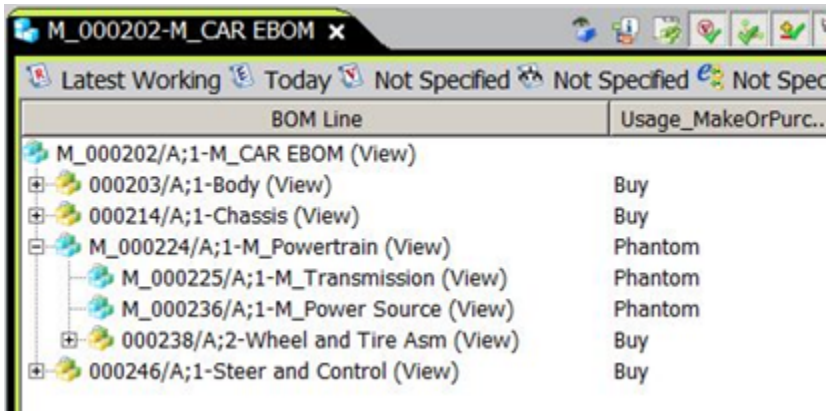
For the following EBOM:



Run the utility:

```
me_create_mbom -u=user-name -p=password -g=group -ebomroot=000202
-revrule="Latest Working" -mrevrule="Latest Working" -depth=2
```

Produces the following MBOM:



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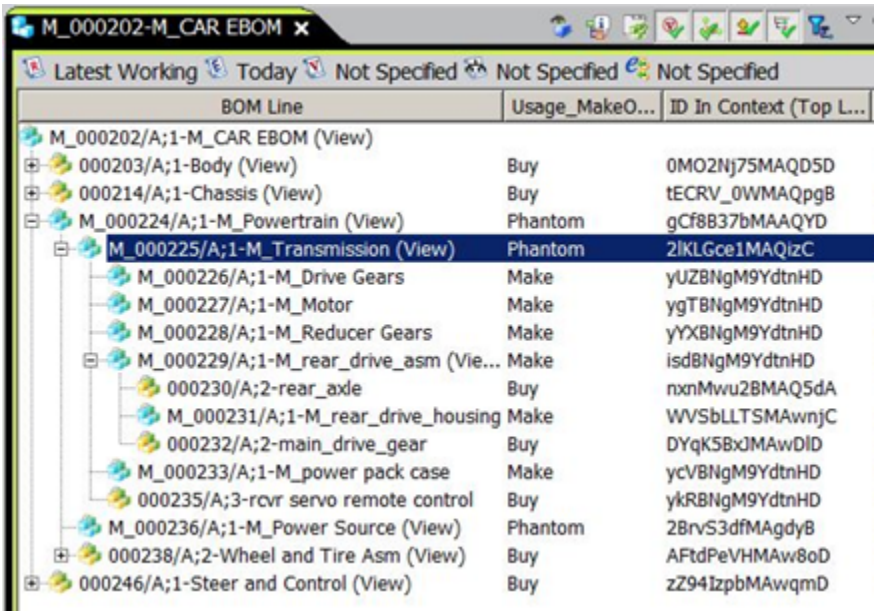
Note that the new MBOM contains only two levels of structure. The remaining levels in the EBOM are ignored.

Updating the MBOM from a specific line

You now update the MBOM above, but only for the M_000225 line and down, requiring the following utility command:

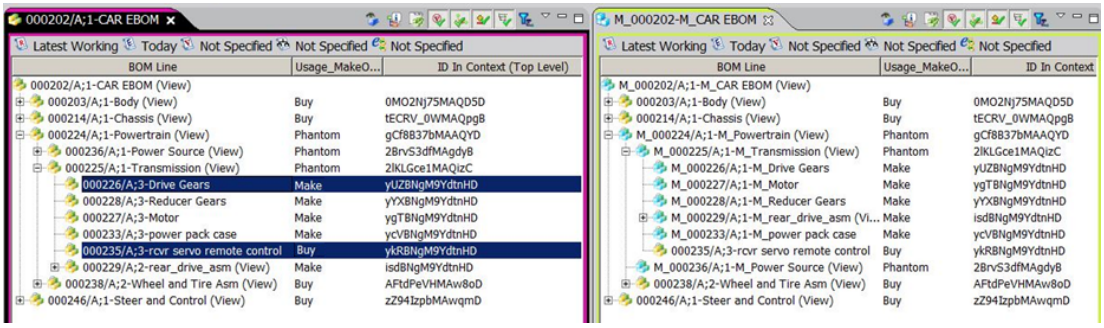
```
me_create_mbom -u=your-user-name -p=your-password -g=your-group
-ebomroot=000202 -scopeid=000225 -revrule="Latest Working"
-mbomroot=M_000202 -mrevrule="Latest Working"
```

The utility creates the following MBOM:



Changing Make to Buy and Buy to Make in the EBOM

For the following EBOM and MBOM:



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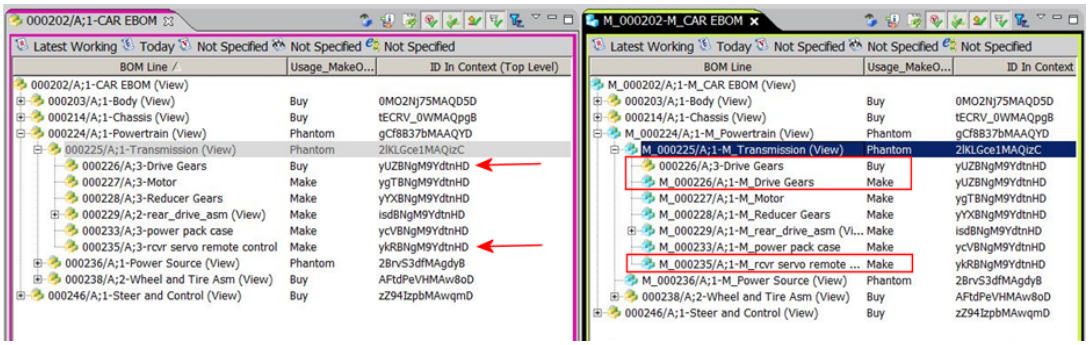
You change the **Make** value to **Buy** for the drive gears and change the **Buy** value to **Make** for the rcvr remote control in the EBOM and run the utility as follows:

```
me_create_mbom -u=user-name -p=password -g=group -ebomroot=000202
-scopeid=000225 -revrule="Latest Working" -mbomroot=M_000202
-mrevrule="Latest Working" -update
```

The results are as follows:



When the rcvr remote control part is changed from a **Buy** to a **Make**, the utility replaces the buy part in the MBOM during update. Buy to make behavior is not affected by preference settings. For the make to buy change (the drive gears), the behavior depends on two preferences:

- The **MEMBOM_Mirror_ReplaceMakeOnChange** preference is set to **FALSE**. The make part is not removed from the MBOM. The buy part is added to the structure.

  The IDIC values on the make part are determined by the **MEMBOM_Mirror_IDICOnChildren** preference.

  - If **MEMBOM_Mirror_IDICOnChildren** is set to **FALSE** (or does not exist), the IDIC on the make part in the MBOM is retained. Performing an accountability check between the EBOM and MBOM results in multiple matches as the MBOM contains both a make and a buy part with the same IDIC.

  - If **MEMBOM_Mirror_IDICOnChildren** is set to **TRUE**, the IDIC on the make part in the MBOM is deleted and an accountability check displays the make part as missing in source.

    > Caution:
    >
    > You must exercise caution when removing an IDIC on any part. This can cause problems in other areas, for example, if the part is consumed in an process structure, you lose the link to that line.

- The **MEMBOM_Mirror_ReplaceMakeOnChange** preference is set to **TRUE**.

  The buy part (drive gears) replaces the make part. The result of the MBOM after update is as follows:

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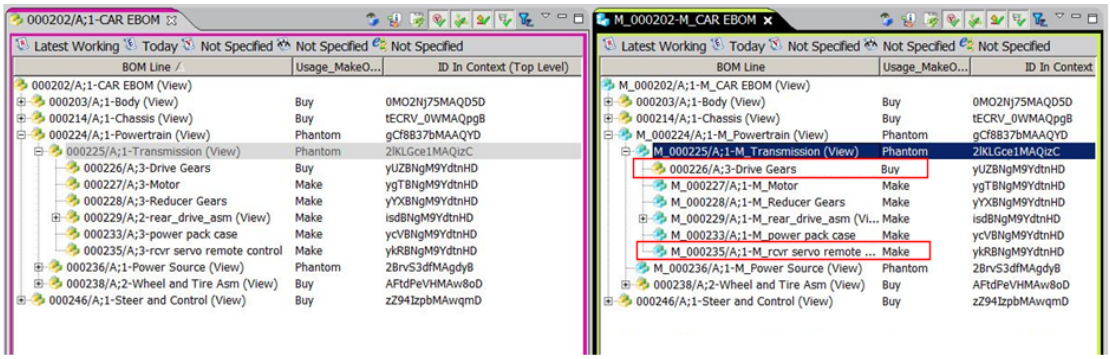


In summary, the behavior of the preferences is as follows:

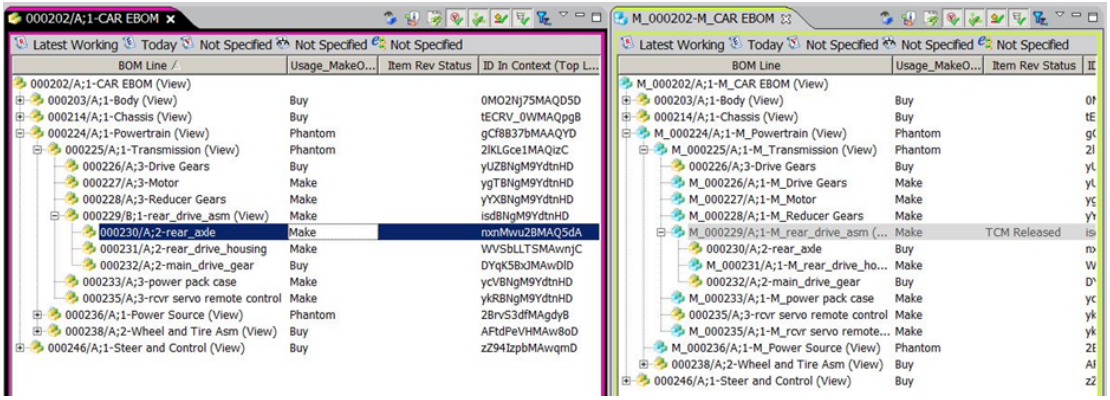
MEMBOM_Mirror_ReplaceMakeOnChange **MEMBOM_Mirror_IDICOnChildren**	**FALSE** **TRUE**	The buy part is added to MBOM and the previous make part is kept in the structure but its IDIC is removed.

MEMBOM_Mirror_ReplaceMakeOnChange **MEMBOM_Mirror_IDICOnChildren**	**FALSE** **FALSE**	The buy part is added to MBOM and the previous make part is kept in the structure but its IDIC is *not* removed.

MEMBOM_Mirror_ReplaceMakeOnChange **MEMBOM_Mirror_IDICOnChildren**	**TRUE** **TRUE/FALSE**	The buy part is added to MBOM and the previous make part is *removed* in the structure, irrespective of the value of **MEMBOM_Mirror_IDICOnChildren**.

Updating a released node in the MBOM

In the following EBOM and MBOM, **M_000229/A;1–M_rear_drive_asm** is released and then the make/buy property on its child, **000230/A;2–rear_axle**, is changed from **Buy** to **Make**.



You revise the MBOM part so you have write access and run the update utility.

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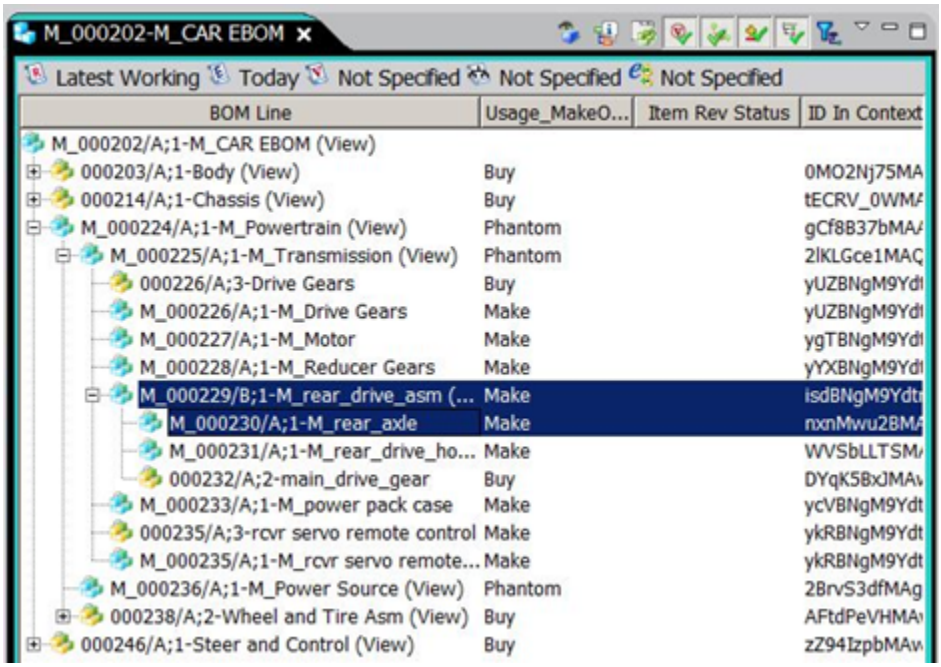
You run the utility with the **-actiononrelease** argument set to **2**.

```
me_create_mbom -u=your-user-name -p=your-password -g=your-group
-ebomroot=000202 -scopeid=000225 -revrule="Latest Working"
-mbomroot=M_000202 -mrevrule="Latest Working" -actiononrelease=2 -update
```

The results are as follows:



The utility revises the part and replaces the old revision with the new one.

Changing properties in the EBOM

To detect property changes in the EBOM, run an accountability check between the EBOM and MBOM. You can propagate any property differences using the accountability check mechanism.

Attachments

Attachments are always synchronized as the attachment is created as a reference on the new make part. Any changes to the attachments on the EBOM side are automatically reflected in the MBOM. If you add a new attachment to the EBOM, you must run the update to see it in the MBOM part.

Managing reused assemblies in an MBOM

What is a reused assembly?

Manufacturing needs are often different from design needs, and the engineering design is created in a CAD package that sometimes cannot be changed by manufacturing personnel. Manufacturing engineers

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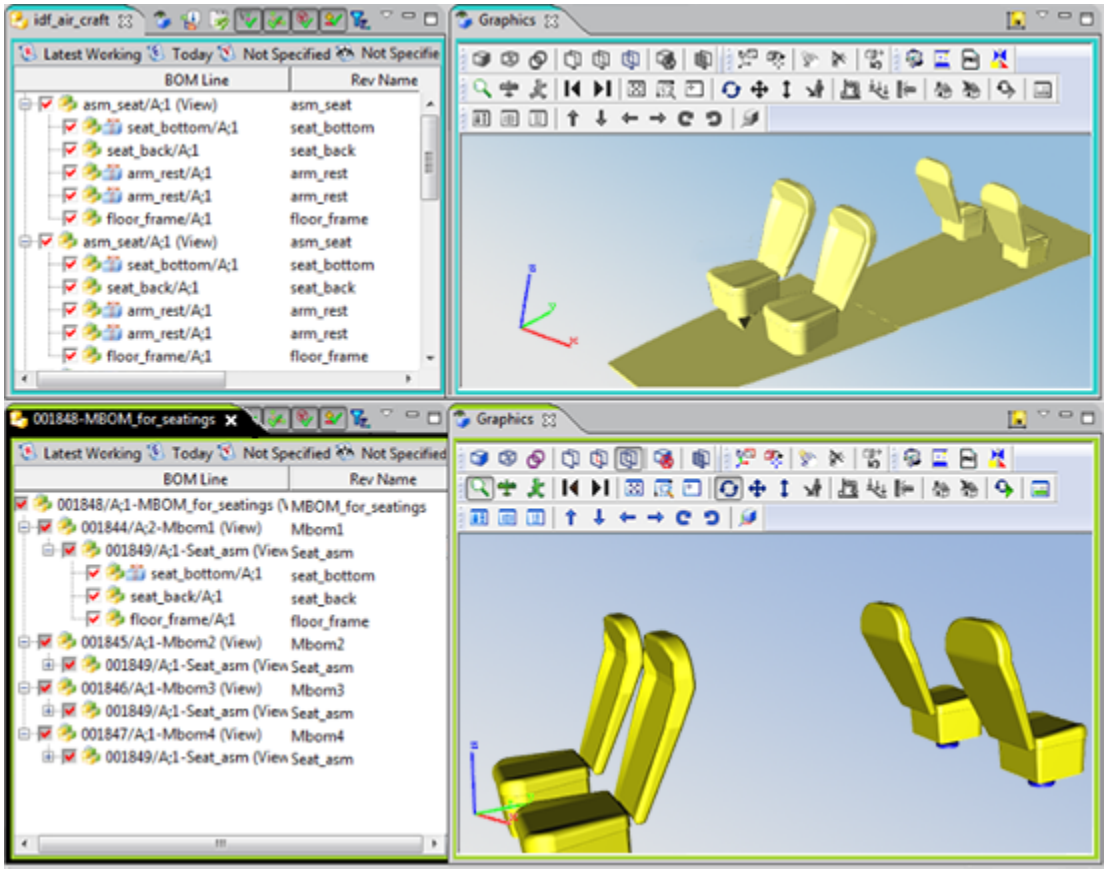
often need to create a manufacturing subassembly in an MBOM from parts in an EBOM. They then need to align the assigned parts in the MBOM with those in the EBOM.



If parts are added to the EBOM that are reused multiple times in the MBOM, such as chair parts in this example, you can update the MBOM by copying those parts to a single reusable assembly. If the same sets of parts in the reusable assembly exist in the EBOM multiple times and are located and oriented in a repeated pattern relative to each other, you can create a reusable assembly from those parts in the MBOM. You can then search the EBOM for other collections of the same parts and patterns and add the same assembly to the MBOM for each collection. Those parts share the same item ID or part number, thereby reducing your inventory and the complexity of your manufacturing process. The reused assemblies are automatically aligned with the EBOM and transformed in the graphical view.

Note:

- If the reusable parts all exist at the same location (for example, 0,0,0), they are ignored.
- Welds, mirrored transforms, and scaled transforms are not supported.
- Patterns in which the same part could exist in multiple assemblies—such as a line of five parts that are ten inches apart and a subassembly that contains two parts ten inches apart—are not supported. All possible combinations that match the reusable assembly's pattern are returned in the search.

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- Parts in the EBOM that are configured out using variants, effectivity, and other overrides are still considered when you create a reusable assembly.
- If you have a second EBOM with parts copied from an original EBOM, they share the same in-context IDs (IDICs). If you set the second EBOM as the scope to be used in an MBOM assembly reused from the original EBOM, Teamcenter will searches and returns found parts in a collection from the second EBOM.

Create a reusable assembly

To reuse an assembly in an MBOM, you must first create a reusable assembly from parts collected from the EBOM.

1. In the EBOM, locate a collection of parts that occurs multiple times and in multiple locations in the product design.

2. In the MBOM, create an assembly item, including phantom nodes and other items as needed.

3. In the EBOM, select the parts to be used in the reusable assembly, and in the MBOM, paste them to the assembly item.

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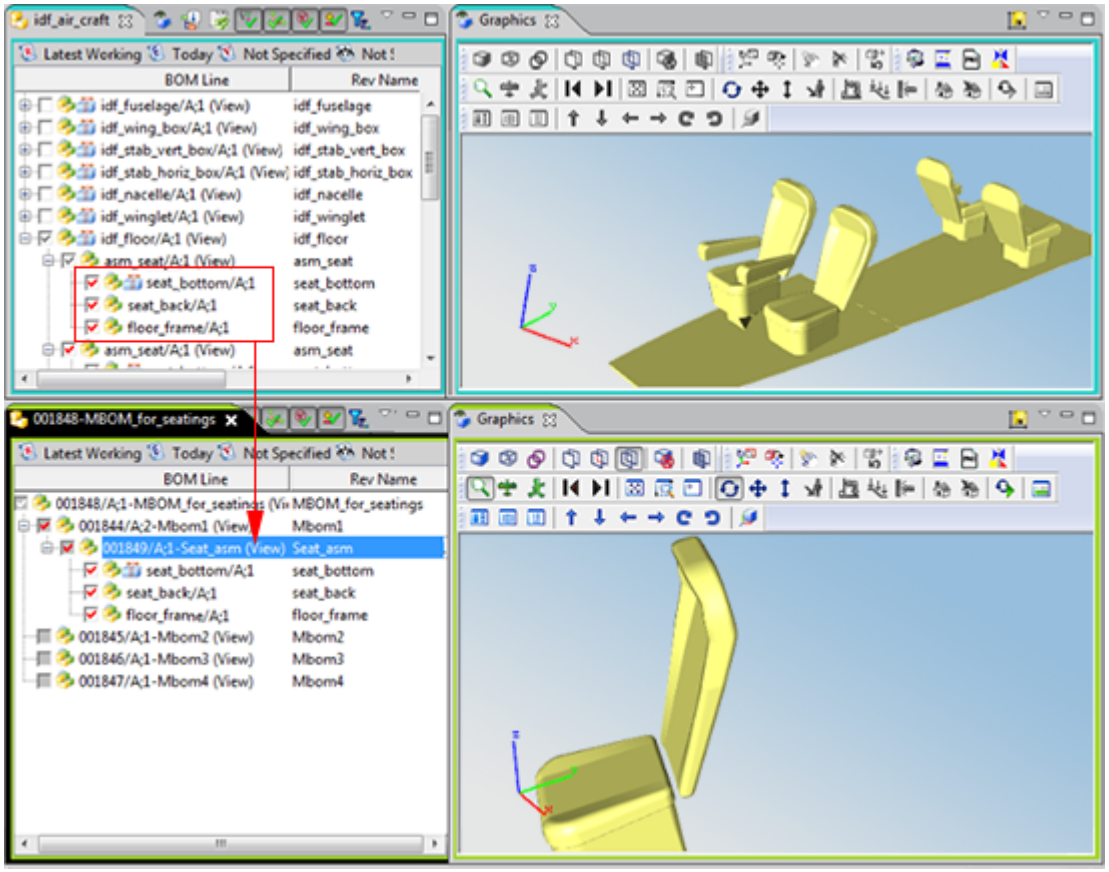

4. Right-click the reusable assembly, choose **Insert Column**, and add the **Reuse Assembly** column to the MBOM view.

> Note:
>
> You can also add this column by right-clicking a BOM line, choosing **Edit Properties**, and selecting the **Reuse Assembly** ☑ check box.

5. In the **Reuse Assembly** column, in the top line of the reusable assembly, type **1**.

The assembly is ready to be reused in your MBOM.

Reuse an assembly

Once you create a reusable assembly in your MBOM, you can search for identical collections in your EBOM and reuse the assembly so that it is automatically aligned and transformed with the EBOM.

> Note:
>
> If you want to search for a single part in your EBOM, you can set the **ME_reuse_override_immediate_context** preference to automatically search from the top line

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in the EBOM. You must also set the **ME_reuse_use_absxform_id_for_multiple_align** preference to a value of **1**. The single part is the CAD-Part alignment case for standard parts that are repeated many times (for example, nuts and bolts).

1. In the MBOM, select the top line of the reusable assembly and choose **Tools→Manufacturing Alignment→Reuse Assembly**.

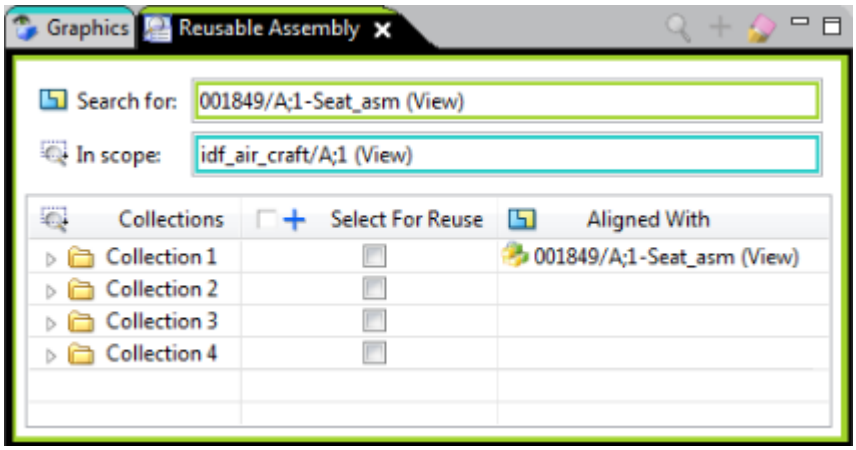
   In the **Reuse Assembly** dialog box, in the **Search for** text box, the reusable assembly parent name is displayed.

2. In the EBOM, select a structure at a level high enough to contain collections of parts identical to those in your reusable assembly and click .

   In the **Reuse Assembly** dialog box, the selected structure is displayed in the **In scope** text box.

3. Click **Search**.

   The **Reusable Assembly** view is displayed, showing collections of parts that match those in your reusable assembly but have specific locations and orientations relative to each other. In the **Aligned With** column, the line where you created your reusable assembly in the MBOM is shown to be aligned. The remaining collections represent opportunities for reuse.



Note:

If no match is found because a part does not have an in-context ID (ICID), you can use the **ME_reuse_use_absxform_id_for_multiple_align** preference to search for patterns and automatically align parts.

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> Warning:
>
> The search results are not updated if you modify or reconfigure the EBOM or MBOM structure while working in the **Reusable Assembly** view. If you do so, rerun the search to ensure the search results are consistent with the current data.

4. In the **Select For Reuse** column, do one of the following.

   - To select individual collections for reuse, select the check boxes for those collections.
   - To select all collections, click the **Select For Reuse** header.

   > Note:
   >
   > The check box icon in the header does not change.

   > Tip:
   >
   > To clear all collections, click the header again.

5. On the **Reusable Assembly** toolbar, click .

6. In the MBOM, select the parent under which you want the selected collections to be created, and in the **Reusable Assembly** dialog box, click .

7. Click **Create**.

   The reused assembly nodes are added to the MBOM. In the **Reusable Assembly** view, the check boxes you selected are cleared to indicate that the reuse is successful. The **Aligned With** column is updated to show which collections are now aligned. If the collections have packed lines or were aligned multiple times, quantities are reported (for example, **x 3**).

   > Note:
   >
   > The precision of transform comparisons can be modified using the **ME_reuse_assm_xform_precision** preference.

8. (Optional) Add the same or different collections to other assemblies in the same MBOM structure.

   After you complete creating your reused assemblies, they should look identical in the MBOM and EBOM **Graphics** views.

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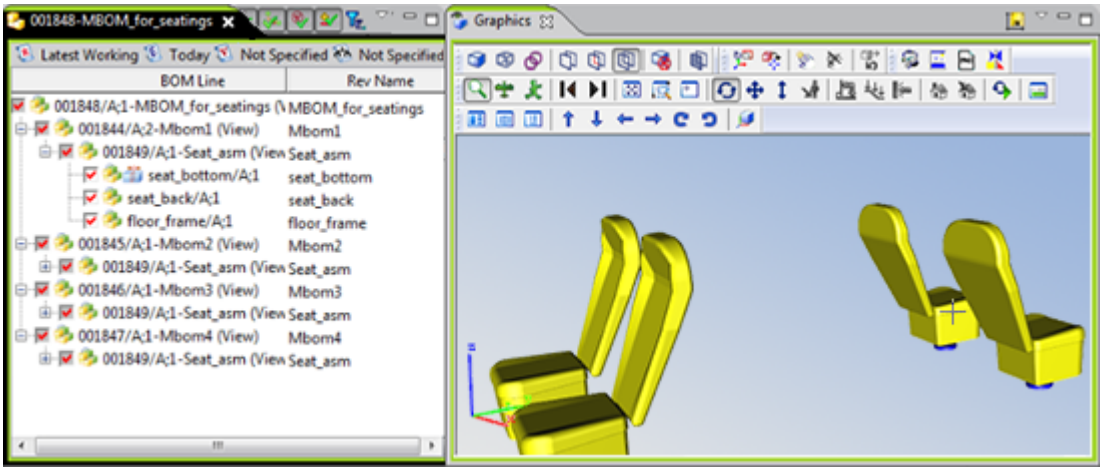

9. (Optional) Run an advanced accountability check to verify that the reused components are correctly mapped to the EBOM.

Add and align parts in a reused assembly

In cases where changes are made to parts in the EBOM (for example, one or more arm rests of a chair assembly have moved, the chair itself and therefore all of its parts have moved, more than one chair location needs to be adjusted, or parts are added), you must realign the assembly with the EBOM to ensure that all reused assemblies in the MBOM reflect those changes. You can add new parts to and align moved parts in a single reuse instance or to all instances in your MBOM.

1. If the EBOM and MBOM are not already linked, link them using the **Link Associate→Link Structures** command.

2. (Optional) If you are viewing unconfigured structures, turn them off so that you have 100% BOMs by deselecting the *show unconfigured* toggles.

While you can run the alignment without fully configuring the structures, not all lines may be aligned.

3. In the EBOM, copy any parts to be added, and in the MBOM, paste the parts to any appropriate reused structure.

4. In the EBOM and MBOM, select the structures to be aligned and choose **Tools→Manufacturing Alignment→Align Reused Assemblies**.

   The **Line to be aligned** and **Line to align with** boxes should match.

5. If it is not already selected, from the **Reused assembly** list, select the reused assembly.

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6. Do one of the following.

   - To align only the reused assembly selected in step 4, rather than all reused assemblies (default), select **Align reused assembly**.

   - To align all reused assemblies, select **Align all reused assemblies**.

7. To align all properties in the **MEAlignedPropertiesList** site preference, select the **Align properties** ☑ check box.

8. Click **Align**.

The parts and reusable assembly are aligned as you specified.

In-context authoring

Cloning, copying, and replacing in-context assemblies

When you edit an assembly in context, you can modify occurrence properties of the lines beneath the top selected line in the context of that line only. No matter how many places the in-context lines occur under other top structures, the changes will only affect this line. For more information on in-context editing, see *Performing in-context editing*.

If you have an assembly with in-context edits that is almost identical to another required assembly—for example, you have a parent with a specific occurrence effectivity and you need to create a new parent with different effectivity—you can save time by using one assembly as a template for another. In MBOM **Product** or **Workarea** views, you can:

- Use the **Clone Assembly in Context** to split an MBOM structure into two structures by cloning it within the same MBOM. You can also copy, reference, or exclude attachments from the structure being cloned and change the occurrence effectivities of both the items being cloned and the cloned structure.

- Copy an assembly with in-context edits and paste it elsewhere in the same MBOM using the **Paste Assembly in Context** command. This command creates a new absolute occurrence of the assembly while retaining in-context edits and attachments. Standard Teamcenter copy and paste commands do not retain any edits made in the assembly in the context of the parent lines above the line you are copying and pasting, so without this capability, you would have to remake these missing in-context edits.

To define different item types for different manufacturing nodes or simply change the item type of a manufacturing node because your manufacturing plan has changed, use the **Replace Assembly with Any Item Type** command. This command replaces the top item of an assembly with an item of a different item type and retains the original item's in-context edits. Using this command, you can also copy, reference, or exclude attachments from the original item.

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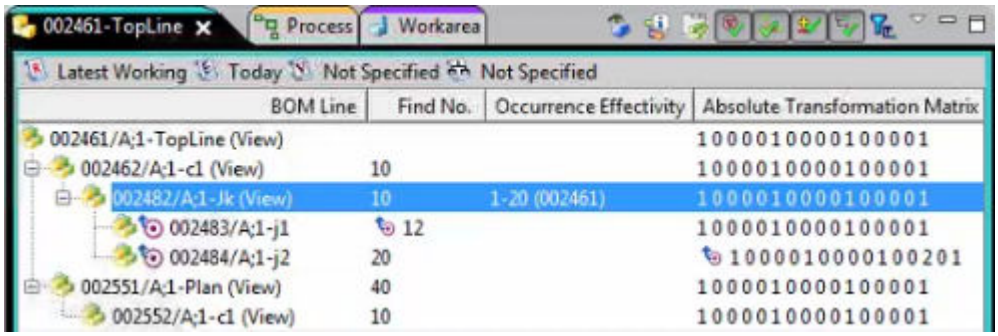
Clone an in-context assembly

You can clone an assembly with in-context edits from a line in an MBOM to a different line in the same MBOM. This command:

- Retains all in-context edits in the cloned assembly.
- Lets you copy, reference, or exclude in-context attachments from the structure being cloned.
- Optionally splits occurrence effectivity dates or ranges between the assembly being cloned and the cloned assembly.

> Note:
> - Existing BOM lines are not changed, only direct attachments that are on new items that are cloned. This command can also control in-context attachments in the cloned structure.
> - Cloning rules are defined by your administrator using the **MECopyAssemblyInContextTemplates** preference. This preference points to the **Item.Item.CopyAssemblyInContext** preference, which lists the cloning rules for the case in which the source is the first item and the target is the second item. By default, all items are cloned. Your results may not follow the same rules as those in this example.

1. If you are editing in context, hide in-context editing mode.
2. In the MBOM **Product** or **Workarea** view, select the line to be cloned.



3. Choose **Edit→In Context→Clone Assembly in Context**.

   In the **Clone Assembly In Context** dialog box, the selected line is displayed in the **Copy Of** box.

4. In the same MBOM, select the equivalent line to which you want to clone the assembly, and next to the **Paste To** box, click .
5. Click **Next**.

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6. (Optional) In the **Assign information** section, in the **ID** box, type an ID or click **Assign**, and optionally, in the **Name** box, type a name for the cloned assembly.

   If you do not type a name, the assembly inherits the name of the structure you selected in step 2.

7. Click **Next**.

8. For each attached object, in the **Define Attached Objects** section, from the **Copy Option** column, select how the attachments should be handled.

   - **Copy Reference** creates a reference to the object attached to the structure that you are cloning.
   - **Copy Object** copies the object to the cloned structure.
   - **No Copy** creates neither a reference or copy of the object in the cloned structure.

9. Click **Next**.

10. (Optional) In the **Related Objects Information** section, expand the related structure items being cloned, type or assign new item revision IDs or related object names, and modify any user data as needed.

    If you do not change the revision IDs, they are automatically assigned. If you do not change the related object names, they retain the names of the structures being cloned.

11. Click **Next**.

12. (Optional) In the **Occurrence Effectivity Cutback** section, set occurrence effectivity.

    a. To set a new effectivity for:

       - The structure being cloned, click next to the original assembly.
       - The cloned assembly, click next to the cloned assembly.

    b. In the **Occurrence Effectivity** dialog box, define the appropriate effectivity for the structure being cloned or the cloned assembly.

13. Click **Finish**.

The assembly is cloned with all in-context edits intact.

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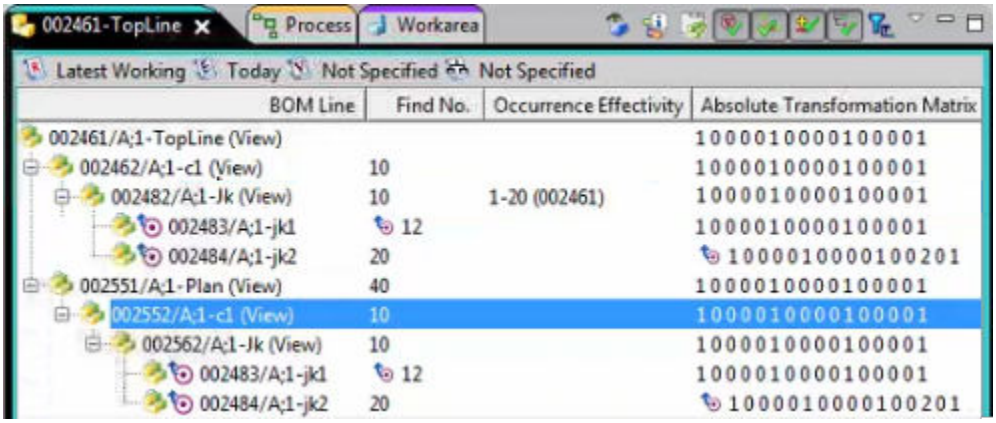

Copy and paste an in-context assembly

You can copy an assembly with in-context edits and paste it elsewhere in the same MBOM. This command creates a new absolute occurrence of the assembly while retaining in-context edits and attachments.

> Note:
>
> Cloning rules are defined by your administrator using the combined **MEDuplicateAssemblyInContextTemplates** and **Item.Item.DuplicateAssemblyInContext** preferences. Your rules may not match the rules in this example.

1. If you are editing in context, hide in-context editing mode.
2. In the MBOM **Product** or **Workarea** view, right-click the line to be copied and choose **Copy**.
3. In the same MBOM, right-click the equivalent line to which you want to paste the assembly.
4. Choose **Edit→In Context→Paste Assembly in Context**.

A new instance of the assembly is created with all in-context edits and attachments as specified in the cloning rules intact.

Replace an in-context line or assembly with a new item type

You can replace a manufacturing bill of materials (MBOM) or bill of equipment (BOE) line or assembly with a new item that has a new item type and retain the original line's or assembly's in-context edits. The procedure is similar to the **File→New** item command, but lets you retain in-context edits and also copy, reference, or exclude attachments from its original structure.

Since by default you cannot copy and paste items from the plant structure to the process structure as anything other than the type **item**, you can use the **Replace Assembly with Any Item Type** command to create a new item of a different item type and that type becomes the default paste option. For

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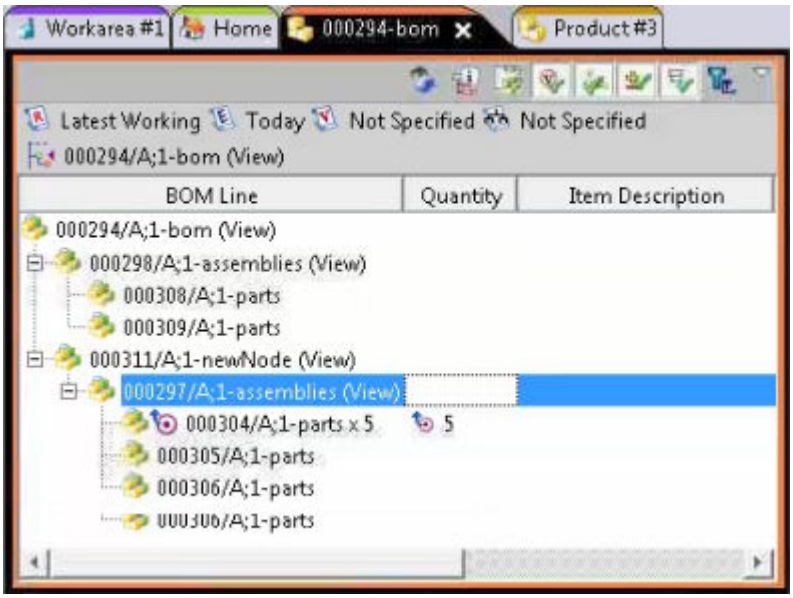
example, you could use the command to replace the item type as a resource (**MEResource** occurrence type) and the system lets you copy and paste items as resource by default.

> Note:
>
> Cloning rules are defined by your administrator using the combined **MEReplaceAssemblyInContextTemplates** and **Item.Item.ReplaceAssemblyInContext** preferences. Your rules may not match the rules in this example.

1. If you are editing in context, hide in-context editing mode.

2. In the MBOM or BOE **Product** or **Workarea** view, select the in-context line/assembly for which you want to change the item type.



3. Choose **Edit→In Context→Replace Assembly with Any Item Type**.

4. In the **New Item** dialog box, select the new item type and click **Next**.

5. In the **ID** and **Revision** boxes, type an ID and revision or click **Assign**.

6. In the **Name** box, type a name for the new item and click **Next**.

   Properties from the in-context line or assembly for which you want to change the item type, such as name, description, and unit of measure, are prepopulated. Your administrator can map common item and revision properties between item types, and define custom item types and properties, using the **MEReplaceAssemblyInContextAlignProperties** preference.

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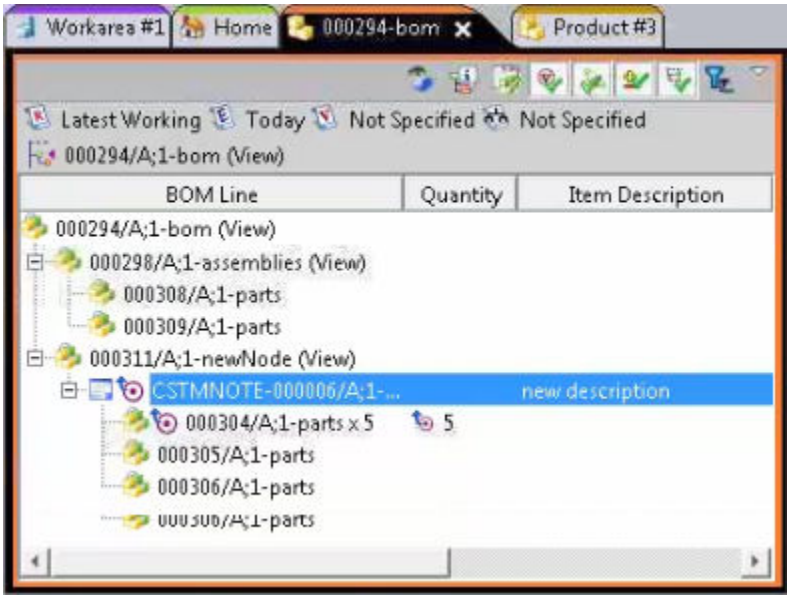
If you click **Next**, the remaining prompts are similar to those in any **New Item** dialog box. You may click **Finish** at any time to accept defaults. Some attributes are prepopulated with the attributes of the original in-context line/assembly. Clicking **Next** lets you modify the defaults.

7. Click **Finish**.

The selected line is replaced with the new item type, ID, revision, and name, with all in-context edits intact.

Now when you use the **Copy**, **Paste**, **Copy As**, or **Paste As** commands, the new item type is the default when you paste.



Using PMM data to generate an MBOM

PMM data flow in Manufacturing Process Planner

You can generate and update a BOM view revision (BVR) structure using the Product Master Management (PMM) solve recipe in Manufacturing Process Planner and then use the BVR structure to generate an MBOM in Manufacturing Process Planner. The solve is a tool to identify all the part usages for an order string that meet specified criteria and to present those usages as a single unit product master.

You must update the BVR if:

- The PMM scope or recipe is changed.
- A versionable property of a part, line of usage (LOU), or solution is changed.
- A nonversionable property of a part, LOU, or solution is changed.

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- A new LOU or solution is found in the query.

Define PMM scope

To begin creating a BOM view revision (BVR) from Product Master Management (PMM) data in Manufacturing Process Planner, you must define the scope of that BVR by locating the PMM data in Teamcenter. As part of your workflow, PMM data to be imported, such as partition or subassembly names, product type, vehicle line, model name or ID, and effective in and out dates, should be provided by Manufacturing Process Planner.

1. In Manufacturing Process Planner, create a new structure of the **Item** type.

2. Select the new structure and add one or more items of the **Item** type, naming each for the appropriate partitions it contains.

3. Right-click the top node in the structure and choose **PMM Scope→Create/Update PMM Scope**.

4. In the **Create or Update PMM Scope** dialog box, enter the required search criteria, select the appropriate package from the results, and click **Create**.

A new icon is displayed on the top line to indicate that a PMM scope object is created and is associated with the selected node.

Manually generate a BVR structure from PMM data

For each partition or subassembly, you can generate a BOM view revision (BVR) in Manufacturing Process Planner from Product Master Management (PMM) data.

1. If you have not already done so, define the PMM scope.

2. Right-click a partition or subassembly node and choose **PMM Recipe→Create/Update PMM Recipe**.

3. In the **Create or Update PMM Recipe** dialog box, enter the required search criteria, select the appropriate recipe from the results, and click **Create**.

A partition icon is displayed on the subassembly to indicate that a PMM recipe object is created and is associated with the selected node.

Update a PMM BVR from the command line

Using the Teamcenter command line utility, you can update a Manufacturing Process Planner BOM view revision (BVR) with Product Master Management (PMM) data.

1. Set the preference **PortalDesignContextSearchEnginePreference** value to **CachelessSearchEngineFactory**.

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2. For each partition or subassembly, open a Teamcenter command prompt and run the utility.

```
pmm_updps -u=<username> -p=<password> -g=<group> -item_id=<Top-nodes-
ItemID>
```

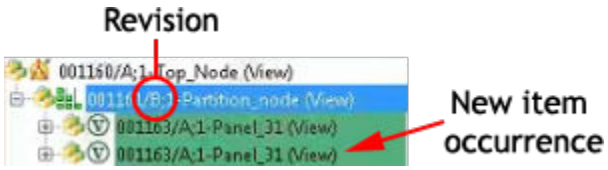
A solve query is sent to PMM, PMM performs a partial solve, and a BVR is generated for selected nodes. Information related to part, LOU, and solution is fetched. Associated designs are searched for in Teamcenter. If found, they are associated with the selected nodes.

Update a BVR structure with PMM changes

When you are informed through your workflow of changes made in Product Master Management (PMM) to a BOM view revision (BVR) previously generated in Manufacturing Process Planner from PMM data, you must refresh the BVR in Manufacturing Process Planner. The **Refresh from PMM** command uses the default "Any Status; No Working" revision value for configurator data. For information about customizing this revision value, see *Configuring and Customizing Product Master Management*.

- Select one or more subassembly nodes to be updated, right-click any selection, and choose **Refresh from PMM**.

  The Product Master Management information is updated for the selected part and changes to the key line of usage (LOU) attributes create a new revision. In the BVR, a new item occurrence is created with the new revision displayed on the node that you updated.



You or your administrator can set the preference **PMM_PS_UseExistingTcItems** to specify the property mapping between the Teamcenter item and PMM part.

- If the preference is not set, while querying the items from the Teamcenter database, if they do not exist, new items, item revisions (with revision effectivity applied), and corresponding forms (Part Form and Part Revision Form) are created in Teamcenter. These forms and the aligned design items are attached to these items. The newly created items are used for creating the BVR.

  Part, line of usage (LOU), solution, and solution group usage (SGU) customization is supported when this preference is not set.

- If the preference is set, while querying the items from the Teamcenter database, if they do no exist, the **Refresh from PMM** action or the command line utility displays an error. If the items exist, the **Refresh from PMM** action neither revises the items nor applies the revision effectivity to them. It also does not create the Part Revision Forms. It only creates the Part Forms and attaches them to the items. The items are then used for creating the BVR. The aligned design items are not attached to the existing Teamcenter items.

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Part customization is not supported when this preference is set.

Output that is displayed in Manufacturing Process Planner when there is an update to Product Master Management data includes the following.

Note:

A pink node revision represents a part version in PMM. Pink node revision effectivity is mapped to part version effectivity.

- In some cases, a part version in PMM is mapped to multiple pink nodes in the BVR because a part can have multiple design revisions. A usage of the part, or different usages of the same part, can be aligned to solutions which have different design revisions.

Pink node occurrence corresponds to usage/occurrence of a part with associated design—line of usage (LOU) + solution.

- Effectivity on a pink node occurrence is combined with effectivity of the part version, LOU version, solution group usage (SGU) version, and solution version.

If a PMM scope or recipe is changed, all the cases that follow may occur and the existing BVR is updated.

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Update	Details
Versionable property change on LOU	If the LOU is versioned, the occurrence effectivity of the previous occurrence is cut back and a new occurrence is added in the product structure for the new version of LOU with the overlapping effectivity dates mapped to its occurrence effectivity.
Versionable property change on part	A new revision of the existing item is created. The previous revision's revision effectivity dates are cut back and the new part's version effectivity dates are mapped with the new item's revision effectivity dates.
Versionable property change on solution	If a solution is versioned, the occurrence effectivity of the previous occurrence is cut back and a new occurrence is added in the product structure for the new version of the solution with the overlapping effectivity dates mapped to its occurrence effectivity.
Versionable property change on SGU	If the SGU is versioned, the occurrence effectivity of the previous occurrence is cut back and a new occurrence is added in the product structure for the new version of the SGU with the overlapping effectivity dates mapped to its occurrence effectivity.
Nonversionable property change on LOU	If there is a nonversionable update on the LOU, the existing occurrence effectivity is updated to the modified effectivity of the LOU (overlapping effectivity dates are mapped).
Nonversionable property change on part	If there is a nonversionable update on the part, the existing revision effectivity is updated to the modified effectivity of the part.
Nonversionable property change on solution	If there is a nonversionable update on the solution, the existing occurrence effectivity is updated to the modified effectivity of the solution (overlapping effectivity dates are mapped).
Nonversionable property change on SGU	If there is a nonversionable update on the SGU, the existing occurrence effectivity is updated to the modified effectivity of the SGU (overlapping effectivity dates are mapped).

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Quantity update on LOU	If quantity is updated and the LOU is versioned, the occurrence effectivity of the previous occurrence is cut back and a new occurrence is added in the product structure for the new version of the LOU with the overlapping effectivity dates mapped to its occurrence effectivity.
Position designator update on solution	If the position designator is updated and the solution is versioned, the occurrence effectivity of the previous occurrence is cut back and a new occurrence is added in the product structure for the new version of solution with the overlapping effectivity dates mapped to its occurrence effectivity.
Part update on LOU	If a part is updated and the LOU is versioned, the occurrence effectivity of the previous occurrence is cut back and a new occurrence is added in the product structure for the new version of LOU with the overlapping effectivity dates mapped to its occurrence effectivity.
Partition update on LOU	If a partition is updated and the LOU is versioned, the occurrence effectivity of the previous occurrence is cut back and a new occurrence is added in the product structure for the new version of the LOU with the overlapping effectivity dates mapped to its occurrence effectivity.
Expression update on LOU	If an expression is updated and the LOU is versioned, the occurrence effectivity of the previous occurrence is cut back and a new occurrence is added in the product structure for the new version of LOU with the overlapping effectivity dates mapped to its occurrence effectivity.
Expression update on solution	If an expression is updated and the solution is versioned, the occurrence effectivity of the previous occurrence is cut back and a new occurrence is added to the product structure for the new version of the solution with the overlapping effectivity dates mapped to its occurrence effectivity.
New LOU found in query for the same part	If a new LOU is found for the same part, it creates a new occurrence and sets an occurrence effectivity and variant condition.

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New solution found in query	If a new solution is found for the same part, it creates a new occurrence and will set occurrence effectivity and variant condition.
New part found in query	If a new part is found in the solve query, it creates a new item and item revision. It then creates a part form and relates it to an item. It then creates a part revision form and relates it with an item revision. Both forms can be seen using the relations.
Logically deleted LOU or discontinued LOU	If a LOU is logically deleted, its existing occurrence's effective in-and-out-dates are the same and the occurrence is configured out.
Reconfigured LOU or continued LOU	If a logically deleted or discontinued LOU is reconfigured in, its existing occurrence's effective in-and-out-date is modified accordingly and the occurrence is configured in for those dates.
Logically deleted solution	If a solution is logically deleted, its existing occurrence's effective in-and-out-date is the same and the occurrence is configured out.
Reconfigured solution	If a logically deleted or discontinued solution is reconfigured in, its existing occurrence's effective in-and-out-dates are modified accordingly and the occurrence is configured in for those dates.
Logically deleted parts	If a particular part's version is logically deleted, the revision effectivity of the corresponding item revision is modified. Because its effective in-and-out-date is identical, that particular revision of the item is configured out.
Reconfigured parts	If a particular part's version that was logically deleted is reconfigured, the revision effectivity of the corresponding item revision is modified and the particular revision of the item is configured in.
New design aligned to a solution	If a new design item is aligned to a particular revision of a solution, a new occurrence of the solution is added in the product structure and the new design item is attached to the existing item of the part that was consumed by the solution.

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New design item aligned to all solutions	If a new design item is aligned to a particular revision of a solution, a new occurrence of the solution is added in the product structure and the new design item is attached to the existing item of the part that was consumed by the solution.
Custom property mapping: LOUs and solutions	**Custom property mapping for LOUs and solutions**.
Custom property mapping for parts	**Set custom property mapping for parts**.

Custom property mapping for LOUs and solutions

The **Cba0PSCustomProperties** global constant maintains the mapping between PMM classes and attributes to the Teamcenter unified architecture platform BOM line properties and item revision properties. The latter is stored in the form **Cba0PartRevisionForm**. This constant, which is empty by default and is available for adding custom attribute mapping, lets you set item/item revision/item master form/item revision master form properties as per the mapping defined by end user.

The format of constant values is:

PMM-Class-Name.PMM-Class-Attribute-Name:Tc-Class-Name.TC-Property-Name

Example:

- *ULineOfUsage.STOCKDISPOSITION:Cba0PMMNoteType.StockDisp* sets the value of *Cba0PMMNoteType.StockDisp* to the value specified by *ULineOfUsage.LINEOFUSAGETUID*.
- *USolution.SOLUTIONID:Cba0PMMNoteType.solution_id* sets the value of *Cba0PMMNoteType.solution_id* to the value specified by *USolution.SOLUTIONID*.
- *UPartNumber.PARTBASE:Cba0PartRevisionForm.part_number* sets the value of *Cba0PartRevisionForm.part_number* to the value specified by *UPartMaster.PARTBASE*.

Cba0PMMNoteType stores customized note properties for lines of usage (LOUs) and solutions. You must map these properties in the global constant.

To store stock disposition on the note type **Cba0NoteType**, you must maintain this entry in the dictionary file.

Example:

- For LOUs, add the *ULineOfUsage.STOCKDISPOSITION* field name in the dictionary of *MFGIntegration_LineOfUsageInfo* line of usage.

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- For solutions, make an entry for the field in the **MFGIntegration_SolutionInfo** dictionary.

In the Business Modeler IDE, you can use the **Cba0PSCustomProperties** global constant to map custom attributes. By default, this constant is empty.

Add these default values:

- *ULineOfUsage.STOCKDISPOSITION:Cba0PMMNoteType.StockDisp*

  This sets the value of *Cba0PMMNoteType.StockDisp* to the value specified by *ULineOfUsage.STOCKDISPOSITION*.

- *USolution.SOLUTIONID:Cba0PMMNoteType.Solution_ID*

  This sets the value of *Cba0PMMNoteType.Solution_ID* to the value specified by *USolution.SOLUTIONID*.

- *UPartNumber.PARTBASE:Cba0PartRevisionForm.cba0part_number*

  This sets the value of *Cba0PartRevisionForm.cba0part_number* to the value specified by *UPartNumber.PARTBASE*.

Set custom property mapping for parts

Two business objects apply to customizing parts:

- **Cba0PartForm** is derived from the form business object that is attached to items with an item to part form relation.
- **Cba0PartRevisionForm** is derived from the form business object that is attached to item revisions to store the property with the relation item revision to part revision form.

Attribute name	Data type	Storage type	Description
cba0PartId	String	Persistent	Stores **PartId**received in PMM response

To store the part number received in the PMM response, add the attribute **cba0Part_Number** in the **cba0PartRevisionFormStorage** class. This stores the value of the part number from PMM to the **cba0Part_Number** attribute on the part form.

Enable the part number as follows:

1. Deploy the template from the Business Modeler IDE so that the database contains all the changes.
2. Launch the rich client and in Teamcenter, choose **Edit→Options**.

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3. On the **General** tab, add the preference **Item To Part Form Relation** and click **Apply**.

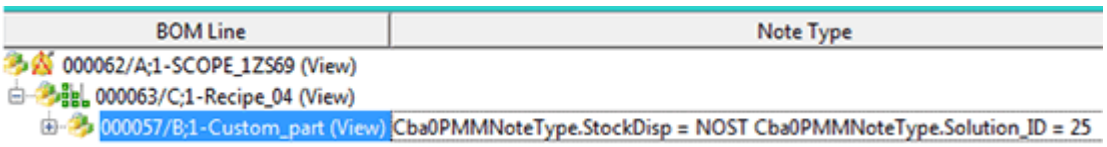
4. For item revisions, add the **Item Revision To Part Revision Form Relation** preference.

5. Create a BOM structure and send it to Manufacturing Process Planner.

6. Define scope on the top node and the recipe on the child node, right-click any selection, and choose **Refresh from PMM**.

7. Expand the scope and recipe nodes.

   The value for **StockDisposition** and **Solution ID** that comes as a response from PMM is set in the **Note Type** column.



8. Go to My Teamcenter, expand the item revisions, and open the part form.

   The part name response from PMM is assigned to the **Part Number** attribute (**cba0Part_Number**).

Managing features

About features

Teamcenter allows you to define design or manufacturing features that are not part of the physical structure imported into the manufacturing bill of materials (MBOM). Manufacturing Process Management supports several feature types, including weld points, arc welds, and datum points. Teamcenter adds Instances of these features to an MBOM structure when the structure is imported from NX.

- Point welding, also called spot welding, uses electric resistance to join pieces with no metal filler.
- Arc welding uses an electric arc to pass current through an electrode to heat and fuse metal, including filler rod metal.
- A datum point is a textual feature used to restrict the transitional and rotational mating surface movement of a part in a manufacturing operation, so that parts can be fused together accurately using the welds.

You can use the two following operation types to help you manage your features:

- **MEContinuousJoinOP**

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This operation is intended for use as an arc weld operation. You cannot assign datums or weld points to an **MEContinuousJoinOP** operation.

- **MEDiscreteJoinOP**

  This operation is intended for use as a weld operation. You cannot assign datums or arc welds to an **MEDiscreteJoinOP** operation.

Feature basics

Feature basics

Feature basics

You can **manage and distribute** features with the **Manufacturing Features** view. The key to body in white manufacturing rough planning workflows is the distribution of manufacturing features to work stations. With Manufacturing Process Planner, you can:

- **Create** features and **edit** feature attributes.
- **Automatically assign** manufacturing features to plant BOP areas, stations, lines, and other structures simultaneously, as well as to features via **processes and operations**.
- Connect features to parts **manually**.
- Automatically **connect features to parts** using the **Auto Feature Part Connector** dialog box.
- **Search** for assigned, broken, and unassigned features.
- **Reset the scope** of the **Manufacturing Features** view, **filter** the view data, and **modify** the view column display.

Manage features with the Manufacturing Features view

The **Manufacturing Features** view is a dockable view that shows all the manufacturing features under the current product scope in a table-like view. It helps you manage scattered manufacturing features in a product structure in an easy and systematic way. Because the features displayed in the **Manufacturing Features** view are BOM lines, you can use the shortcut menu to perform many tasks.

1. Right-click an item revision in the product structure and choose **Open with→Manufacturing Features** view from the shortcut menu.

   Teamcenter opens the **Manufacturing Features** view with the selected line in the product structure as the scope of the view. By default, Teamcenter displays all the features of the type chosen in the previous session below this selected line, including those contained in child parts. The configuration shown below the scope at the top of the view is the same as that of the product structure. If you change the product configuration, Teamcenter clears the **Manufacturing Features** view. You must then reset the scope.

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You can open multiple **Manufacturing Features** views.

> Note:
>
> The **Manufacturing Features** view does not show connected parts that are not expanded.

2. Choose the feature that you want to display from the list of features by clicking the **Select Manufacturing Feature Type** button at the top of the view.

   You can choose from:

   - **Arc Welds**
   - **Datum Points**
   - **Weld Points**

3. Do as many of the following as necessary.

Choose this from the shortcut menu	To
Copy	Assign a feature
Send to	Open a feature in a note

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Choose this from the shortcut menu	To
	her application.
Refresh	Refresh the component and the vie

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Choose this from the shortcut menu	To
Properties	View structure line properties.
Find in Source Views	Find the originating

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Choose this from the shortcut menu	To
Find in All Visible Views	Find the occurrence

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Choose this from the shortcut menu	To
	of the selected feature in the process structure, if t

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Choose this from the shortcut menu	To
	hat pane is open.
Blank	Hide the display of the selected fea

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Choose this from the shortcut menu	To
	tu re in th ea ss em bl y vi ew er if th at vi ew is op en .
Display	Disp

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Choose this from the shortcut menu	To
	Lay the selected feature in the assembly view if tha

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Choose this from the shortcut menu	To
	t v i e w i s o p e n .
Add to Favorites	A d d s e l e c t e d f e a t u r e s t o a f e a t u r e l i s

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Choose this from the shortcut menu	To
	t .

4. **View** assignment indication.

5. **Reset** the scope of the view.

6. **Filter data** in the view.

7. (Optional) **Modify** the column configuration.

8. (Optional) Export data to a Microsoft Excel spreadsheet by clicking the **Menu** button ▾ and choosing **Objects to Excel** from the view menu commands.

   You can export either selected data or all data. If the data is filtered based on some condition, only filtered data is available for export. Only textual data is exported to Excel. Teamcenter does not export graphics.

Create features

1. Select an item in a product structure.

2. Choose **File→New→Manufacturing Feature**.

   Teamcenter displays the **New Manufacturing Feature** dialog box.

3. Select the type of feature that you want to create from the list of types and click **Next**.

   You can select from:

   - **ArcWeld**
   - **Datum Point**
   - **Fastener**
   - **Fastener Group**
   - **Weld Point**

4. Click **Assign** to automatically assign a unique ID.

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5. Type a name for the new feature. Make it unique so you can search the database using this term.

   By default, the display name for features is the name that you type here. You can configure the display name using the **MEMFGDisplayName** preference.

   > Note:
   >
   > If you have multiple features that you want to have the same name, you must change the **MEMFGDisplayName** default value of **bl_occurence_name** to **bl_item_item_id** and **bl_item_object_name**.

6. (Optional) Type a description for the feature.

7. Click **Next**.

   Teamcenter displays the form associated with the revision of the feature.

8. (Optional) Enter item revision attributes and click **Next**.

   You can use the **Manufacturing Search** view to find features based on the values entered in this form.

9. (Optional) If you are creating a weld point, type location information using the X, Y, Z coordinates and an orientation degree and click **Next**.

   The units displayed in the location boxes are derived from the assembly with which you are working. The values you enter here are stored in the **SpotWeld** attribute form and on its occurrence.

   You can change the location of a weld point later by using the **Graphics→Transformation→Persistent Transformation** command, but this new location information is no longer stored in the attribute form. It is stored on the weld point's occurrence only. In addition, after creating the features, you can change the values in the weld point's form, but the new values do not change the position of the weld.

10. (Optional) Enter data into the feature's form.

    This form contains feature-specific attributes. If you entered location information in the previous step, the values are stored in this form.

    If you create datums, you select which type of datum in the **Datum Type** box in this form. You can select from:

    - **Datum Surface** (default)
    - **Datum Pin**

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- **Measurement Datum**

The feature's attribute form is attached to the latest revision of the newly created feature using a **TC_Feature_Form_Relation** relation.

11. Select a JT file to graphically represent the feature and click **Next**.

    You can choose to use the default file, or select a customized file. The name of the dataset containing the default file is specified in the following preferences:

    - For weld points: **MENEWMFG_DefaultWeldPointJTDatasetName**
    - For datums: **MENEWMFG_DefaultDatumJTDatasetName**

      The default JT file for datums is dependent on the **Datum Type** value you set in the attribute form.

    The dataset is attached to the latest feature revision using the **TC_Feature_Form_Relation** relation.

    > Note:
    >
    > There is no default JT file available for arc welds.

12. Click **Finish**.

    Teamcenter creates the feature under the selected item in the product structure.

Edit feature attributes

Do one of the following:

1. In the **Attachments** view, double-click the feature form.

   Teamcenter displays the form.

2. Check out the form and modify its values.

3. Check the form back in.

-or-

1. Add the form attributes as columns to the structure view.

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> Note:
>
> Not all form attributes are available to add as columns. For example, you cannot add **Connected Part** attributes as columns.

2. Modify the attributes in the column cells.

Automatically assign welds to stations

You can automatically assign manufacturing features from a manufacturing bill of materials (MBOM) to plant bill of process (BOP) areas, stations, and lines simultaneously, and then refine the assignments later. This method of assignment is faster than manually assigning each weld or arc weld feature one at a time. Teamcenter searches through the consumed parts in the specified process structures and finds parts that have connected features. It then creates operations and assigns the features to those operations.

> Note:
>
> You must install the weld management environment manager template to use this functionality.

The type of structure to which you can select and apply features in the plant BOP is dependent on the values in the **ProcessStationForAutomatedMfgAssignment** preference. Use this preference to apply features to a process area, process line, process station, process, or station in a plant BOP.

This example demonstrates how to assign features to lines and stations in a plant BOP.

1. If you moved parts in your plant BOP between lines and stations so that they are consumed in different locations, update the PERT flows. While dynamic in-process assembly (DIPA) nodes do not appear in the BOP, they are created internally.

   a. Select the top line of the plant BOP and choose **Tools** → **Update Flows**.

   b. In the **Update Flows** dialog box, select **Include Structure Sub-Hierarchies** and click **OK**.

2. Right-click the source MBOM or target plant BOP for the assignment and choose **Automatic MFG Assignment**.

   > Note:
   >
   > You can also select a process area, line, or station. Only welds from your selected scope will be assigned. If you select only the bill of materials, you must select the target process in the resulting dialog box. If you select only the target process, the dialog box displays all open product structures. You can add or remove source structures using the or buttons; you can remove target processes using the button.

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The order in which the processes are listed in the **Target Processes** list is the order in which the assignment mechanism processes the structures for assignment.

3. Click **OK**, and at the warning prompt, click **OK** again.

   The assignment mechanism searches through the consumed parts in the specified process structures and finds the parts that have features connected.

4. (Optional) Open the Automatic Feature Assignment Report.

   Teamcenter displays a report indicating which operations were created. It also indicates which features are assigned. Any features that are:

   - Successfully assigned are displayed in the **Assigned MFGs** column.
   - Already assigned in plant BOP structures but are connected to parts that are not consumed, removed, or changed in the product structure, are displayed in the **Obsolete MFGs** column.
   - Already assigned in the plant BOP structures are displayed in the **Already Assigned MFGs** column.

Assign features to processes and operations

Do one of the following.

- In the structure view:

  1. Open the product structure containing the features in one structure view and the process structure in another.
  2. Copy the feature and paste it to the process or operation that should consume it or use the drag-and-drop option.

- In the **Manufacturing Features** view, drag a feature from the **Manufacturing Features** view to the appropriate process or operation in the structure view.

- In the **Manufacturing Features** view:

  1. Right-click a feature and choose **Copy**.
  2. Paste the feature into the process or operation that should consume it.

Teamcenter adds a consumed feature underneath the process or operation.

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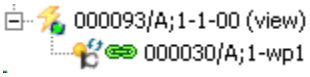

When you assign an arc or datum to a process structure, Teamcenter creates an override form that contains the attributes you want to edit in the process structure. The override form is attached with the **Mfg0TCContextFeatureFormRel** relation and is added in the context of the operation or process to which the feature is assigned.

- For arc welds, the override form additionally contains attributes that can be populated from Process Simulate on Teamcenter.
- Do not change the type of datum in the datum override form. You can change the datum usage type.
- You can add all attributes from the override form as run-time properties to the structure view.
- After assigning a feature, editing attributes in the feature form does not change the override form, and vice versa.

Manually connect features to parts

1. Select at least one part in a product structure and one feature using the Ctrl key to make multiple selections.
2. Choose **Advanced→Connect MFG to Parts**.

Teamcenter connects the feature to all selected parts.

Search for features

You can perform feature searches in several ways.

- Use the **Structure Search view** to search for features.
- Also in the **Structure Search** view, search for features using the **Not assigned to** search criteria.

  You can choose a process or operation as the scope for this search.
- If a change in weld points in the bill of materials (BOM) results in broken links in an associated process plan, use the **Repair Broken Links** dialog box to help you search for and **repair** these links by entering properties from the weld form as search criteria.

Reset the scope of the view

1. Select a different product line in a product structure.
2. Click the **Set Scope** button .

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If the assignment filter or assignment indication is on, Teamcenter turns it off when loading a new scope.

Filter data in the view

You can filter the data in the view based on BOM line properties to show only a subset of the contents in the table.

1. Click the **Menu** button and choose **Filter** from the view menu commands.

   Teamcenter displays the **Auto Filter** dialog box. This dialog box contains a list of all conditions that you create to filter data. The dialog box remembers any conditions you create, including those in other views.

2. Click + to add a new condition line.

   Teamcenter displays the **Filter Condition Editor** dialog box.

3. Create a condition by combining BOM line properties, operators, and available objects and click +.

4. (Optional) Remove a condition by clicking −.

5. (Optional) Clear a condition by clicking .

6. (Optional) Negate the condition by clicking the **!{..}** button.

7. Click **OK**.

   Teamcenter displays the new condition in the **Auto Filter** dialog box.

8. Select the condition that you want to apply to the table.

   Teamcenter displays the filtered results in the view table.

   > Tip:
   >
   > You can select more than one condition in the **Auto Filter** dialog box using the Ctrl key. The search result must fulfill all of the selected conditions (they are joined with the **AND** Boolean operator).

9. (Optional) To remove the filter, select **All** from the condition list or close the **Auto Filter** dialog box.

Modify the column display

1. Select a line in the table in which you want to modify the columns to make the table the active one in the view.

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This is important in views that contain multiple tables.

2. Click the **Menu** button ▾ and choose **Columns** from the view menu commands located in the top-right corner of the view.

   Teamcenter displays the **Column Management** dialog box.

3. Select the desired columns from the **Available Properties** list and move them to the **Displayed Columns** list with the right arrow.

4. (Optional) Modify the order the columns appear in the selected view table using the up and down arrows.

5. Do one of the following:

   - Click **Apply** to save the current state.

   - Click **Save** and type a name for the column configuration. You can restore a saved column layout by choosing **Apply Column Configuration** from the view menu commands and selecting the saved configuration from the list.

Comparing features

Comparing features in a source and target structure

You can compare two BOM structures containing manufacturing features (for example, welds and datums) using the **accountability check** in Manufacturing Process Planner. The comparison checks whether all the features in the source structure are found in the target structure. In addition, the comparison checks whether the features are connected to the same parts and, optionally, connected in the same order.

After completing the accountability check, you can then **propagate differences** you find from the source structure to the target structure. For example, if a weld is connected to Part A and Part B in the source structure and Part A and Part C in the target structure, running an accountability check results in a partial match and you can then change the connection in the target from Part C to Part B.

The two structures that you compare must be linked as an EBOM and MBOM using the **Link Structures** menu command.

You can also **create a printable Excel report** when comparing features in structures.

Compare features in two structures using the accountability check

There are several scenarios of interest when comparing features in two BOM structures. You may want to:

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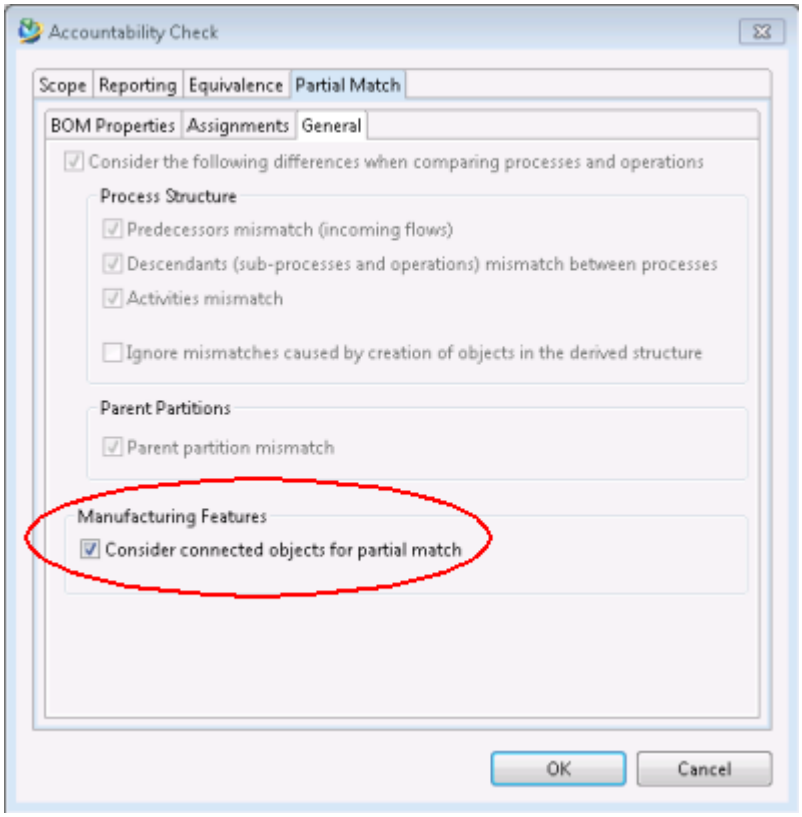
- Compare part connections without considering the order of the parts.
- Compare part connections while considering part order.

You can use the accountability check to compare part connections. If the check finds differences, such as a weldpoint connected to Part A and Part B in the engineering BOM but to Part A and Part C in the manufacturing BOM, these differences are marked as partial matches and displayed in the **Accountability Check Result** view. You can choose to propagate the differences from the engineering BOM to the manufacturing BOM.

1. Run an accountability check using an engineering BOM as source and a manufacturing BOM as target.

2. Select the **General** tab on the **Partial Match** tab.

3. Select the **Consider connected objects for partial match** option.



4. Select any other desired options and complete running the accountability check.

5. On the **Partial Match Details**, select the **Connected Parts** and the **BOM Properties** tabs and view the results.

   Missing parts are displayed in yellow.

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Note:

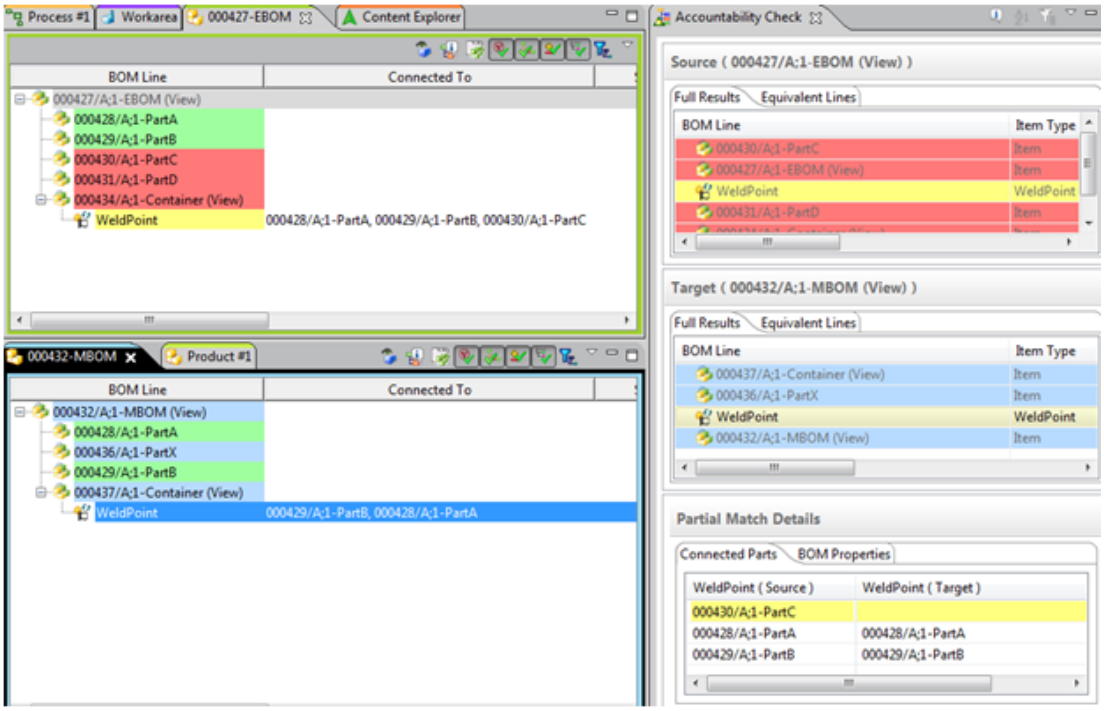
If you work with welds from NX, Teamcenter stores the order of the parts from NX in the **Stackup** property on the weld attribute form. Therefore, you must ensure that this property is published from NX. This comparison only works for item-based welds in a precise structure.

Propagate changes from the source structure to the target structure

Before you propagate, you must run an accountability check as explained in *Compare features in two structures using the accountability check*. If there is a mismatch, the results are shown in yellow for a partial match and red for missing in target in the **Accountability Check** view.

1. Select a yellow partial match line.

   Teamcenter opens the **Partial Match Details** tab.



2. Right-click the partial match line and select **Propagate** or choose **Tools→Accountability Check→Propagate**.

   Teamcenter propagates any differences in part connections. If there are errors, Teamcenter displays a message informing where a log file is stored.

3. Open the log file and rectify any errors. This can include copying parts that are missing in the target from the source to the target and rerunning the accountability check.

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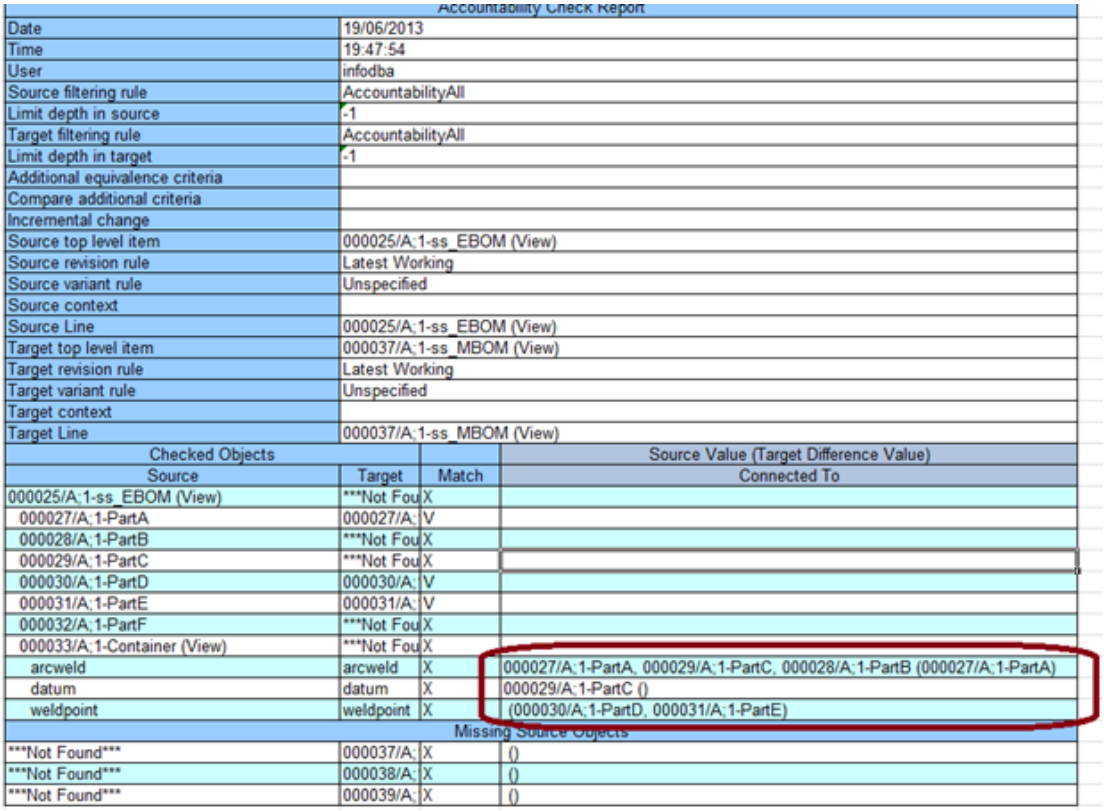
Create an Excel report of the feature comparison

You can create a printable Excel report when comparing features in structures.

To check the mismatch in parts for weld points, datums, or arc welds, you can add the **Connected To** property to the list of properties that are compared.

- Open the **Partial Match→BOM Properties** tab and add the **Connected To** property to the **Selected Properties** list.



Accountability Check Report			
Date	19/06/2013		
Time	19:47:54		
User	infodba		
Source filtering rule	AccountabilityAll		
Limit depth in source	-1		
Target filtering rule	AccountabilityAll		
Limit depth in target	-1		
Additional equivalence criteria			
Compare additional criteria			
Incremental change			
Source top level item	000025/A;1-ss_EBOM (View)		
Source revision rule	Latest Working		
Source variant rule	Unspecified		
Source context			
Source Line	000025/A;1-ss_EBOM (View)		
Target top level item	000037/A;1-ss_MBOM (View)		
Target revision rule	Latest Working		
Target variant rule	Unspecified		
Target context			
Target Line	000037/A;1-ss_MBOM (View)		
Checked Objects			Source Value (Target Difference Value)
Source	Target	Match	Connected To
000025/A;1-ss_EBOM (View)	***Not Fou	X	
000027/A;1-PartA	000027/A;	V	
000028/A;1-PartB	***Not Fou	X	
000029/A;1-PartC	***Not Fou	X	
000030/A;1-PartD	000030/A;	V	
000031/A;1-PartE	000031/A;	V	
000032/A;1-PartF	***Not Fou	X	
000033/A;1-Container (View)	***Not Fou	X	
arcweld	arcweld	X	000027/A;1-PartA, 000029/A;1-PartC, 000028/A;1-PartB (000027/A;1-PartA)
datum	datum	X	000029/A;1-PartC ()
weldpoint	weldpoint	X	(000030/A;1-PartD, 000031/A;1-PartE)
Missing Source Objects			
Not Found	000037/A;	X	()
Not Found	000038/A;	X	()
Not Found	000039/A;	X	()

Feature and part connections

About feature and part connections

You can compare features, such as weld points, arc welds, and datums, to their part connections using a variety of methods.

- **Show** connected features and **view** parts **connected** and **unconnected** to each feature.
- Automatically **connect many features to parts** using the **Auto Feature Part Connector** dialog box.

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Show connected manufacturing features

1. Right-click one of the following:

   - A part in a product structure
   - A consumed part in a process structure
   - A part in the **Graphics** view

2. Choose **Show Connected Manufacturing Features**.

   Teamcenter highlights all the features connected to the selected part in the associated views. Features that are currently hidden by configuration are not shown.

   Tip:

   - If you set the **MEShowConnectedRetainSelection** preference to **True**, the **Show Connected Manufacturing Features** command displays both features and parts in the structure views.
   - If you turn on cross probing ( ), Teamcenter displays the connected features in all the visible views.

View connected parts

Do one of the following:

- In the **Auto Feature Part Connector** dialog box, select a row or a part and click **Display part**.
  - If you select a row, Teamcenter highlights all the parts connected to that feature in the structure pane.
  - If you select a part (a single cell in the table), Teamcenter highlights only that part in the structure pane.
- In the structure pane, select a feature in the product structure or a consumed feature in the process structure and choose **View→Show Connected Lines**.

  Teamcenter high;ights features connected by lines to the parts in the associated views.

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Note:

- If you set the **MEShowConnectedRetainSelection** preference to **True**, the **Show Connected Lines** command displays both parts and features in the structure views.
- If you turn on cross probing (), Teamcenter displays the connected lines in all the visible views.
- You can add the **Connected to** column to provide an additional indication of connected parts.

- In the **Manufacturing Search** view, enter feature criteria to perform a feature search using the **Connected to** option.
- In the **Manufacturing Features** view, select a feature.

  Teamcenter displays the names of all connected parts in the **Connected Parts** list at the bottom of the view. When you select these parts, they are highlighted in the source structure in the structure pane.

Tip:

Before you select a feature in the **Manufacturing Features** view, set the **MEExpandtoSelection** preference to **True** to ensure that the connected part can be highlighted in the structure pane.

View unconnected features

1. Select a part in the product structure as the starting point of the search.
2. Choose **Tools→Auto Feature Part Connector**.

   Teamcenter opens the **Auto Feature Part Connector** dialog box that lists all the features found under the selected part.
3. Click the **Filter connected rows** button in the **Manufacturing Features** view.

   Teamcenter removes all the features that are already connected to at least one part from the list of features.

The following are preferences that affect Auto Feature Part Connector filtering:

- **MEAPCEnableTrueShapeFiltering** – This preference enables true shape filtering for the Auto Feature Part Connector command. The default value is **true**.
- **MEAPCSearchType** – This preference defines the type of the parts that are going to be searched by the Auto Feature Part Connector command. The default is **ITEM**. This preference can only accept one

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type at a time. If a different type is desired, you should change the value from ITEM to the relevant type.

Connect welds to parts using the Automatic Feature Connector

The **Automatic Feature Connector** dialog box enables you to assign large quantities of features to parts automatically, eliminating the need to assign each feature manually. The **Automatic Feature Connector** dialog box streamlines the process by searching for and displaying up to four parts within a configurable distance of the features. You can then confirm or reject the assignments as required.

1. Select a part in the product structure to be the starting point of the search.
2. Choose **Tools→Auto-feature Part Connector**.

   Teamcenter opens a dialog box that lists all the features found under the selected part.
3. Click the **Settings** button .
4. Set a distance from the features that Teamcenter should search for candidate parts with which to connect each feature.
5. Click **OK**.
6. In the dialog box, click **Search**.

   Teamcenter searches for all those parts within the specified distance from each feature and lists them in the part columns. It only lists up to four parts per feature. Parts that are already assigned to a feature are displayed in bolt green, and parts that are not yet assigned are displayed in black.
7. Do one of the following:

   - Remove a part from the list by clicking the **Remove part** button .
   - Add a removed part back to the list by clicking the **Add part** button .
   - Connect all the parts to a feature (all the parts in one line) by clicking **Accept**.
   - Connect all suggested parts with their respective features by clicking **Accept All**.

   Note:

   Weld points are configured by their parts. If you configure out a part in any way (variant, revision rule or incremental change), the weld points that are connected to this part are also configured out. You can configure whether this behavior occurs when at least one

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of the connected parts is configured out or all of them are configured out using the **MEShowWeldPointsConnectedToConfiguredOutParts** preference.

Set Suggestive Planner scope

Suggestive Planner helps you to eliminate full structure searches by suggesting that you assign consumable parts and manufacturing features from a product to a process without necessarily showing the original product bill of material (BOM). This procedure allows you to add, remove, or edit one or more suggested scopes in a bill of process (BOP).

1. Open a linked BOM and process view contained in a collaboration context (CC).

2. In a process view, right-click a process line with a partially assigned or unassigned assembly of parts and features, such as a station, and choose **Suggestive Planner→Set Product Scope**.

3. In the **Set Product Bucket** dialog box, in the BOM view, select the process line containing unassigned parts and features that are relevant to those in the process view, click **Scope**, and then click **OK**.

4. To edit or alter the scope, do the following.

   a. In the process view, right-click the process line to be edited and choose **Suggestive Planner→Set Product Scope**.

      - To add or edit one or more scopes from the BOM view, click each line to be added to or removed from the process view and click **Scope**.

      - To delete a BOM line scope, in the **Set Product Bucket** dialog box, select the **BOM Line name** and click **Remove Scope**.

   b. Click **OK** to update the process view.

5. Do one of the following:

   - **Use Suggestive Planner** in a process view.

   - **Use Suggestive Planner** with weld feature validation.

Use Suggestive Planner in a process view

You can employ, or assign other planners to employ, a process that uses Suggestive Planner to offer product or manufacturing features from a process view without displaying the BOM.

1. **Set** the Suggestive Planner scope.

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2. In the process or a related Program Evaluation Review Technique (PERT) view, right-click a station or other process item within the scoped area, and choose **Suggestive Planner→Assign Suggested Product** or **Assign Suggested Features**.

   With **Assign Suggested Product** selected, in the **Assign Suggested Product** dialog box, a list displays all unassigned parts and products.

   With **Assign Suggested Features** selected, in the **Assign Suggested Discrete Features** dialog box, a list displays all unassigned parts that share a manufacturing feature connection to the available parts in that station.

   > Note:
   >
   > If you select **All unassigned product**, all the unassigned parts from the scope are listed. If you select **Suggested product**, consumed parts from that station or the incoming DIPA are listed, if they have features that share connections, such as welds, to parts in the selected process.

3. If you choose to assign suggested products, do the following.

   a. Select a different line in the process or PERT view and then, in the **Assign Suggested Product** dialog box, select that line in the **Station** list by clicking **Scope** .

      The **Assign Suggested Product** dialog box only allows you to select a line with a process, such as a line or station. You can also click the process view's **Back** or **Next** buttons to step between selected lines of the same process type.

   b. Select one or more lines in the **Suggested Product** group and click **Assign**.

      The items are removed from the **Suggested Product** group and show as consumed in the process or PERT view. If you now select **Suggested product** in the **Criteria** group, any of the new consumed products that have connections with the selected process or PERT view are also available for assignment.

4. If you chose to assign suggested features, do one of the following.

- Select a line in the process or PERT view and then, in the **Assign Suggested Discrete Features** dialog box, select a line in the **Station** list by clicking **Scope** .

  > Note:
  >
  > The **Suggested Features** list box only allows you to select discrete weld spots (discrete spots, no continuous features or datums) and then add them to a line with a process type, such as a line or station.

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Unassigned manufacturing features display as connected to parts within your scope in the process or PERT view. **Connected To (1)** and **Connected To (2)** columns in the **Suggested Features** list box indicate to which parts the features are connected.

- In the **Assign Suggested Discrete Features** dialog box, select one or more unassigned features, and in the **Assign to Operation** group, do one of the following.

  - To assign the features to a root operation at the end of a station, do not select any lines from the group, just click **Assign**.

  - To assign the features to a selected process item, select relevant lines from the **Assign to Operation** group, and then click **Assign**.

  The features are removed from the **Suggested Features** group and show as consumed in the process or PERT view.

Use Suggestive Planner with weld feature validation

To validate weld assignments to process stations following product updates, use Suggestive Planner and weld validation to identify discrete manufacturing features assigned from a bill of materials (BOM) to a bill of process (BOP) before all the connected parts are assigned.

1. (Optional) If you want to assign manufacturing features to newly created operations under a suggested station using a default operation naming convention, set the name value using the preference **MEWeldValidationDefaultOperationName**.

2. (Optional) If you have weld feature types that require fasteners, define the fastener feature types to be added to the BOP, and add valid values for the weld point or arc weld property **Mfg0weld_type** to the preference **MEWeldValidationFastenerFeatureTypes**.

   Example:

   Weld Stud, **Weld Nut**. These values are necessary if a fastener and its weld feature type are assigned in the same station.

3. Select the BOM lines and the BOP process lines containing the partially assigned or unassigned parts and features you want to keep, reassign, unassign, and validate in the BOP, and set the Suggestive Planner scope.

4. In the BOP, right-click the BOP line to validate and choose **Feature Assignment Validation**.

   In the **Feature Assignment Validation** dialog box, the **Suggested Assignment** tab lists previously assigned (current) and suggested assignments. The suggested assignment station is always the station where features were most recently connected to the parts.

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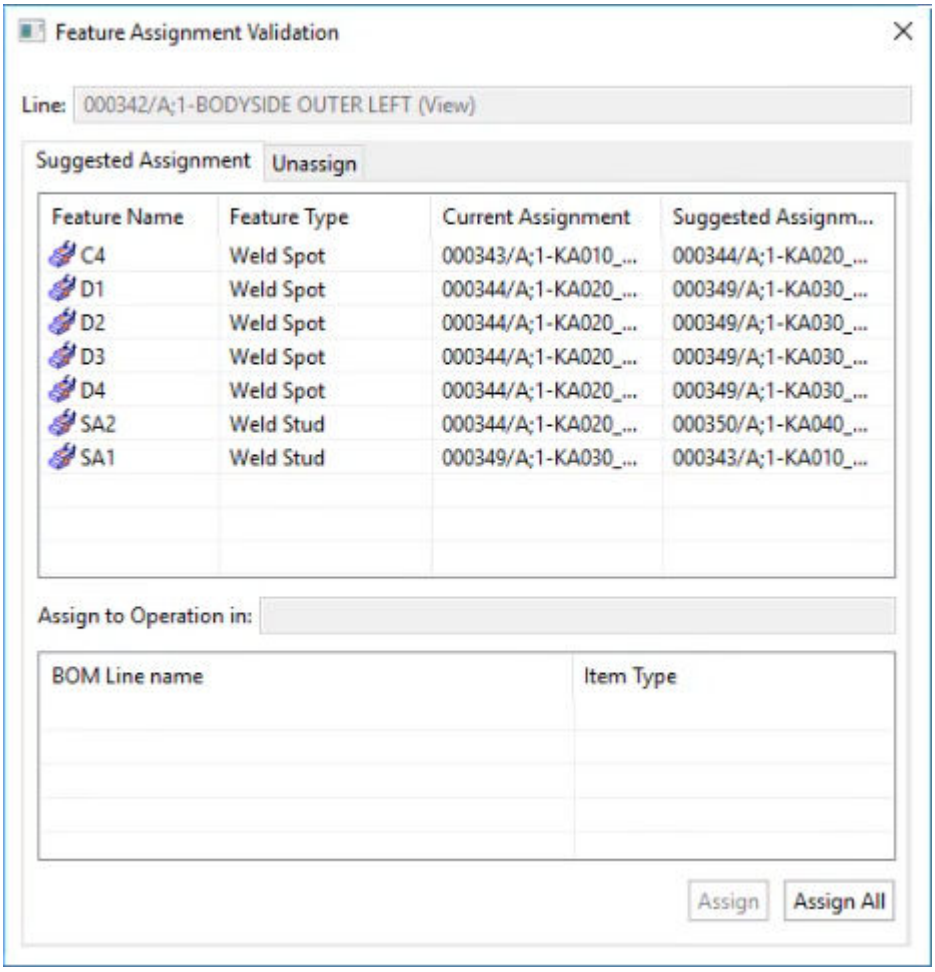

5. In the **Suggested Assignment** list, select a feature to review, assign, or reassign.

   In this example, the lower list shows existing discrete join operations in a station where the features can be assigned.

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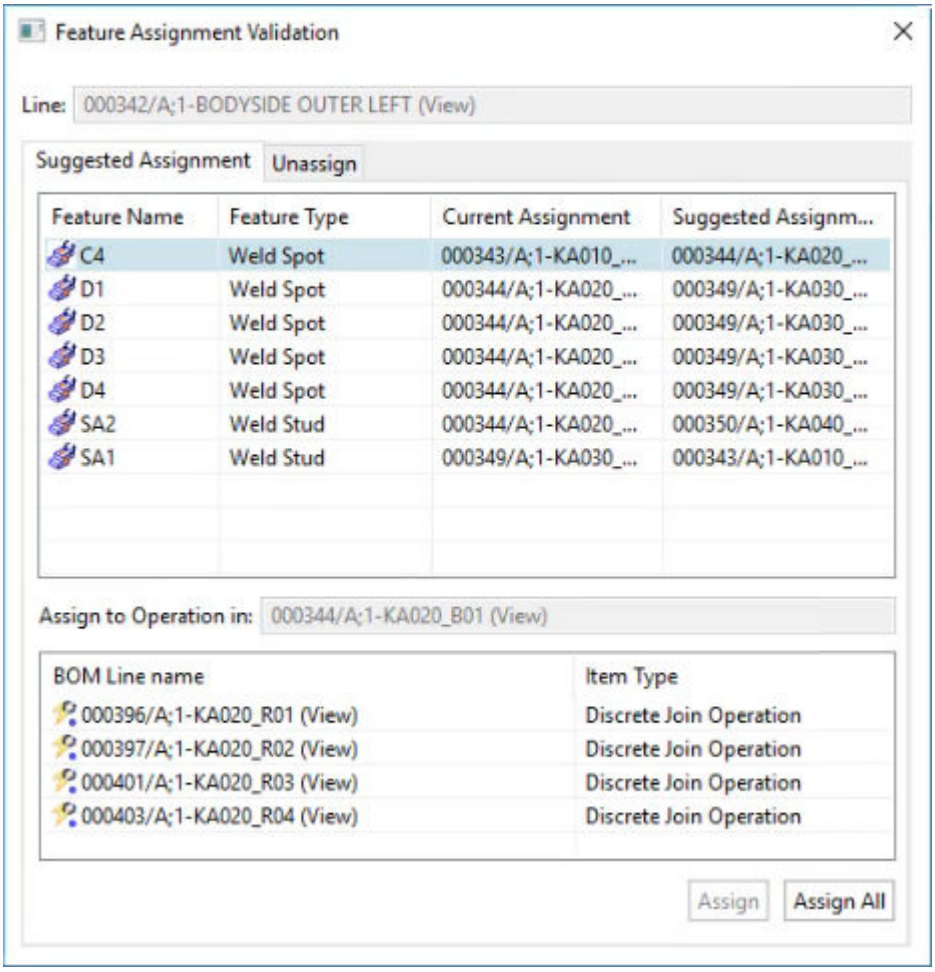

6. Do one of the following.

   - Click **Assign**.

     The features in the BOM lines reported in the lower list are assigned to the station.

   - Click **Assign All**.

     The features in the BOM lines reported in the lower list are assigned to a newly created operation under the **Suggested Assignment** location. If you set a name value using the preference **MEWeldValidationDefaultOperationName**, the operation uses that naming convention.

   A dynamic in-process assembly (DIPA) does not display in the BOP but is internally created. If you defined fastener feature types to be added to the BOP for validation of feature assignments using the preference **MEWeldValidationFastenerFeatureTypes**, those fasteners and their associated weld features are assigned to the same operation.

7. Click the **Unassign** tab to review features with connected parts that are not assigned to those parts and click **Unassign**.

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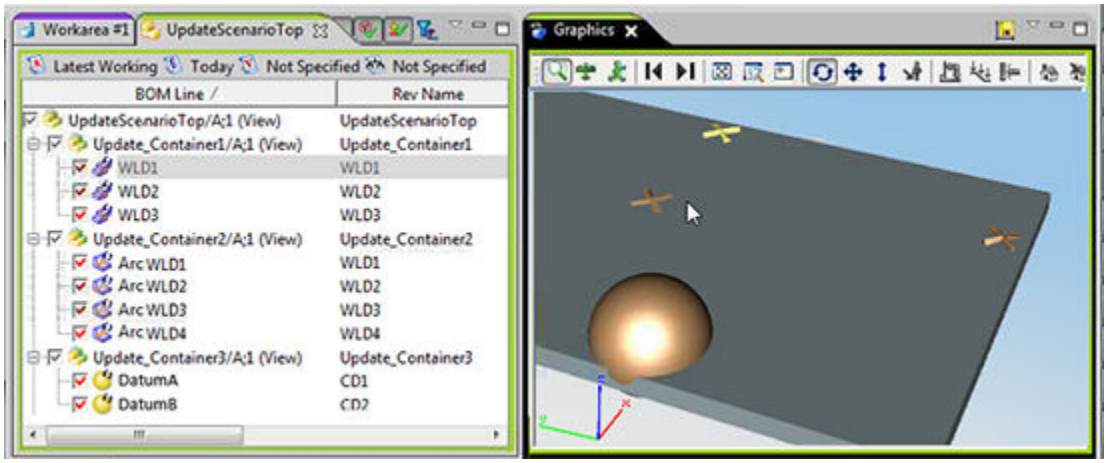
8. In the upper-right corner of the **Feature Assignment Validation** dialog box, click ✕.

   View assignment indications in the BOP to review the effect of the feature assignments and unassignments, and if necessary, run feature assignment validation again.

Importing and exporting features

Importing features overview

Using a PLM XML file, you can import discrete and continuous manufacturing features—including weld points, continuous arc welds, and datum points—from external CAD or legacy systems using either **Teamcenter** or the **me_import_mfgs utility**. You can then manage the features in Teamcenter while maintaining their connections to parts. The import creates or updates manufacturing features under a specified container object. Teamcenter creates or updates attribute forms with the required values and adds a direct model dataset containing 3D JT data. Teamcenter updates connections to weld and datum point parts according to the part IDs.



Weld point Arc weld Datum point

When importing manufacturing features, you can identify a container (an item revision) to which the features are imported or specify the import location in the PLM XML file.

When importing manufacturing features:

- Teamcenter connects the features to parts, provided you already imported the parts into the database.
- The parts must have an ID that is unique and persistent in the external CAD system.
  - The unique ID can be stored on any occurrence note.
  - Your administrator must define the name of the occurrence note in the **MEImportMFGsManufacturingFeatureIdAttributeName MEImportMFGsPartIdAttributeName** preferences, as it can differ between CAD systems.

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MEImportMFGsManufacturingFeatureIdAttributeName defines which BOM line property is used as the manufacturing feature ID. **MEImportMFGsPartIDAttributeName** defines which BOM line property is used as the part ID.

> Note:
>
> The preferences **MEImportMFGsManufacturingFeatureIdAttributeName** and **MEImportMFGsPartIDAttributeName** should be set to the value **Usage_ArchitectureId**.

- Existing features can also be identified using an ID that is unique and persistent in the external CAD system. Equivalently:
  - The unique ID can be stored on any attribute occurrence note.
  - You must define the name of the occurrence note in the **MEImportMFGsManufacturingFeatureIdAttributeName** preference, as it can differ between CAD systems.
- At the time of import, Teamcenter reads the transformation from the input PLM XML file, and by default, interprets the transformation as absolute location. Use the **MEImportMFGsUseAbsoluteLocation** preference to set the transformation to relative location. You can choose whether to make an incremental update or to update the entire container.

The **MENEWMFG_DefaultJTDatasetNameForSpecificWeldType** preference specifies the name of the JT dataset which is by default attached to the specific type of newly created Weld Point object. Valid values are in the format: weld_type:number_of_connected_parts:dataset_name. Possible values for the weld_type are geo, respot, and process. Possible values for the number_of_connected_parts are <2, 2, 3, 4, >4. The value for the dataset_name portion depends on the weld_type section.

The JT files representing weld points vary according to how many parts are involved in the connection.

	Number of connected parts				
Weld designation	**Less than 2**	**2**	**3**	**4**	**More than 4**
geo	rswp_2t_dim_ctrl.jt	rswp_2t_dim_ctrl.jt	rswp_3t_dim_ctrl.jt	rswp_4t_dim_ctrl.jt	rswp_4t_dim_ctrl.jt
respot	rswp_2t.jt	rswp_2t.jt	rswp_3t.jt	rswp_4t.jt	rswp_4t.jt
process	rswp_2t_pro_ctrl.jt	rswp_2t_pro_ctrl.jt	rswp_3t_pro_ctrl.jt	rswp_4t_pro_ctrl.jt	rswp_4t_pro_ctrl.jt
None	rswp_2t.jt	rswp_2t.jt	rswp_3t.jt	rswp_4t.jt	rswp_4t.jt

> Note:
>
> These representations do not apply to datums or weld arcs.

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Import manufacturing features in Teamcenter

Using a PLM XML file, you can import features—including weld points, weld arcs, and datum points—into a structure using Teamcenter rather than add each one manually. In the PLM XML file, you can specify the JT name to which the features are connected. For weld points and datums, JT datasets are assumed to already exist in Teamcenter and the import connects the weld points and datums to the existing datasets. For weld arcs, the import creates new JT datasets.

1. Create containers (item revisions) for the features at the required level in the structure.

   > Note:
   >
   > You can also specify the container in the PLM XLM file to be imported.

2. Select the line under which you want to import the features.

   > Note:
   >
   > If your PLM XML file contains manufacturing features for parts that are not in the selected line, or if you have variants configured out of the structure, all features are imported into the selected line. In the **Connected To** column of the view, features with hidden or configured-out parts have no value. They are reported as errors in a log file after the import completes.

3. Choose **Tools→Import Manufacturing Features**.

   In the **Import Manufacturing Features** dialog box, the **Scope of Connected Parts** text box displays the line you selected.

4. Next to the **Imported File** text box, click ••• and browse to and select the PLM XML file that contains the import information.

5. (Optional) In the product structure, select a different container to which you want to import the features.

6. To specify a different feature container, next to the **Default Container of Manufacturing Features** text box, click and browse to and select a folder.

7. If you want to import the entire contents of the import file into the container, in the **Advanced Settings** group, select the **Cleanup - delete manufacturing features if they are not included in the imported file** check box.

   Features that are not listed are removed. If you do not select this option, you perform an incremental update. Only those features that are included in the PLM XML are changed. New features found in the import file that are not in the container are added to the container. Features in the container that are not in the import file are not changed.

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8. If features in the PLM XML file exist outside the default container location in the structure, and you do not want them to be duplicated, select the **To avoid duplicates, search for the existing features under this scope** check box, click , and select the folder where these features reside.

9. Click **OK**.

   Teamcenter imports the features, displays a warning concerning features that may have been configured out, and, optionally, displays a log file.

   If you performed an incremental update, any features that have a released status before the import are revised. If they have a working status, Teamcenter updates the current revision.

10. (Optional) Right-click a feature and choose **Open with→Attachments** to verify that attributes and a JT file exist for that feature.

me_import_mfgs utility

Import manufacturing features using the me_import_mfgs utility

For very large imports or updates, use the manufacturing feature batch import utility to import manufacturing features from a command line. To access help on this process, run the following command:

```
me_import_mfgs -h
```

Example:

```
me_import_mfgs -u=myUserName -p=myPassword -g=myGroup
-rootid=myStructureTopLine -rootrev=A -revrule="Latest Working"
-input_file="D:\temp\feature_updates.xml"
```

Use the argument **-mode=keepExistingFeatures** or **-mode=refreshWholeContainer** to run incremental updates or complete updates. Complete updates delete any features below the **rootid**. The default value is **keepExistingFeatures**.

After the command has completed, the utility reports any issues at the prompt and creates a log file where you can look up details. If the structure is open in Teamcenter, you must refresh or reload it to see the effects of the import.

Manufacturing features export/import file format

You must export manufacturing features from the external system using the PLM XML file format and **ProcessSimulateExport** transfer mode to import them and their defined content into Teamcenter. The following is a sample of that format. For more specific examples and information, see **Export file details**.

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```
<?xml version="1.0" encoding="utf-8"?>
<!-- GENERATED BY: PLM XML SDK 7.0.3.296 -->
<PLMXML xmlns="http://www.plmxml.org/Schemas/PLMXMLSchema"
 schemaVersion="6" language="en-us" date="2015-06-24" time="14:47:54"
author="Teamcenter P10000.1.0.50_20150526.00 -
HHC@IMC--1443886670(-1443886670)">
<Header id="id1" traverseRootRefs="#id9"
transferContext="ProcessSimulateExport"></Header>
<ProductRevision id="id23" name="part1" subType="ItemRevision"
masterRef="#id21" revision="A">
</ProductRevision>
<ProductRevision id="id33" name="part2" subType="ItemRevision"
masterRef="#id31" revision="A">
</ProductRevision>
<ConnectionRevision id="id50" name="arc" subType="ArcWeldRevision"
masterRef="#id49" revision="A">
</ConnectionRevision>
<ConnectionRevision id="id69" name="wp" subType="WeldPointRevision"
masterRef="#id68" revision="A">
</ConnectionRevision>
<Product id="id21" name="part1" subType="Item" ></Product>
<Product id="id31" name="part2" subType="Item" ></Product>
<Connection id="id49" name="arc" subType="ArcWeld" ></Connection>
<Connection id="id68" name="wp" subType="WeldPoint" ></Connection>
<ProductView id="id6" ruleRefs="#id2" rootRefs="id9">
<AssociatedAttachment id="id41" attachmentRef="#id42"
role="IMAN_Rendering"></AssociatedAttachment>
<AssociatedAttachment id="id46" attachmentRef="#id47"
role="TC_Feature_Form_Relation"></AssociatedAttachment>
<AssociatedAttachment id="id65" attachmentRef="#id66"
role="TC_Feature_Form_Relation"></AssociatedAttachment>
<Occurrence id="id18" instancedRef="#id23" instanceRefs="#id25" >
<UserData id="id20" type="InstanceNotes">
<UserValue value="part1_id" title="GCS CP"></UserValue></UserData>
<Transform id="id16">1 0 0 0 0 1 0 0 0 0 1 0 0 0 0 1</Transform></
Occurrence>
<Occurrence id="id28" instancedRef="#id33" instanceRefs="#id35">
<UserData id="id27">
<UserValue value="" title="OccurrenceName"></UserValue></UserData>
<UserData id="id30" type="InstanceNotes">
<UserValue value="part2_id&#xA;" title="GCS CP"></UserValue></UserData>
<Transform id="id26">1 0 0 0 0 1 0 0 0 0 1 0 0 0 0 1</Transform></
Occurrence>
<Occurrence id="id38" instancedRef="#id50" instanceRefs="#id54"
associatedAttachmentRefs="#id41 #id46" >
<UserData id="id39" type="AttributesInContext">
<<UserValue value="arc" title="OccurrenceName"></UserValue>
</UserData>
<UserData id="id40" type="InstanceNotes">
```


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```
<UserValue value="arc_id" title="GCS CP"></UserValue></UserData>
<Transform id="id36">1 0 0 0 0 1 0 0 0 0 1 0 0 0 0 1</Transform>
  <Reference id="id52" type="connection" occurrenceRef="#id18"></
Reference>
<Reference id="id53" type="connection" occurrenceRef="#id28"></
Reference></Occurrence>
<Occurrence id="id57" instancedRef="#id69" instanceRefs="#id72"
associatedAttachmentRefs=" #id65" >
<UserData id="id58" type="AttributesInContext">
<UserValue value="wp" title="OccurrenceName"></UserValue></UserData>
<UserData id="id59" type="InstanceNotes">
<UserValue value="wp_id" title="GCS CP"></UserValue></UserData>
<Transform id="id55">1 0 0 0 0 1 0 0 0 0 1 0 0 0 0 1</Transform>
<Reference id="id71" type="connection" occurrenceRef="#id28"></
Reference></Occurrence></ProductView>
<DataSet id="id42" name="c21l" version="1" memberRefs="#id44"
type="DirectModel">
</DataSet>
<ExternalFile id="id44" locationRef="c21l.jt" format="jt"></ExternalFile>
<Form id="id47" name="002211_ArcWeldForm" subType="ArcWeld Attribute
Form" subClass="ArcWeld Attribute Form">
<Description>ArcWeld Attribute Form</Description>
<UserData id="id48" type="FormAttributes">
<UserValue value="" title="Connected_part_1"></UserValue>
<UserValue value="" title="Connected_part_2"></UserValue>
<UserValue value="" title="Connected_part_3"></UserValue>
<UserValue value="" title="Connected_part_4"></UserValue>
<UserValue value="" title="Connected_part_5"></UserValue>
<UserValue value="" title="Connected_part_6"></UserValue>
<UserValue value="" title="Connected_part_7"></UserValue>
<UserValue value="" title="Connected_part_8"></UserValue>
<UserValue value="" title="Connected_part_9"></UserValue>
<UserValue value="" title="Contour"></UserValue>
<UserValue value="" title="Contour_height_1"></UserValue>
<UserValue value="" title="Depth"></UserValue>
<UserValue value="" title="First_leg"></UserValue>
<UserValue value="" title="Groove_angle"></UserValue>
<UserValue value="" title="Groove_radius"></UserValue>
<UserValue value="" title="Group_id"></UserValue>
<UserValue value="" title="Height"></UserValue>
<UserValue value="" title="Id"></UserValue>
<UserValue value="" title="Method"></UserValue>
<UserValue value="" title="Output_type"></UserValue>
<UserValue value="" title="Penetration_depth_1"></UserValue>
<UserValue value="" title="Plug_diameter"></UserValue>
<UserValue value="" title="Process"></UserValue>
<UserValue value="" title="Root_opening"></UserValue>
<UserValue value="" title="Root_penetration"></UserValue>
<UserValue value="" title="Second_leg"></UserValue>
```


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```
<UserValue value="" title="Setup"></UserValue>
<UserValue value="" title="Size"></UserValue>
<UserValue value="" title="Weld_length"></UserValue>
<UserValue value="" title="Weld_type"></UserValue>
<UserValue value="" title="Weld_volume"></UserValue></UserData></Form>
<Form id="id66" name="002212_SpotWeldForm" subType="SpotWeld Attribute
Form" subClass="SpotWeld Attribute Form">
<Description>SpotWeld Attribute Form</Description>
<UserData id="id67" type="FormAttributes">
<UserValue value="" title="Connected_part_1"></UserValue>
<UserValue value="" title="Connected_part_2"></UserValue>
<UserValue value="" title="Connected_part_3"></UserValue>
<UserValue value="" title="Connected_part_4"></UserValue>
<UserValue type="real" value="" title="Cool_time1"></UserValue>
<UserValue type="real" value="" title="Cool_time2"></UserValue>
<UserValue value="" title="Feat_comment"></UserValue>
<UserValue value="" title="Gov_mtl_thk"></UserValue>
<UserValue value="" title="Group_id"></UserValue>
<UserValue type="real" value="" title="Hold_time"></UserValue>
<UserValue value="" title="Id"></UserValue>
<UserValue type="real" value="" title="Max_current"></UserValue>
<UserValue value="" title="Metal_comb"></UserValue>
<UserValue type="real" value="" title="Min_current1"></UserValue>
<UserValue type="real" value="" title="Min_current2"></UserValue>
<UserValue type="real" value="" title="Nugget_dia"></UserValue>
<UserValue type="int" value="2" title="Number_of_sheets_welded"></
UserValue>
<UserValue type="int" value="" title="Number_of_welds_in_group"></
UserValue>
<UserValue value="" title="Output_type"></UserValue>
<UserValue type="int" value="" title="Pulse_num1"></UserValue>
<UserValue type="int" value="" title="Pulse_num2"></UserValue>
<UserValue type="real" value="" title="Pulse_time1"></UserValue>
<UserValue type="real" value="" title="Pulse_time2"></UserValue>
<UserValue type="real" value="" title="Resistance"></UserValue>
<UserValue value="" title="SPOT_KPC"></UserValue>
<UserValue value="" title="Spot_dimensional_ctrl"></UserValue>
<UserValue value="" title="Spot_kpc_justification"></UserValue>
<UserValue value="" title="Spot_process_ctrl"></UserValue>
<UserValue type="real" value="" title="Squeeze_time"></UserValue>
<UserValue value="" title="Stackup"></UserValue>
<UserValue value="" title="Standard"></UserValue>
<UserValue type="int" value="" title="Tol"></UserValue>
<UserValue value="" title="Weld_class"></UserValue>
<UserValue value="" title="Weld_designation"></UserValue>
<UserValue type="real" value="" title="Weld_force"></UserValue>
<UserValue type="int" value="" title="Weld_group_min"></UserValue>
<UserValue type="int" value="" title="Weld_group_total"></UserValue>
<UserValue type="real" value="" title="Weld_i_value"></UserValue>
```


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```
<UserValue type="real" value="" title="Weld_j_value"></UserValue>
<UserValue type="real" value="" title="Weld_k_value"></UserValue>
<UserValue type="real" value="" title="Weld_time"></UserValue>
<UserValue value="" title="Weld_type"></UserValue>
<UserValue type="real" value="0" title="X_pos"></UserValue>
<UserValue type="real" value="0" title="Y_pos"></UserValue>
<UserValue type="real" value="0" title="Z_pos"></UserValue></UserData></
Form>
</PLMXML>
```

Import file details

Examples of the PLM XML features import format explaining weld point, arc weld, and datum features are detailed below.

For each weld point, arc weld, and datum point you import, the JT is determined by a unique dataset name that you must specify in the PLM XML file.

Example:

```
<ExternalFile id="id222 ext file" locationRef="Arc 5508.jt" format="jt"/>
```

```
<Occurrence id="id1" instancedRef="#id1_con"
associatedAttachmentRefs="#id1_att_form #id1_att_render"
parentRef="#id1_parent">
```

Weld points

In the following example, *id1* is a unique weld point ID that defines a single weld point. Everything with `id="id1..."` is aligned with it, and its container is defined by the attribute `instancedRef="#id1_con"`.

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```
<Occurrence id="id1" instancedRef="#id1_con" associatedAttachmentRefs="#id1_att_form
#id1_att_render" parentRef="#id1_parent">
    <UserData id="id1_instancenotes" type="InstanceNotes">
        <UserValue value="WP_4264" title="Usage_ArchitectureId"/>
    </UserData>
    <Transform id="id1_trafo">-1 0 0 0 0 1 0 0 0 0 -1 0 0.53625 -0.029585 -0.084999 1
    </Transform>
    <Reference id="id1_con1" type="connection" occurrenceRef="#id1_con1_occ"/>
    <Reference id="id1_con2" type="connection" occurrenceRef="#id1_con2_occ"/>
</Occurrence>
<Occurrence id="id1_con1_occ">
    <UserData id="id1_con1_occ_inst" type="InstanceNotes">
        <UserValue value="FrontFloor_000" title="Usage_ArchitectureId"/>
    </UserData>
</Occurrence>
<Occurrence id="id1_con2_occ">
    <UserData id="id1_con2_occ_inst" type="InstanceNotes">
        <UserValue value="FrontFloor_020" title="Usage_ArchitectureId"/>
    </UserData>
</Occurrence>
<Occurrence id="id1_parent">
    <UserData id="id1_parent_inst" type="InstanceNotes">
        <UserValue value="FrontFloor_MFG" title="Usage_ArchitectureId"/>
    </UserData>
</Occurrence>
```

Additional attributes define bill of materials (BOM) line information, including:

- A unique *UserValue value* and a *title* that serves as a connection to the part (`<UserValue value="WP_4264" title="Usage_ArchitectureId"/>`).
- A *Transform* location that connects the weld point (*id1*`_trafo"`) in your structure.
- A parent location (`Occurrence id="`*id1*`_parent"`) and value (`"FrontFloor_MFG"`) that defines where in your structure to place the weld point.

Attributes defined later in the document define additional associated functionality.

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```
<AssociatedAttachment id="id1_att_form" attachmentRef="#id1_form" role="TC_Feature_Form_Relation"/>
<AssociatedAttachment id="id1_att_render" attachmentRef="#id1_render" role="IMAN_Rendering"/>
<DataSet id="id1_render" name="Mfg_Tech_0001_Dataset_Weld_Geo" type="DirectModel"/>
<ConnectionRevision name="WP_4264" id="id1_con" masterRef="#id1_con_master" subType=
"WeldPointRevision" revision="A"/>
<Connection id="id1_con_master" name="WP_4264" subType="WeldPoint"/>
<Form id="id1_form" name="SpotWeldForm" accessRefs="" subType="SpotWeld Attribute Form" subClass=
"SpotWeld Attribute Form">
    <Description>SpotWeld Attribute Form</Description>
    <UserData id="id1_form_attr" type="FormAttributes">
        <UserValue value="WP_4264" title="Id"/>
        <UserValue type="int" value="2" title="Number_of_sheets_welded"/>
        <UserValue value="III" title="Weld_class"/>
        <UserValue value="Geo" title="Weld_designation"/>
        <UserValue type="real" value="-0.000000000000002" title="Weld_i_value"/>
        <UserValue type="real" value="0.000000000000002" title="Weld_j_value"/>
        <UserValue type="real" value="-1.000000000000000" title="Weld_k_value"/>
        <UserValue type="real" value="1" title="Weld_time"/>
        <UserValue value="Resistance Spot" title="Weld_type"/>
        <UserValue type="real" value="536.25" title="X_pos"/>
        <UserValue type="real" value="-29.59" title="Y_pos"/>
        <UserValue type="real" value="-85" title="Z_pos"/>
    </UserData>
</Form>
```

This could include associated attachments such as:

- Forms, including your own custom forms (`id="`*id1*`_att_form"`).
- Weld point representations (`id="`*id1*`_att_render"`).
- Other attachments need not be part of the import, such as dedicated datasets created inside Teamcenter (`name="Mfg_Tech_0001_Dataset_Weld_Geo"`).
- Revision (`subType="WeldPointRevision" revision="A"`), item information, and custom form attributes such as ijk values and xyz positions. The latter is just textual information and does not impact the weld import, which was earlier defined in the transform matrix (*id1*`_trafo"`).

Arc welds

Arc welds provide one additional feature in addition to arc points: the ability to import a JT file (`Arc_5508.jt`) from your local file system.

The JT file exists in a folder beneath the PLM XML import folder.

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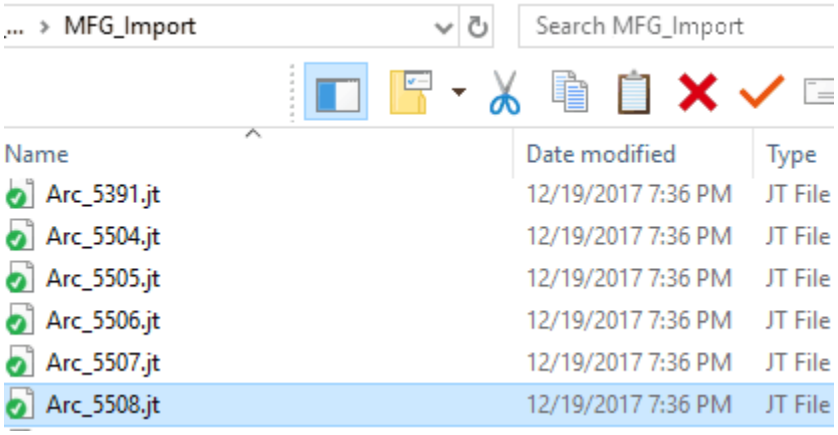


```
<DataSet id="id222_render" memberRefs="#id222_ext_file" name="Arc_5508" type="DirectModel"/>
<ExternalFile id="id222_ext_file" locationRef="Arc_5508.jt" format="jt"/>
```

Feature datums

Datums (`DatumPoint_1000002` below) are similar to weld points but have different forms.

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```
<DataSet id="id2_render" name="MFG_DatumPoint_03" type="DirectModel"/>
<ConnectionRevision name="DatumPoint_1000002" id="id2_con" masterRef="#id2_con_master" subType=
"DatumPointRevision" revision="A">
    <UserData id="id2_conrev_attr">
        <UserValue value="1000002" title="Description"/>
    </UserData>
</ConnectionRevision>
<Connection id="id2_con_master" name="DatumPoint_1000002" subType="DatumPoint"/>
<Form id="id2_form" name="DLFForm" accessRefs="" subType="DLF Attribute Form" subClass="DLF
Attribute Form">
    <Description>DLF Attribute Form</Description>
    <UserData id="id2_form_attr" type="FormAttributes">
        <UserValue value="Part_1" title="Connected_part_1"/>
        <UserValue value="Part_2" title="Connected_part_2"/>
        <UserValue value="Part_3" title="Connected_part_3"/>
        <UserValue type="real" value="0" title="Dlf_i_value"/>
        <UserValue type="real" value="0" title="Dlf_j_value"/>
        <UserValue type="real" value="0" title="Dlf_k_value"/>
        <UserValue type="boolean" value="False" title="Fixed_location"/>
        <UserValue type="boolean" value="False" title="Mature"/>
        <UserValue type="real" value="0" title="MfgOCSYS_i_value"/>
        <UserValue type="real" value="0" title="MfgOCSYS_j_value"/>
        <UserValue type="real" value="0" title="MfgOCSYS_k_value"/>
        <UserValue value="SphereDatum" title="MfgODatum_Type"/>
        <UserValue type="boolean" value="False" title="MfgOcntrl_i_direction"/>
        <UserValue type="boolean" value="False" title="MfgOcntrl_j_direction"/>
        <UserValue type="boolean" value="False" title="MfgOcntrl_k_direction"/>
        <UserValue type="real" value="0" title="MfgOx_pos"/>
        <UserValue type="real" value="0" title="MfgOy_pos"/>
        <UserValue type="real" value="0" title="MfgOz_pos"/>
        <UserValue type="real" value="0" title="wdmOaxis_direction_x"/>
        <UserValue type="real" value="0" title="wdmOaxis_direction_y"/>
        <UserValue type="real" value="0" title="wdmOaxis_direction_z"/>
        <UserValue type="real" value="0" title="wdmOplane_normal_x"/>
        <UserValue type="real" value="0" title="wdmOplane_normal_y"/>
        <UserValue type="real" value="0" title="wdmOplane_normal_z"/>
    </UserData>
</Form>
```

Imported feature revisioning

When you import weld, datum, and arc weld features using the **me_import_mfgs** utility, Teamcenter compares information in the PLM XML file to what is already in the product structure and:

- Updates only the features that have changed.
- Adds new features that are not present in the structure.

> Note:
>
> To update a feature, at least one major property must be changed for that feature.

The following properties are used as keys for comparison.

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- Occurrence (occurrence name, relative transformation matrix, connected to relation)
- Revision attributes (revision name)
- Form attributes:

Weld points	Datums	Arc welds
Resistance	Type	**Depth**
Weld_class	Major control coordinate	**Method**
Weld_designation	Position (**x_pos**, **y_pos**, **z_pos**)	**Process**
Weld_type		**Weld_type**
Weld_force		**Weld_length**
Weld_time		**Weld_volume**

This diagram illustrates how feature revisions are handled. If the feature has a working status, then the existing revision gets updated but not revised, and is renamed. If the feature has a release status, a new revision is applied.

> Note:
>
> If the weld, arc weld, and datum manufacturing feature containers—the parents of welds you want to add, remove, or update in your BOM view revision (BVR)—are not writeable, the import will automatically revise those containers.

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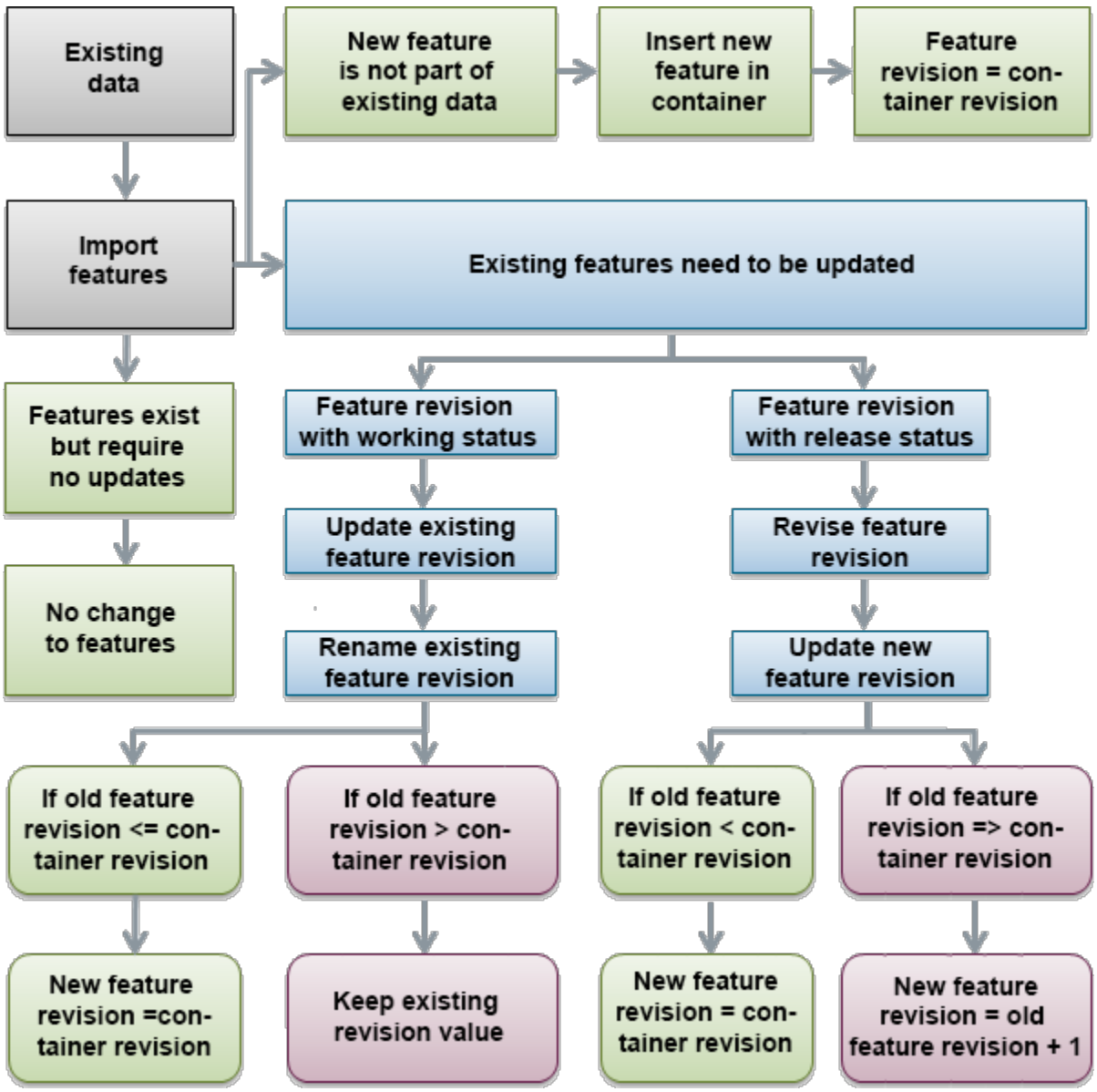

Printing and saving feature data

Print weld point table data

1. Click the **Print** button.

2. (Optional) Change the print format to **Text** (HTML is the default print format).

3. (Optional) Modify the print format settings by clicking the **Set results format** button and entering one of the following:

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Title	Adds a title you specify to the output.
Delimiter	Specifies the character that separates character strings in text file output.
Date	Adds the current date to the output.
Object Count	Adds the object count to the printed output.
Column Alignment	Aligns columns when using text format.

4. To save the file, open it in a Web browser or send it to a printer and complete the process that is appropriate to the file type and desired output.

Open HTML files in a Web browser

a. Click the **Open in Web Browser** button .

b. Execute your browser's print command.

c. Return to the Teamcenter window and click **Close**.

Print a text or HTML file

a. Click the **Print** button in the lower-right corner of the **Print** dialog box.

b. Define the printer to which the file is sent.

You can accept the default printer or select a different printer from the list.

c. Click **Print**.

d. Click **Close**.

Save output to a user-specified (HTML or text) file

a. Click the **Save** button in the lower-right corner of the **Print** dialog box.

b. Navigate to the directory location where you want to save the file.

c. Type the name of the file, including the **.htm**, **.html**, or **.txt** extension, in the **File name** box.

d. Click **Save**.

e. Click **Close**.

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Export weld point table data to Excel

1. Click the **Export Table to Excel** button .

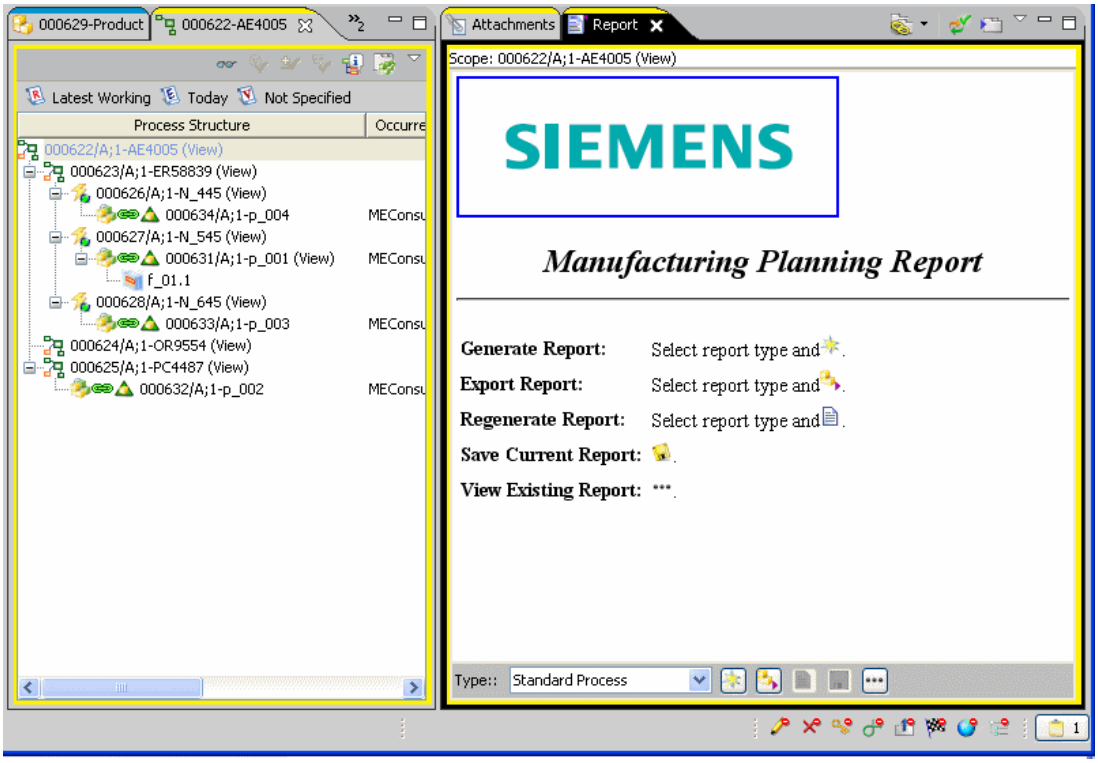
   Teamcenter displays the **Save** dialog box.

2. Specify the path to the directory on your operating system where you want to save the file and click **Save**.

   Teamcenter saves the table as a comma separated file that you can open in Microsoft Excel.

Generating reports for features

You can obtain several types of reports. For a selected process or product, the **Report** view lets you generate a report of the selected type. For example, for a process, you can generate weld sequence, datum utilization, and datum coordination reports. For a product, you can generate an unallocated welds report.



Sample report

Use the menu at the bottom of the view to choose the criteria for a report, and click the buttons to select the desired action, such as generate, save, or view the report.

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The weld process report is applicable to a station process structure built according to best practice. The report assumes that the station process root contains multiple operations directly below it. You must customize the report if the structure you use differs from this best practice.

View assignment indication

Assignment indication mode displays whether a feature is assigned to a process or operation in the target process.

1. Select a target process or operation in the structure pane and click in the **Manufacturing Features** view.

   A target process or operation is the process to which features in the source product structure are assigned.

   Teamcenter adds the selected process or operation as target and displays its name in the target box.

2. Do one of the following:

   - Click the **Show assignment indication** button .

     Teamcenter marks all the features that are assigned to any process or operation under the selected target with the symbol.

   - Filter the features based on whether they are assigned or unassigned.

     a. Click the **Filter data based on assignment status** button .

     b. Select **Assigned** or **Unassigned** from the list.

   Teamcenter displays only those features that are either assigned or unassigned, depending on your selection. Click the **Filter data based on assignment indication** button to turn off the display.

Working with occurrence groups

Introduction to occurrence groups

Occurrence groups help you scope data from a very large structure to a more manageable structure that contains only those objects that you currently need for your work. If you have a very large structure, for example, you can create subsets of this structure in occurrence groups that are tailored to the needs of different departments.

An occurrence group structure is attached to the main structure (the *base view*) and can only hold occurrences from that structure. An occurrence under an occurrence group is the same occurrence

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as in the main structure. Making changes in the occurrence group structure is the same as making these changes in the main structure. You can think of an occurrence group as holding shortcuts to the occurrences in the main structure. You can have multiple shortcuts to the same occurrence, that is, you can assign the same occurrence to multiple occurrence groups. You can create multiple occurrence group structures, each one holding a different list of occurrence groups and a different list of occurrences from the main structure.

> Note:
>
> You can create incremental change information about occurrence groups and their content (children). However, configuring the view to show or hide configured changes does not work for this information. Only incremental change information that is common with the base view (in the item structure) is filtered.

Create an occurrence group

1. Select a line in the base view.
2. Choose **File** → **New** → **Occurrence Group** or click .

   Teamcenter displays the **New Occurrence Group** dialog box.
3. Select the type of occurrence group and click **Next**.
4. Type a name and description of the new occurrence group and click **Finish**.

   Teamcenter creates a new root occurrence group and displays it as a new tab next to the **Base View** tab.
5. Drag components, subassemblies, and other occurrence groups from the source view and drop them into the new occurrence group or use copy and paste.

   > Note:
   >
   > Open the structure twice to be able to have both the root structure and the occurrence group visible at the same time.

Create an occurrence group within an existing occurrence group

1. Select an existing occurrence group within an occurrence group structure.
2. Choose **File→New→Occurrence Group**.

   Teamcenter displays the **New Occurrence Group** dialog box.
3. Type a name and description of the new occurrence group and click **OK**.

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Teamcenter creates a new occurrence group under the selected occurrence group.

Configuring an occurrence group structure

An occurrence group structure holds shortcuts to the original occurrences in the base view. Therefore, all configurations applied on the base view are also applied on all occurrence group structures, and vice versa.

Removing a line under an occurrence group

When working in an occurrence group structure, the **Remove Line** command can have two different meanings depending on the selected object:

- Selecting an occurrence directly under an occurrence group

  The **Remove Line** command removes the occurrence from that specific occurrence group. The occurrence still remains in the base view. Any other shortcut to this occurrence under another occurrence group is not removed.

- Selecting an occurrence that is not directly under an occurrence group (that is, a part below an assembly under the occurrence group)

  The **Remove Line** command removes the occurrence from its parent assembly. This also affects the base view and any other occurrence group containing this assembly. Moreover, if this occurrence was also directly assigned under an occurrence group, it is automatically removed from that occurrence group.

Creating a new occurrence under an occurrence group

When working in an occurrence group structure, you can also add a new occurrence by using either the **New** command or by copying and pasting. Adding an occurrence to an occurrence group also adds it to the base view as follows:

- If the new object is created directly under an occurrence group, it is added to the root object in the base view.

- If the new object is created under an occurrence in an occurrence group, it also appears under the same occurrence in the base view.

Show or hide an occurrence group structure

If you have multiple occurrence groups attached to a base view, you can decide which one to show and which to hide.

1. Choose **Show/Hide Occurrence Groups** from the view menu or click in the structure view toolbar.

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Teamcenter displays a dialog box listing all available occurrence groups.

2. Select the one you want to show or hide.

   Alternatively, select **None** or **All**.

   If you loaded a structure directly, this mode is not saved for the next session. If you loaded a structure within a structure context, the list of visible occurrence groups is managed by the structure context. The last state is saved and loaded in the next session.

Synchronizing occurrence group configuration with the base view

There are several points to note about synchronizing the occurrence group configuration with the base view configuration.

- The configuration between the occurrence group and the base view is synchronized.
- Setting the revision rule, effectivity, occurrence type filter, variant configuration, and show unconfigured data in the occurrence group changes this configuration in the base view, and vice versa.
- All the occurrence groups that are not currently visible are updated when they become visible.

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5. Managing EBOMs-MBOMs

Managing part BOMs

What is a part BOM and why use it?

A part bill of materials (BOM) takes its structure from a CAD model in a released state, such as NX or CATIA. The part BOM can be a collection of design or part items but is essentially a physical model that improves on the Teamcenter EBOM/MBOM relationship. Once the part BOM is created, it can be used to create a manufacturing BOM (MBOM), similarly to an EBOM.

In many cases, a Teamcenter part requires a connection to a CAD design so that the part BOM can be kept up-to-date with the CAD model. A part BOM delivers a lifecycle separation of CAD design and Teamcenter part life cycles to better support downstream applications like Process Simulate, Teamcenter Manufacturing, SIMATIC, Manufacturing Execution System Integration (MES), and Electronic Work Instructions. Although a part BOM is based on the traditional EBOM/MBOM paradigm, it is intended to offer a more controlled and predictable separation between the design BOM and part BOM in Manufacturing Process Planner.

The part BOM is intended for a design engineer, the owner of the part or subassembly. The design engineer is responsible for all aspects of the part/subassembly definition, including ensuring that a new part is actually required and that a suitable part does not already exist in the part catalog, coordinating with the Enterprise Resource Planning (ERP) system to define the part number and material master, and authorizing CAD design work if 3D definition is needed. To create the part BOM, the design engineer would typically:

1. Receive a design BOM structure converted from a CAM/CAD application that consists of design elements.

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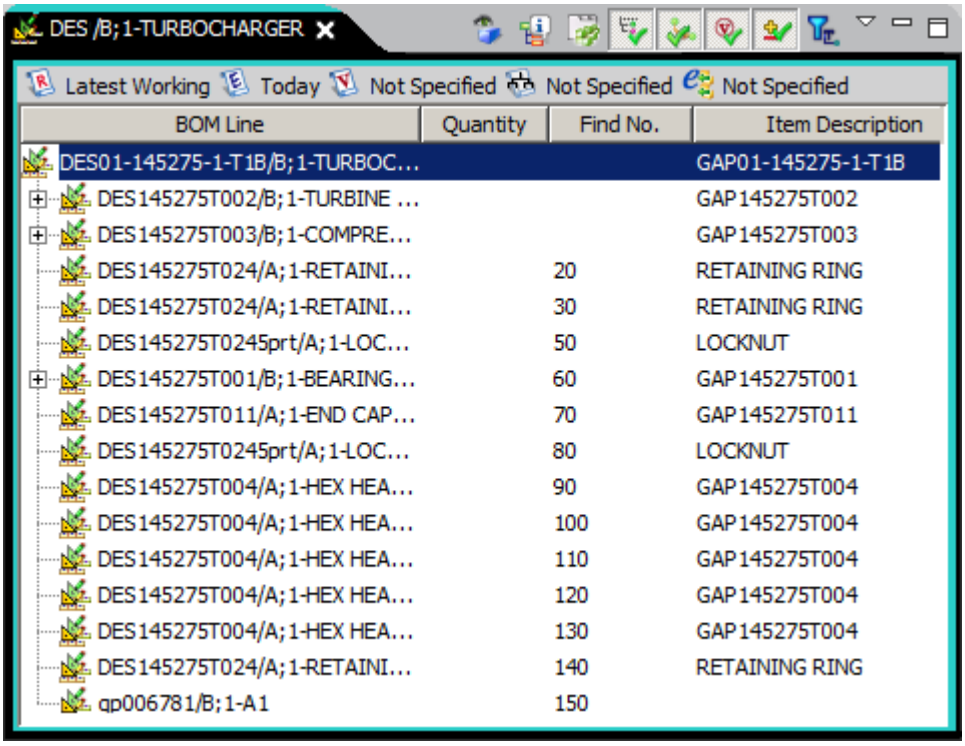
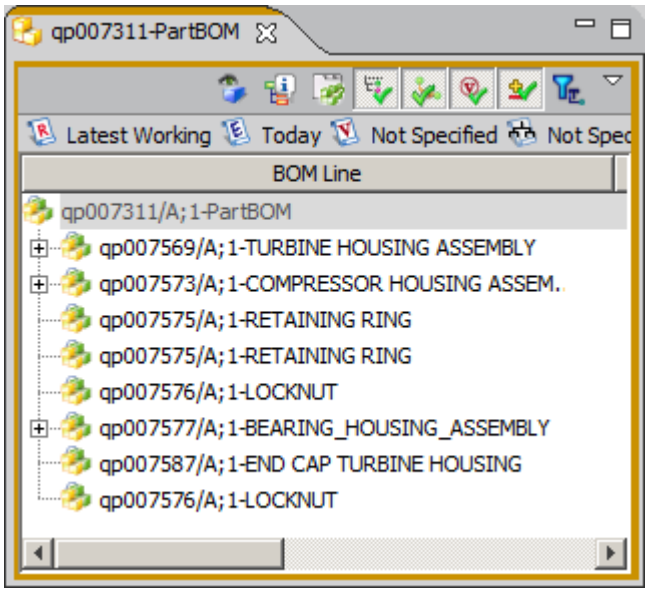


2. **Create a preliminary part or subassembly BOM** with parent and child parts that match the design BOM structure in the context of the manufacturing process, and link the preliminary to the design BOM.



3. Perform **alignments** between the design BOM and preliminary BOM to create the part BOM.

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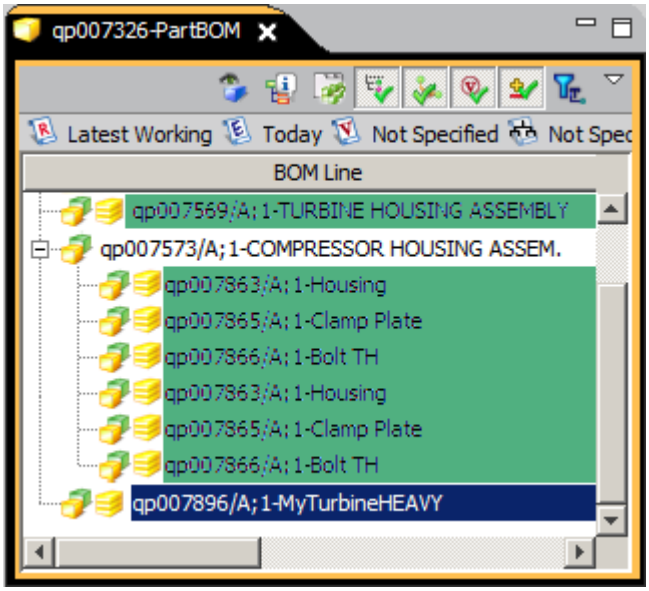

Note:

A system administrator can also create a part BOM from a design BOM using the **me_create_mbom** utility.

4. Use a workflow handler to propagate design revisions as part of your existing design review and approval to update:

   - Alignments and their relationships.
   - Part BOM line properties.
   - All BOMs and BOPs to which part BOM lines are assigned or consumed.

5. Regularly **run an advanced accountability check** between the design BOM and part BOM to ensure BOM lines match, and **update or remove** BOM lines as changes require.

Part BOM requirements

To create a part BOM from a design BOM:

- The **MEDesignToBom_Enabled** preference must be set to **true** (default = **false**).
- Part structures that are created in a part BOM using heavy alignment have parts with BOM view revisions (BVRs) that are not actually assemblies. Change any existing customizations to treat parts with BVRs as leaf lines if they are to be marked as end items.
- The design BOM items and structures must either be created in a CAD system or empty design items created by a manufacturing engineer as a work order for the designer.

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- The design BOM must consist of design object types.
- The part BOM must consist of part object types.
- In the part BOM, add a precise clause to the top of the revision rules.

  Example:

  The **group** feature can be used to create the following clause: **Has Item Type (Design) {Precise}**.

To calculate rolled-up variant conditions from the design BOM and add the logically equivalent variant condition to the aligned part line, add the **bl_condition_tag** property to the **MEDesignToBomAlignmentProperties** preference.

To avoid errors during heavy alignments, if you are using the **TCAllowedChildTypes_<Part>** preference, you must modify it to allow design items. Similarly, if you use the **TCAllowedParentTypes_<Design>** preference, modify it to allow part Items.

Understanding part BOMs

To create a part BOM, you must first create a preliminary part BOM. Once the preliminary BOM parts and subassemblies are **created and linked** to the design BOM, you must align the design BOM with the part BOM. Part BOM part geometry and position are determined by design BOM geometry. To support situations in which you need 3D geometry and others in which you need only subassembly metadata, two types of alignment are available.

- A heavy alignment carries 3D data from the design BOM into the part BOM, generates an end item, and sets each part's unique ID in Context (IDIC) to the same value as that of the design BOM. It also aligns BOM line properties; in other words, BOM line attributes that are represented as column values in the part BOM and the design BOM views. An end item icon is displayed on the heavily aligned item to indicate that any part BOM children are hidden. The design BOM line is copied as a child to the part BOM line and each line is highlighted in green, indicating that a precise BOM View Revision (BVR) has been set and that two levels of alignment have been applied: revision and occurrence. If the **Design Assignment State** column is visible in the part BOM, it displays a value of **2** to indicate a heavy alignment. A BVR precisely defines which revision the part BOM is using.
- A light alignment also aligns BOM line properties but does not appear as an end item and does not carry over 3D geometry. Use light alignments to align the parent of a design BOM subassembly to the parent of a companion part BOM subassembly. This is useful when the children of the design BOM subassembly need to be treated individually. You can then run heavy alignment on child nodes in that subassembly that need to be treated individually and retrieve 3D data for those nodes. If the **Assignment Level** column is visible, it displays a value of **1** to indicate a light alignment.

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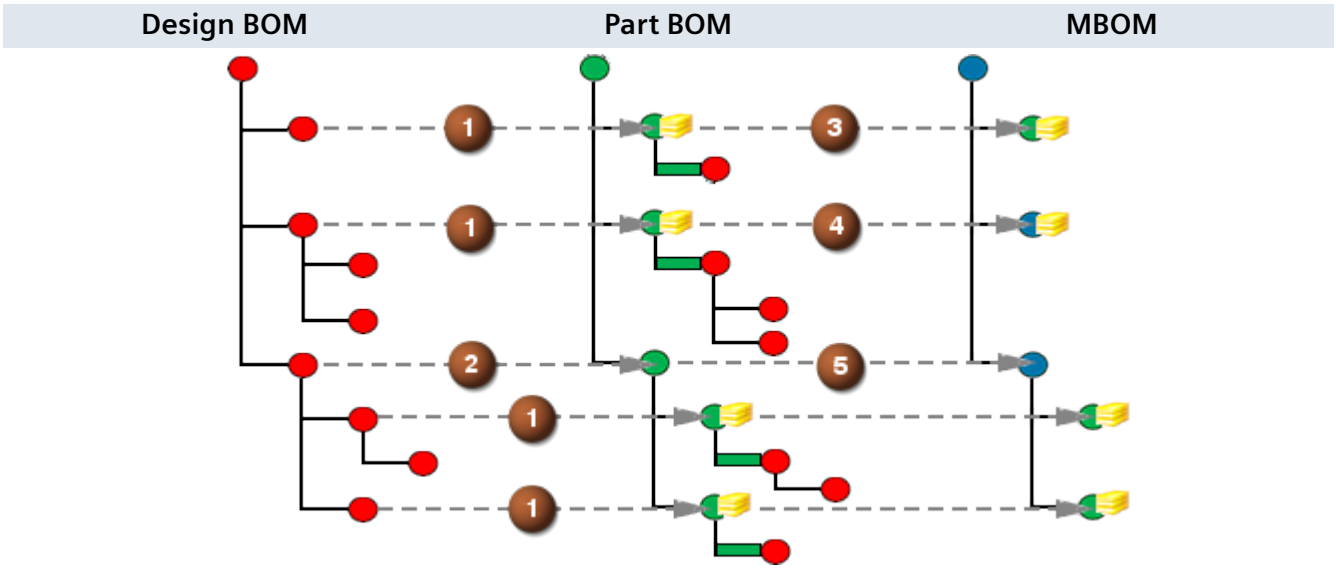

design BOM design object Part Manufacturing part/assembly Precise End Item

1. Heavy alignment includes both an occurrence and revision alignment, both of which are interrelated. An individual design BOM revision can be related to many part revisions, while an individual part revision can be related to 0 or 1 design revisions. Heavy alignment:
   - Applies an end item to the part BOM line, which hides all children of a subassembly.
   - Brings 3D geometry to the part BOM.
   - Treats a subassembly as a single part. If parts in a subassembly need to be accessed in multiple locations downstream, subassemblies should use light alignment on the subassembly and then apply heavy alignment to those parts.
2. Light alignment applies only occurrence alignment (part properties) but retains all children. Light alignment does not bring 3D geometry to the part BOM.
3. When applied from the part BOM to the MBOM, a heavy-aligned part can be assigned to an outsourced (buy) part.
4. A heavy-aligned part can also be assigned to the MBOM as an internally manufactured (make) part.
5. A light-aligned manufacturing assembly can be assigned to the MBOM as a collection of heavy-aligned parts, each of which is internally manufactured and assembled.

When you create a standard EBOM from a design BOM in Manufacturing Process Planner, the EBOM links to the parts in the EBOM. When you create a part BOM from a design BOM, the parts are not linked but are instead copied to the part BOM.

Create and link a preliminary part BOM to a design BOM

Before you can align a part BOM with a design BOM, you must create a preliminary BOM and link it to the design BOM. A preliminary part BOM is essentially a part BOM with a structure that can be aligned

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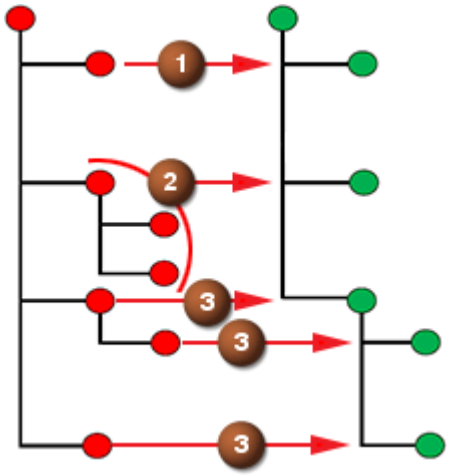
with the design BOM but is more appropriate to the actual manufacturing process. Because some parts and subassemblies are made and some are outsourced, parts and subassemblies that exist in the part BOM can be defined as *end items* in the part BOM—single items that represent a combination of consumed end products, component parts, and/or materials that are not of interest in a manufacturing process.

Example:



1 You can create your part BOM structure to align a single part in the design BOM to another in the part BOM using either:

- A light alignment that aligns the part's BOM line properties and revision information but not a BOM view revision (BVR). Light alignments do not copy 3D geometry to the part BOM.
- A heavy alignment that generates an end item with a precise BVR and an occurrence revision. Heavy alignments copy 3D geometry to the part BOM.

2 A heavy alignment that generates a single end item that represents an outsourced subassembly of parts.

3 A light alignment that aligns several parts' BOM line properties.

1. Ensure that no alignments have been created using the legacy Manufacturing Process Planner **Tools→Structure Alignment** options, and that the **MEDesignToBOM_Enabled** preference is set to **true**.

   Note:

   If you are using the **Rollup_Variant_Feature** preference, usually used to roll up variants on an EBOM to an MBOM, and you want the rolled-up variant conditions to be applied when you align a design BOM to a part BOM, add the **bl_condition_tag** property to the **MEAlignedPropertiesList** preference.

2. Open the design BOM for which you want to create a part BOM.

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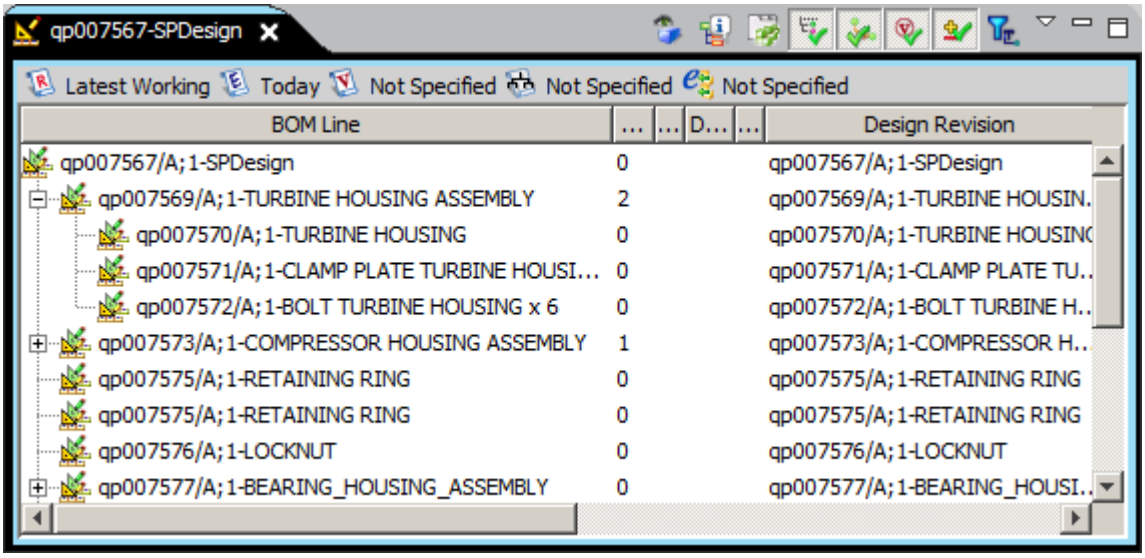

3. With no lines in the design BOM selected, choose **File→New→Part**.

> Note:
>
> If 4th Generation Product Master is installed with Teamcenter on a 64-bit Linux server, you can only create legacy part objects (**File→New→Legacy Part**).

4. In the **New Part** dialog box, click **Next**.

5. In the **Part Information** section, type an ID/revision or click **Assign**, type a name for your part BOM, and click **Finish**.

   A new BOM opens with the top line defined. By default, when you create a part, its **Design Required** attribute is set to **True**. To align with the design BOM, all parts must have this attribute set to **True**.

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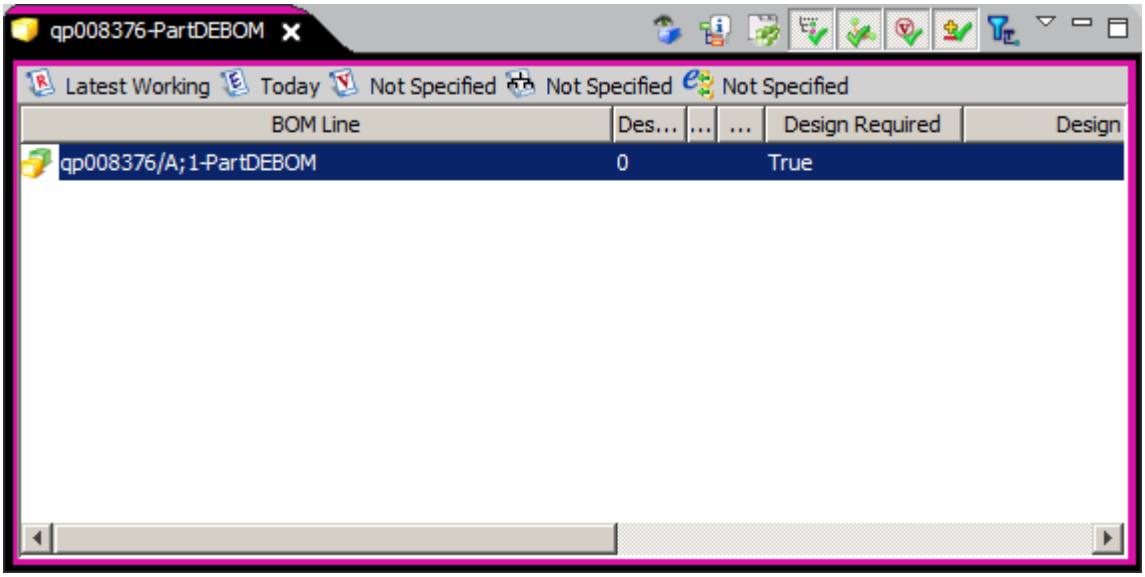

6. With the top line selected, add additional parts or assemblies to match the design BOM structure as needed.

   In this example, note that all of the CAM BOM hex head bolts share the same ID, **qp007588**, indicating that they are reusable instances of one design. In cases like this, the part in the part BOM is copied and pasted rather than created so that all hex bolts in the part BOM retain a single ID, **qp008378**. You could also locate an existing part in Teamcenter that was created for a previous product using the **Attachments** pane.

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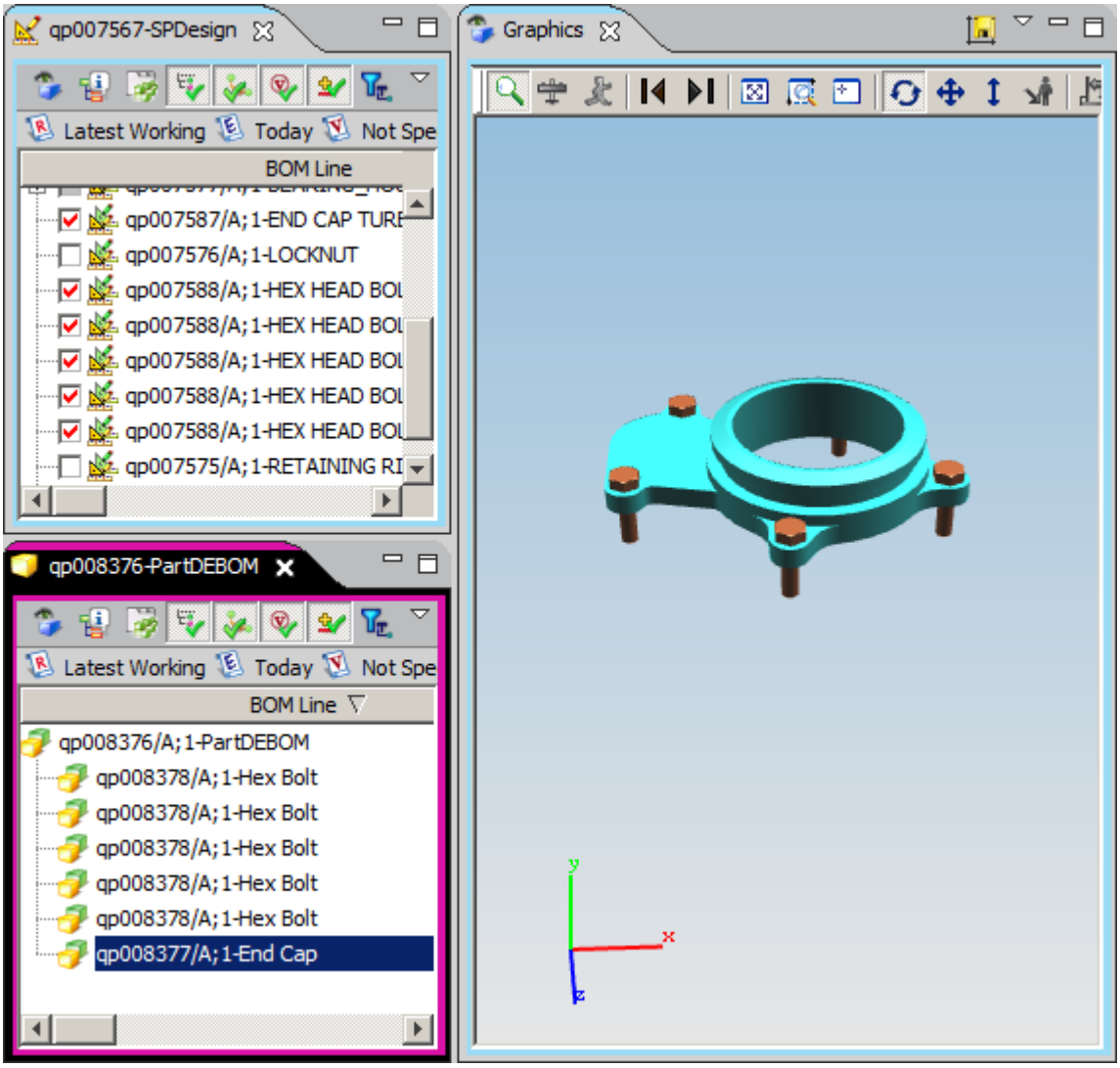

7. Right-click the top line of the part BOM and choose **Link/Associate→Link Part to Design Top Line**.

   If you later want to verify which design BOM is linked to a part BOM or vice versa, you can open the linked BOM using the **Linked to Product** find command.

8. Select the top line of the part BOM and in the **Link Part to Design Top Line** dialog box, click **Set/Add current selection**.

9. Click **OK** and in the resulting confirmation, click **OK** again.

   The two structures are linked, and you are ready to align their components.

Manually align a part BOM to a design BOM

You can manually heavy- or light-align a part BOM to a design BOM. There are different benefits to heavy versus light alignments.

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Create one or more heavy alignments

1. If you have not already done so, **create and link** a part BOM to a design BOM and ensure that all **requirements** are met.

2. Do either of the following.

   - Heavy align a single part or part subassembly.

     > Note:
     >
     > If you apply heavy alignments to many children of a parent subassembly, you should always apply light alignment to the parent subassembly. If the parent of heavily aligned children is also heavily aligned and transform changes are applied to both, you will need to separately **update** both the parent and the child heavy alignments. If the parent is lightly aligned, you only need to update that alignment to the parent to update all parent and child transforms.

     a. In the part BOM, right-click the part or subassembly to be aligned and choose **Create Heavy Alignment to Design**.

        > Note:
        >
        > You can also locate the design and create a heavy alignment using the **Search for Design and Create Heavy Alignment** command.

        In the **Create Heavy Alignment to Design** dialog box, the part is displayed in the **Part** list box.

     b. In the design BOM, select the part or subassembly to be aligned, and next to the **Design** list box, click **Set/Add current selection** .

     c. Click **OK**, and in the confirmation, click **OK** again.

        The part or subassembly is aligned to the design element and displays an end item icon . If you chose to align a subassembly, it is treated as a single element in the part BOM.

     d. Click **Show Graphics** in the part BOM and show the aligned part or subassembly.

        If the designer has completed his work, the part or subassembly is visible in the graphics window.

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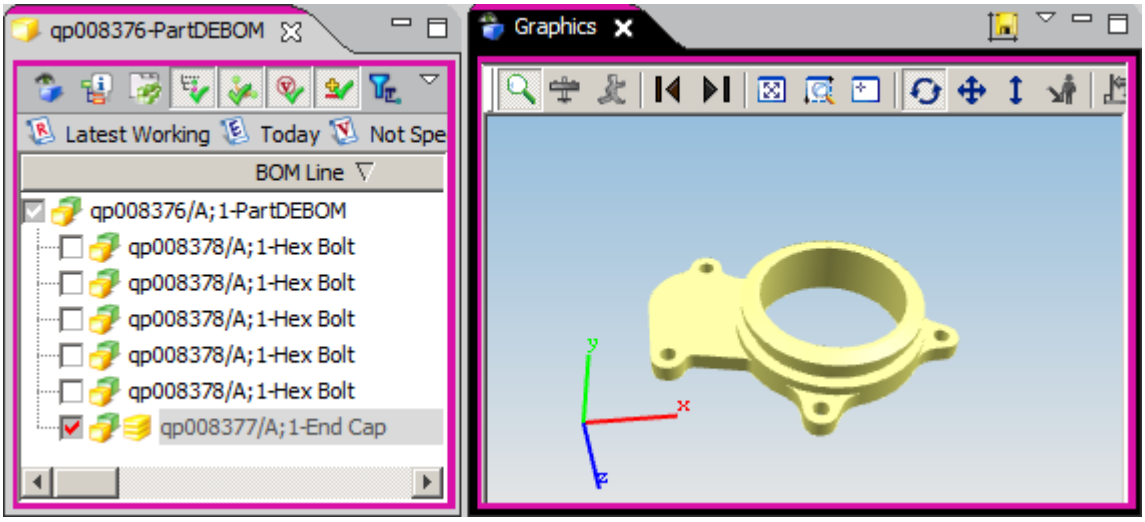

- Heavy align multiple parts.

  Note:

  You can only align multiple parts with the same item ID. Use the **Copy** and **Paste** commands to create parts with the same item ID (for example, a collection of identical bolts), or find a reusable part in Teamcenter.

  a. Press Ctrl, and in the part BOM, select the parts to be aligned.

     Note:

     You can also locate the design and create a heavy alignment using the **Search for Design and Create Heavy Alignment** command.

  b. Choose **Create Heavy Alignment to Design**.

     In the **Create Heavy Alignment to Design** dialog box, the parts are displayed in the **Part** list box as well as their total count.

  c. In the design BOM, select the same parts to be aligned, and next to the **Design** list box, click **Set/Add current selection**.

     The design objects are displayed in the **Design** list box as well as their total count.

     Note:

     There is no guarantee that multiple selected bolts in the part BOM align in the same order as those selected in the design BOM.

  d. Click **OK**, and in the confirmation, click **OK** again.

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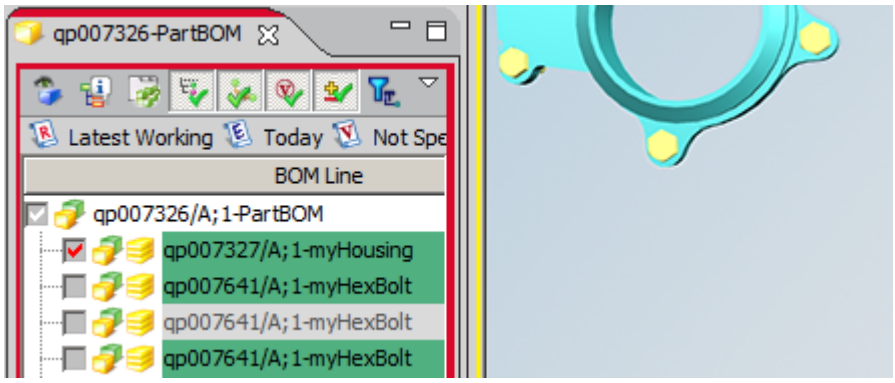
The parts are aligned to the design element and display end item icons .

e. Click **Show Graphics** in the part BOM and show the aligned parts.



Create one or more light alignments

1. If you have not already done so, create and link a part BOM to a design BOM and ensure that all requirements are met.

2. Do either of the following.

   - Light align a single part or part subassembly.

     a. In the part BOM, right-click the part or subassembly to be aligned and choose **Create Light Alignment to Design**.

     > Note:
     >
     > You can also locate the design and create a light alignment using the **Search for Design and Create Light Alignment** command.

     In the **Create Light Alignment to Design** dialog box, the part is displayed in the **Part** list box.

     b. In the design BOM, select the part or subassembly to be aligned, and next to the **Design** list box, click **Set/Add current selection** .

     c. Click **OK**, and in the confirmation, click **OK** again.

     The part or subassembly is aligned to the design element. If you chose to align a subassembly, all parts are aligned in the part BOM.

   - Light align multiple parts.

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> Note:
>
> You can only align multiple parts with the same item ID. Use the **Copy** and **Paste** commands to create parts with the same item ID (for example, a collection of identical bolts).

a. Press Ctrl, and in the part BOM, select the parts to be aligned.

> Note:
>
> You can also locate the design and create a light alignment using the **Search for Design and Create Light Alignment** command.

b. Choose **Design Alignment→Create Light Alignment to Design**.

In the **Create Light Alignment to Design** dialog box, the parts are displayed in the **Part** list box as well as their total count.

c. In the design BOM, select the same parts to be aligned, and next to the **Design** list box, click **Set/Add current selection** .

The design objects are displayed in the **Design** list box as well as their total count.

> Note:
>
> There is no guarantee that multiple selected bolts in the part BOM align in the same order as those selected in the design BOM.

d. Click **OK**, and in the confirmation, click **OK** again.

The parts are aligned to the design element.

Align a part BOM using a smart search

While you can manually apply heavy or light alignments to part BOMs from CAD BOMs, you can also search for design objects based on a variety of attribute criteria that exists in the system or is defined by your administrator, and create heavy or light alignments based on search results:

- If you never aligned part/CAD BOM items before.
- If you previously aligned them but the alignment somehow became broken.

1. Decide whether you want to perform a **heavy or light alignment**.

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2. Right-click a part in the part BOM and choose **Search for Design and Create Heavy Alignment** or **Search for Design and Create Light Alignment**.

   In the **Create Heavy Alignment to Design** or **Create Light Alignment to Design** dialog box, any CAD BOM objects found to share attributes in common with the selected part object in the part BOM are displayed.

3. Click **Set/Add current selection** to align the objects.

4. For the current session only, if you want to search for other matching objects and want to automatically align the objects if a single exact match is found, select the **Do not show this dialog again for single exact matches** check box, and then click **OK**.

   A message is displayed reporting that the CAD and part objects are aligned.

5. If you would rather not see this message again while aligning other objects, select the **Do not show this warning again in the session** check box.

Run a part BOM accountability check

To validate completeness between your part BOM and design BOM, you should run an advanced accountability check on a regular basis and as your workflow requires.

> Note:
>
> Completeness checks are not supported.

1. Select the root BOM line of the design BOM and then the part BOM, and choose **Tools→Accountability Check→Advanced Accountability Check**.

2. In the **Advanced Accountability Check** dialog box, on the **Scope** tab, ensure the top lines are correct.

3. Click the **Inclusion Rules** tab and select **Search lines per filtering rule**.

4. From the **Source filtering rule** and **Target filtering rule** lists, select **DesignToBomAll**.

   > Note:
   >
   > Your administrator may create another option specific to your process.

5. Click the **Partial Match** tab and **BOM Properties** subtab, and add the properties **Design Revision**, **Find No. Absolute Transformation Matrix**, and **ID in Context (Top Level)**

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> Caution:
>
> When you create a BOM from a part BOM, if the assigned parts do not copy the absolute transform matrix **bl_plmxml_abs_xform** properties over to the new BOM, you must define separate business object types for MBOM containers. If this is not possible, ensure that the **is_designrequired** property is set to **false** for all MBOM containers.

6. Apply any additional **advanced accountability check settings** that are required by your organization.

7. Click **OK** to run the accountability check.

   The check should report no nonequivalent lines, only a missing in source and missing in target alert for the top BOM lines, which should not match. If any alignments are incorrect, **update or remove** them.

Update or remove a part BOM alignment

Update a part BOM

You can update a part BOM by simply **aligning parts** with design BOM elements again or by **running** a part BOM advanced accountability check. If parts are still shown as matching in the accountability check even though alignment is removed, use the **Design Revision** property to detect misalignments in partial matches.

> Note:
>
> If you have apply and update a heavy alignment to a parent assembly that also contains heavily aligned children, and those children are affected by positioning transformations, you must also reapply heavy alignments to the children to update their transforms.

Remove one or more heavy or light alignments in the part BOM

You can remove an alignment if you make a mistake or a design change exists.

> Warning:
>
> Removing an alignment can impact other structures that use the same part. Avoid using the **Remove Alignment** command except in cases where the part revision in the part BOM needs to align with a new design item in the design BOM. For aligning to another revision of the same design Item, use the heavy or light alignment commands.

1. To remove one or more heavy or light alignments, respectively, in the part BOM, click a single part or press Ctrl and then select multiple parts with the same item ID.

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2. Right-click a selected portion of the part BOM and choose **Design Alignment→Remove Alignment**.

   In the **Remove Part Design Alignment** dialog box, all BOM lines that contain the part in the open part structure are displayed.

3. Click **OK**.

4. If you are removing alignments from other unselected BOM lines in the same structure, or if the alignment reomoval impacts any structure that contains its part revision, confirm that you want to remove the alignment from those structures by clicking **OK** in the warning.

   The alignment is removed from the part or parts. Teamcenter removes any occurrence and item revision data, and heavy-aligned parts lose their end items and green precise color.

   > Note:
   >
   > If you later choose to realign a part that was aligned and its alignment removed as part of a multiple selection, Teamcenter remembers that the multiple parts were previously similarly aligned and applies alignment to the other parts as well. These parts display a gray icon until you unload and reload the part BOM.

Find linked part or design structures

You can quickly locate part structures that are linked to a design BOM, or design structures that are linked to a part BOM.

1. Do one of the following.

   - To find part structures linked to a design BOM, in the design BOM, right-click the design or part object to be found and choose **Find Linked Part Structure(s)**.

   - To find design structures linked to a part BOM, in the part BOM, right-click the part object to be found and choose **Find Linked Design Structure(s)**.

   > Note:
   >
   > You must select only a single line to be found. You cannot select the top line of a design or part BOM to locate a linked structure.

2. In the **Find Linked Part Structures** or **Find Linked Design Structures** dialog box, select the structures you want to view and click **Open**.

The structures containing the part or design object are loaded in Teamcenter.

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Comparing the EBOM and MBOM

The manufacturing engineer creates a manufacturing structure (MBOM or manufacturing bill of materials) from the product structure (EBOM or engineering bill of materials). The MBOM is a different arrangement of the EBOM that can be optimized for manufacturing purposes. You must specify two structures to be the EBOM and MBOM using the **Link Structures** command. When you link an EBOM with an MBOM, their BOM view revisions are linked by an **METarget** relation.

To ensure that all required parts in the EBOM are contained in the MBOM you can **run an advanced accountability check**. This feature uses the in-context ID (IDIC represented by the **AbsOccID** property) to establish logical equivalence between aligned occurrences. If you want to use this feature, you cannot use the in-context ID for any other purpose. Using an accountability check, you can see if parts have been added or removed from the EBOM, discern any property changes, propagate any changes from the EBOM to the MBOM, or run the accountability check at a scheduled time.

If you use Multi-Site Collaboration and want to consume a remote EBOM in the MBOM, you must create the in-context IDs for the BOM lines to be consumed at the owning site before you export the EBOM to a remote site. Otherwise, a check does not report differences between the structures.

Operation of these features is controlled by preferences.

Caution:

- You cannot link an EBOM to an MBOM contained in a composition structure context. If you use a structure context to hold the MBOM, you cannot use the alignment check feature.
- Cutting and pasting the same line back into an MBOM creates a new occurrence without an in-context ID. This removes the equivalence between the new occurrence and the original source part in the EBOM and causes the pasted line to be displayed as missing in the other structure in an accountability check.

Assign occurrences between structures

1. Open the EBOM root line (source) and MBOM root line (target) in separate structure views. It is helpful to detach one view so you can display the structures side-by-side.

   Tip:

   Use the **Manufacturing - BOM Reconciliation** perspective when performing EBOM-MBOM alignment. This perspective already contains the required views for this task without you having to modify the layout of the **Manufacturing Process Planner** perspective.

2. Configure the EBOM and MBOM appropriately. The root lines of the structures provide the context for assignments.

3. Select the MBOM root structure and choose **Tools→Link/Associate→Link Structures**.

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Teamcenter displays the **Link Structures** dialog box.

4. Select the EBOM structure root that you want to link and click in the **Link Structures** dialog box.

> Caution:
>
> You cannot link an MBOM structure contained in a composition structure context to an EBOM structure.

Teamcenter links the EBOM root and the MBOM root. When these structures are linked, all further assignments into the MBOM from the EBOM create logically equivalent MBOM occurrences. The occurrences in the EBOM and MBOM are associated based on the in-context ID (IDIC) and the defined properties copied from the EBOM to the MBOM.

> Note:
>
> The **MEAlignedPropertiestoExcludeFromInitialization** preference defines the list of BOM line properties that are not copied to an aligned target occurrence when it is initialized.

If the line you are assigning contains in-context attachments, see *Carrying forward in-context attachments*.

5. Rearrange the MBOM for manufacturing purposes. The aligned occurrences and their properties remain linked.

> Note:
>
> If you assign a line containing children from the EBOM to the MBOM, only the parent line is given an IDIC. If you remove that parent line from that MBOM, the children move up a level in the hierarchy, but because they do not have an IDIC, they do not show up as a match when running an accountability check between the two structures. Use the **MECreateIdInContextforAssignedchildlines** preference to specify that Teamcenter assigns an IDIC to the child lines when assigning the parent from the EBOM to the MBOM.

Carrying forward in-context attachments

If you work with an engineering bill of materials (EBOM) and a manufacturing bill of materials (MBOM), when you assign structures from the MBOM to the EBOM, you can carry forward attachments that are associated in-context in the EBOM. The same information is available in the bill of processes (BOP), when MBOM occurrences with in-context information are assigned to the BOP.

Three preferences manage in-context attachments. One preference manages how in-context attachments from the MBOM are made available in the BOP. Your Teamcenter administrator sets the preference values. It is helpful to know how these preference values control the behavior of in-context attachments in your environment.

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Caution:

If preference values are not set, attachments are not carried over when you perform an assign operation.

- *MEAssignAttachmentAndRelationToUseInCopyRule* – indicates which datasets are carried forward as in-context attachments, and whether the datasets are treated as a reference or a copy.

  For example, set the value to DirectModel:IMAN_Rendering:Reference to carry forward flexible (deformable) parts as in-context attachments referenced in the MBOM.

- *MEAssignAttachmentContext* – sets the context for the in-context attachment of an assigned occurrence from the EBOM to the MBOM, as either set the top line of the MBOM or a direct parent of the occurrence assigned from the EBOM to the MBOM.

- *MEAssignPropertiesInContext* – carries forward the in-context overridden value of a property on an occurrence or its child in an EBOM when assigning that occurrence from the EBOM to the MBOM. This feature is supported for the absolute transform matrix (bl_plmxml_abs_xform) only.

- *MEAssign_support_incontext_below_consumed* – makes in-context datasets available as attachments and transforms overrides for child lines of consumed lines from the MBOM to the BOP.

Occurrence effectivity options from EBOM to MBOM

Using the **MEAlignedPropertiesList** and **MEEffectivityAssignmentMode** preferences, your administrator can configure a linked EBOM and MBOM so that the *unit-based* occurrence effectivity of the EBOM (source) is automatically established in the MBOM (target) after a line or assembly has been assigned to the target. This option helps you avoid errors resulting from manually entering the occurrence effectivities yourself.

Depending on your administrator's settings, when you assign a line in an EBOM to an MBOM, the assigned line may:

- Inherit only the occurrence effectivity defined on the EBOM line, if such effectivity exists. This is the default behavior.

  Example:

  Assigning EBOM line **000155/A;1-c7** to the linked MBOM inherits its effectivity from that line, not from any line with a different effectivity higher in the structure.

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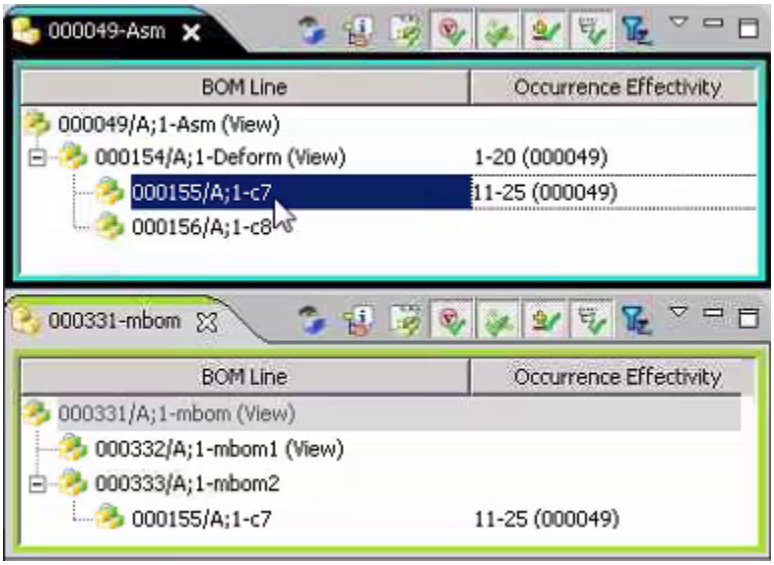
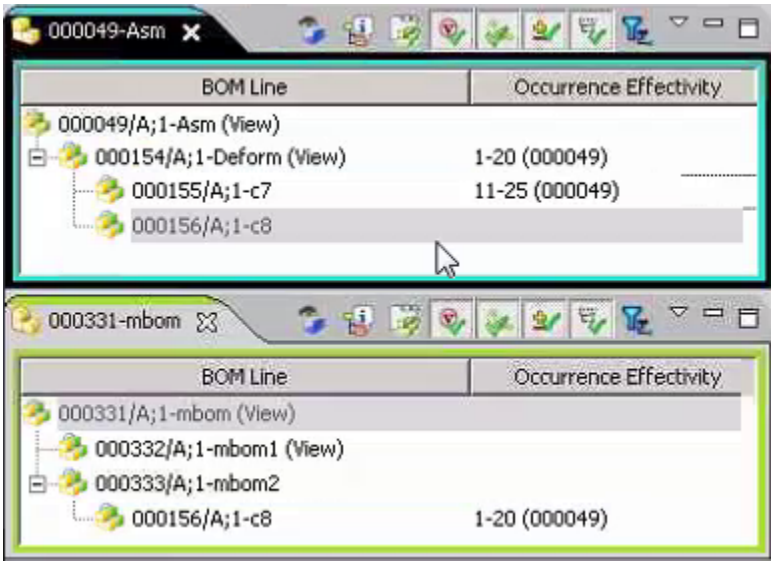


- Inherit the effectivity of its parent if it has no effectivity of its own.

Example:

Assigning EBOM line **000156/A;1-c8** to a linked MBOM results in the assigned line inheriting its effectivity from its parent line because it has no effectivity. If you assign EBOM line **000156/A;1-c7** to the MBOM, it retains its own effectivity of 11-25.



- Display a calculated net effectivity value.

  Net effectivity calculates the intersection of effectivities set on the path from the EBOM line to be assigned up the parent chain. Starting from the selected EBOM line, and including the EBOM line itself, net effectivity traverses up the parent chain until it finds the first parent with an explicitly

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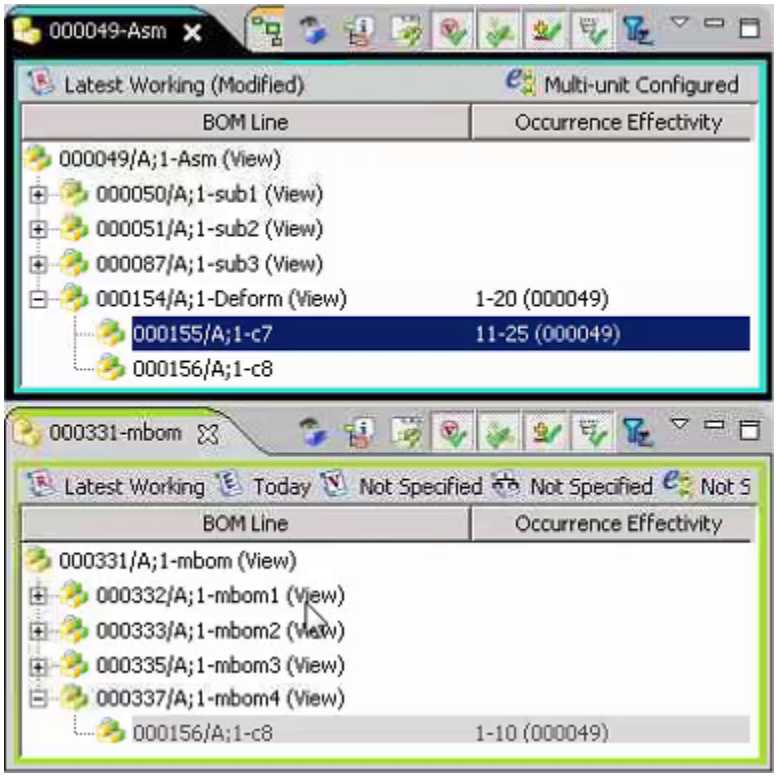
defined occurrence effectivity. The occurrence effectivity defined on that parent becomes the MBOM line's net effectivity. If an effectivity is defined in the BOM window's revision rule, the computation will intersect the parent's occurrence effectivity with that defined in the revision rule. The result of the intersection is the final net effectivity.

Example:

The top line of the EBOM shown is associated with a multi-unit configured effectivity group with values of 1-10 (not visible). Line **000156/A;1-c8** has no effectivity, but its parent, **000154/A;1-Deform** has a value of 1-20. Net effectivity calculates the available range shared by the multi-unit configured effectivity group value (1-10) and the **000154/A;1-Deform** value (1-20), which is 1-10.



Rolling up variant conditions

You can optionally propagate **rolled-up variant conditions** when you assign parts from the EBOM to the MBOM or from a product BOP to a plant BOP. As a result, the BOM lines in the MBOM or plant BOP hold the same variant conditions as the corresponding BOM lines in the EBOM or product BOP. Teamcenter copies the variant condition on the source line, rolls up the variant conditions of all parents of the source line, and then propagates the rolled-up variant condition to the target MBOM line, as shown.

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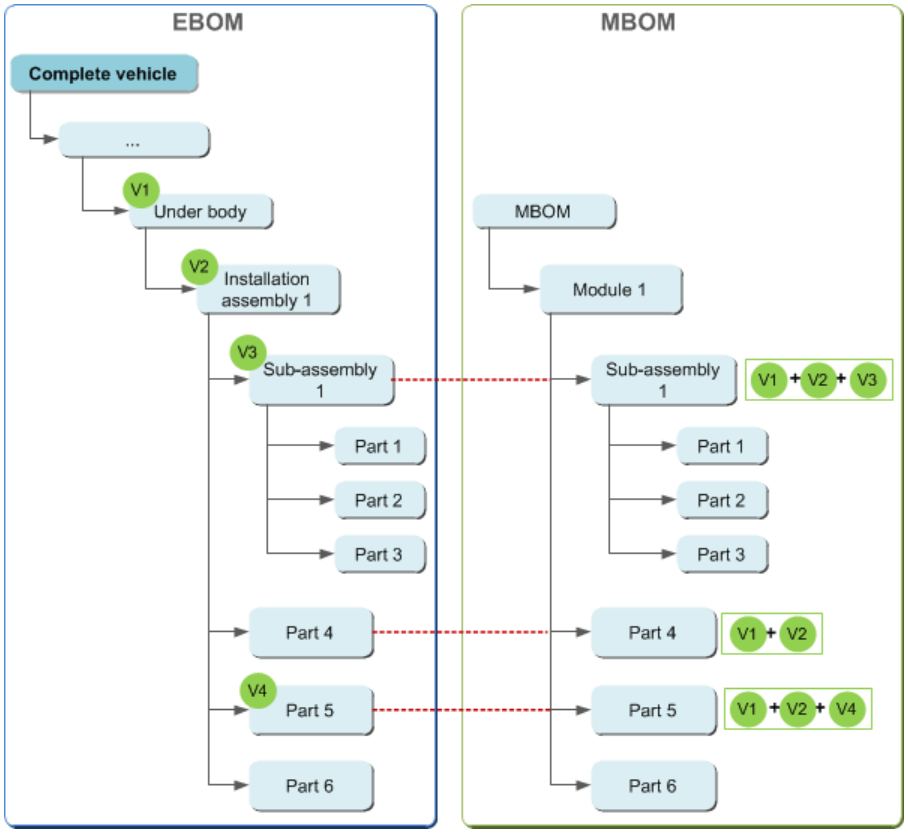

The top levels of the EBOM and MBOM must be linked for correct propagation of rolled-up variant conditions. Teamcenter calculates the rolled-up variant condition by traversing from the source line to the linked top or up to the installation assembly level, and then adding together all the variant conditions found during the traversal.

If the source line does not have variant conditions, Teamcenter calculates the rolled-up variant condition by considering the variant conditions of the parent and all levels above.

The accountability check is modified to recalculate the rolled-up variant condition on the source line and compare it with the variant condition already stored on the associated MBOM line. It then reports any partial match discrepancies between the variant conditions.

By default, rolling up of variant conditions is disabled and must be enabled by setting the **Rollup_Variant_Feature** site preference to **true**. You should also set the **RollUp_Variant_Traverse_Level_Is_InstallationAssembly** preference to determine the level to which rolled-up variant conditions are calculated. If this preference is set to **TRUE**, Teamcenter calculates the rolled-up variant condition by traversing up to the installation assembly level in the structure. If the preference does not exist or is set to **FALSE**, it calculates the rolled-up variant condition by traversing up to the linked top.

If the rolled up variant expression is too long, your administrator can create the **Rollup_Variant_Optimized_Format** preference and set it to **TRUE**. Teamcenter then optimizes the rolled up variant expression for storage and display.

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The following installation assembly preferences must also be set:

- **PortalDesignContextIsInstallationAssemblyMethod**
- **PortalDesignContextIsInstallationAssemblyMethod.hasIRType.Type**
- **PortalDesignContextIsInstallationAssemblyMethod.has_bomline_prop.name**
- **PortalDesignContextIsInstallationAssemblyMethod.has_bomline_prop.value**

> Note:
>
> For the EBOM/MBOM scenario, Teamcenter calculates a rolled-up variant condition only if an assignment is made from the EBOM to the MBOM and both structures are linked.
>
> Rolled-up variant condition supports the Teamcenter Product Configurator and classic model, not with modular variants.
>
> The rolled-up variant condition is saved in optimized form in the database but, when you view it, you see a summation (**AND** calculation) of all variant conditions from the source line to the linked top. Consequently, the rolled-up variant condition displayed on the target line may contain some redundant clauses. This helps you decompose the variant condition to its constituent building block expressions.

Additional preference settings:

- Set **PSM_enable_product_configurator** to **true**.
- Set **Rollup_Variant_Feature** to **true**.
- Add **bl_formula** to the **MEAlignedPropertiesList** preference.
- Make sure **bl_formula** is not in any preferences beginning with **MEAlignedPropertiesToExclude...**

When Teamcenter calculates the variant condition when allocating from a product BOP to a generic BOP, it only calculates for the line being allocated. Therefore, if you allocate a process with child processes or operations, it does not calculate the rolled up variant condition for any children of the process being allocated. This results in a mismatch if you run an accountability check between the product BOP and the plant BOP. You have two choices in this case:

- Do not run the accountability check for a level lower than the one you allocate.
- Propagate the mismatch between the children of the process from the product BOP to the plant BOP.

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Run an alignment check

Perform an alignment check

If the EBOM is modified, broken links or other anomalies may occur. To identify and resolve such issues, run an alignment check to assess the alignment (logical equivalence) of occurrences in the EBOM and MBOM.

1. Open the two structures in separate structure views. Teamcenter considers all contexts for the lines in scope. The check compares specific properties of the logically equivalent occurrences that are under the designated scope.

2. If packed lines are present, unpack the structures before performing the alignment check.

3. Select a line in the source structure as scope for the alignment check.

4. Choose **Tools→Alignment Check** .

   Teamcenter opens the **Alignment Check** dialog box with the source structure already selected.

5. In the target structure, select the line you want as scope and click **Add selected** in the **Alignment Check** dialog box.

6. Click **OK**.

   Teamcenter initiates the assessment and, when it is complete, displays the **Structure Alignment Check** dialog box showing the results.

   The upper table shows all pairs of occurrences, regardless of whether they match. Pairs with matched data are marked with a ✓ symbol, while pairs with mismatched data are marked with a ✗ symbol.

   The lower table shows all the properties of the currently selected pair of occurrences, allowing you to visually identify mismatched properties.

   > Note:
   >
   > The **MEAlignedPropertiestoExcludeFromDetection** preference defines the list of any BOM line properties that are not compared between aligned occurrences.

7. (Optional) Click **Save As Report** in the dialog box.

   Teamcenter displays a **Structure Alignment Check Report** dialog box that allows you to choose a name or accept the default report name.

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8. (Optional) Synchronize the data of all occurrence pairs or selected occurrence pairs, as follows:

   a. Choose each pair of occurrences whose data you want to synchronize by selecting the corresponding check boxes in the **V** column of the **Alignment Check Results** table in the **Structure Alignment Check** dialog window. To select all lines for synchronization, click .

   b. Click **Update**.

      Teamcenter updates the properties of the target lines of all selected pairs. After the update completes, the **Match** status of the selected pairs is updated and the corresponding check boxes disabled.

      If any of the selected pairs cannot be synchronized, Teamcenter displays an error message.

   Note:

   The **MEAlignedPropertiestoExcludeFromSync** preference defines the list of BOM line properties that are not copied to an aligned target occurrence when it is synchronized.

Note:

The results of the alignment check may be incorrect and an attempt to synchronize aligned occurrences may fail if the precision of aligned occurrences does not match, that is, one occurrence is precise and the other is imprecise.

Teamcenter assumes you use the same unit of measure (UOM) value for the same item throughout the system. The comparison does not check if the quantity differs between occurrences because different UOMs are used. In this case, the result may indicate a mismatch, but it would be incorrect to update the quantity without also updating the UOM value.

Compare properties

You can optionally identify individual properties that are mismatched between the source and target lines. This avoids the necessity to inspect all the properties of the mismatched lines to determine if synchronization is required.

1. Run the structure alignment check as described in *Perform an alignment check*.

   Teamcenter displays the **Structure Alignment Check** dialog box.

2. In the **Alignment Check Results** list, select the appropriate structure line and click **Show in Tree**.

   Teamcenter highlights the source line in the main pane.

3. Select a row in the **Alignment Check Results** list, and then select the **Show only mis-matched properties** check box.

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Teamcenter updates the **Properties Comparison** list to show only those properties that are mismatched.

> Note:
>
> If you do not select the **Show only mis-matched properties** check box, all properties are shown and mismatched properties are highlighted in bold. The properties are listed in alphabetic order after the **Object** property, which is always listed first.

4. (Optional) Click **Update Selected**.

   Teamcenter updates the mismatched properties, synchronizing the source and target line pairs selected in the **Alignment Check Results** list.

Finding and interpreting alignment reports

- Alignment reports are stored in the My Teamcenter **Newstuff** folder if the **MEAlignmentCheckReportLocation** preference is set to **False** or are attached to the item revision of the top line of the structure if it is set to **True**.

  You can retrieve an existing alignment check report for a selected occurrence (structure line) from the **Newstuff** folder or by opening the **Attachments** view from the top line of the MBOM.

- If a report with the specified name already exists, the **TC_CRF_overwrite_existing_dataset_content** preference controls if the existing report is overwritten. If this preference is set to **1**, the existing contents are replaced, otherwise the new report is appended.

- The creation and format of the report is determined by the following preferences:

  - **MEAlignmentCheckReportDefinition**

    This preference specifies the name of the report definition object that controls creation of the report. The default value is **AlignmentCheckReportDefinition**.

  - **MEAlignmentCheckReportStylesheet**

    This preference specifies the name of the style sheet used when creating alignment check reports. A default style sheet is provided, but you can create your own style sheet using the Report Builder application. The default value is **AlignmentCheckReport.xsl**.

- The report format is similar to that provided for the accountability check, as described in *About comparing structures and propagating changes*. However, you should note the following differences:

  - The **Source** column includes no indentation because the alignment check only considers aligned nodes.

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- The **Target** column cannot contain multiple targets. Instead, multiple target lines may be listed for a source line.

- The **Match** column may show a mismatch, even though the user already performed an update action. This occurs if the comparison properties differ from the synchronization properties. In this case, the column shows if the update action was performed successfully, not whether the lines now match.

Save and replace in context

The manufacturing engineer can create a new MBOM substructure from an existing one, while preserving the occurrence information on the line. Typically, this is done to create a new subassembly when it is not possible to revise the existing subassembly, possibly because the existing MBOM is still in use on the shop floor.

This situation arises in the aerospace industry to create a new kit from an existing one. It is also useful when manually creating an MBOM from an EBOM in cases where you do not want to use a different item type for manufacturing parts. Use this menu command on each level in the structure for which you want to create a manufacturing-specific part.

- Select the top line of the subassembly and choose **File→Save As→Replace Assembly In Context**.

  Teamcenter creates a copy of the subassembly and propagates existing alignments to the copy. All relationships of the items in the kit are preserved, regardless of GRM rules. Options and variant rules are *not* carried over from the original line.

  If this action is performed in the context of an incremental change, it is recorded.

Realign MBOM and EBOM assemblies

If your MBOM is significantly different from the linked EBOM from which it derives, it is possible that links between the two, as well as their properties, may become accidentally broken due to changes in the EBOM, MBOM, or both. This loss of equivalence criteria results in unreliable results when you run an accountability check and breaks the **Find in other Structure** function.

In many cases, you can fix the equivalence criteria in the EBOM and MBOM by aligning their properties so that the accountability check reports full matches. If parts have moved in either structure, this action also realigns their transformations.

1. If the EBOM and MBOM are not already linked, link them using the **Link Associate→Link Structures** command.

2. (Optional) If you are viewing unconfigured structures, turn them off so that you have 100% BOMs by deselecting the *show unconfigured* toggles.

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While you can run the alignment without fully configuring the structures, not all lines may be aligned.

3. Select the top line of the EBOM and the top line of the MBOM, and choose **Tools→Manufacturing Alignment→Align**.

   In the **Align** dialog box, your MBOM appears as **Line to be aligned** and your EBOM as **Line to align with**. By default, the command is set to align the selected assemblies (EBOM and MBOM) and all children of the selected top lines.

4. To align all properties in **MEAlignedPropertiesList** site preference, with the exception of reused assembly lines, select the **Align properties (for non-reused assembly lines)** ☑ check box.

5. Click **Align**.

   An **Alignment Summary** prompt reports on the success of the cammand and the number of lines that were not aligned.

6. To view the alignment log, click **Yes**; to continue without viewing the log, click **No**.

   The alignment log reports reasons for line alignment failures, such as multiple equivalent lines in the EBOM.

7. If multiple equivalent lines are identified, identify which are correct and rerun the align command on those selected lines only.

8. Run an accountability check to verify that the structures are aligned.

Propagate objects with changed item IDs from EBOM to MBOM

If you use part or manufacturing feature objects with design names instead of generated item IDs that must be replaced with part IDs in the production phase, you can quickly propagate, in bulk, parts or features with item ID changes. To enable this capability, you or an administrator must set the preference value **MEAutoReviseWhilePropagation** to **true**.

1. Open the EBOM and MBOM.

2. From the menu bar, select **Tools→Accountability Check→Advanced Accountability Check**.

3. In the **Advanced Accountability Check** dialog box, on the **BOM Properties** subtab of the **Partial Match** tab, confirm that **Primary Revision Configured** is the only property in the **Selected Properties** list.

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4. Confirm that the **Consider values of properties when searching for a partial match** ☑ check box is selected.

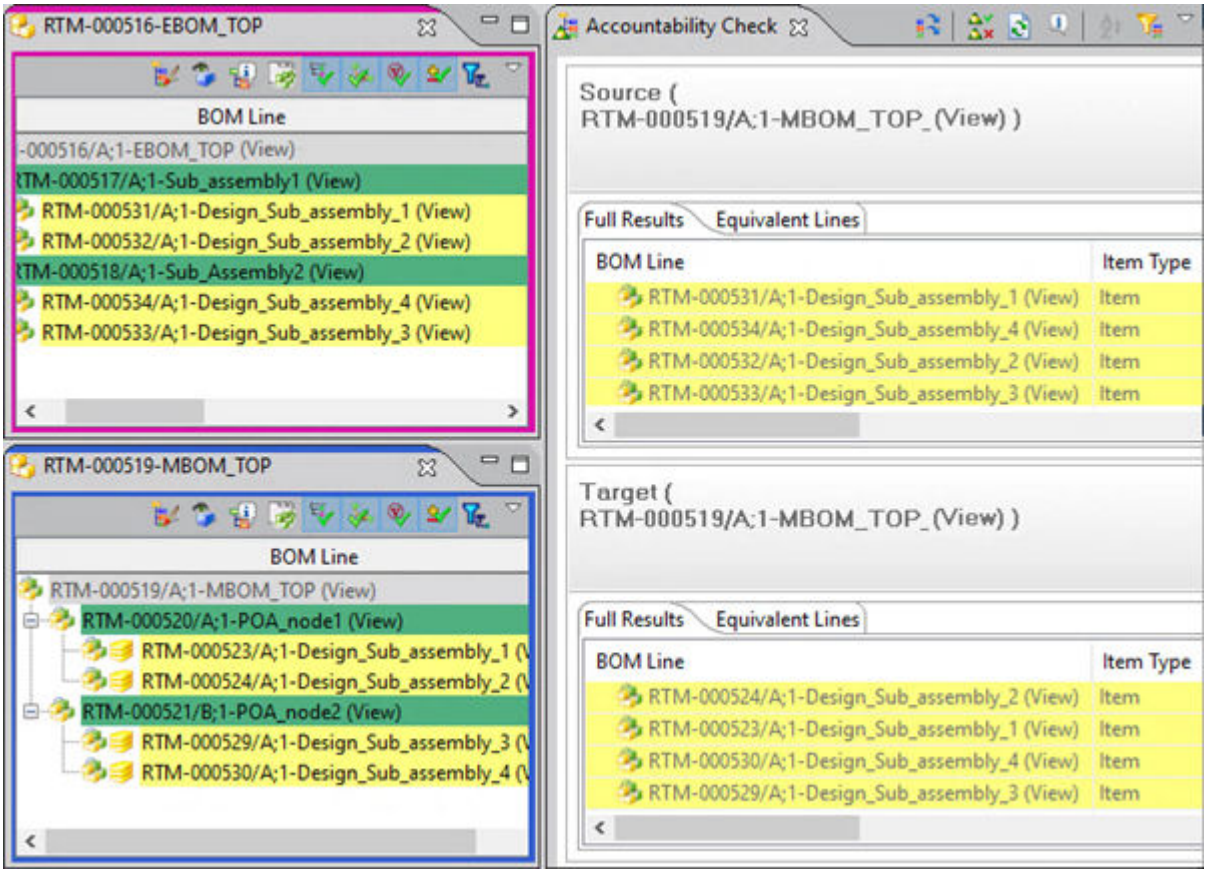
5. On the **Reporting** tab, select **Report the selected check criteria** and the **Color the compared objects** ☑ check box.

6. In the **Display Options** group, confirm that only the **Partial match** ☑ check box is selected.

7. On the **Inclusion Rules** tab, select **Search lines per filtering rule**, and from the **Source filtering rule** list, select **AccountabilityAll**.

8. Click **OK**.

   Partial matches are shown as yellow lines in the image below. Note that while item names like **Design_Sub_assembly1** appear to be identical in the EBOM and MBOM, the item IDs differ: the EBOM item ID for **Design_Sub_assembly1** is **000531** while the MBOM item ID is **000523**. The differences indicate that the part in the EBOM were either modified or replaced and that as a result, any downstream changes from the MBOM (such as simulations in Process Simulate) are lost.



9. For all partially matching lines, from the **ID in Context** column of the EBOM, copy the value of each mismatch and paste it to the **ID in Context** column of the appropriate lines in the MBOM.

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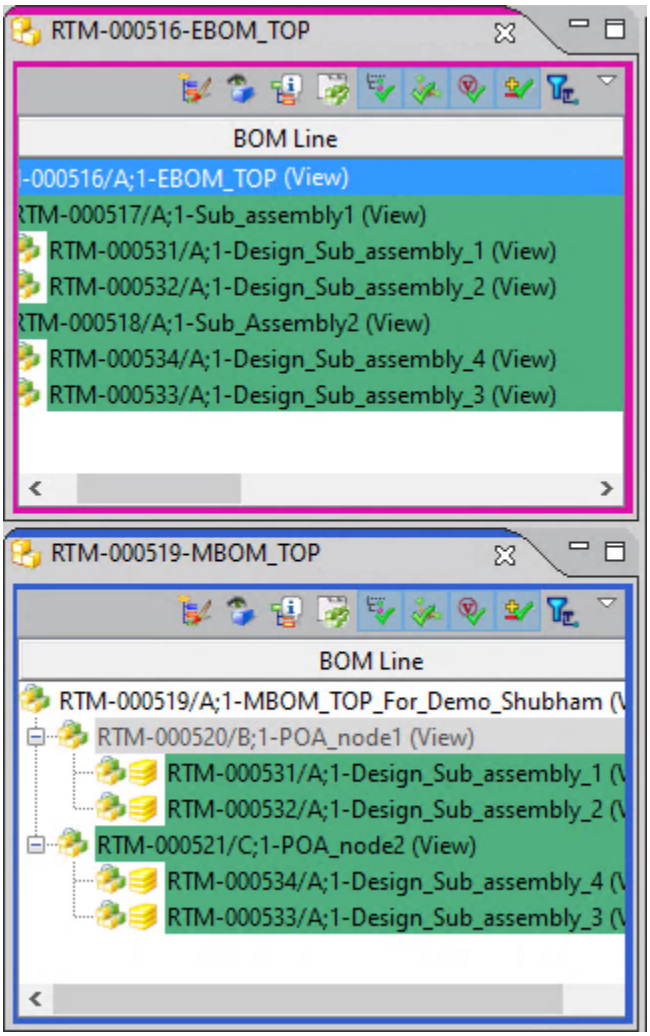
10. In the **Accountability Check** view, click **Propagate All Partial Matches** to recursively propagate the item ID changes from EBOM to MBOM.

11. Run the accountability check again.

All items for which you have rights now have identical item IDs and appear green in the report. If updates are incomplete, an error message points you to a log file that identifies which parts or features failed to propagate and why.



Realign lines in MBOM and EBOM structures

If an accountability check reports that lines in your MBOM are no longer linked to lines in the EBOM from which it derives, in many cases, you can fix the problem by aligning their properties so that the accountability check reports a full match. If parts have moved in either structure, this action also realigns their transformations.

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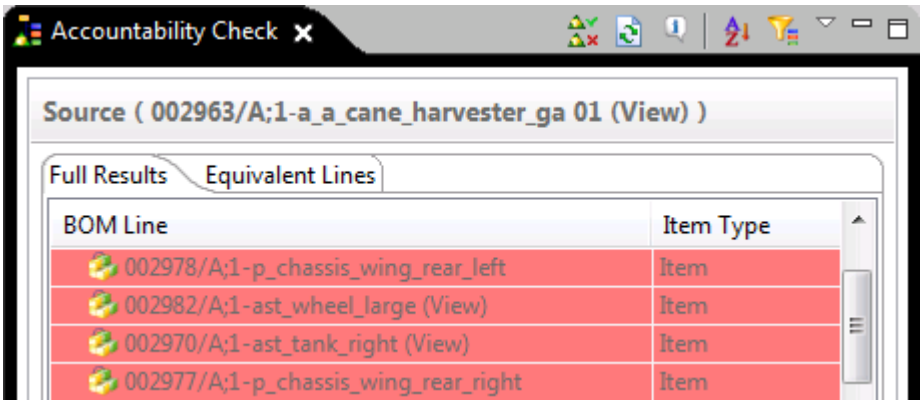
1. If the EBOM and MBOM are not already linked, link them using the **Link Associate→Link Structures** command.

2. (Optional) If you are viewing unconfigured structures, turn them off so that you have 100% BOMs by deselecting the **Show Unconfigured** toggles.

While you can run the alignment without fully configuring the structures, not all lines may be aligned.

3. Run an advanced accountability check, and from the advanced accountability result view, search result view, or BOM view, press Ctrl and select each line to be realigned.



4. Choose **Tools→Manufacturing Alignment→Align Selected Lines**.

In the **Search Equivalent Lines** dialog box, the lines you selected appear in the **Lines to search for** list.

5. In the EBOM, select the top line, and in the **Search Equivalent Lines** dialog box, next to the **Scope to search in** box, click .

In the **Align Selected Lines** dialog box, lines found in the EBOM are displayed in the **Source** column next to the lines you searched in the MBOM **Target** column.

Source	Target	Handled
002965/A;1-a_axle_front (View)	002965/A;1-a_axle_front (View)	X
002985/A;1-p_axle_rear	002985/A;1-p_axle_rear	X
002997/A;1-p_elevator_cowl	002997/A;1-p_elevator_cowl	X
002998/A;1-p_elevator_cowl_support	002998/A;1-p_elevator_cowl_support	X
003002/A;1-p_elevator_rear_pivot	003002/A;1-p_elevator_rear_pivot	X
003004/A;1-a_chopper_hydraulic_ram (Vie	003004/A;1-a_chopper_hydraulic_ram	X

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> Tip:
>
> To avoid scrolling, your administrator can control the number of lines to appear at one time in this list using the **MEAlignmentNumberToSearch** site preference (default = 15). You can then click **Previous** and **Next** to cycle through the line sets.

6. Click in the list of source/target lines, and in the **Properties Comparison** group, review similarities and differences between source and target.

   As you select the lines in the list, they are highlighted in the EBOM and MBOM.

7. After you determine which lines should be aligned, select the lines to be aligned.

> Tip:
>
> To deselect or select all lines, click ☐ or ☑.

8. To align all properties in the **MEAlignedPropertiesList** site preference, select the **Align properties for the repaired lines** ☑ check box.

9. Click **Align**.

   Aligned lines are indicated in the **Handled** column.

Source	Target	Handled
002965/A;1-a_axle_front (View)	002965/A;1-a_axle_front (View)	✔
002985/A;1-p_axle_rear	002985/A;1-p_axle_rear	✔
002997/A;1-p_elevator_cowl	002997/A;1-p_elevator_cowl	✔
002998/A;1-p_elevator_cowl_support	002998/A;1-p_elevator_cowl_support	✔
003002/A;1-p_elevator_rear_pivot	003002/A;1-p_elevator_rear_pivot	✔
003004/A;1-a_chopper_hydraulic_ram (Vie	003004/A;1-a_chopper_hydraulic_ram	✔

10. Run an accountability check to verify that the structures are aligned.

Align single EBOM/MBOM lines with different item types

You can align single lines and their properties even if they have different item types.

> Example:
>
> You can align a line that has a part type with a line that has an item type.

1. If the EBOM and MBOM are not already linked, link them using the **Link Associate→Link Structures** command.

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2. (Optional) If you are viewing unconfigured structures, turn them off so that you have 100% BOMs by deselecting the **Show Unconfigured** toggles.

3. Run an advanced accountability check, and from the EBOM and MBOM views, select the two lines to be realigned.

4. Choose **Tools→Manufacturing Alignment→Align**.

   In the **Align** dialog box, the selected MBOM line is displayed in the **Line to be aligned** text box and the EBOM line is displayed in the **Line to align with** text box.

5. Select **Align the selected lines only**.

6. To align all properties in the **MEAlignedPropertiesList** site preference, select the **Align properties (for non-reused assembly lines)** ☑ check box.

7. Click **Align**.

   In the prompt warning you that the two lines have different item types, click **Yes**.

8. In the **Alignment Succeeded** prompt, click **OK**.

9. Run an accountability check to verify that the structures are aligned.

Overriding BOM line properties delegated from an MBOM to a BOP

You can override some delegated manufacturing bill of materials (MBOM) line properties in a bill of process (BOP). Delegated properties reference the MBOM and appear in the BOP on assigned (consumed) lines if the MBOM is loaded.

To keep the BOP synchronous with the engineering bill of materials (EBOM), your administrator can use the **MEDelegatedOccurrenceProperties** preference to mark a subset of these properties so that MBOM values are delegatable. Properties that can be delegated include occurrence effectivity, variant formula, quantity, absolute transformation matrix, occurrence name, ID in context (all levels), variant conditions, and any note type. If a property that was copied over in previous versions is not defined in the **MEDelegatedOccurrenceProperties** preference, that property is copied over and will always be visible since it is independent of the MBOM.

Note:

- You can still edit the relative transform matrix in the BOP to align an absolute transformation matrix.

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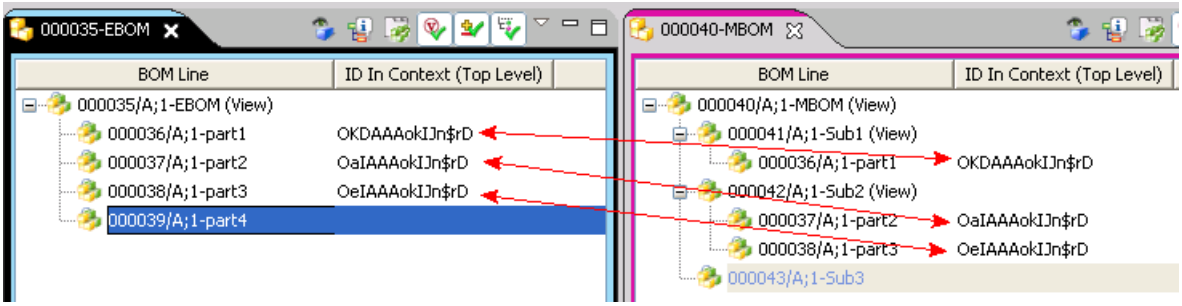
- By default, quantity is copied to the BOP. If you delete a quantity value in the BOP, the quantity value is delegated from the MBOM.

If the **MEDelegatedOccurrenceProperties** preference is absent, no properties are delegated. If your organization prefers to copy rather than delegate line properties from the MBOM to the BOP, an administrator should remove the property names from the **MEDelegatedOccurrenceProperties** preference and add them instead to the **MEAssignProperties** preference.

Reconciling EBOM and MBOM in a Multi-Site environment

The determination of equivalence between the engineering bill of materials (EBOM) and the manufacturing bill of materials (MBOM) is based on the in-context ID (IDIC, also referred to as the absolute occurrence ID). When you paste a part from the EBOM to the MBOM, Teamcenter generates an identical, unique absolute occurrence ID for the part on both the EBOM and the MBOM. This mechanism is used when aligning structures to determine whether parts are missing in the source or target structures.



The ID is generated in the context of the top-level item. Even if you do not have write access to the top level of the EBOM, Teamcenter allows this ID to be generated and saved with the top-level item. If you are using Multi-Site and the EBOM is at the remote site, however, this mechanism does not work as Teamcenter must be able to check out the top level to generate the ID. A similar problem arises if you want to assign from an EBOM that exists on a remote site to a local process.

To enable a remote site to use the EBOM-MBOM mechanism in these situations, your administrator can generate in-context IDs on the EBOM that are available when you paste parts to the MBOM.

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6. Configuring structures by using Product Configurator variants

Advantages of using Product Configurator variants

In classic or modular variants, the variability data such as families, features, and rules are associated with the structures. However, the task to manage the variability data is independent of the task of managing structures. Therefore, it is advisable to separate out the variability data from the structure. Doing so ensures that any changes to the variability data do not change the structure. The Product Configurator application provides dictionaries and configurator contexts to manage the variability data separately. Therefore, different domains, such as system engineering, design, content management, and manufacturing, can use the same variability data without updating a structure.

You can use the Product Configurator variants once the administrator:

- Installs the solution template to support Product Configurator for Structure Manager.
- Sets the preference to enable the Product Configurator variant mode.

Associate a configurator context with any structure supported by Manufacturing Process Planner

To obtain the required variability data such as *families*, *features*, and *rules* from a configurator context, you associate the configurator with the product structure.

You can perform this association only if you have the **Manage Variability** privileges. To verify that you do:

1. In My Teamcenter, right-click the topmost item of the product structure and click **Access**.
2. In the **Access** dialog box, verify that the **Manage Variability** privilege is enabled.

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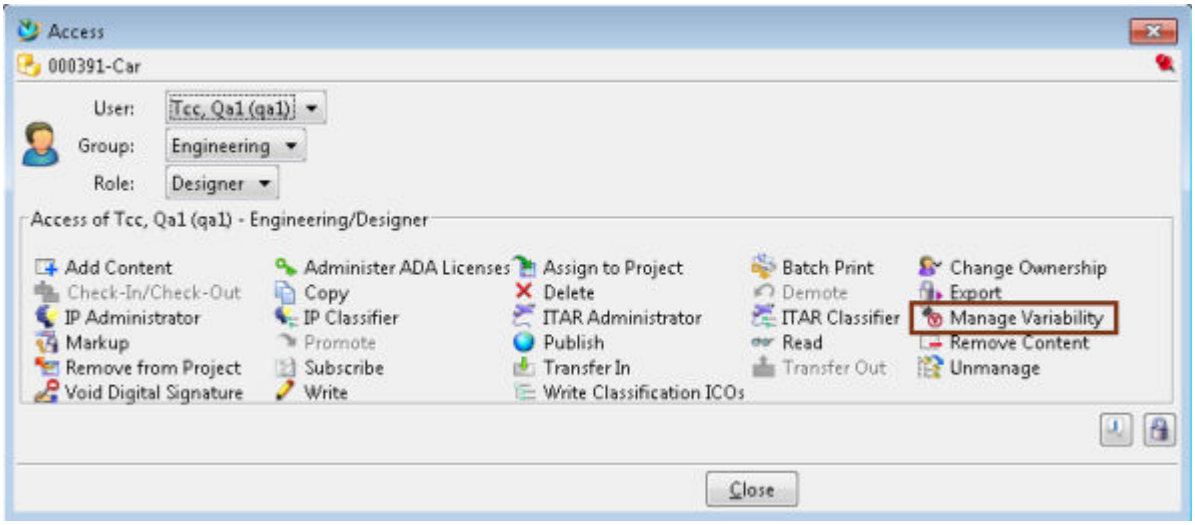

Note:

Using a mixture of legacy and product configurator variants can cause data corruption. By default, the system uses the preference **ME_EnableMixVariantModelCheck** to prevent loading structures that use a mixture of these variants. If you are using only one variant, or no workflow results in mixed variants, change the value of **ME_EnableMixVariantModelCheck** to **false**. This value enables the system to open structures without a check.

Associate a configurator context with a structure

1. In My Teamcenter, search for the structure and the configurator context.

2. Right-click the configurator context and click **Copy**.

3. Right-click the product structure and choose **Paste**. You cannot associate the configurator context with the item revision of the structure.

   To verify if the configurator context is associated with the structure, select the product structure and click the **Details** view. The **Relation** column must show **Variability Scope**.

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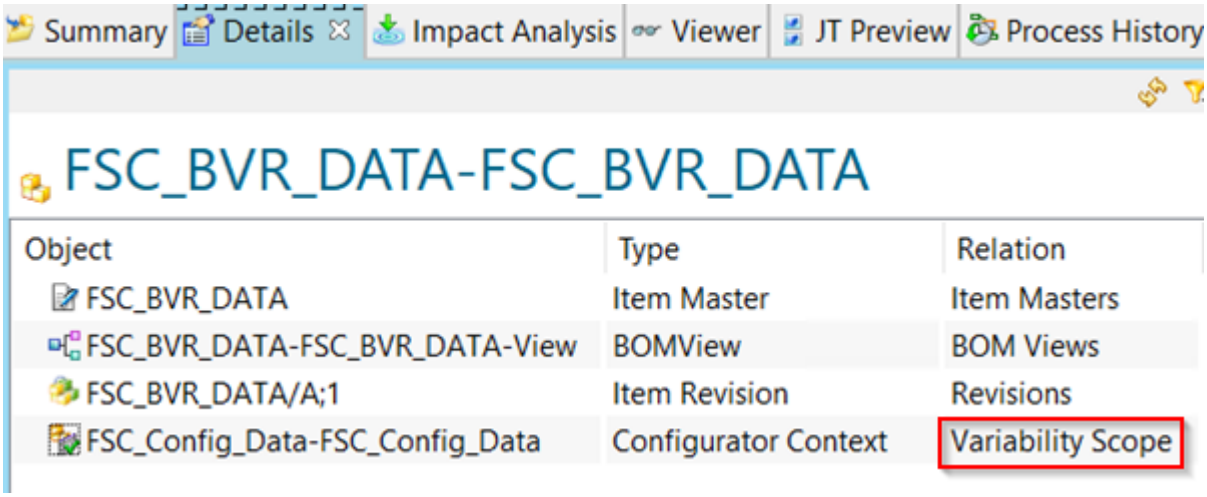

Only the configurator context associated with the topmost line item of the structure is considered for authoring variant conditions.

> Tip:
>
> If you are likely to use this configurator context as the basis for several structures, set this as the default context.

Determination of variant engine when loading structures

All data structures loaded in Manufacturing Process Planner must use the same variant engine, either Product Configurator or classic. If a structure being loaded uses a different variant engine than a previously loaded structure, the data is not loaded. The variant control is determined by the first structure you load in Manufacturing Process Planner.

This functionality allows you to gradually move to Product Configurator, program by program, data by data. It encourages the use of the same variant engine for all the data structures involved in the project (EBOM, MBOM, BOP, BOE, and so on) and requires you to maintain a strict methodology of not mixing variant information within a product program.

If variant structures conflict, you receive one of several notification messages that explain why the data was not loaded, and in some cases suggest how to fix the issue.

Conflict notification scenarios

- If you try to load a collaboration context in which two different variant engines are used, you receive the following message indicating the conflict.

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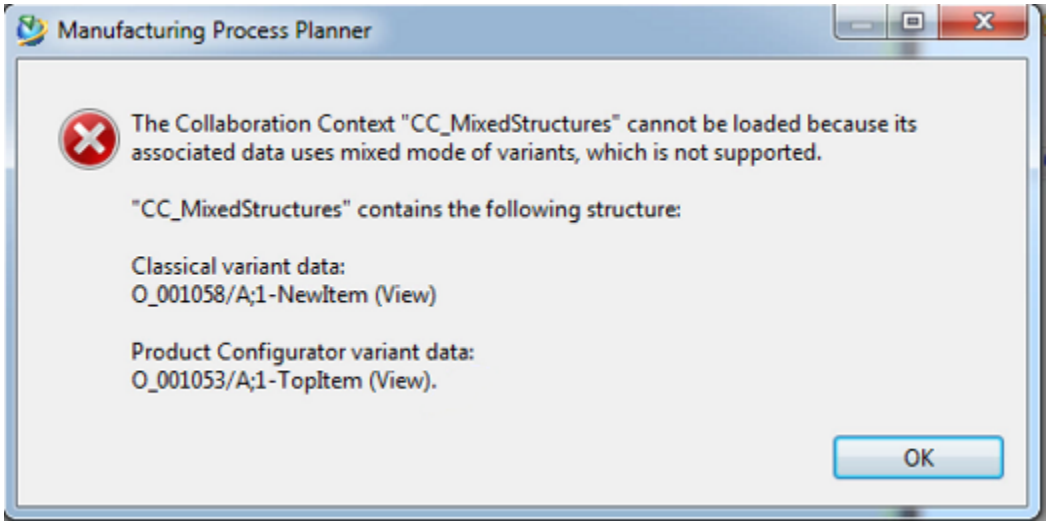
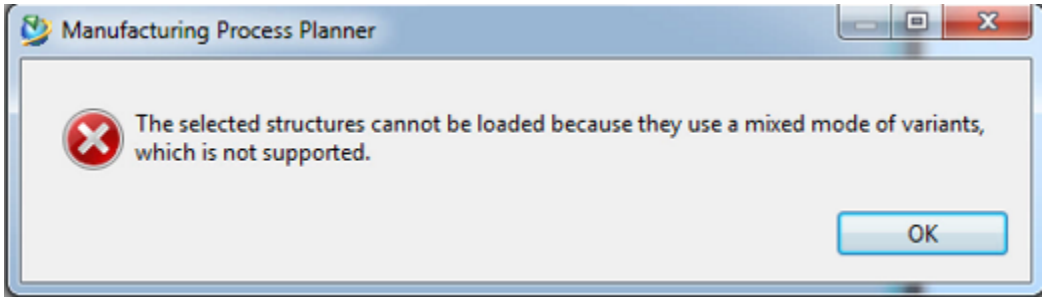
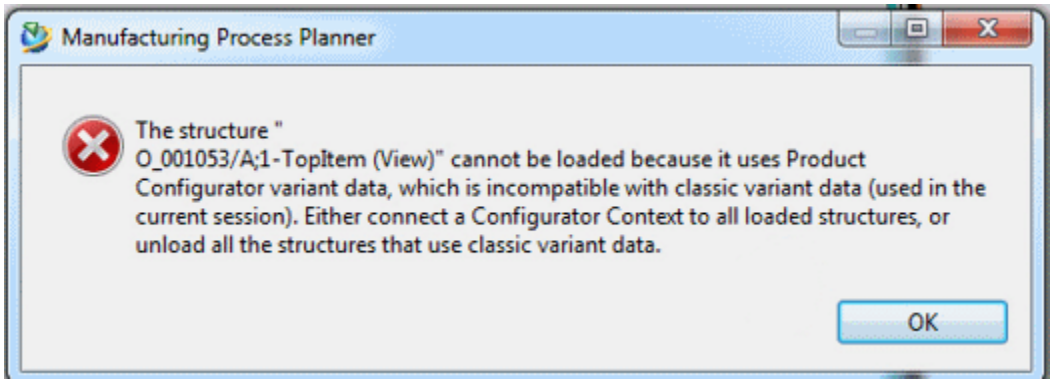


- If you try to load two different variant engines at the same time, independent of a collaboration context, you receive the following message indicating the conflict.



- If you try to load a variant structure that is different than the variant structure already loaded in Manufacturing Process Planner, you receive the following message indicating the conflict.



- If a structure with certain types of variants (for example, Configurator Variants) is loaded first, and a structure with either different types of variants or no variants at all is loaded second, then you receive an error message similar to the one shown above.

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Note:

Product Configurator is used if the top line of the assembly is connected to a configurator context, or if the default configurator context is applied in Manufacturing Process Planner.

Set the default configurator context

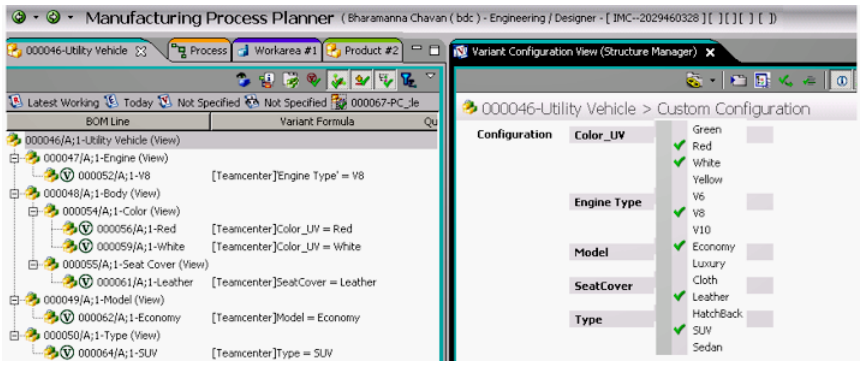
When you set a *specific* configurator context as the default, it acts as the effective configurator context for all structures that you open in Manufacturing Process Planner.

1. In Manufacturing Process Planner, choose **Edit→Set as Default Configurator Context**.

2. In the **Set Default Configurator Context** dialog box, search for the relevant configurator context and click **OK**.

   After setting the default configurator context, you must close Manufacturing Process Planner and open it again from the left navigation pane.

   To verify whether the default configurator context is set, open a structure in Manufacturing Process Planner. The Manufacturing Process Planner view displays the configurator context currently associated with the structure.



Remove the default configurator context

Consider a case where a structure is associated with a configurator context that is not the default configurator context. On opening this structure in Manufacturing Process Planner, a warning is displayed, specifying that the associated and the default configurator contexts are different. In such cases, the default configurator context is applied to the structure. For the associated configurator context to be applied to the structure, you must remove the default configurator context. To do so, in Manufacturing Process Planner, choose **Edit→Unset as Default Configurator Context**.

For the associated configurator context to take effect, you must close Manufacturing Process Planner and open it again from the left navigation pane.

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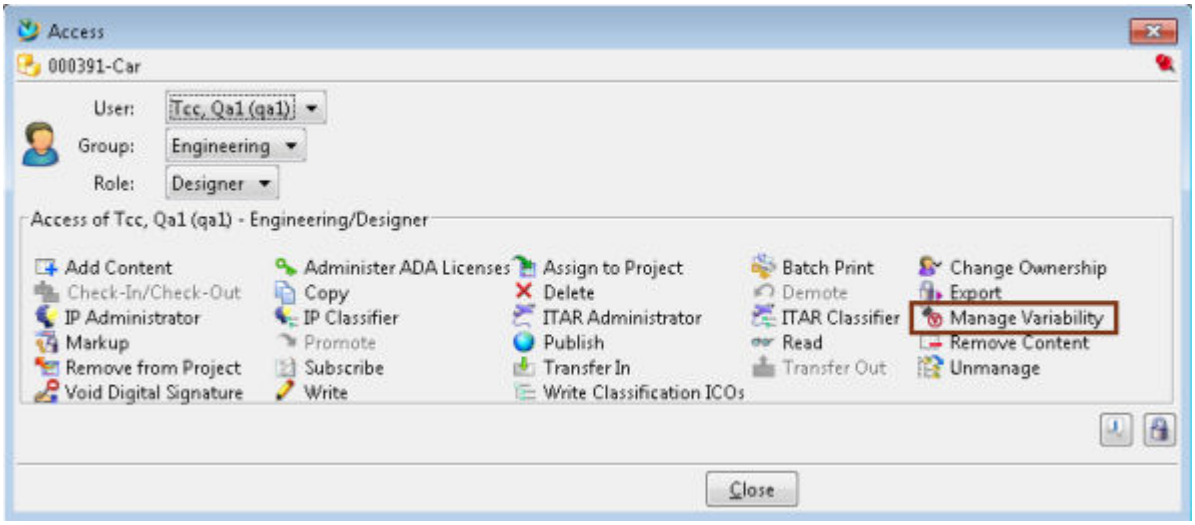
Remove the association between a structure and a configurator context

You can remove the association between a structure and a configurator context only if you have the **Manage Variability** privilege. To verify this:

1. In My Teamcenter, right-click the top item of the structure and choose **Access**.

2. In the **Access** dialog box, verify if the **Manage Variability** privilege is enabled.



To remove the association:

1. In My Teamcenter, search for the structure.

2. Expand the structure, right-click the associated configurator context, and choose **Cut**.

Author variant expressions

1. Open the structure for which you want to author variant conditions in Manufacturing Process Planner.

   Ensure that the **Variant Formula** property column is displayed in the product structure tree. This property displays the variant condition and is not visible on the use interface by default.

2. Select the BOM line items for which you want to author the variant condition, for example, **Engine**. Click **Edit the variant condition** .

3. In the **Variant Formula Expression Editor** view, select the required options to define a variant condition.

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The area at the bottom of the view displays the variant condition based on your selection.

In the **Variant Formula Expression Editor** view, the first column lists the option values organized by their families. You construct a variant condition by clicking the cells. Selections are indicated by a check mark ✔ or a circle backslash icon ⃠ in a cell. The check mark ✔ indicates that the option is applicable. The circle backslash icon ⃠ indicates that the option is not applicable to the BOM line.

You can also edit an existing variant condition by changing any of the fields. Updated rules are displayed but not saved instantly.

If a BOM line has a variant condition previously authored using classic variants, the older value displayed in **Variant Condition** is replaced with the new condition and is displayed in **Variant Formula**. However, if a BOM line has a variant condition previously authored using a modular variant, you must delete the old condition before creating a new one.

> Note:
>
> If you open a BOM line containing classic conditions with the legacy option family, you cannot edit the variant formula. Structure Manager displays an error message saying that some of the selected BOM lines have classic variant expressions with classic variability. In such cases, you must clear the classic variant expression.

4. Click **Save the current content** on the main toolbar to set the variant condition.

   You cannot update this variant condition using classic or modular variants. After you author variant expressions, configure the structure by setting variant rules.

Author variant expression in Grid Authoring mode

The **Variant Formula Expression Editor** view displays **Grid Authoring** as the default mode. You can select multiple BOM lines to author the variant expression in this mode.

1. Select the BOM line items for which you want to author the variant condition.

2. In the **Variant Formula Expression Editor** view, select the required options to define a variant condition.

   The area at the bottom of the view displays the variant condition based on your selection. This is not available if you select multiple BOM lines.

   In the **Variant Formula Expression Editor** view, the first column lists the option values organized by their families. You construct a variant condition by clicking the cells. Selections are indicated by a check mark ✔ or a circle backslash icon ⃠ in a cell. The check mark ✔ indicates that the option is applicable. The circle backslash icon ⃠ indicates that the option is not applicable to the BOM line.

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You can also edit an existing variant condition by changing any of the fields. Updated rules are displayed but not saved instantly.

If a BOM line has a variant condition previously authored using classic variants, the older value displayed in **Variant Condition** is replaced with the new condition and is displayed in **Variant Formula**. However, if a BOM line has a variant condition previously authored using a modular variant, you must delete the old condition before creating a new one.

> Note:
>
> If you open a BOM line containing classic conditions with the legacy option family, you cannot edit the variant formula. Structure Manager displays an error message saying that some of the selected BOM lines have classic variant expressions with classic variability. In such cases, you must clear the classic variant expression.

3. Click **Save the current content** on the main toolbar to set the variant condition. You cannot update this variant condition using classic or modular variants.

   After you author variant expressions, configure the structure by setting variant rules.

Author variant expression in Formula Authoring mode

The **Variant Formula Expression Editor** view displays **Grid Authoring** as the default mode. You can switch to the **Formula Authoring** mode by selecting the **Switch to formula authoring mode** toggle. You can select only a single BOM line to author the variant expression in this mode.

If the authored expression is not available in the **Grid Authoring** mode, the system switches automatically to the **Formula Authoring** mode and displays an error message. The **Expression** display area loads the **bl_formula** property and this can be edited to be updated or written from scratch to author a variant condition.

1. Select the BOM line item for which you want to author the variant condition.

2. Select the **Switch to formula authoring mode** toggle.

3. Edit the formula by using the Variant Formula property.

   The text editor supports **Cut** (Ctrl+X), **Copy** (Ctrl+C), and **Paste** (Ctrl+V) keyboard operations. In case the expression is large, the text editor can be resized or vertical scroll bars can be used to navigate.

   The formula that can be normalized to represent a simpler grid expression is normalized and shown in the grid. This does not affect the formula but only the grid representation of it.

   Examples:

   ([013016]Engine = V4 & [013016]Engine != V6) is shown in the grid as **[013016]Engine = V4**.

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([013016]Engine = V4 | [013016]Engine != V6) is shown as **([013016]Engine != V6**

Formula expressions that are logically equivalent to tautology (always **TRUE**) or contradiction (always **FALSE**) are shown as empty in the grid.

Examples:

([013016]Engine = V4 | [013016]Engine != V4) that is a tautology and any configuration would satisfy this condition. This is shown as empty in the grid.

([Teamcenter]Engine = V4 & [Teamcenter]Engine != V4) is a contradiction because no configuration would satisfy this condition. Thus, no grid is shown for this kind of expression.

Foreign options are only editable in formula authoring mode by using the text editor in the bottom area. They can be authored, updated, and deleted.

In the above screen, feature **4** is a foreign option in the current configuration. The **?** icon before it tells us that. The selection cell for the feature is greyed out and is not modifiable. If you wish to author or modify it, switch to the formula authoring mode.

The below screen shows the variant condition with the foreign option authored by using the formula authoring mode.

Variant conditions authored from families and features of a different context are shown as unconfigured variants in the grid. In the following example, feature **100** of family **Weight** belongs to context with ID **013010** and not to **013016**. This is saved as an unconfigured variant or a foreign option.

Changing to **Grid Authoring** mode shows that it is unmodifiable.

4. Click **Save the current content** on the main toolbar to set the variant condition.

   After you author variant expressions, configure the structure by setting variant rules.

Configure a structure by setting option values

1. Open the structure that you want to configure in Manufacturing Process Planner.

2. Click **Set option values for selected module** on the toolbar.

3. In the **Variant Configuration View** view, click **Applies default to the configuration** to set the variant option with their default values.

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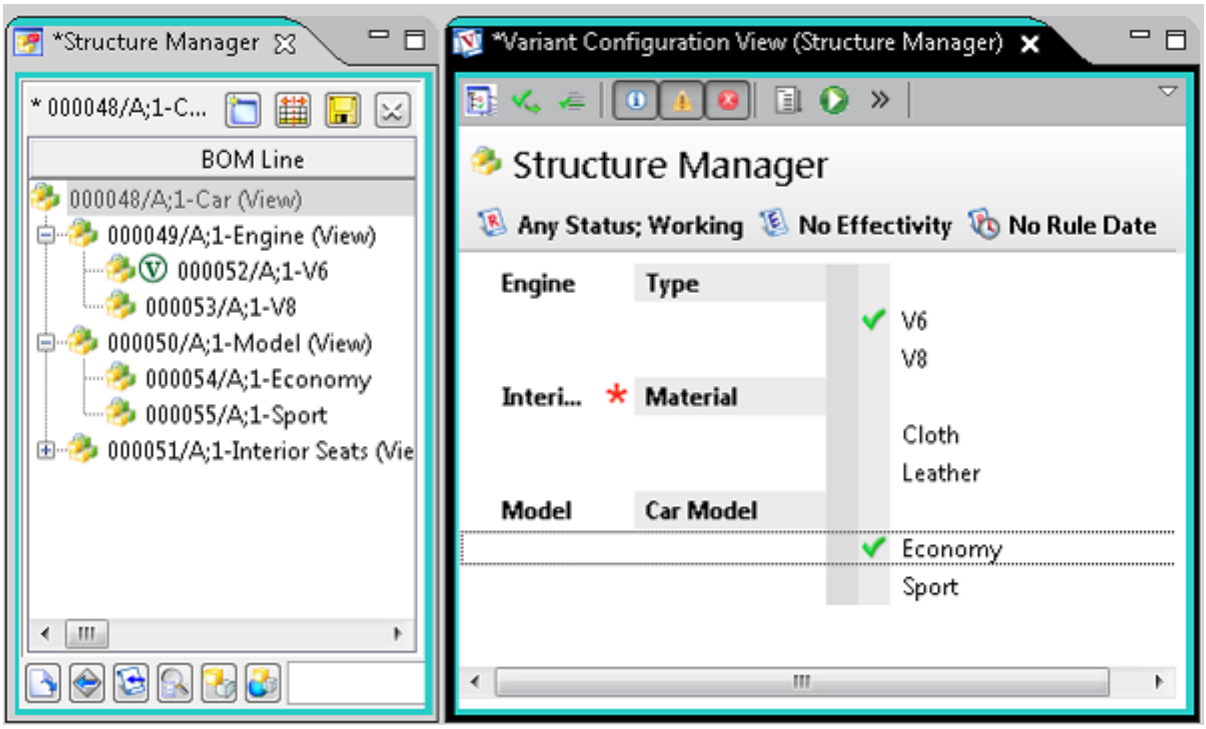

4. Select the required option values. Selections are indicated by a check mark ✔ or a circle backslash icon ⃠ in a cell. The check mark ✔ indicates that the option is included in the product configuration. The circle backslash icon ⃠ indicates that the option is excluded from the configuration.

5. (Optional) To clear all the selections you have made, click the **View** menu and choose **Clear Expression**.

6. (Optional) To clear the saved variant rule you have applied, click the **View** menu and choose **Clear Variant Rule**.

7. (Optional) To clear unconfigured features, click the **View** menu and choose **Clear Unconfigured Feature**.

   The expression on the unconfigured feature in the view is removed. Also, the row holding the unconfigured feature is removed.

8. To load an existing configuration:

   a. Click **Replace or overlay existing selections**.

   b. In the **Load selections from saved configurations** dialog box, select each saved configuration that you want to load and click **OK** to replace the existing selections.

      Alternatively, you can select **Add values to existing configuration** to load the configurations in a separate column, preserving the existing selections.

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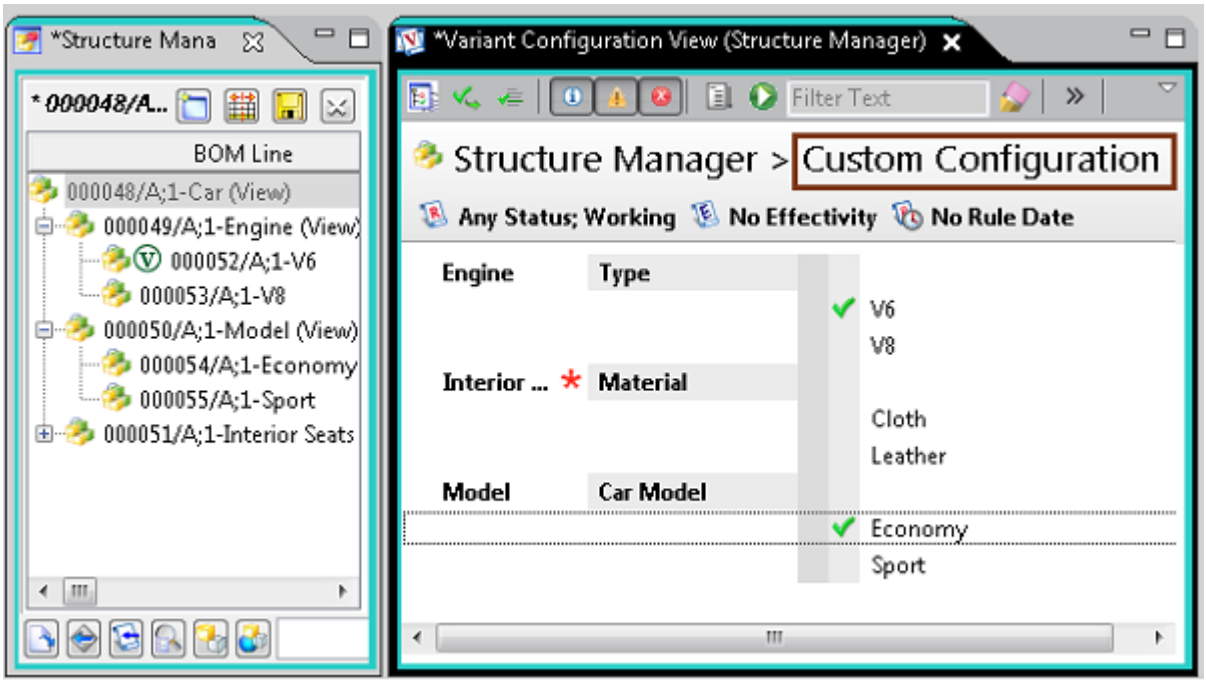
9. Click **Validate the Current Configuration** to validate if the selected options are applicable to the structure.

   To view any informational messages, while the configuration is being validated, click **Set Info level violations to be fetched while applying validations** . To view the warnings, click **Set Warning level violations to be fetched while applying validations** .

10. Click **Applies the current configuration to the associated structure** to apply the selected options to the structure.

    Applying the selected options to the structure creates a custom configuration.



If the **Apply Constraints** button is deselected while applying the configuration, only user selections are applied on the content. However, if the **Apply Constraints** button is selected and the **Allow Validation Rules to Expand** button is deselected, the validation rules are not considered while applying the configuration. By default, Teamcenter displays the **Variant Configuration** view with the **Apply Constraints** and **Allow Validation Rules to Expand** as selected.

You can save the custom configuration to create a saved variant rule, which you can use to configure other structures.

Create saved variant rules

1. Click **Save the current contents** on the toolbar.

2. In the **Save As** dialog box, enter the required information and click **OK** to create the saved variant rule.

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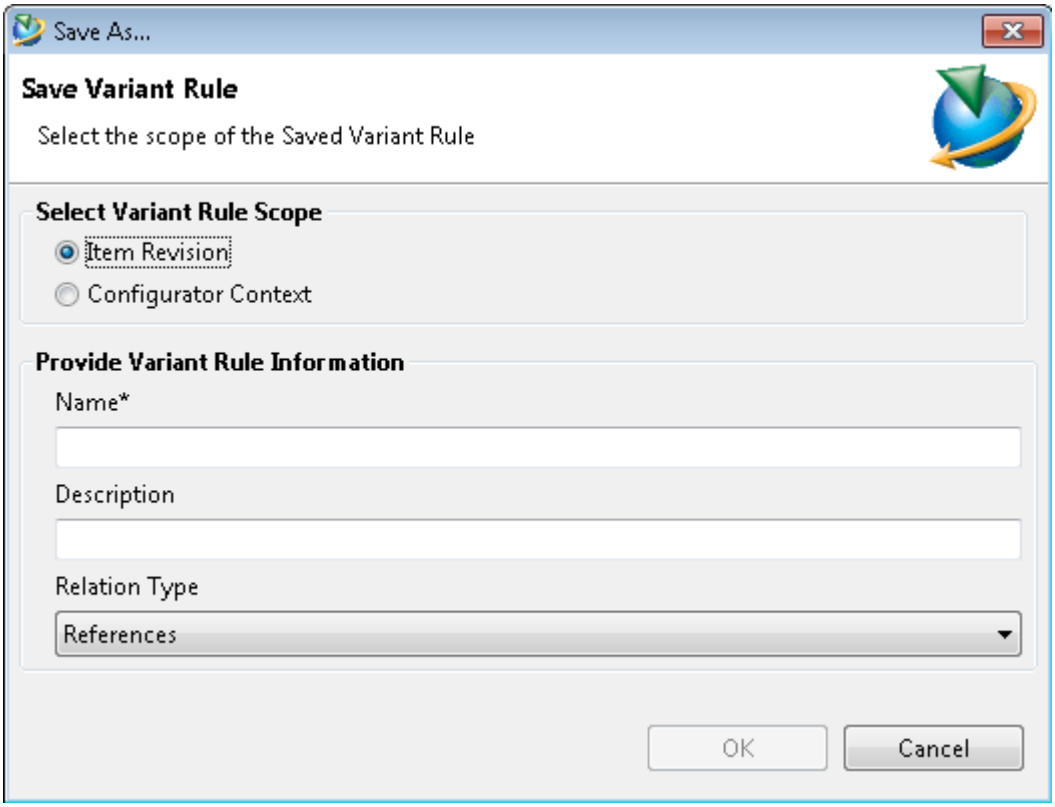

Field	Action to perform
Item Revision	Select this option to create the saved variant rule for the current item revision.
Configurator Context	Select this option to create the saved variant rule for all structures associated with the current configurator context.
Name	Enter the name of the saved variant rule.
Description	Enter a short description for the saved variant rule.
Relation Type	Choose a relation type if you selected **Item Revision** as the variant rule scope. The variant rules are stored in the top-level item revision of the structure.

Configure a structure by loading saved variant rules

1. Open the structure that you wish to configure in Manufacturing Process Planner.
2. Click **Open saved variant rules dialog** on the toolbar.
3. In the **Load Variant Rule** dialog box, select the variant rule filter.

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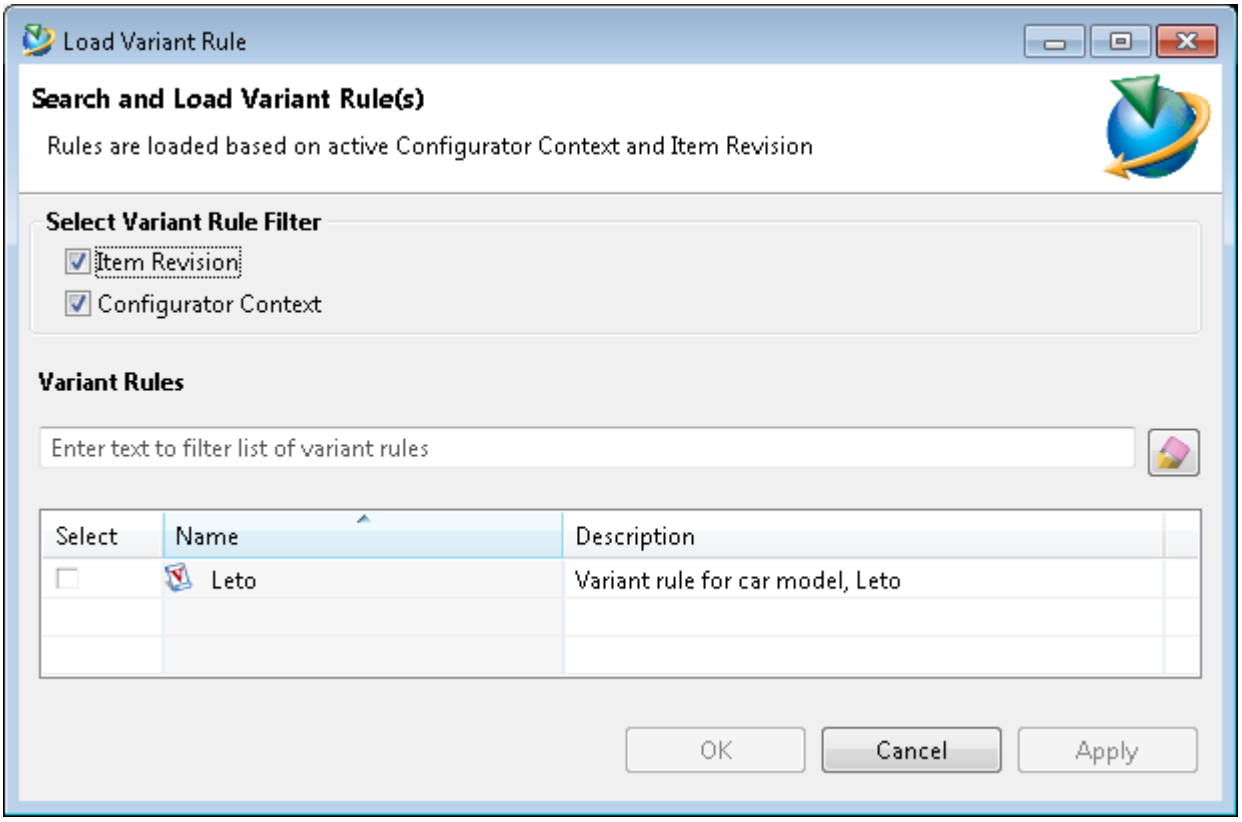

- Select the **Item Revision** check box to apply the saved variant rule to the current item revision.

- Select the **Configurator Context** check box to apply the saved variant rule to all the product structures associated with the current configurator context.

4. Enter the text to filter the list of variant rules in **Variant Rules**.

5. Select the saved variant rule that you wish to use to configure the structure and click **OK**.

Set the session information for new variant rules and variant criteria

You can set the session information for new variant rules and variant criteria in the **Saved Variant Rules** view by clicking **View menu** and then selecting **Configuration Profile Settings**. It displays the **Configuration Profile Settings** for new **Variant Rules** dialog.

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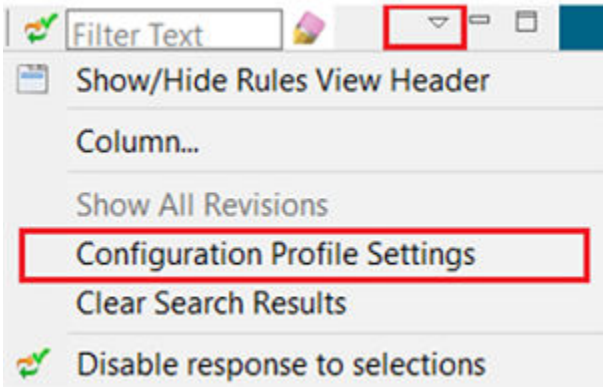

Button	Description
Validation mode	Select the validation mode for the new variant rules: **Order** or **Overlay**. In **Overlay** mode, rules greater than or equal to validation severity are evaluated. Rules for validation verdict and expand operations in overlay mode are same. In **Order** mode, during the expand operation, rules lower than validation severity are dropped if they conflict with rules of higher severity. The validation mode in the dialog defaults based on the value of the **Cfg0DefaultValidationMode** user preference. By default, it is set to **Order** mode.
Validation severity	Select the severity of violation for the new variant rules (error, warning and info). The error severity is selected by default.
Apply Constraints	Select if all constraints should be considered while applying the variant rule expression on the content. If deselected, only user selections are applied. By default, it is selected in the dialog.
Allow Validation Rules to Expand	Select if validation rules should participate during criteria expansion. If deselected, only violations are reported, if present. System selections based on validation rules do not occur in the expanded criteria. By default, it is selected in the dialog.

While creating a new variant rule or variant criteria, you can choose the profile settings from the dialog. The selected values are saved as session information on the newly created variant rule or variant criteria.

You cannot modify the profile setting while updating the variant rule or variant criteria in the **Saved Variant Rules** view. To update the profile settings for the variant rule or variant criteria, it should be opened in the **Variant Configuration** view.

Any changes made in the default settings of configuration profile settings dialog are persisted till the **Saved Variant Rules** view is open. When a new instance of the view is opened, the selections are reset to their default values.

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Configure variants based on selections

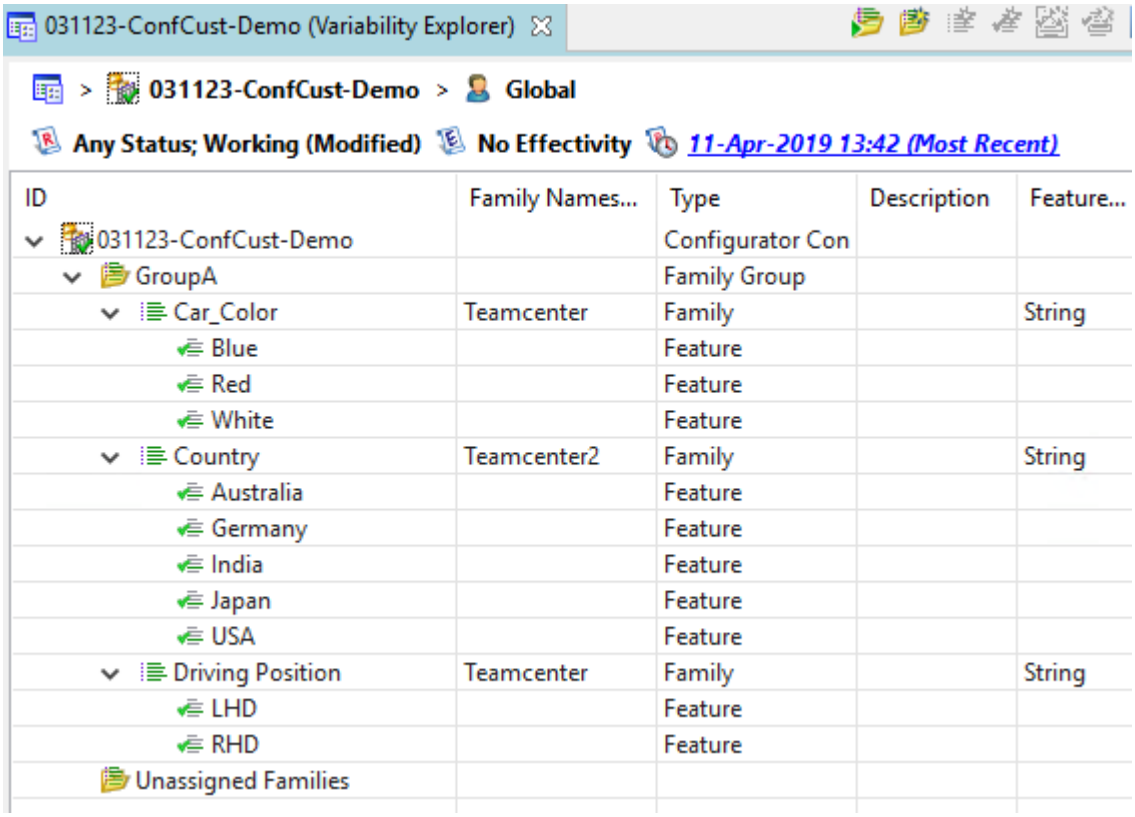
You can configure a structure from the variant expression of one or more BOM lines.

When you configure variants based on selections, the system considers Product Configurator rules such as inclusion, exclusion, and availability and removes BOM lines that are not relevant.

Structure Manager does not support the *order validation* mode and uses the *overlay validation* mode.

An example of configuration based on selection:

1. Create a positive availability biased configurator context as follows:



ID	Family Names...	Type	Description	Feature...
031123-ConfCust-Demo		Configurator Con		
GroupA		Family Group		
Car_Color	Teamcenter	Family		String
Blue		Feature		
Red		Feature		
White		Feature		
Country	Teamcenter2	Family		String
Australia		Feature		
Germany		Feature		
India		Feature		
Japan		Feature		
USA		Feature		
Driving Position	Teamcenter	Family		String
LHD		Feature		
RHD		Feature		
Unassigned Families				

2. Create the structure with the following BOM lines and variant formula.

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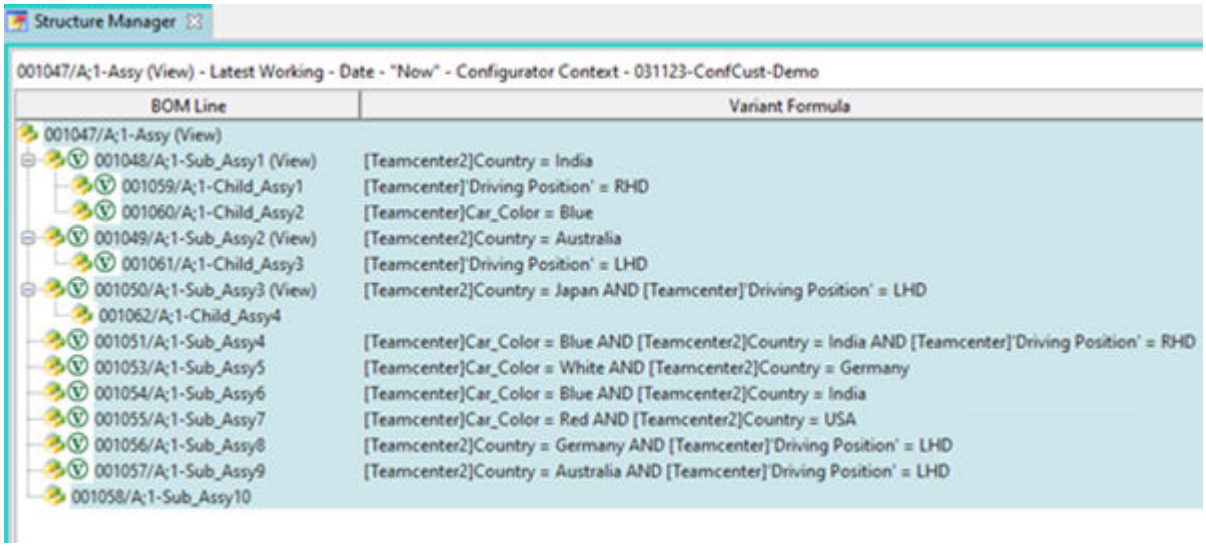
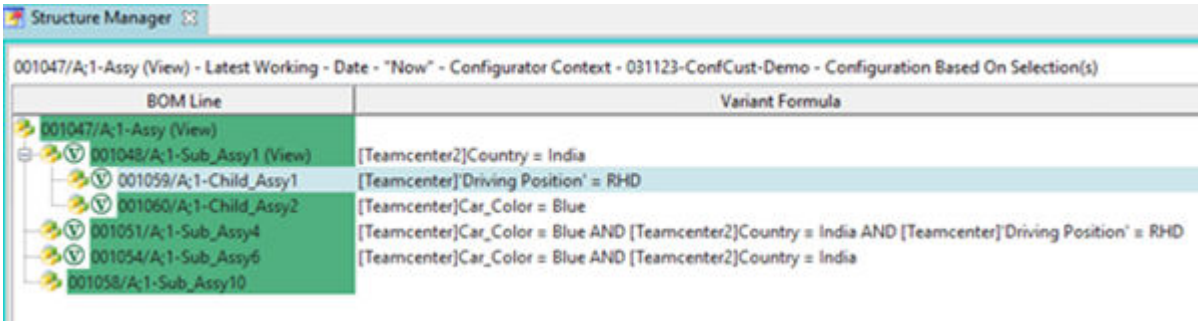


3. Select **Child_Assy1**, right-click, and choose **Configure Variants Based on Selection(s)**.

   The **Driving Position = RHD** variant formula is set for **Child_Assy1**.

   Therefore, when you configure the structure based on this selection, the system excludes all the BOM lines *not* set for right hand drive (RHD) or India. The following is the result.



> Note:
>
> When this action is performed the preference value for **Cfg0DefaultRuleDateForContent** is considered.

4. Select **Child_Assy1** and **Child_Assy2**, right-click, and choose **Configure Variants Based on Selection(s)**.

   The **Driving Position = RHD** variant formula is set for **Child_Assy1** and **Car_Color = Blue** for **Child_Assy2**.

   Therefore, when you configure the structure based on these selections, the system excludes all the BOM lines set for LHD (countries such as USA, Australia, Germany, and Japan) and all colors other than blue.

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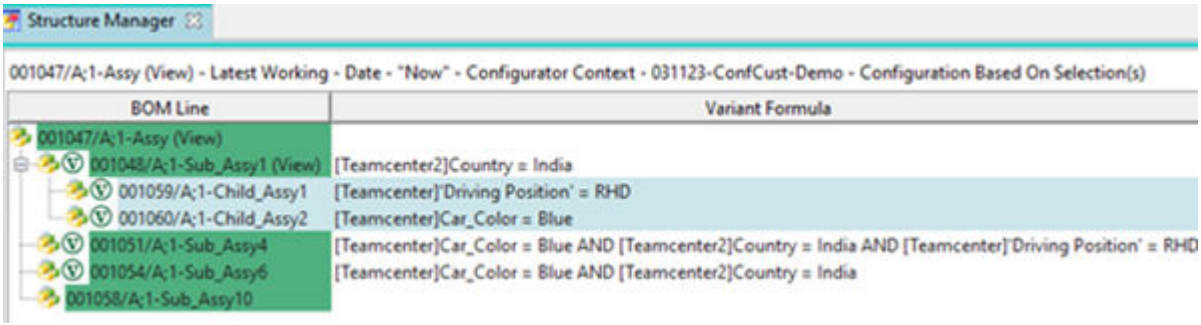
The following is the result.



Search for and apply saved variant rules

After creating a variant rule, you can save it as a saved variant rule (SVR). You can save an SVR to an item revision or a configuration context. In addition, you can create revisions of the SVR.

After you open a structure and you want to apply a variant rule, you can use the **Search and Load Variant Rules** dialog box to search for the SVR by name, description, revision ID, or ID.

1. In Manufacturing Process Planner, open a structure.

2. Click the **Open Saved Variant Rules Dialog** button on the main toolbar.

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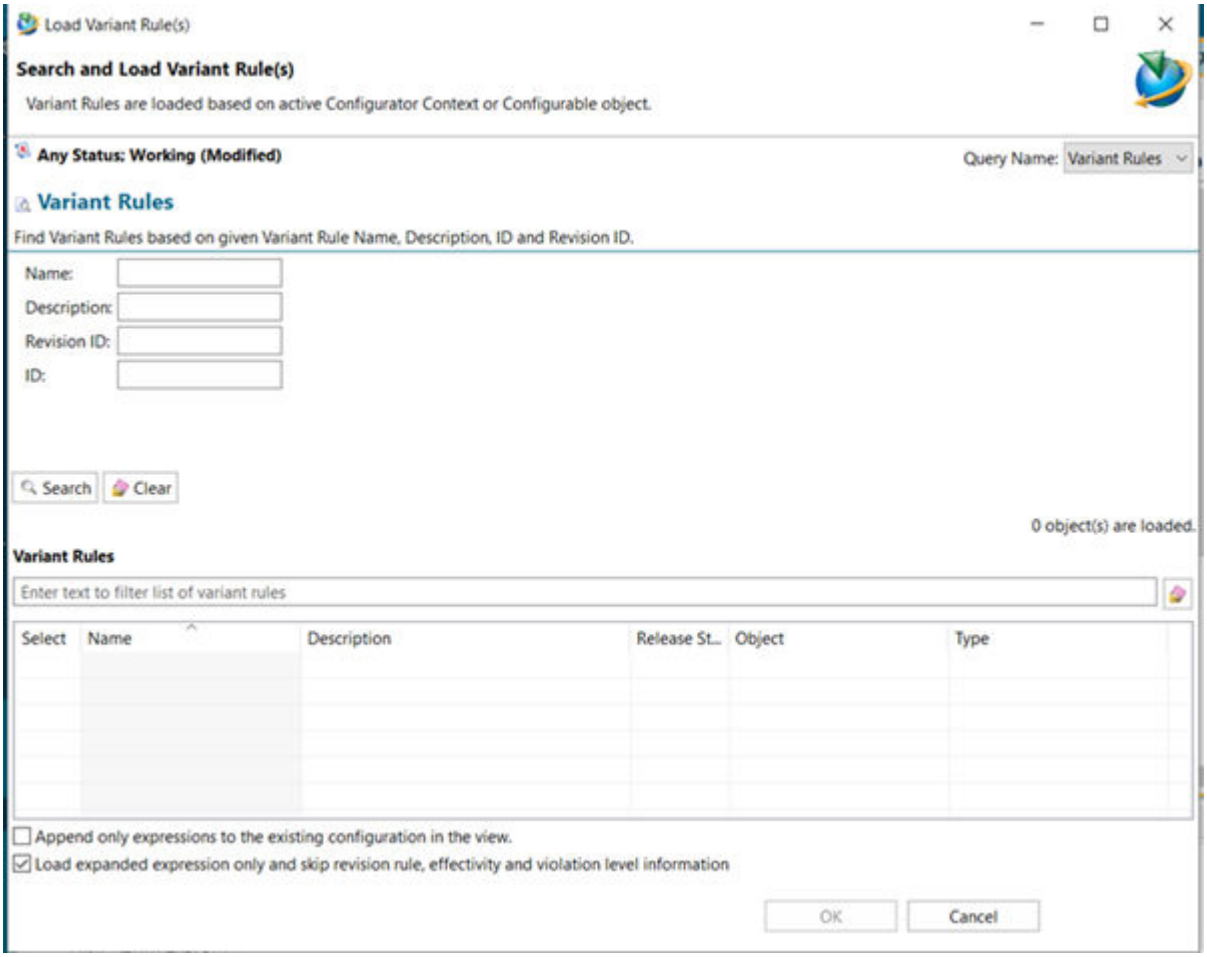

3. Specify your search criteria and click **Search**.

   You can use a wildcard search such as an asterisk on any of the search fields or on multiple search fields.

4. To apply the SVR, select it and click **OK**.

Author variant conditions in a multilevel structure

When you author variant conditions in a multilevel structure that has a configurator context associated at different levels, the variability displayed on the **Variant Expression Editor** view is that of the immediate parent. If the variability is not present at the immediate parent, the system continues to look till the top line to find the associated variability.

Let us assume that you open a multilevel structure that has configurator context associated at different levels. For example, the **LegacyCar** structure has the **Car** configurator context with features from both **Fuel** and **Engine** configurator contexts at the root level. Additionally, the **Fuel** and **Engine** configurator contexts are associated with **SubAsm1** and **SubAsm2**, respectively.

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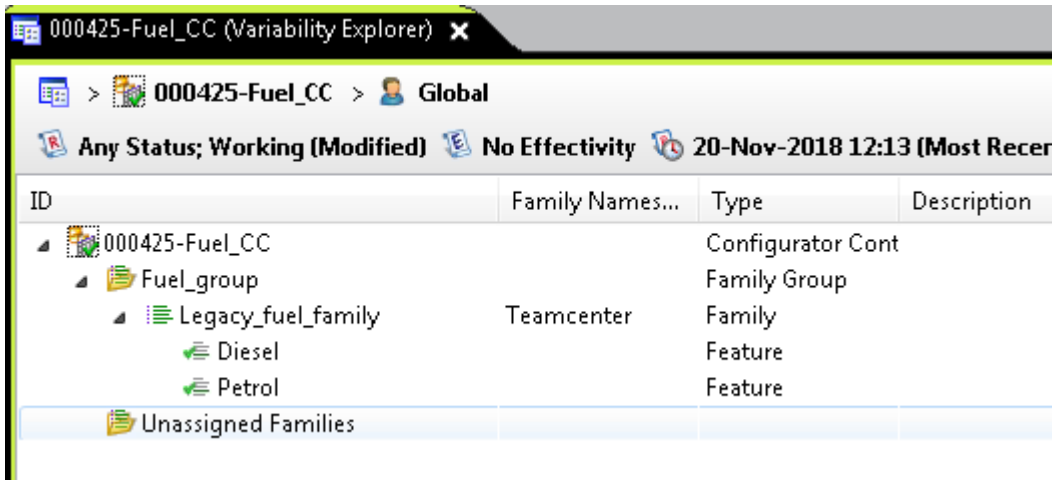
> Note:
>
> The root level configurator context must have all the variability available from the configuration context of its subassemblies.

In such a scenario, the **P11** and **P12** BOM lines for **SubAsm1** display only the **Fuel** configurator context features. Similarly, the **P21** and **P22** BOM lines display only the **Engine** configurator context features.

If you want to author variant conditions on **SubAsm1**, the features of the **Car** configurator context, that is, features from both **Fuel** and **Engine** configurator contexts are available.

Structure	Possible variant conditions	Configurator contexts at different levels
LegacyCar (root)		**Car** configurator context (**Fuel**, **Engine**)
SubAsm1		**Fuel** configurator context
P11	**Fuel** only	
P12	**Fuel** only	
SubAsm2		**Engine** configurator context
P21	**Engine** only	
P22	**Engine** only	
SubAsm3		
P31	**Fuel** and **Engine**	

1. In Product Configurator, create the **Fuel_CC** configurator context with the group, family, and features as follows:



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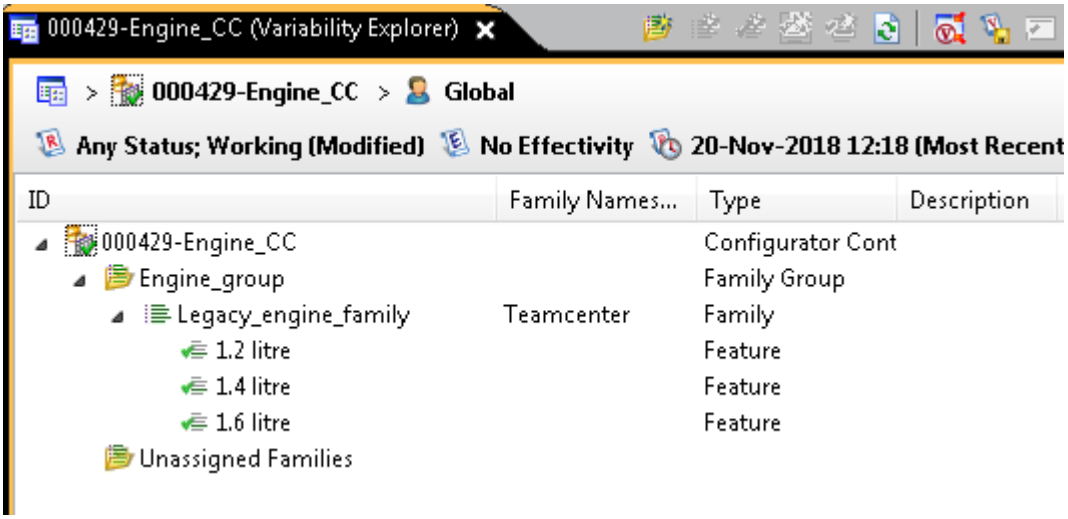
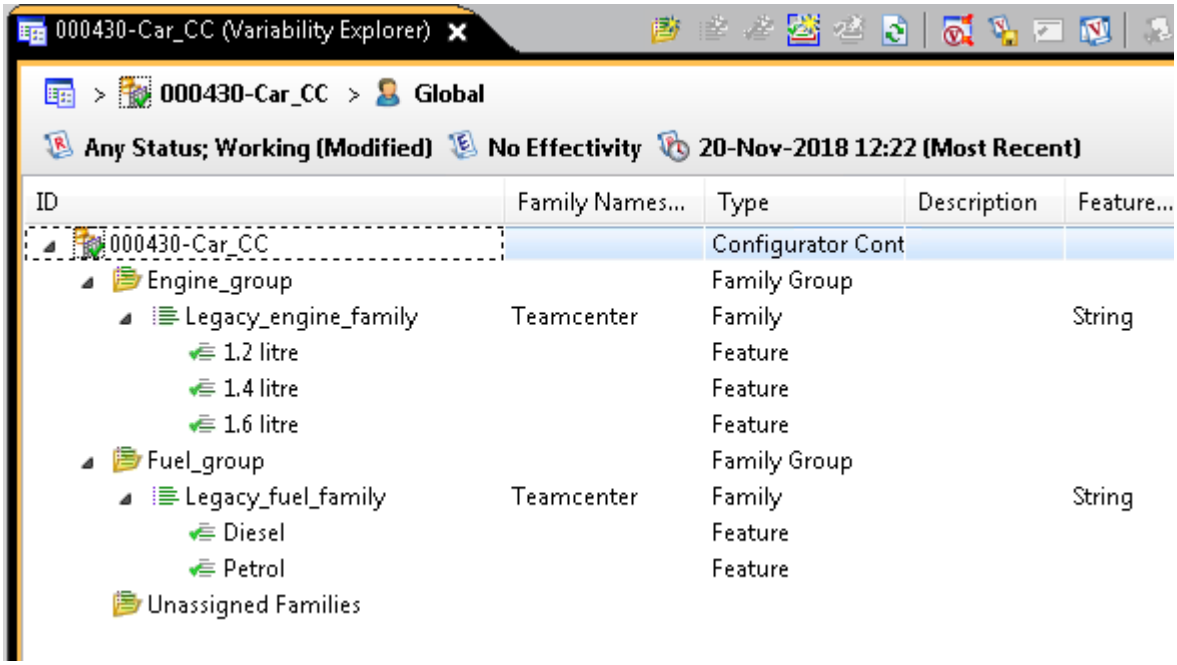
2. Create the **Engine_CC** configurator context with the group, family, and features as follows:



3. Create the **Car_CC** configurator context with the group, family, and features as follows:



4. In Structure Manager, create the following structure.

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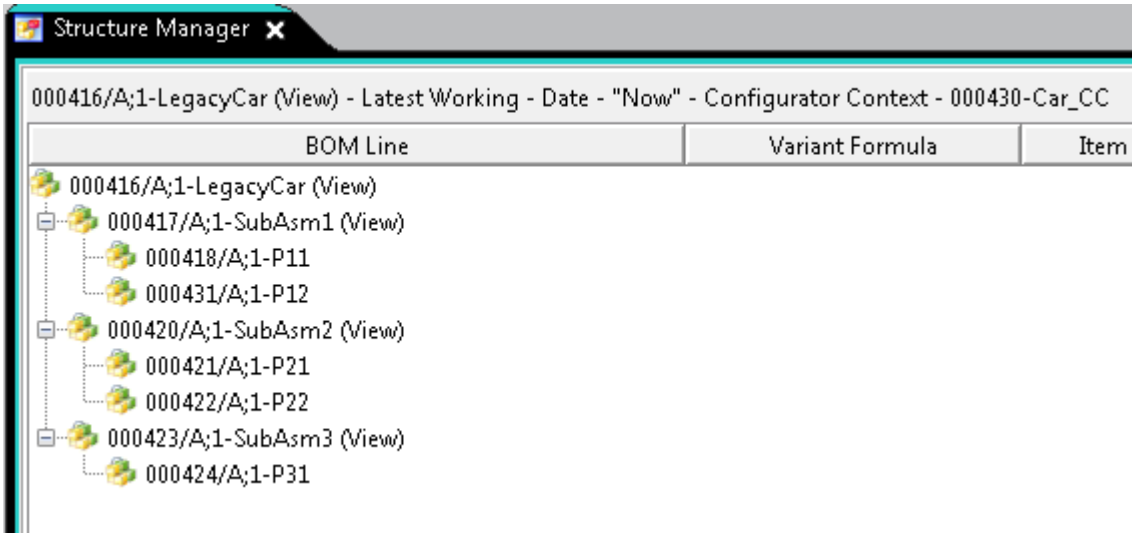
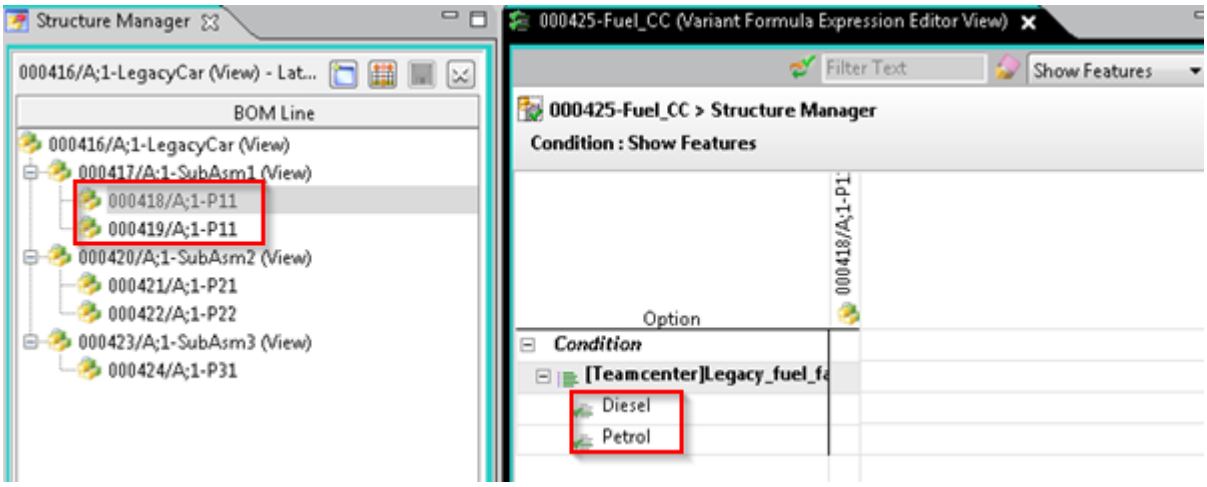


5. Associate **Car_CC** to the root structure, **Fuel_CC** to **SubAsm1**, and **Engine_CC** to **SubAsm2**.

6. Double-click the **Variant Formula** column for the **P11** and **P12** BOM lines. The **Variant Formula Expression Editor** view displays **Diesel** and **Petrol** features defined in the **Fuel_CC** configurator context.



7. Double-click the **Variant Formula** column for **P21** and **P22** BOM lines. The **Variant Formula Expression Editor** view displays **1.2 litre**, **1.4 litre**, and **1.6 litre** features defined in the **Engine_CC** configurator context.

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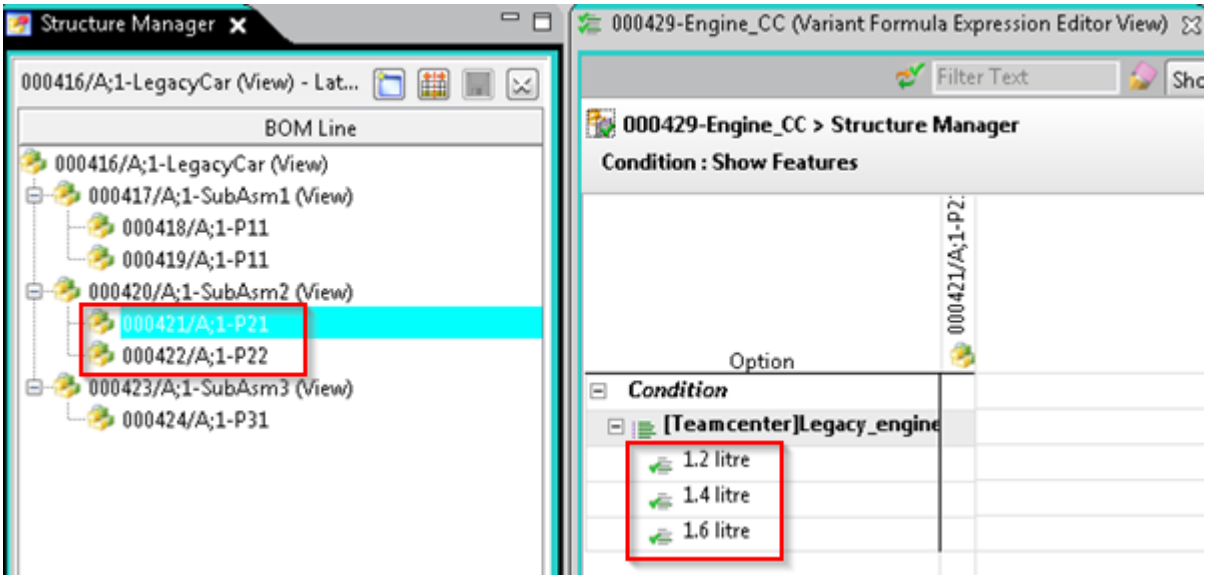
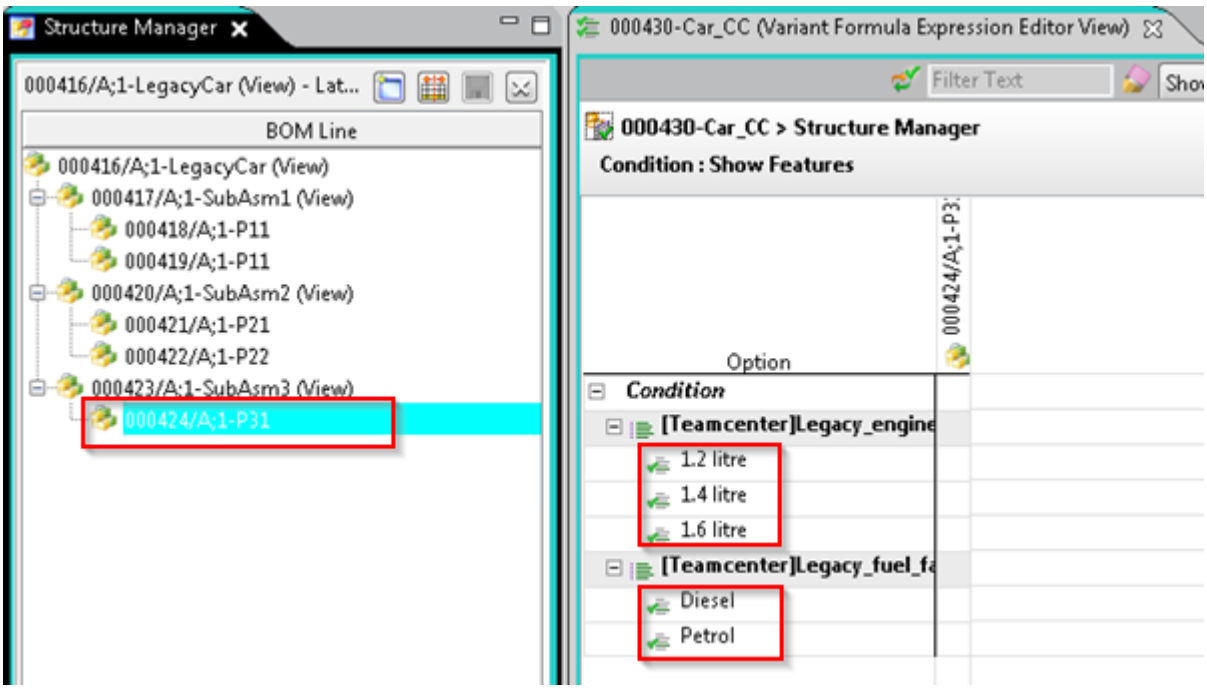


8. Double-click the **Variant Formula** column for the **P31** BOM line. The **Variant Formula Expression Editor** view displays **1.2 litre**, **1.4 litre**, and **1.6 litre** features defined in the **Engine_CC** configurator context and **Diesel** and **Petrol** features defined in the **Fuel_CC** configurator context.



Set the configurator feature to BOM line properties and create a solution variant

You can set BOM line properties based on Product Configurator feature selections and persist those properties while creating a solution variant.

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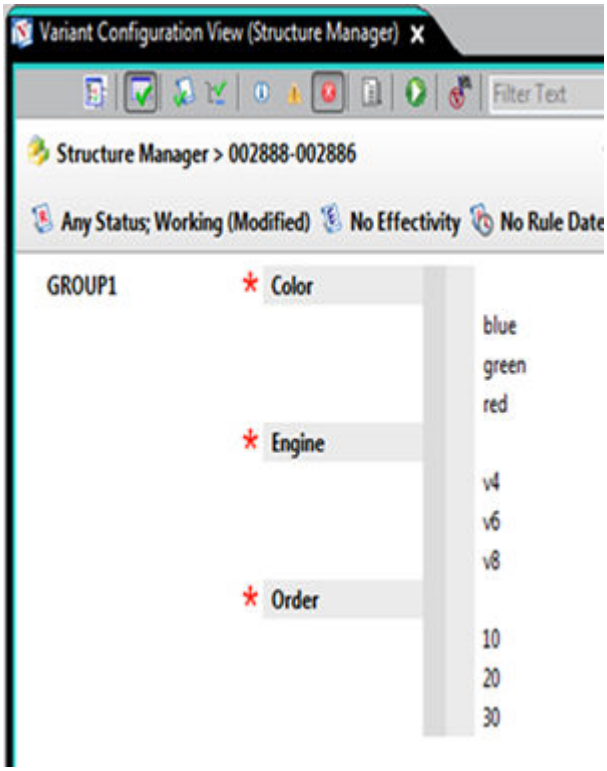
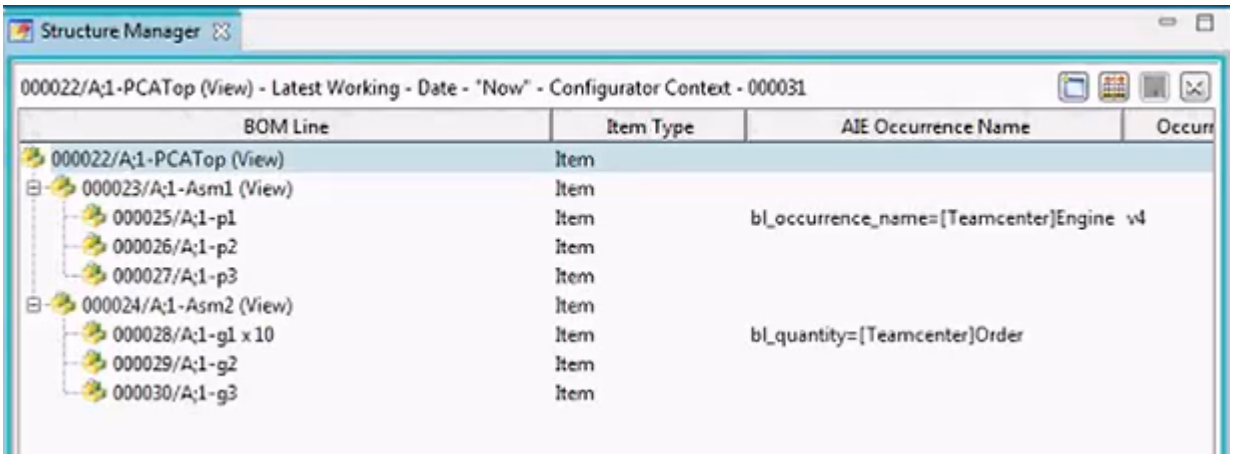
1. In Product Configurator, create the following configurator context.



2. In Structure Manager, create the following structure:



3. Associate the configurator context you created in step 1 to the structure you created in step 2.

4. Set the **PSEConfiguratorFeaturePropertyMapping** user level preference.

   This preference indicates the BOM line property (for example, occurrence note) you want to persist while creating a solution variant.

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Enable the BOM line property set under this preference. You may also want to enable the properties set using the configuration. For example, you can select **AIE Occurrence Name** for the mapping logic and set the occurrence name property based on this.

5. Right-click columns and enable the **AIE Occurrence Name**, **Occurrence Name**, and **Quantity** columns if they are not available in your view.

6. Create the mapping for the BOM line for which you want to set the properties:

   a. Set the value for the BOM line property. BOM line properties have display names or system names, and the system names are in the format **bl_***xxx*. You must use system names for the property. For example, if you choose the **AIE Occurrence Name** column to store the mapping and you want to set the value of the Engine family on the BOM line property, then the format of the mapping is: *bl_occurrence_name=[Teamcenter]Engine*.

   > Tip:
   >
   > The format of the mapping is *bl_property_name=[Namespace]Feature*. If the mapping is not defined as per the format, the system does not set the property.

   You can specify multiple occurrence notes or properties by specifying a semi colon (**;**) as a separator. Example: *bl_occurrence_name=[Teamcenter]Engine;bl_quantity=[Teamcenter]Order*.

   b. Similarly, type *bl_quantity=[Teamcenter]Order* for BOM line **000028**.

7. Click **Set option values for selected module** on the toolbar to open **Variant Configuration View**. Select **v6** engine and **30** order.

8. To apply the selected features to the structure, click **Applies the current configuration to the associated structure**.

   The occurrence name and quantity columns have **v6** and **30** as values for the respective BOM lines on which you created the mapping.

9. After validating the configuration, create a solution variant. To do so, click **Solution Variant** .

10. Close all the structures, open the solution variant you created, and verify the occurrence name and quantity columns.

    The occurrence name and quantity columns have *v6* and *30* as values for the respective BOM lines on which you created the mapping.

    These values are not populated on generic variant assemblies.

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Load a structure to display only configured variants

To quicken the loading of a structure, you can apply a filter so that only the configured variants are loaded. You can load the structure either by selecting an existing saved variant rule or by creating a custom configuration.

1. In Manufacturing Process Planner, choose **View→Enable Variant Configure To Load**.

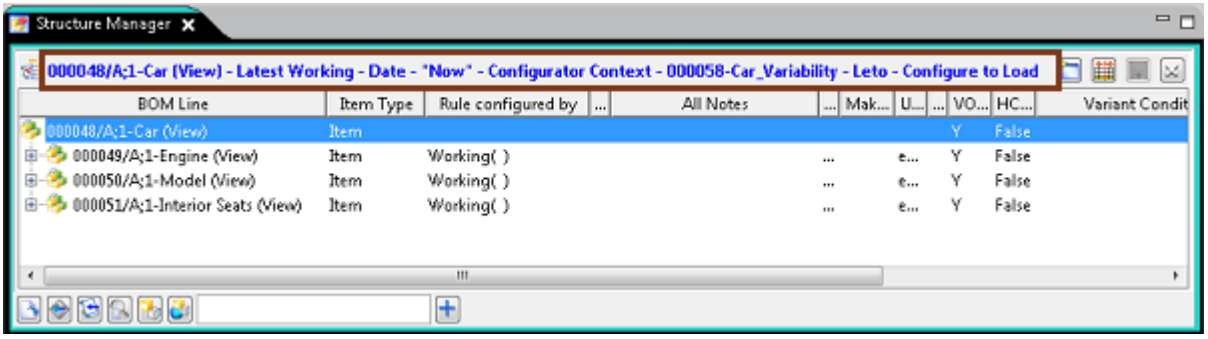
2. Send the structure to Manufacturing Process Planner.

3. In the **Load Variant Rule** dialog box, perform either of the following steps:

   - Select the saved variant rule using which you want to configure the structure. Select the **Filter unconfigured BOM lines due to Variants** check box and click **OK**.

   - Click **Open Variant Configuration View** . In **Variant Configuration View**, create a custom configuration by selecting the required options.

   When the structure is subsequently loaded, the BOM lines configured by the applied variant rules are only displayed. The title bar of the structure tree pane is highlighted in a different color (here, blue) to indicate that filtering is applied.



You cannot hide this selection when the structure is loaded. It persists each time the structure is loaded. To change it, you must follow the previous steps and clear the **Filter unconfigured BOM lines due to Variants** check box.

Once the variant rule is applied to a structure that is configured to load, you cannot reconfigure the structure with a different variant rule. To do this, open the structure in another view and apply a different variant rule in the new view.

Show or hide the unconfigured components in a structure

To display all components, configured and unconfigured, in a product structure, select the structure and choose **View→Show Unconfigured Variants**. The **VOC - Variant Occ. Config'd** column in the

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Manufacturing Process Planner view shows a **Y** if the component is configured. This column is blank if the component is not configured.

To hide all the unconfigured components in the structure, click **Show Unconfigured Variants** again.

Configure with custom variant configuration (manual validation)

Manual configuration mode is primarily used to perform a study or an overlay analysis in the application that manages product content. Manual configuration is also used by configuration analysts to study the system response based on variety of selection paths. Using this mode, you can build and save valid configurations or study configurations.

If your system is configured with the global constant that points to **Name** as a primary business property, the **Variant Configuration** view displays **Name** instead of **ID** in the corresponding areas.

1. Search for the structure in My Teamcenter, and click **Open**. Select it, right-click and select **Send To→Manufacturing Process Planner**.

2. To open the **Variant Configuration** view, in the **View Menu** on the view toolbar, select **Configure Variants**.

3. Set a revision rule, effectivity, and rule date by clicking the corresponding hyperlink.

   If an unconfigured feature exists in a configuration, such as after applying a saved variant rule, the system displays a question mark symbol next to the selected feature.

4. Select manual validation mode by clicking **Guided configuration mode** off. (The configuration mode always defaults to manual when you open a new session.)

   By default, Teamcenter displays the **Variant Configuration** view in the **Overlay** configuration mode with all the available variant features including standalone features, feature packages, feature summaries, and summary models. You can select more than one feature from the single select family in the **Overlay** mode.

   To switch to the **Order** configuration mode, click **Overlay Configuration Mode**. When you switch between the **Overlay** and **Order** modes, Teamcenter resets the system selections that were derived based on rules prior to switching the mode.

   If you hover the cursor over the button in the order mode, the tooltip displays **Order Configuration Mode**.

   Your administrator can change the default configuration mode using the **Cfg0DefaultValidationMode** preference. By default, it is set to **Order** mode.

   Observe that the header of the view displays the completeness check indicators. The icons appear active or inactive based on the results of the validation.

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- Valid and complete product configuration .

  Valid and complete means that the BOM is targeting a complete structure, that is, a 100% BOM. When a configuration is valid and complete, you could take this configuration input and perform a cost or a weight rollup, compute the center of gravity, or perform a digital analysis of that product.

  On the contrary, if you do not see this completeness icon, you should not typically perform any of the above actions. It means that you have less content or more content.

  When a configuration is valid and complete, it assigns a value to every family. This is irrespective of whether the family is mandatory or discretionary.

  When you click **Validate** , the system only validates your input.

  - indicates that your input expands into a valid and complete configuration if you click **Expand**, such as it is a prediction of what would happen if you choose to expand your configuration.

  When you click **Expand** , it means that the expanded configuration in the current configurator context is complete.

  - indicates that your input was valid and was successfully expanded into a valid and complete configuration. If the icon was not active prior to clicking **Expand** , the **Variant Configuration view** was changed during the **Expand** operation.

- Valid and incomplete product configuration .

  When you click **Validate** , it means that the input criteria is valid during the validation.

  When you click **Expand** , it means that the expanded expression is incomplete. For example, mandatory families may need to be selected to complete this configuration. You can also view a tooltip with a violation message with a list of incomplete families if you hover the cursor over the result. The tooltip displays a list of incomplete mandatory families.

- Invalid product configuration .

  It means that the input criteria is invalid based on the configurator rules set in the current configurator context.

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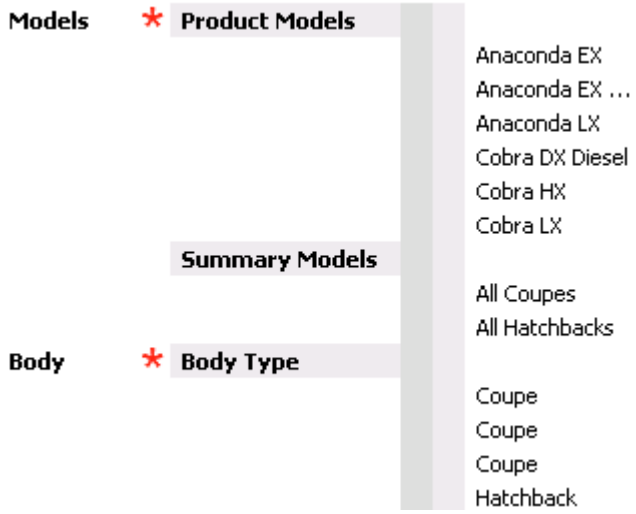
Note:

Contact your system administrator if the system returns a validation failure without showing a list of information, warnings, or errors. It may be an access control issue.

A red asterisk * next to the family indicates that a variant feature selection is required. Once you make a selection that completes a required configuration, the red asterisk * disappears.



Warning:

Do not create configurator rules, variant conditions, or saved variant rules by combining a product model with a summary model or a product line.

5. Click the cell to select the variant condition you want to use to define the configuration:

- Click one time to display a green check mark ✔ to include the variant condition when defining the configuration.
- Click two times to display a red circle backslash ⃠ to exclude the variant condition when defining the configuration.
- Click three times to display a blank cell to indicate the variant condition is not used when defining the configuration.

If the cell is positively selected with a green check mark ✔ , it means **ANY**. If it is negatively selected with a red circle backslash ⃠, it means **NONE**.

Multiple variant conditions are connected using a logical **AND** operation in the variant expression that defines the configuration.

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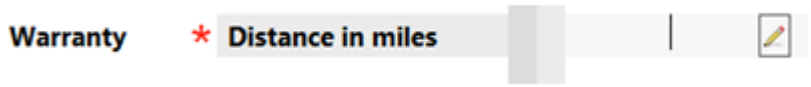
6. If you want to override the system-assigned default feature, click the system default feature once to deselect, and then click another feature from the same family.

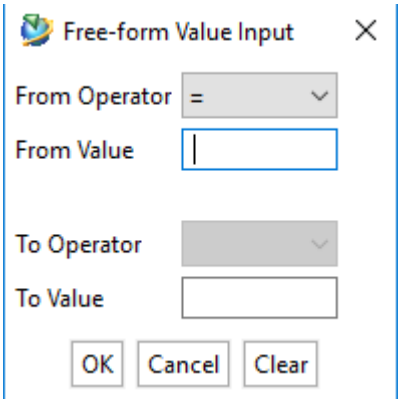
7. If the feature is a free-form text, perform the following steps:

   a. Click to the right of the cell under the corresponding feature to display the edit pencil symbol.



   b. Click to type the values.

   c. In the **Free-form Value Input** dialog box, type the values to set the variant condition.



   d. Click **OK**.

      If the entered value contains any validation or formatting issues, the free-form feature is displayed in red in the feature text field and flagged with an error message.

8. Use the above procedure to specify values for free-form non-string, numerical, or date type families.

   Click below the last cell with enumerated values to display a new line and the edit pencil symbol.

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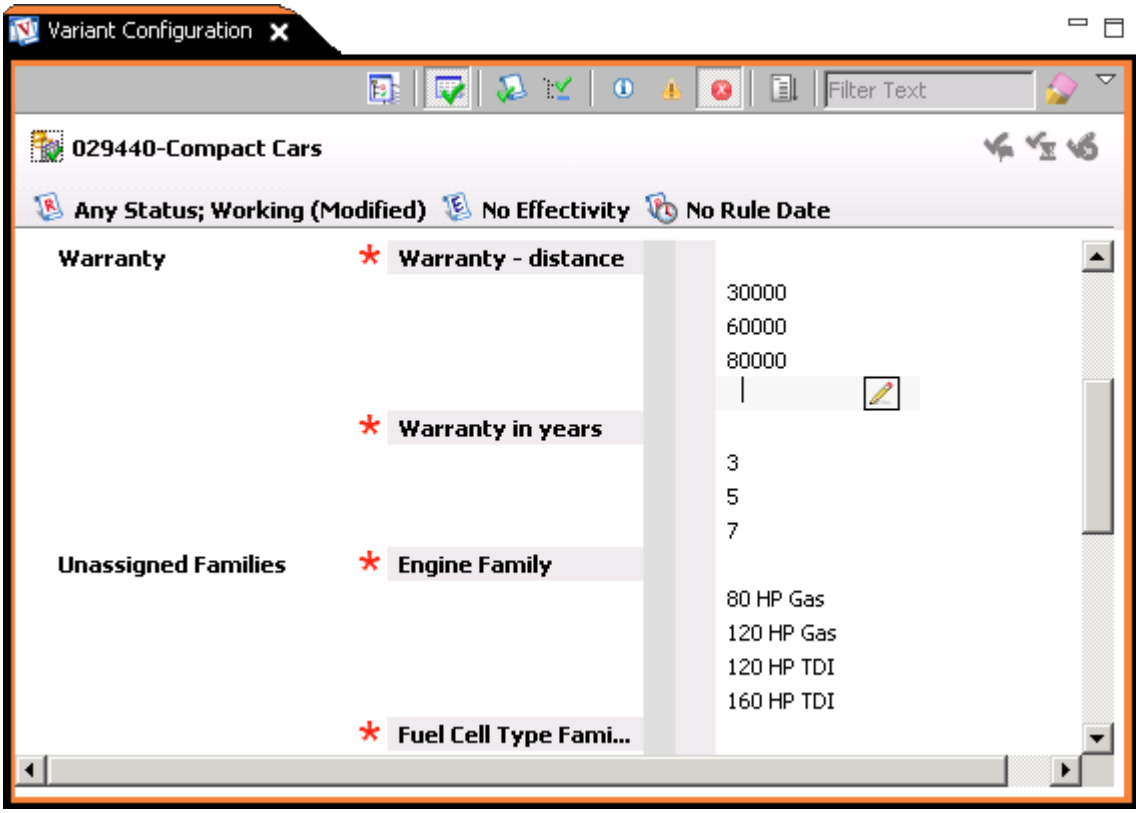
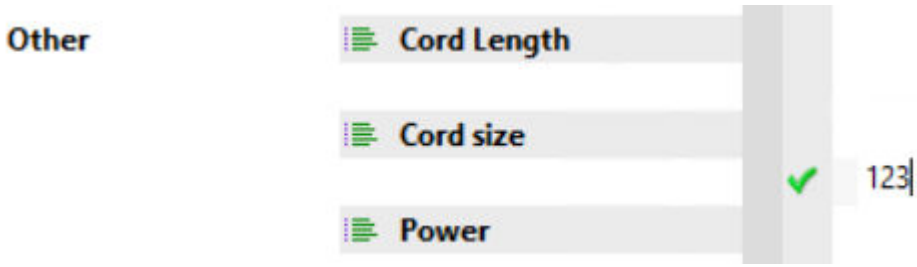


You can use operators only for the enumerated values for numeric families.

9. If a family is defined as free-form string, perform the following steps:

   a. Click to the right of the corresponding cell under the free-form string family.

   b. Enter values directly in the cell.



10. If a family is defined as date, perform the following steps:

    a. Click to the right of the cell to display the date symbol.

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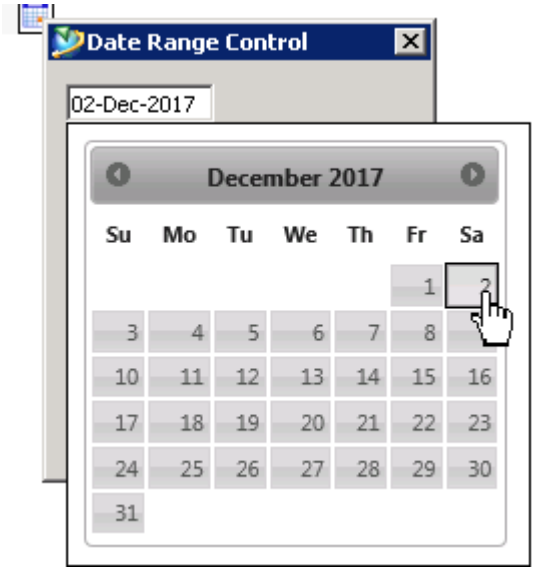
b. Click to define dates.

c. In the **Date Range Control** dialog box, click today's date to open the calendar to set the required date or type the values and ranges.



The calendar initially displays the current day, month, and year.

For a non-free-form data type, predefined features are not listed in the drop-down list when choosing a range.

For example, if an integer family **Horse Power** has features of **200**, **400**, and **500**, then the dialog box displays **200**, **400**, and **500** in the drop-down list. If a family **Release** has features of **01-01-2018** and **01-01-2019**, then the dialog box does not display a drop-down list with these features. If you want to use a range by using these features, select the precise date using date control in the **Date Range Control** dialog box.

d. Click **OK** to set the date.

11. If a family is defined as a dynamic family, when you select a standalone feature in the manual mode, it is valid across all the selections in the dynamic families where this feature resides.

Your administrator can enable the creation of dynamic families and standalone features using the **Cfg0EnableDynamicFamilySupport** preference.

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> Note:
>
> The standalone features and the dynamic family concept are in an incubation phase. They should only be used with the approval from Siemens product management. They require authoring in Active Workspace and consumption of configurator data.

12. If you do not want to apply constraints, deselect **Apply constraints**. By default, this option is selected.

    - If selected, constraints are applied while applying the variant rule expression on the content.
    - If deselected, only user selections are applied.

13. If you do not want validation rules to participate during criteria expansion, deselect **Allow validation rules to expand**. By default, this option is selected.

    - If selected, allows validation rules to participate during criteria expansion.
    - If deselected, only violations, if present, are reported. The system selections based on validation rules does not occur in the expanded criteria.

14. To remove all variant expressions, click **View menu** and choose **Clear Expression**.

    The system re-evaluates the configuration and displays features that were hidden based on the previous selections.

15. To load an existing configuration for viewing or editing, perform the following steps:

    a. Click **Load Variant Rule(s)** .

       Teamcenter displays the **Load Variant Rule(s)** dialog box. You can search and filter variant rules or variant criteria using your defined criteria in this dialog box.

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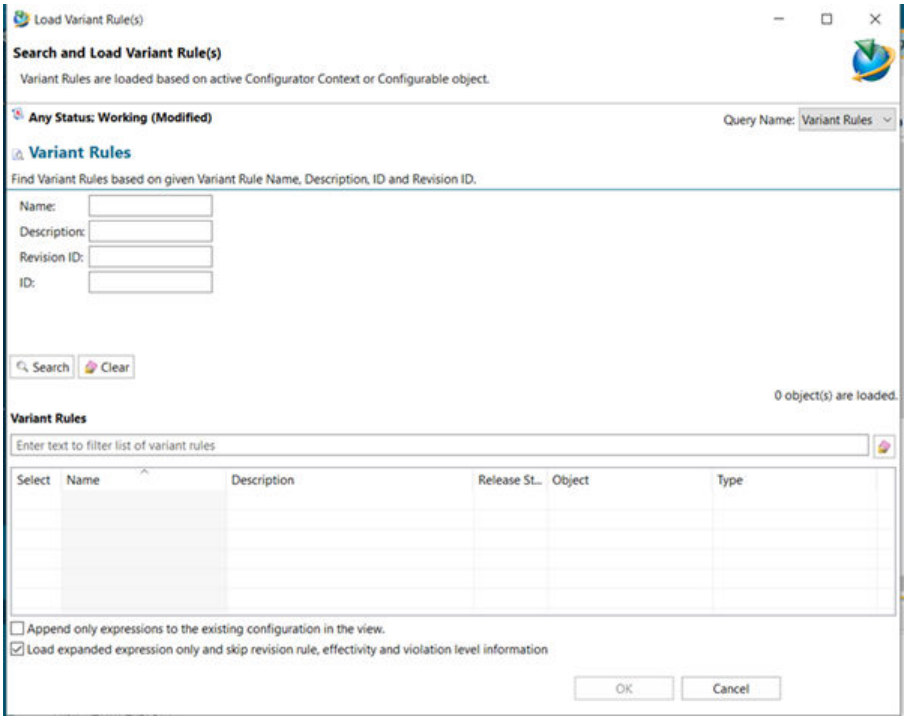

b. Type a name or description as your search criteria to find variant rules or variant criteria.

- For variant criteria only, you can also search using the revision ID or ID. Additionally, you can specify the revision rule and the rule date in the **Load Variant Rule(s)** dialog box to locate the required revision of your variant criteria.

Press Enter or click **Search**.

Your administrator controls which queries and search criteria display in the **Load Variant Rule(s)** dialog box using the **PCA_VariantRuleSearch_SavedQueries** preference. This preference sets the default value as **Variant Rules** which is a generic saved query used to perform a search for variant rules. You can define your own saved query for variant rules and add its name to the **PCA_VariantRuleSearch_SavedQueries** preference.

If your administrator adds configurator context to the search criteria, the system locates only variant rules that are shared with the current and active configurator context in the **Variant Rule(s)** view.

Your administrator controls if you create variant rules or variant criteria using the **Cfg0CreateVariantRuleType** preference. The preference can be set to either **VariantRule** or **Cfg0VariantCriteria** which allows you to create either variant rules or variant criteria, respectively. By default, it is set to **Cfg0VariantCriteria**. If the value is not set, you see an error message notifying you that no valid variant rule is found in the system.

All variant rules that match your search criteria are listed in a table at the bottom of the dialog box. Additionally, it displays the number of variant rules found in your search.

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c. If needed, you can filter the results by typing your criteria in the filter box.

d. Check one or more boxes to select product configurations you want to load and click **OK** to replace the existing selections. By default, **Load expanded expression only and skip revision, effectivity and violation level information** is selected.

> Note:
>
> The default state of the check box is controlled by the **Cfg0LoadExpressionInfoForVR** user preference. By default, it is set to **false** and the variant rule is loaded without session information.

The system loads expressions of the selected variant rules or variant criteria in the **Variant Configuration** view.

If not selected, the configuration session information with expressions is loaded for the selected variant rule. A variant rule session information consists of severity, validation mode, revision rule, effectivity, and a rule date saved along with an expression.

When you load the rule without the session information, the system displays it as **Custom configuration**. If you modify and save it, the system saves it as a new rule.

If you load the entire rule including all of the expressions and the session information, the system displays the name of the variant rule or the ID, revision, and the name of the variant criteria. If you make any changes to that rule, the system overrides the information and saves the changes in the same rule. Validation information is not saved along with the rule. It is recommended to validate the rule after you reload it.

When you make changes to variant rules or variant criteria, such as make a new selection, change a revision rule or effectivity, the system resets the validation flags.

Alternatively, you can select **Append only expressions to the existing configuration in the view** and Teamcenter loads each in a separate column, preserving the existing selections. Teamcenter loads only saved expressions. The system applies the configuration to the current content and logically overlays multiple columns, resulting in a 120% BOM configuration or an imprecise configuration.

When using the **Load Variant Rule(s)** dialog box to append new saved variant rules to your configuration using **Append only expressions to the existing configuration in the view**, you can only view the already loaded SVRs but you cannot deselect them. You can choose to load other available saved variant rules.

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When you overlay configurations, the system displays each configuration in a separate column during authoring and validation. Configurations are also expanded column by column. Number of columns in the input and output configurations are maintained by the system.

If you select variant rules to load with **Append only expressions to the existing configuration in the view** not selected, then the system does not append the columns for the selected rules. If you search and load variant rules or variant criteria multiple times, then the system constructs results only for the newly selected objects and does not include the already loaded ones.

> Note:
>
> If you make imprecise selections, you cannot switch to the guided (active) mode. The system generates an error message stating that the active validation mode only supports the precise configuration.

16. (Optional) Click **View menu** and choose **Clear Variant Rule** to unload the variant rule or variant criteria from the view and reset the session information, including severity, validation mode, revision rule, effectivity, and the rule date, to the default state.

17. (Optional) Click **View menu** and choose **Clear Un-configured Feature** to remove unconfigured features.

    The expression on the unconfigured feature in the view is removed. Also, the row holding the unconfigured feature is removed.

18. Click **Validate**. The system validates your input and considers all system rules to validate and report the verdict. It does not change the input expression. It does not consider rules below the selected severity level, such as default rules.

    You can specify operators for numerical or date family when validating your configuration.

    Teamcenter provides feedback after performing a set of functions as follows:

    a. Validates the selected criteria against the system rules with the severity equal or greater than the input severity.

    b. Applies all configurator rules.

    c. Reports violations based your selections.

    If prior to validation, all families have precise selections, the system displays the **Valid and complete product configuration** status. Otherwise, the system displays the **Valid and incomplete product configuration** status and provides additional information indicating the reason for the invalid status.

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d. Reports violation on the free from families where value specified is outside their minimum or maximum range.

If you hover over the violation, the tooltip displays object details that caused this violation, such as specific features or configurator rules. If needed, you can select and copy the violation message.

If your configuration contains an inconsistent or conflicting rule set, then the violation occurs irrespective of any selection in the **Variant Configuration** view or for any other validation. In such cases, the violation may not be displayed on your selection. For example, if no features from mandatory families are available, then during the validation, the violation occurs. The violation is displayed on features of mandatory families even if they are not a part of the input configuration to validate.

Configurator constraint rules, such as inclusion or exclusion rules, specify a severity level. When you are validating your configuration, the system reports the constraint rule violations with the specified severity level.

19. You can perform the following actions to modify the interaction for validations during the manual configuration:

a. Click **Set Info level violations to be fetched while applying validations** to switch between displaying and enforcing or hiding and dropping of all informational messages.

b. Click the **Set Warning level violations to be fetched while applying validations** to switch between displaying and enforcing or hiding and dropping of all warning messages.

Error level violations are always displayed.

During the validation process, if you have multiple rules with conflicting severity levels, the systems validates and enforces the rules based on the following severity ranking:

a. Error (highest severity)

b. Warning

c. Information

d. Package Default

e. Default

f. System Enforced Defaults (lowest severity)

20. Click **Expand**. The system considers all system rules to validate your input and assigns features or precise values to the feature families using system knowledge.

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If **Allow Validation Rules to Expand** button is deselected during expansion, only violations are reported, if present. The system selection based on validation rules does not occur in the expanded criteria. By default, Teamcenter displays the **Variant Configuration** view with this button as selected.

- In the **Overlay** mode, the system assigns values based on the valid input criteria.
  - The system appends your input in the **Variant Configuration** view with the values that the system identified as the only possible solution in the selected families. The system considers all configurator rules with the severity equal or greater than the input severity.

    Note:

    The families with multiple possible solutions are left unassigned.

  - The system informs you if the expanded criteria is complete or incomplete.
- In the **Order** mode, the system assigns values based on the valid input criteria, similar to the **Overlay** mode. Moreover, it provides additional values to help you create 100% configuration or order configuration. These additional values are provided for all families.

  The system suggests the empty value as the default if there are multiple solutions or for an optional family. This means the resulting configuration is not choosing any values for the optional family.

  All of the nonconflicting low severity rules, including default rules, are considered.

21. Click to save the custom rule.

    If you started from a blank view, Teamcenter displays the **Save Product Configuration** dialog box; otherwise it saves the changes to the existing product configuration.

    If you exit the **Variant Configuration** view without saving, you are prompted to save the changes.

22. To save a new configuration, in the **Save Product Configuration** dialog box, type a name and description, and click **OK**.

    Teamcenter creates a custom configuration with the specified name and variant configuration. The system adds the name of the saved variant rule to the title bar.

23. To clear a previously loaded custom configuration, click **View menu** and choose **Clear Variant Rule**.

    The system removes the name of the saved configuration from the title bar and then resets user and system selections to the initial state.

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Configure with guided variant configuration (active validation)

Guided configuration mode is primarily used to simulate the configuration behavior for customer interactions. The users of this configuration want to be sure that there is a valid configuration path for every planned product variant. Similar to manual configuration mode, validated configurations can be saved and used to track primary configurations.

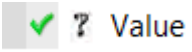
If your system is configured with the global constant that points to **Name** as a primary business property, the **Variant Configuration** view displays **Name** instead of **ID** in the corresponding areas.

1. Search for the structure in My Teamcenter, and click **Open**. Select it, right-click and select **Send To→Manufacturing Process Planner**.

2. To open the **Variant Configuration** view, in the **View Menu** on the view toolbar, select **Configure Variants**.

3. Set a revision rule, effectivity, and rule date by clicking the corresponding hyperlink.

   If an unconfigured feature exists in a configuration, such as after applying a saved variant rule, the system displays a question mark symbol in front of the selected feature.

4. Click to use guided validation by clicking **Guided configuration mode** on. (The validation mode always defaults to manual when you open a new session.)

   By default, Teamcenter displays the **Variant Configuration** view in the **Overlay** configuration mode.

   To switch to the **Order** configuration mode, click **Overlay Configuration Mode**. When you switch between the **Overlay** and **Order** modes, Teamcenter resets the system selections that were derived based on rules prior to switching the mode.

   If you hover the cursor over the button in the order mode, the tooltip displays **Order Configuration Mode**.

   Your administrator can change the default configuration mode using the **Cfg0DefaultValidationMode** preference. By default, it is set to **Order** mode.

   Observe that the header of the view displays the completeness check indicators. The icons appear active or inactive based on the results of the validation.

   - Valid and complete product configuration

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Valid and complete means that the BOM is targeting a complete structure, that is, a 100% BOM. When a configuration is valid and complete, you could take this configuration input and perform a cost or a weight rollup, compute the center of gravity, or perform a digital analysis of that product.

On the contrary, if you do not see this completeness icon, you should not typically do any of the above actions. It means that you have less content or more content.

When a configuration is valid and complete, it assigns a value to every family. This is irrespective of whether the family is mandatory or discretionary.

- Valid and incomplete product configuration

  In the guided mode, Teamcenter does not provide a list of incomplete mandatory families.

  > Tip:
  >
  > To locate a list of missing required families, switch to the manual mode. For the valid and incomplete product configuration in the manual mode, Teamcenter generates a tooltip with a list of incomplete mandatory families.

- Invalid product configuration

Teamcenter shows a list of groups with the first in bold and arrows above and below the list. Any features that violate constraints are indicated. The families and features of the group are displayed in the right pane.

A red asterisk * next to the family indicates that a variant feature is required. Once you make a selection, * next to the family disappears.

- A symbol is displayed next to the system-assigned available features.

  It indicates that the displayed features are enforced in the current configuration. Typically, features configured due to include, exclude, and availability rules are shown as system-assigned.

  A system selection is only shown for families with exactly one solution.

- A symbol indicates that the presence of the selected feature is denied by the system due to configurator constraints, such as inclusion, exclusion, or availability rules.

- A symbol is displayed next to the default features when the selection is enforced by:

  - A default rule.

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The applicability of the default rule is satisfied either directly by a user–defined criteria or by a system selection enforced by include, exclude, and availability rules.

- An include rule.

  The applicability of the include rule is satisfied through a default rule.

- A symbol indicates that a selected feature is denied by the system due to the default rule.

If you have an imprecise configuration displayed using manual validation, you cannot switch to the guided (active) mode. The system generates an error message stating that the active validation mode only supports the precise configuration.

Guided configuration displays variant data within one group at a time. These are user-created groups. Every configurator context contains a default **Unassigned Families** group. As this group is system-generated and not manually created by a user, it is *not* displayed in a guided configuration mode. Thus, the variant data within the **Unassigned Families** group is also *not* displayed in a guided mode. However, in a manual mode, both the **Unassigned Families** group and its variant data are displayed. Families and features become visible in a guided configuration mode, once you create a new parent group or move the unassigned families with the corresponding features to an existing group.

Standalone features and dynamic families with standalone features are also displayed, if available.

The system displays all of the available Boolean features and features from the multi-select families, only if they are made explicitly available.

> Note:
>
> Product lines, summaries, summary models, and families that reside in the **Unassigned Families** group are not displayed during the guided validation.

5. Click the cell to select the variant condition you want to use to define the configuration.

   - Click one time to display a green check mark to include the variant condition when defining the configuration.

   - Click two times to display a blank cell to indicate the variant condition is not used when defining the configuration.

   - Click the , , or system-assigned features once to change them to the user-assigned selections.

   If the cell is positively selected with a green check mark , it means **ANY**. If it is negatively selected with a red circle backslash , it means **NONE**.

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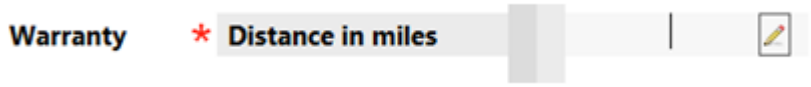
Multiple variant conditions are connected using a logical **AND** operation in the variant expression that defines the configuration.

If you select features that define a model, validation automatically selects a model. When you select a product model or a feature package, then the system adds the corresponding product model or feature package members, respectively, to the configuration.

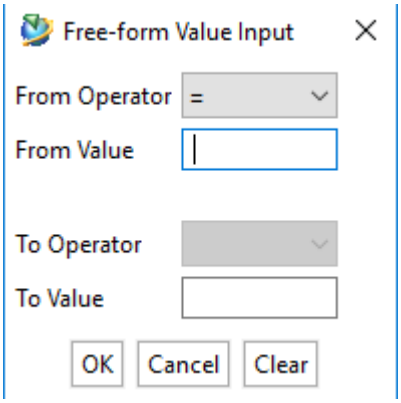
6. If the feature is a free-form text, perform the following steps to set the feature:

   a. Click to the right of the cell under the corresponding feature to display the edit pencil symbol.



   b. Click to type the values.

   c. In the **Free-form Value Input** dialog box, type the values to set the variant condition.



   d. Click **OK**.

   If the entered value contains any validation or formatting issues, the free-form feature is displayed in red in the feature text field and flagged with an error message.

7. If a family is defined as a free-form string, perform the following steps:

   a. Click to the right of the corresponding cell under the free-form string family.

   b. Enter values directly in the cell.

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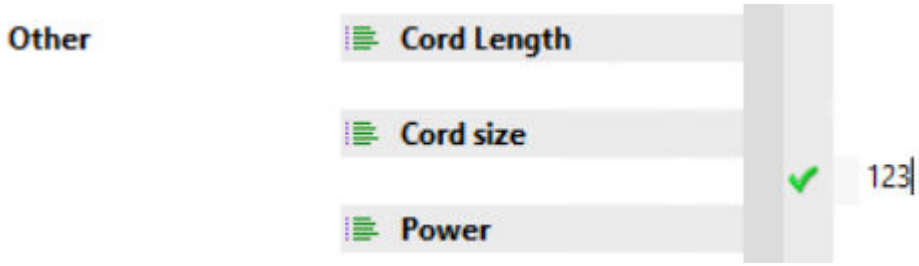
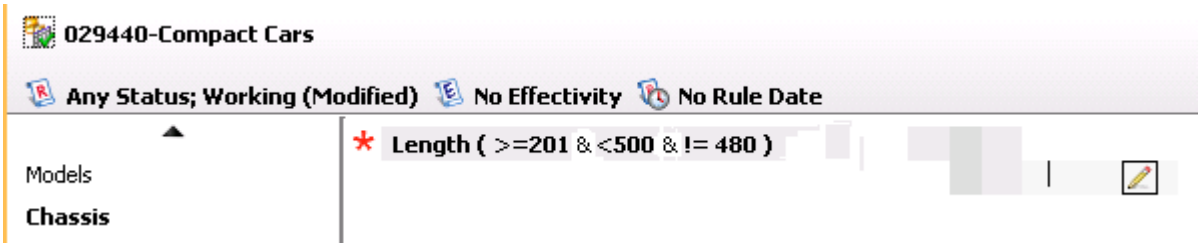
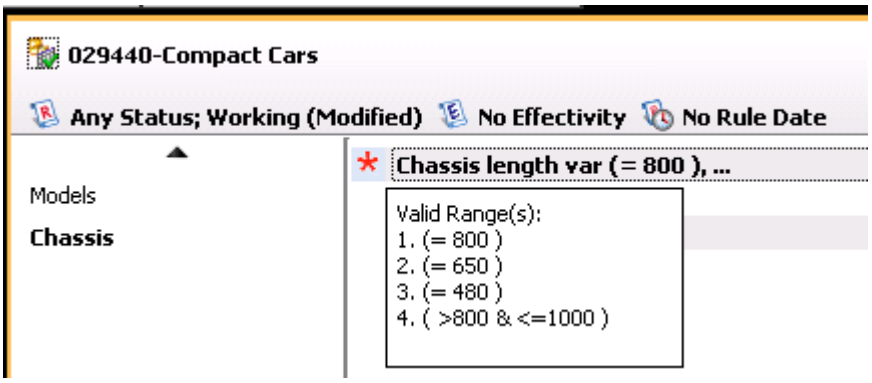


8. During guided validation mode, for enumerated and free-form non-string families, the system displays allowable ranges by considering all of the configurator rules.



The system displays the updated range and considers all possible subranges. The tooltip displays the disjointed ranges, if present.



9. To remove all variant expressions, click **View menu** and choose **Clear Expression**.

   The system re-evaluates the configuration and displays features that were hidden based on the previous selections.

10. Set the type of violation messages to be displayed by the system as follows:

    - Click **Set Info level violations to be fetched while applying validations** to switch between displaying and enforcing or hiding and dropping of all informational messages.
    - Click the **Set Warning level violations to be fetched while applying validations** to switch between displaying and enforcing or hiding and dropping of all warning messages.

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Error level violations are always displayed.

The severity of the rule is honored when the system displays the available features in active mode. For example, if you set a minimum error severity of *warning*, then the features that violate the *information* severity rules are also available for selection in active mode along with the features that do not violate any other rules.

11. Select families, one group at a time, making modifications and resolving violations.

    Click ▲ or ▼ to switch groups to select families, one group at a time.

    If you deselect the **Allow Validation Rules to Expand** button, system selections based on validation rules does not occur after selection in the guided mode.

    Teamcenter applies constraints to each group according to your previous selections. Each time you select a different group, it:

    - Displays only valid available features. Features that are not available are hidden.
      - If no model is selected, the system shows all features that are available to any model in the configurator context.
      - Once a model is selected, the system only shows the features that are available to the selected model.
      - Similarly, if you select a feature prior to selecting any models, then the system only shows the models where that feature is available.

      > Note:
      >
      > Because configuration validation is automatically done whenever you navigate to a different group, you can make modifications to resolve the violations.

    - Validates the current selections and identifies the validation result with appropriate symbols.
    - Determines valid selections in the next group and applies constraints.

      If there are no valid selections for a family in the next group, that family is not included. If the family is required, it displays an error message.

      The system preselects features based on defined configurator rules. It also hides the features that are excluded as a result of constraints. If multiple features apply, the system does not suggest a selection. In this case, you can create a default configurator rule to define a preferred selection.

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Selection of features through inclusion rules during configuration rules out other features. Whereas selection of features from default rules does not rule out other features. You can only select features that are available and selectable, if no other rules create any conflicts.

- Applies system-assigned features and defaults to the families in the next group.

  You can change the selection from a system-assigned to a user-assigned feature. For example, if a **Music Player** feature is set to a system-assigned **DVD** feature, you can choose an **MP3** feature instead, as an upgrade.

The system allows you to validate configurations by specifying operators only for free-form families. You can only use = and != operators for text and free-form string features.

> Note:
>
> While computing a valid and complete configuration in the guided mode, the system selection of features within families in a group is only honored for that group. Switching to a new group makes the system selection ineffective for the previously selected groups. After switching groups during the guided mode, you can switch to the manual mode to view the system-selected features that impact the completeness of your configuration.

12. If you do not want to apply constraints, deselect **Apply constraints**. By default, this option is selected.

    - If selected, constraints are applied while applying the variant rule expression on the content.
    - If deselected, only user selections are applied.

13. If you do not want validation rules to participate during criteria expansion, deselect **Allow validation rules to expand**. By default, this option is selected.

    - If selected, allows validation rules to participate during criteria expansion.
    - If deselected, only violations, if present, are reported. The system selections based on validation rules does not occur in the expanded criteria.

14. Click to save the custom rule.

    If you started from a blank view, Teamcenter displays the **Save Product Configuration** dialog box; otherwise it saves the changes to the existing configuration.

    If you exit the **Variant Configuration** view without saving, you are prompted to save the changes.

15. To save a new configuration, in the **Save Product Configuration** dialog box, type a name and description, and click **OK**.

    Teamcenter creates a custom product configuration with the specified name and variant configuration. The system adds the name of the saved variant rule to the title bar.

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16. To clear previously loaded custom configuration, click **View menu** and choose **Clear Variant Rule**.

    The system removes the name of the saved configuration from the title bar and then resets user and system selections to the initial state.

17. (Optional) Click **View menu** and choose **Clear Un-configured Feature** to remove unconfigured features.

    The expression on the unconfigured feature in the view is removed. Also, the row holding the unconfigured feature is removed.

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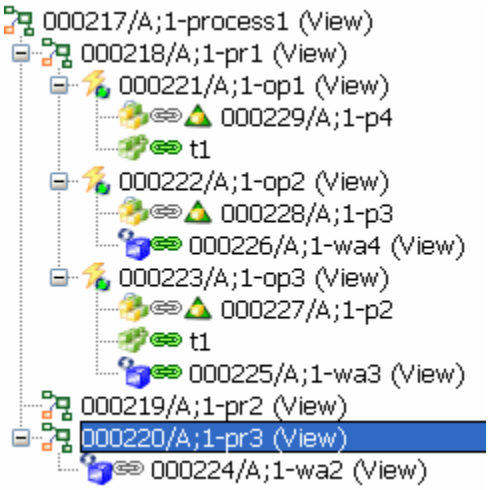
7. Authoring manufacturing process plans

Creating process structures

About process structures

A *process structure* describes how an assembly or part is manufactured. Processes are structured in hierarchical parent-child relationships. Sequence relationships can also exist between child processes. These relationships let you specify both sequential and parallel processes, as shown in the following figure.



Defining process structures

A process is referred to as a *composition* structure because its configuration is affected by the configuration of its assigned structures. Although a process is a distinct entity and is revised and controlled independent of the part or product, lines in the process structure can configure out depending on the configuration of the assigned structure. You can specify which open structure configures the process structure using the **Define Configuring Structures** menu command.

When you assign a product or part to a process, certain properties of the part are copied over to the process. You can specify which properties in the **MEAssignProperties** preference.

By default, when you assign a part to a process, Teamcenter assigns the part using the **MEConsumed** type. Your administrator can change the **controllingOccsForProcessConfiguration** preference to specify another occurrence type to use for assignment at your site. If this preference is blank, the configuration of consumed items does not affect the configuration of operations.

Also, by default, if an occurrence type is defined for a BOM line, and you assign the BOM line to a process or operation, Teamcenter assigns the BOM line using the same occurrence type. However, if your

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administrator sets the **MEAssignCustomizedOccurrenceType** preference, you can specify a different occurrence type during the assignment.

Create a new process structure

Create a process as a new root object or as a child of another process by selecting the parent process before you open the **New Process** dialog box.

1. Choose **File→New→Process** or click **Create a New Process** .

2. In the **New Process** dialog box, select one of the process types from the list.

   For more information on creating additional process types, see *BMIDE for Data Model Design*.

3. Click **Next**.

4. Enter the ID number to be assigned to this new process. If this new process is a revision of an existing one, type the ID of the existing process. You can assign a unique revision number in the **Revision** box.

   To let the system automatically assign a unique ID, click **Assign**.

5. Type a name for the new process. Make it unique so you can search the database using this term.

6. Select **Show as new root** to specify that the newly created process is opened as a root object. It is not pasted to the selected process. If you do not select this option, the new process is pasted as a child of the selected process.

   If the **Show as new root** option is selected but unavailable, Teamcenter does not allow you to create a new object under the selected object, for example, if you try to create a work area under a process.

7. Type a process description.

   At this point, you have all the information required to create a new process.

8. (Optional) Click **Next** to add optional information, such as filling out the item's forms, or checking the process item out of the database.

9. Enter logical designator information.

   A logical designator is an expression associated with a process, operation or partition that captures commonality between them. This step appears only if you are creating a process under a generic BOP, and only if your administrator has defined a logical designator class for the process. This form may include mandatory fields. You cannot proceed until these are filled. If you create multiple

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processes, the information you enter in this form is passed to each logical designator in each new process.

> Note:
>
> Propagating changes from a product BOP with logical designators used in multiple operations and a generic BOP using cloning can result in accountability errors. After running an advanced accountability check, operations that should display partial matches are sometimes reported as missing in target and missing in source. Use the **Copy** and **Paste** commands between generic and product BOPs rather than **cloning**.

10. (Optional) Select **Define Options** to specify the following:

    - Select **Use item identifier as default display** or **Use revision identifier as default display** if you created an alternate identifier for the item and want to use it as the default display object.
    - Select **Check Out Process Revision on Create** to check the newly created process out of the database immediately upon creation.

11. Click **Finish** to create the new process.

12. Click **Close** to close the **New Process** dialog box.

Open an existing process structure

Do one of the following

- Open a process revision in the Manufacturing Process Planner using the **Open Process** dialog box.
- Find the process revision item in My Teamcenter. Using the mouse, drag it to Manufacturing Process Planner in the navigation pane, or use the shortcut menu and choose **Send To** to send the item to Manufacturing Process Planner.
- Open a product revision in Manufacturing Process Planner.

  All processes and work areas associated as target to this product open by default if the **MSE_load_related_product_process_plant** preference is set to **true**. However, to enable auto-loading of all the linked product structures and plant structures to a Bill of Process or Plant Bill of Process, the **MELoadAllLinkedStructures** preference should also be set to **true**.

Process structure example

The following example of a crankshaft rod and piston assembly shows a process structure that involves both assembly and machining processes, which together describe a manufacturing process.

- Crankshaft assembly – the main process

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- Rod and piston – a subprocess
  - Assembly – assembly process to assemble the rod and piston
  - Rod – subprocess to capture the rod's manufacturing process
    - ◊ Raw material – operation to cut the raw material
    - ◊ NC machining rough – machining operation to rough the material
    - ◊ Heat treatment – operation to send the rough part through heat treatment to release stresses
    - ◊ NC machining finish – operation to machine the part to its final dimensions
    - ◊ Inspection – operation to inspect the part
  - End caps – subprocess to manufacture the end caps. It contains individual operations as shown in the example above.
  - Piston – subprocess to manufacture the piston. It contains individual operations as shown in the example above.

  With the benefit of experience, standard process structures may be developed for your plant. Templates can be made from these processes to speed the workflow through your organization.

Importing structures using the tcexcel_import utility

Creating structures by importing from Excel

There are two ways to import structures using Microsoft Excel:

- You can populate structures in Teamcenter based on definitions in a Microsoft Excel spreadsheet using the **tcexcel_import** utility. The main purpose of this utility is to import process structures, such as build sequences or process plans, but the utility can also import any type of product, process, plant, and resource information. Additionally, the utility supports:
  - Linking between multiple structures.
  - Assigning relations (consumed, required, work area, and resources).
  - Attaching forms and filling out attribute values.
  - Modifying ownership.

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- Defining activities (with time information).
- Attaching variant information.

Remember: The **tcexcel_import** utility is designed for data *creation* only. You can set the description on items and revisions during creation. Once you create an item, you can only update the item description.

> Note:
>
> Importing an item that already exists in the database can result in BOM duplications or new revisions. To avoid this problem, set **-o** (option) = **off** to update the database item using the information in the Excel spreadsheet.

> Example:
>
> **tcexcel_import -u=username -p=password -o=off -i=<file_name>.txt**

- You can use Microsoft Excel to import structures from an external source, for example, from a design contractor that does not have Teamcenter. The structure is defined in an Excel spreadsheet that Teamcenter validates against a predefined control file to ensure all the necessary data is present. If the structure subsequently changes, you can reimport the same spreadsheet and update the latest working data in Teamcenter. You must have Teamcenter Client for Microsoft Office installed to import or update structures in this way.

  > Note:
  >
  > You can only import imprecise structures in this way. Also, the import process does not configure the structure (for example, by defining revision rules) or set the view, nor does it support absolute occurrences or incremental changes.

- You can import structures from an Excel file that was exported from Teamcenter using the **Work Offline and Import** option in the **Export to Excel** dialog box. With this option, the control file data is generated automatically on a separate tabbed sheet in the export file. The control file does not have to be predefined manually.

Import a spreadsheet into the database

1. Create a Microsoft Excel file with specific headings. The import utility recognizes specific headings and formats in the Excel file and translates them into Teamcenter structures.

   Sample Excel file:

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	A	B	C	D	E
1	**Header1**	**Item**	**Item**	**Item**	**Description**
2	Header2	Item	Item	Item	
3	Header3	Item	Item	Item	
4	**Title**	**Root**	**Sub1**	**Sub2**	**Descr**
5		Product Root			New product for next year
6			Sub Assy 1		Structure Packaging
7				Comp11	Box
8				Comp12	Manual
9				Comp13	Package material
10			Sub Assy 2		Structure Engineering
11				Comp21	Product Component 1
12				Comp22	Product Component 2
13				Comp23	Product Component 3
14				Comp24	Product Component 4
15				Comp25	Product Component 5

2. Save the Excel file as a text file.

   a. In Excel, click **File→Save** to save the Excel file.

   b. Choose **File→Save as**.

   c. In the **Save as type** box, select **Text (Tab delimited)(*.txt)**.

   Sample .txt file saved from the sample Excel file:

```
Header1 Item    Item    Item    Description
Header2 Item    Item    Item
Header3 Item    Item    Item
Title   Root    Sub1    Sub2    Descr
        Product Root                    New product for next year
                Sub Assy 1              Structure Packaging
                        Comp11  Box
                        Comp12  Manual
                        Comp13  Package material
                Sub Assy 2              Structure Engineering
                        Comp21  Product Component 1
                        Comp22  Product Component 2
                        Comp23  Product Component 3
                        Comp24  Product Component 4
                        Comp25  Product Component 5
```

   d. If you are updating the text file, you are asked if you want to replace the existing file. Click **Yes**.

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Excel displays a message stating that certain features in your file may not conform to a tab-delimited text file.

e. Click **Yes**.

f. Click **File→Close** to close the Excel text file. If a dialog appears requesting that you save the text file, click **No**.

The text file is saved in the same directory as the Excel file. This is the input for the import utility.

> Note:
>
> The pipe character (|) is not permitted within the Excel file. It causes an error in the import routine.

The structures from the Excel file are imported into the database and you can open them in Manufacturing Process Planner.

3. Call the **tcexcel_import** utility to import the Excel file into the Teamcenter database.

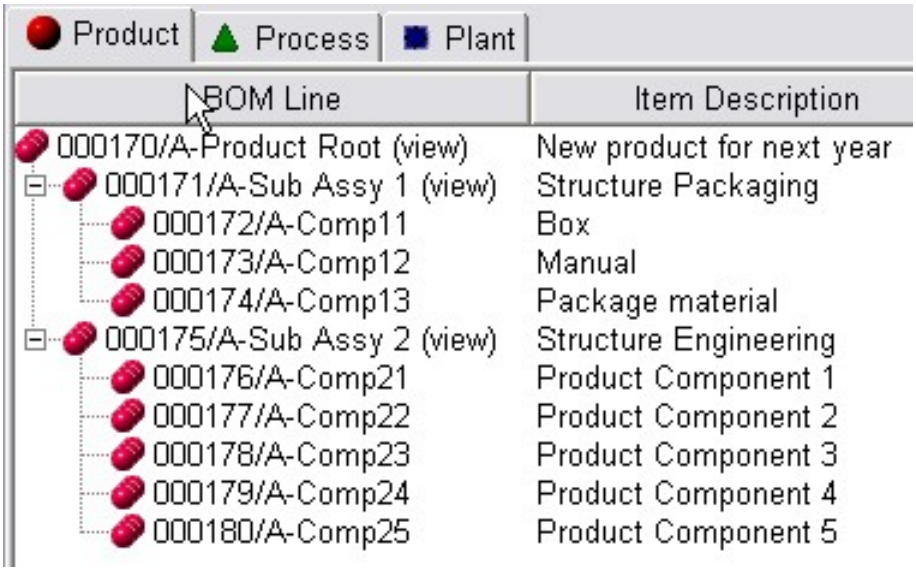
a. Open a Teamcenter shell (Teamcenter command prompt).

b. Change to the import directory where the Microsoft Excel file is stored.

c. Call:

tcexcel_import -u=*user_name* **-p=***password* **-g=***group_name* **-i=***my_excel_file.txt*

Sample structure created from the .txt file that was saved from the sample Excel file:



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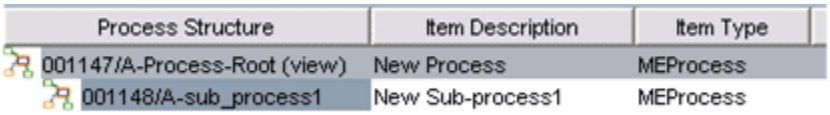
Creating a simple structure

The import utility recognizes specific row headings along with keywords found in those columns. The following is a very simple Microsoft Excel input file that creates a process containing a subprocess.

Header1	**Item**	**Item**	**Description**
Header2	**Process**	**Process**	
Header3	**Process**	**Process**	
Title	Root	Root	Description
	Process-Root		New Process
		sub process1	New Sub-process1

> Note:
>
> You can copy the content of HTML tables and paste them into an Excel file to use them as examples.

The keyword **Item** results in an item being created with the name listed in the **Item** column (for example, **Process-Root** or **sub-process1**). Because there are two columns with the header **Item**, the utility creates a nested structure—an item inside an item. The **Process** entries signify the types and subtypes of the item to be created. This results in the following structure.



A more involved structure is shown in the following example.

Header1	**Item**	**Item**	**Item**	**Description**
Header2	**Process**	**Process**	**OP**	
Header3	**Process**	**Process**	**NCMachining**	
Title	Root	Root	Part no.	Description
	Process-Root			New Process
		sub_process1		New Sub-process1
			OP01	Read
			OP02	Get and place cable
			OP03	Record lot control
			OP04	Get from printer and place on carrier
		sub_process2		New Sub-process2
			OP05	Get sign and place on carrier
			OP06	Set model switch
			OP07	Remove beam from cart
		sub_process3		New Sub-process3
			OP08	Lock both sides and latch in place

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		sub_process4		New Sub-process4
			OP09	Get wire harness and position

In this file:

- **Header1**, **Header2**, and **Header3** are mandatory row headings.
- The **Item** columns designate the number of levels in the structure you import. In the example, the imported structure has three levels, as seen by the three **Item** columns.
- The strings in the Item columns represent the names that are assigned to the newly created items (for example, **sub-process3** or **OP08**).
- The entries in the columns of the **Header2** row represent the types of the objects that you create. The entries in the columns of the **Header3** row represent the subtypes. In the example, the third **Item** column contains an operation of type **OP** that uses the **NCMachining** subtype.
- The **Description** column contains the description for each object you create.
- The utility ignores all entries in the row containing the **Title** heading.
- The utility looks for the first entry in the row following the **Title** row and uses this as the name of the root object for your structure. In the example, that is the **Process-Root** entry. You can insert any number of rows between the row containing **Title** and the last **Header** row before it to help organize your data, but they are ignored by the utility.
- If you want to stop the import at a certain point in the Excel file, insert **END-OF-PROCESS** (case sensitive) at the desired point in the first column of the spreadsheet. The utility stops importing when it hits that row.

Converting these Excel file creates the following structure.

Process Structure	Item Type	Item Description
000336/A-Process-Root (view)	MEProcess	New Process
000337/A-sub_process1 (view)	MEProcess	New Sub-process1
000338/A-OP01	MENCMachining	Read
000339/A-OP02	MENCMachining	Get and place cable
000340/A-OP03	MENCMachining	Record lot control
000341/A-OP04	MENCMachining	Get from printer and place on carrier
000342/A-sub_process2 (view)	MEProcess	New Sub-process2
000343/A-OP05	MENCMachining	Get sign and place on carrier
000344/A-OP06	MENCMachining	Set model switch
000345/A-OP07	MENCMachining	Remove beam from cart
000346/A-sub_process3 (view)	MEProcess	New Sub-process3
000347/A-OP08	MENCMachining	Lock both sides and latch in place
000348/A-sub_process4 (view)	MEProcess	New Sub-process4
000349/A-OP09	MENCMachining	Get wire harness and position

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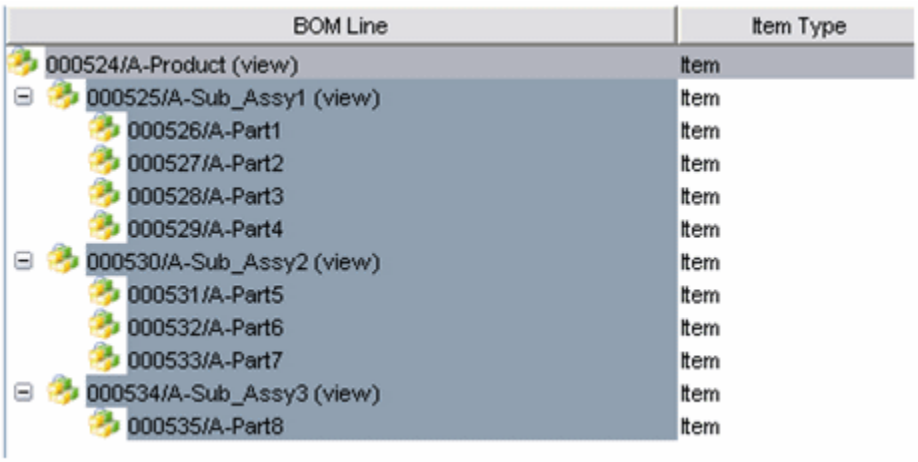
By default the item IDs are assigned automatically. You can also **specify item IDs or item revision IDs**.

All of this information holds true for other types of structures. The following example shows a product structure that is imported by the utility.

Header1	Item	Item	Item	Description
Header2	Item	Item	Item	
Header3	Item	Item	Item	
Title	Root	Name	Name.	Description
	Product			New Product
		Sub_Assy1		New_Sub_Assy1
			Part1	Desc of Part1
			Part2	Desc of Part2
			Part3	Desc of Part3
			Part4	Desc of Part4
		Sub_Assy2		New_Sub_Assy2
			Part5	Desc of Part5
			Part6	Desc of Part6
			Part7	Desc of Part7
		Sub_Assy3		New_Sub_Assy3
			Part8	Desc of Part8

This results in the following structure.



List of keywords

Header1	Header2	Header3	Data value	Remark
Item	*item_type*	*item_subtype*	*item_name*	The BOM line values define the item name.
Item	**MEActivity**	**MEActivity**	*activity_name*	Adds an activity to an operation.

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Header1	Header2	Header3	Data value	Remark
Activity	**Description**	–	*description*	Specifies the activity description.
Activity	**Time**	–	*time*	Specifies the activity duration.
Activity	**Unittime**	–	number	Specifies the activity unit time.
Activity	**Frequency**	–	number	Specifies the activity frequency.
Activity	**Category**	–	VA, NVA, NVABR	Specifies the activity category.
ActivityForm	*form_name*	*form_attribute_name*	*attribute_value*	Adds a form to the activity and enters the attribute value.
ItemID	–	–	*item_ID*	Autogenerates an ID if the item ID value is empty.
ItemID	–	–	M:*store_marker*	Creates a new item and autogenerates the ID. Stores new ID and revision in a text file.
ItemID	–	–	L:*use_marker*	Creates a new item and uses ID stored as marker in the text file.
ItemRev	–	–	*revision*	Assigns an item revision if the item revision value is empty.
Description	–	–	*description*	Specifies the item description.
Type	–	–	*item_subtype*	Allows you to overwrite the item subtype from the **Header3 Item** column.
Attribute	*form_name*	*form_attribute_name*	*attribute_value*	Adds a form to the current item revision and enters the attribute values.
Attribute	**ItemRevision Master**	*form_attribute_name*	*attribute_value*	Enters attribute value in the corresponding revision master form.
Attribute	**Item Master**	*form_attribute_name*	*attribute_value*	Enters an attribute value in the corresponding item master form.
Occurrence	**Note**	*occ_note_name*	*occ_note_value*	Adds occurrence note to the BOM line.
Occurrence	**AbsOccurrence**	**AbsOccurrence**	*occ_ID_value*	Adds absolute occurrence ID to the BOM line.
Quantity	–	–	*number*	Adds a quantity to a BOM line.
NumOccs	–	–	*number*	Adds a number of occurrences to a BOM line.
Sequence	–	–	*number*	Adds a sequence (find number) to a BOM line.
Status	–	–	*status*	Adds a release status to an item revision.
Owner	–	–	*person*;*group*	For the root node, specifies the default owner for the entire structure.

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Header1	Header2	Header3	Data value	Remark
Owner	–	–	*person*	For each item, specifies the owner for this item or item revision.
Variants	*item_ID*/ *item_revision*	–	*variant_conditions*	Specifies the item to which the variant options are assigned.
Relation	**Consumed**	*occurrence_type*	*product_root_ID*	Specifies the relation that links the process root to the product root to link the two structures.
Relation	**Consumed**	*occurrence_type*	*consumed_item*	Specifies one or multiple consumed items (separated by a **;**) for all nodes other than the root node.
Relation	**Workarea**	*occurrence_type*	*plant_root_ID*	Specifies the relation that links the process root to the plant root to link the two structures.
Relation	**Workarea**	*occurrence_type*	*workarea_ID*	Specifies one or multiple work areas (separated by a **;**) for all nodes other than the root node.
Relation	**Resource**	*occurrence_type*	*resource_ID*	Assigns a resource to an operation. The occurrence type from the **Header3** column is used.
Relation	**Resource**	*occurrence_type*	*resource_ID*~ *occurrence_type*	Assigns a resource to an operation using the specified occurrence (not the one found in the **Header3** column).
Relation	**Resource**	*occurrence_type*	*resource_ID* **[;***resource_ID***]**	Assigns multiple resources to an operation using the occurrence type specified in the **Header3** column.

Specifying type

You can use the **Type** column to overwrite the item subtype that you specified in the **Header3** column for the corresponding item.

Header1	**Item**	**Item**	**Type**
Header2	**Process**	**OP**	
Header3	**Process**	**OP**	
Title	Process	Operation	
	CAM_Setup1		
		Material procurement	
		Rough milling	NCMachining
		Washing	
		Machine Pocket	NCMachining
		Inspection	
		Drilling	NCMachining
		Heat Treatment	

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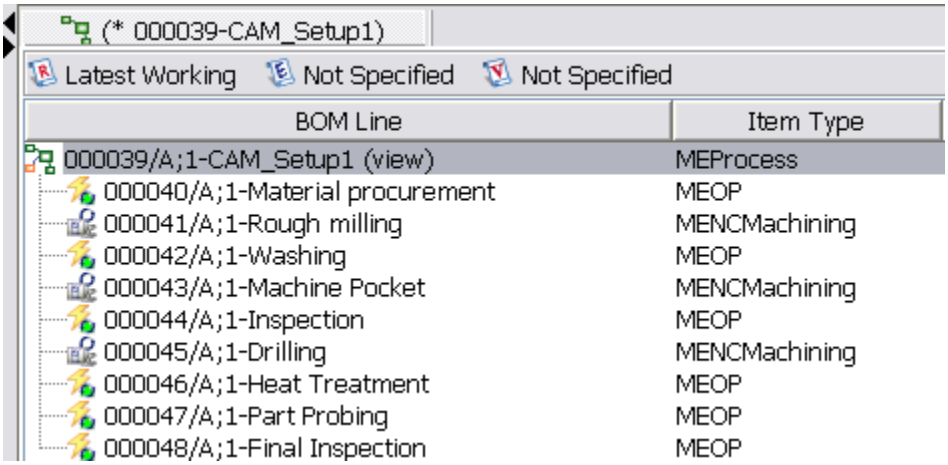
		Part Probing	
		Final Inspection	

This produces the following output.



Specifying IDs

By default, IDs are created automatically (based on the same rules that are applied by the business modeler). You can specify IDs in a **ItemID** column in the Microsoft Excel sheet that are assigned to the objects during import. If you specify an ID that already exists in the database, it is updated using the information from the Excel sheet.

Optionally, you can specify the item revision using an **ItemRev** column.

Header1	**Item**	**Item**	**Description**	**ItemID**	**ItemRev**
Header2	**Item**	**Item**			
Header3	**Item**	**Item**			
Title	Name	Name	Desc	ID	Revision
	Assy		Assembly	PAR_as-00	A
		Comp10	CheckBox	PAR_cn-10	A
		Comp20	RadioButton	PAR_cn-20	001
		Comp30	ListBox	PAR_cn-30	
		Comp40	StaticImage	PAR_cn-40	B
		Comp50	MenuItem	PAR_cn-50	002
		Comp60	DropDownList	PAR_cn-60	A
		Comp70	Spacer	PAR_cn-70	

Note:

You can also use the **ID** column to automatically generate IDs and store them in a text file for future reference.

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For more information, see *Linking multiple structures—overview*.

Adding activities

You can add activities to an operation by adding rows in the Microsoft Excel sheet for these activities. In addition, you can add a **Time** column to enter the duration time for each activity.

Header1	Item	Item	Item	Description	Activity	Activity	Activity Category
Header2	**Process**	**OP**	**Activity**		**Description**	**Time**	**Category**
Header3	**Process**	**OP**	**Activity**				
Title	Proc	Oper	Activity	Desc	Act-Desc	Time	Category
	Act-Process						
		OP10		Operation10			
		OP20		Operation20			
			Act1		activity 1	6	VA
			Act2		activity 2	10	VA
			Act3		activity 3	3	NVA
		OP30		Operation30			
		OP40		Operation40			
			Act4		activity 4	2	VA
			Act5		activity 5	4	NVA
		OP50		Operation50			

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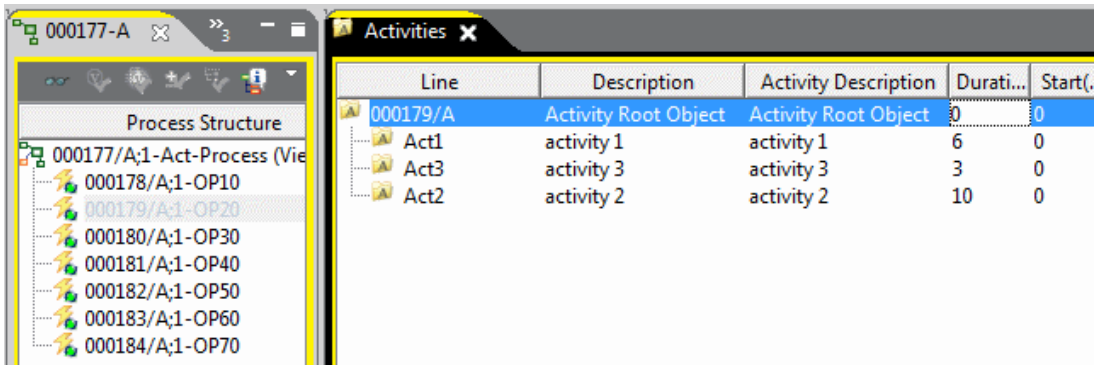
		OP60		Operation60		
		OP70		Operation70		

You must place activities on separate rows. These activities then appear in Manufacturing Process Planner as follows.



Creating the PERT sequence on import

During import, the **tcexcel_import** utility can create the PERT sequence on the structures. The sequence is based on the hierarchy as listed in the template.

Example:

Create the following in the import template.

Item	Item
MEOP	MEActivity
MEOP	MEActivity
Operation	activity_name
INSTALL FRONT LH DOOR STRIKER	
	GET DOOR STRIKER KIT
	WALK TO VEHICLE
	LOAD PILOT LOCK

After importing, the following PERT sequence is created.

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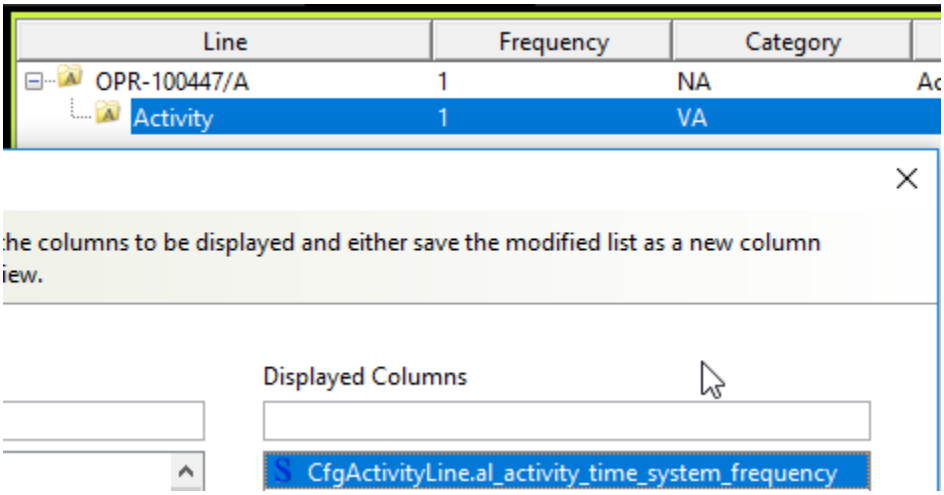
Importing the frequency of an activity

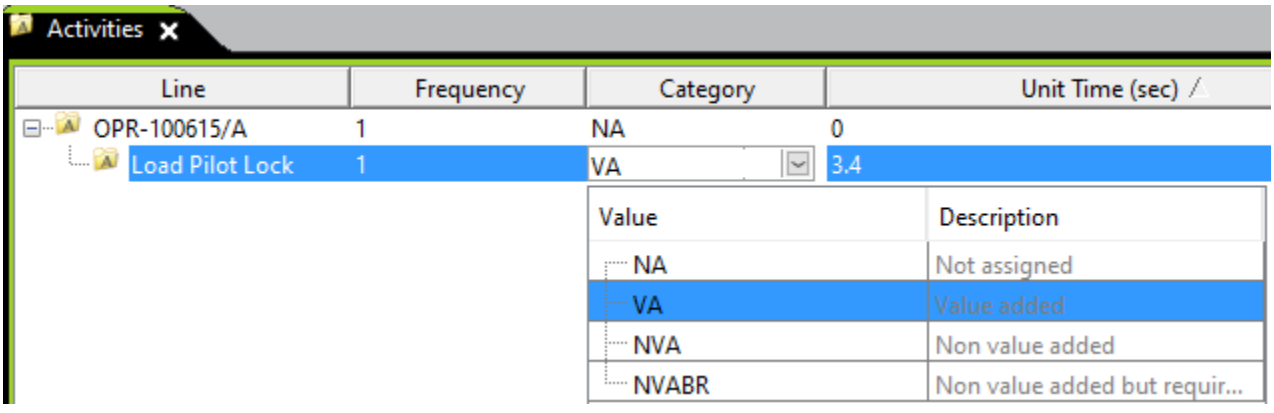
When importing plant structures, the **tcexcel_import** utility can also populate the frequency.



> Note:
>
> The frequencies are numeric values.

Importing the category of an activity

When importing plant structures, the **tcexcel_import** utility can also populate the category.



> Note:
>
> The category values are based on an existing (OOTB) LOV.

Importing the unit time of an activity

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You can also use the **tcexcel_import** utility to populate the unit time of the imported plant structure, as shown in the **Activities** view above.

To do so, create the following in the import template.

Header1 Activity
Header2 Unittime

> Note:
>
> The unit times are numeric values.

Importing multiple structures

You can import multiple items on a single Microsoft Excel spreadsheet by adding the required item IDs to the **Item** column as follows.

Header1	**Item**	**Item**	**Description**
Header2	**Item**	**Item**	
Header3	**Item**	**Item**	
Title	Root	Sub	Desc
	Item1		Assembly 1
		Comp11	Component 11
		Comp12	Component 12
		Comp13	Component 13
	Item2		Assembly 2
		Comp21	Component 21
		Comp22	Component 22
	Item3		Item 3
	Item4		Item 4
	Item5		Assembly 5
		Comp51	Component 51

You can see the results of importing these structures in My Teamcenter.

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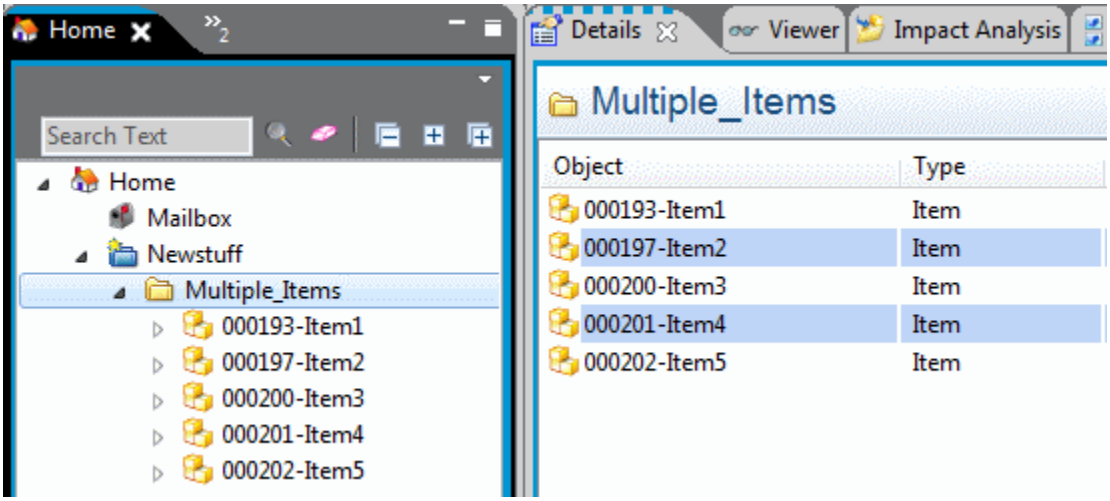

Describing multiple BOM lines in one row

You can expand the types of definitions you assign to the imported objects by adding another header row to the Microsoft Excel file. This allows you to create, for example, several objects in one row and overwrite values that already exist with new values.

Header1	**Item**	**Item**	**Item**	**Description**	**Description**
Header2	**Process**	**Process**	**OP**		
Header3	**Process**	**Process**	**NCMachining**		
Header4	**Root**	**Proc**	**Op**	**ALL**	**Op**
Title	Root	Proc. Name	Op. Name	Description	Overwrite Description
	Process-Root			New Process	
		sub_process1	OP01	New Sub-process1	Read
			OP02		Get and place cable
			OP03		Record lot control
			OP04		Get from printer and place on carrier
		sub_process2	OP05	New Sub-process2	Get sign and place on carrier
			OP06		Set model switch
			OP07		Remove beam from cart
		sub_process3	OP08	New Sub-process3	Lock both sides and latch in place
		sub_process4	OP09	New Sub-process4	Get wire harness and position

The **Header4** row allows you to overwrite values for columns that exist twice. In the example, there are two **Description** columns. But if you look at the row containing **sub_process1**, you see that there are also two objects in the same row (**sub_process1** and **OP01**). The utility sees that there are two description columns. It assigns the description contained in the **ALL** column (this is a case-sensitive keyword) to everything except for that which is contained in the **Op** column (this is a reference to the first column named **Op**). The utility assigns the description in the first column (the one designated by

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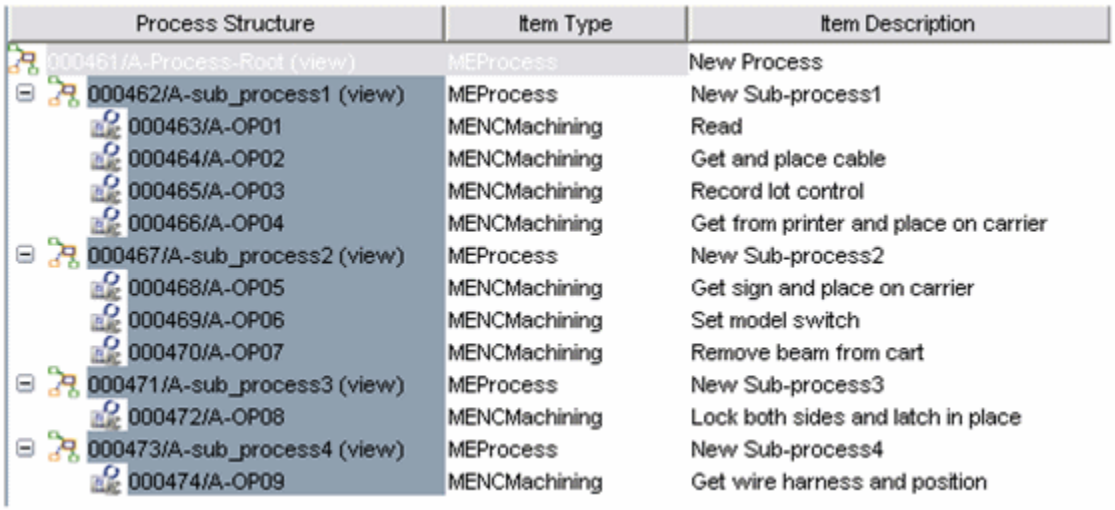
ALL) to every object that it imports. It then looks at the second column and sees that this is a special description for all objects contained in the **Op** column. Importing the Excel file results in the following structure.



Process Structure	Item Type	Item Description
000461/A-Process-Root (view)	MEProcess	New Process
000462/A-sub_process1 (view)	MEProcess	New Sub-process1
000463/A-OP01	MENCMachining	Read
000464/A-OP02	MENCMachining	Get and place cable
000465/A-OP03	MENCMachining	Record lot control
000466/A-OP04	MENCMachining	Get from printer and place on carrier
000467/A-sub_process2 (view)	MEProcess	New Sub-process2
000468/A-OP05	MENCMachining	Get sign and place on carrier
000469/A-OP06	MENCMachining	Set model switch
000470/A-OP07	MENCMachining	Remove beam from cart
000471/A-sub_process3 (view)	MEProcess	New Sub-process3
000472/A-OP08	MENCMachining	Lock both sides and latch in place
000473/A-sub_process4 (view)	MEProcess	New Sub-process4
000474/A-OP09	MENCMachining	Get wire harness and position

You can now specify two different descriptions for two different objects in one line of the Microsoft Excel file.

Overwriting data in columns

Similar to overwriting descriptions, you can use the overwrite mechanism to overwrite other data in the structure. The following is an example of creating different values for the **cost_estimate** attribute in an **Impact Analysis** form in the same line in the Excel file.

Header1	**Item**	**Item**	**Item**	**Item**	**Attribute**	**Attribute**	**Attribute**
Header2	**Item**	**Item**	**Item**	**Item**	**ImpactAnalysis Form**	**ImpactAnalysis Form**	**ImpactAnalysis Form**
Header3	**Item**	**Item**	**Item**	**Item**	**cost_estimate**	**cost_estimate**	**cost_estimate**
Header4	**Level1**	**Level2**	**Level3**	**Level4**	**ALL**	**Level3**	**Level4**
Title					Attr: Cost	Attr: Cost	Attr: Cost
	Product-Root				0.00		
		P1	P1.1	P1.1.1	1.00	100.50	111
				P1.1.2			112
				P1.1.3			113
			P1.2	P1.2.1		123.45	121
				P1.2.2			122
		P2	P2.1	P2.1.1	2.00	90.00	211
			P2.1	P2.1.2			212
			P2.2	P2.2.1		200.00	221
			P2.3	P2.3.1		222.88	231

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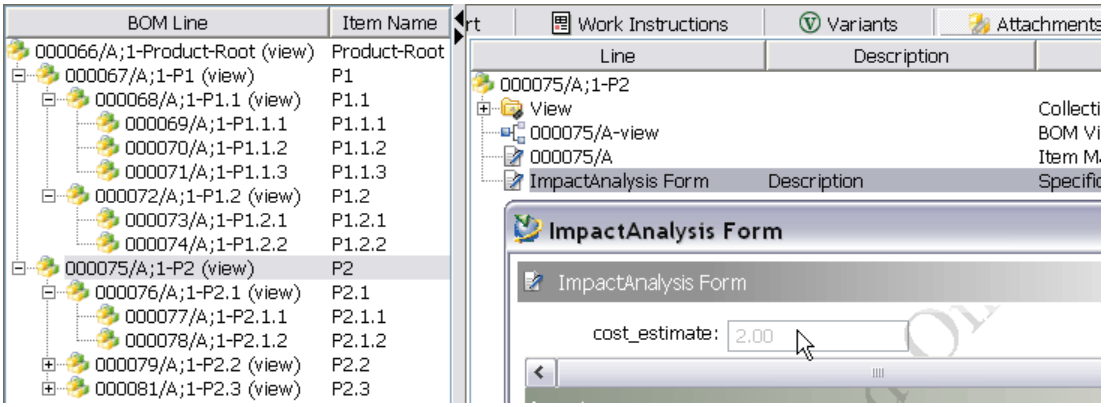
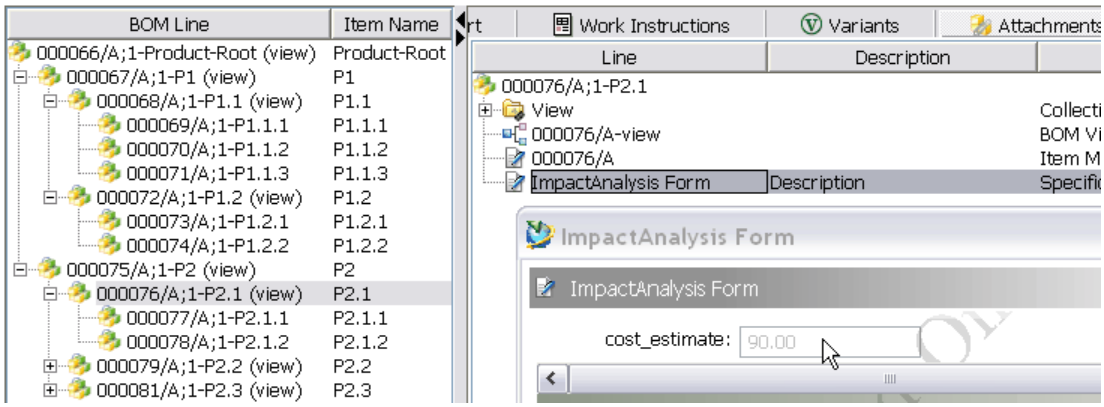
The resulting output shows the **cost_estimate** attribute set to **2.00**. This is specified by the **Header4** entry for the **Attribute** column that contains the keyword **ALL** (shown in white in the spreadsheet).



The **Header4** entry for the next **Attribute** column, **Level3** (shown in red), specifies that the **cost_estimate** value for **P2.1** is set to **90.00**. This overwrites the value **2.00** that was set by the **ALL** entry in the previous figure.



The **Header4** entry for the next **Attribute** column, **Level4** (shown in cyan), specifies that the **cost_estimate** value for **P2.1.1** is set to **211**. This overwrites the value **2.00** that was set by the **ALL** entry and the **90.00** set by the **Level3** entry in the previous column.

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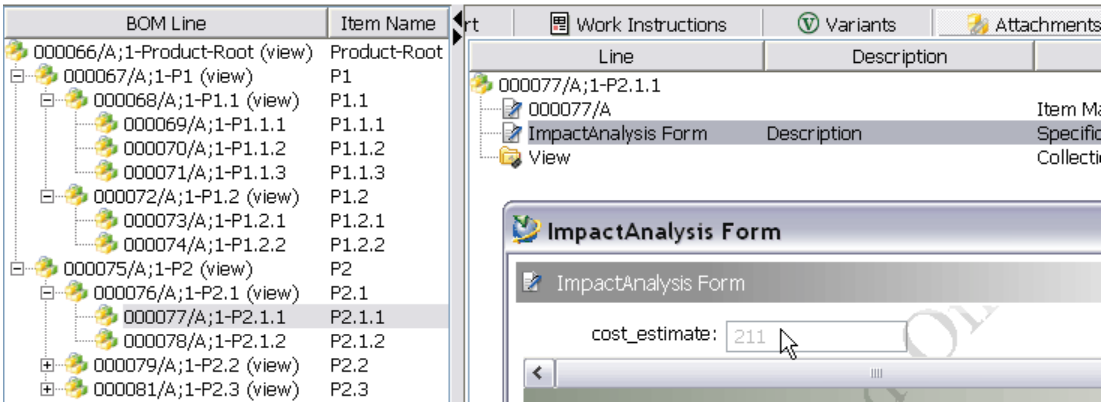

Attaching forms

You can add forms to your structure, and fill out attributes within these forms. The following Microsoft Excel sheet shows an example of this.

Header1	**Item**	**Item**	**Item**	**Description**	**Attribute**
Header2	**Item**	**Item**	**Item**		**ItemRevision Master**
Header3	**Item**	**Item**	**Item**		**project_id**
Title	Root	Proc. Name	Op. Name	Description	Item Project ID
	Product			New Product	Project xyz
		Sub_Assy1		New_Sub_Assy1	Project 1
			Part1	Desc of Part1	Project 1
			Part2	Desc of Part2	Project 1
			Part3	Desc of Part3	Project 1
			Part4	Desc of Part4	Project 1
		Sub_Assy2		New_Sub_Assy2	Project2
			Part5	Desc of Part5	Project2
			Part6	Desc of Part6	Project2
		Sub_Assy3		New_Sub_Assy3	Project3
			Part7	Desc of Part7	Project3

Item Master and **ItemRevision Master** are keywords that signify that the values in those columns should be inserted into the master form or the revision master form, respectively, of the type specified in the **Header2** row. The entry in the **Header3** row specifies the attribute to be filled in by the given values. This must be in the internal format specified in the Business Modeler IDE application (for example, in the previous example, the **Project ID** string is shown in the user interface, but the string shown in the Business Modeler IDE application is **project_id**).

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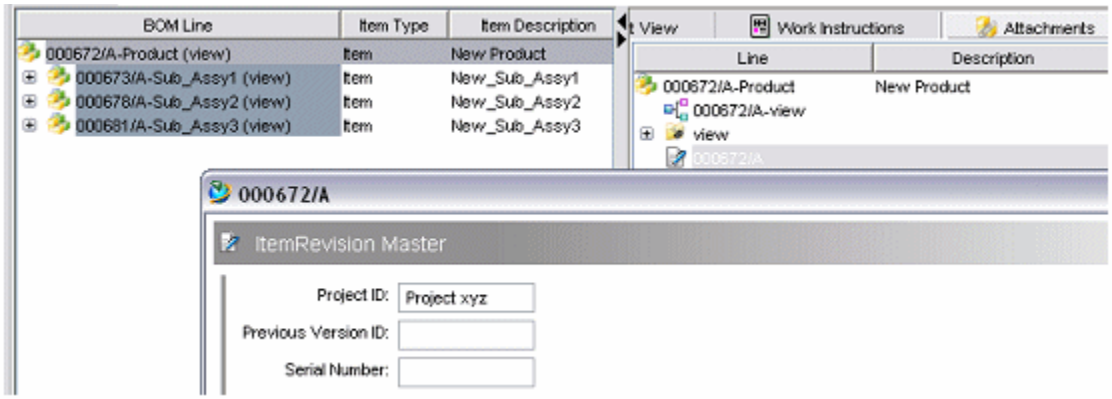
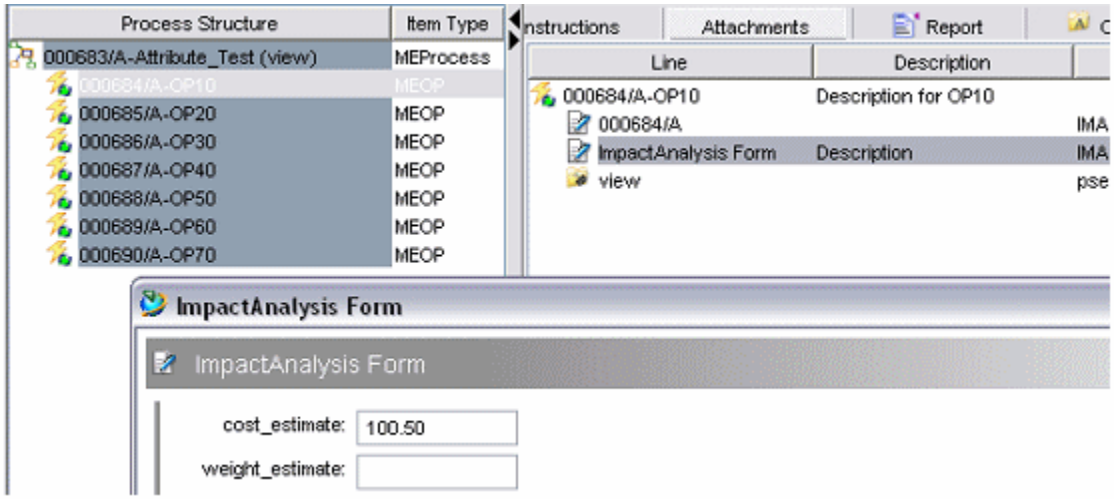


You can also add a form of your choice to the structure. In the following example, in addition to entering a value in the revision master form for program ID, you add the **ImpactAnalysis** form to the operations and fill in the cost estimate field with the given values.

Header1	Item	Item	Description	Attribute	Attribute
Header2	Process	OP		ItemRevision Master	ImpactAnalysis Form
Header3	Process	OP		program_id	cost_estimate
Title	Proc	Oper	Desc	AttrProgram #	Cost
	Attribute_Test			F4711 0815	
		OP10	Description for OP10	F4711 0816	100.50
		OP20	Description for OP20	F4711 0817	123.45
		OP30	Description for OP30	F4711 0818	
		OP40	Description for OP40	F4711 0819	200.00
		OP50	Description for OP50	F4711 0820	222.88
		OP60	Description for OP60	F4711 0821	
		OP70	Description for OP70	F4711 0822	90.00

This results in the following structure.



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Specifying the date attribute for forms

You can specify a date field in a form that you import using Microsoft Excel. The format for the date depends on the value for the **DefaultDateFormat** key defined in the **timelocal_locale.xml** file. This file is located in the following directory:

*TC-root-directory***lang\textserver\en_US**

If, for example, the following format for the date is specified in the **timelocal_locale.xml** file:

%d-%b-%Y %H:%M

You must enter the date and time as **15-Aug-2013 18:30** in the Excel input value. The date format is as follows:

%d	Day of the month (0-31)
%b	Abbreviated month name
%Y	Year with century (1970-2069)
%H	Hour (24-hour clock 00-23)
%M	Minute (00-59)

The following spreadsheet shows how to add a date attribute value to the form.

Header1	**Item**	**Attribute**	**Attribute**
Header2	**Item**	**Item Master**	**Item Master**
Header3	**Item**	**fnd0Date**	**user_data_3**
Title	Name	Date Attribute	User Data
	Test	19-Aug-2013 18:30	check

This example imports an item called **Test** and the two attributes on the **Item Master** form, **fnd0Date** and **user_data_3**, are updated with the values **19-Aug-2013 18:30** and **check**, respectively.

> Note:
>
> The **fnd0Date** attribute is added on the **Item Master** form for illustration purposes only. This attribute is not available by default in Teamcenter.

Attaching multiple forms of the same type to an activity

You can create multiple forms of the same type when creating operation activities. The header definition for creating forms does not change. You specify the data for multiple forms in the value fields separated by the ~ character, for example, **V41~V42~V43**. The number of entries in the **Attribute** column defines

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the number of forms that are created. The attribute values are written into the forms in the order that they appear in the cell. The first entry is written into the first form, the second entry is written into the second, and so on, until there are no more attribute values in the cell.

The following spreadsheet shows how to add multiple forms to activities.

Header1	**Item**	**Item**	**Item**	**Description**	**Activity**	**Activity**	**ActivityForm**	**ActivityForm**
Header2	**Process**	**OP**	**Activity**		**Description**	**Time**	**BVRSyncInfo**	**BVRSyncInfo**
Header3	**Process**	**OP**	**Activity**				**appl_data**	**view_type**
Title	Proc	Oper	Activity	Desc	Act-Desc	Time	Attr user1	Attr user2
	Act-Process							
		OP10		READ INPANEL SHEET				
			Act1		Get Cable	20	appl_data11~appl_data 12	V11~V12~V13
			Act2		Place to Inpane	38	appl_data21~appl_data 22 ~appl_data23	V21~V22
			Act3		Fix Retainer firmly	12	appl_data31	V31~V32~V33
			Act4		Adjust settings	23	appl_data41~appl_data 42 ~appl_data43	V41~V42
			Act5		Inspection	10	appl_data51	V51

In this example, in the row containing **Act4**, three forms are created because the cell in the **appl_data** attribute column contains three entries.

The Excel input produces the following output.

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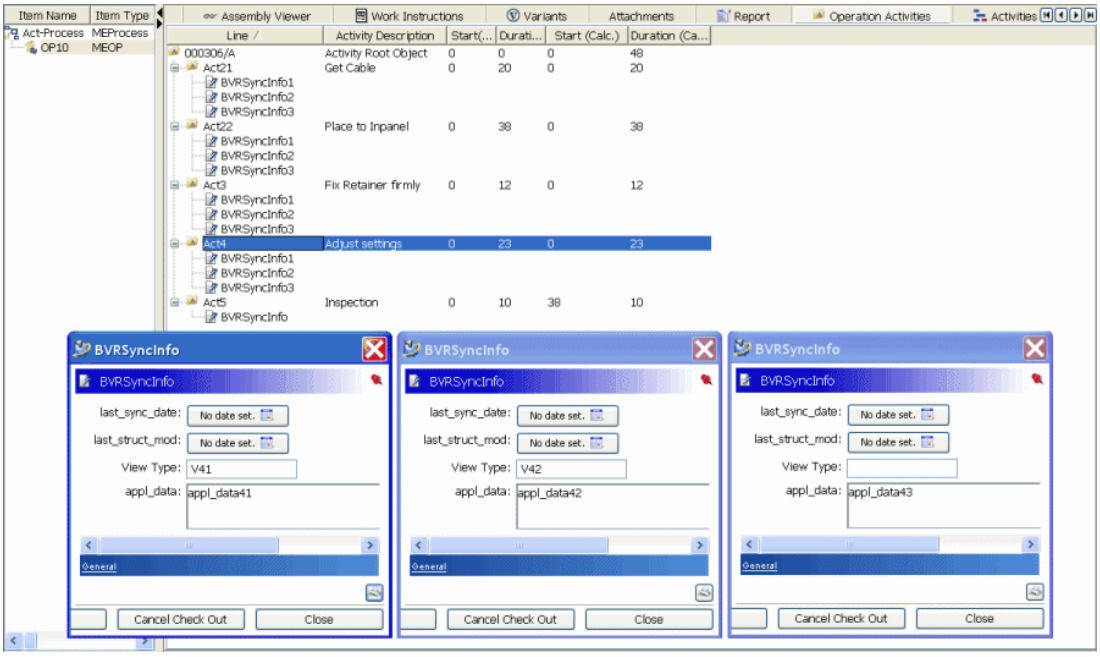

Assign resources

You can assign resources to operations in a process structure or to work areas in a plant structure.

1. If necessary, import the resources into the database.

Header1	**Item**	**Item**	**ItemID**
Header2	**Item**	**Item**	
Header3	**Item**	**Item**	
Title	Root	Sub	ID
	Milling Tool Assembly		res_tool_mill_001
		Holder	
		Cutter	
		Insert	
	Twist Drilling Tool		res_tool_drill_001
		Holder HSK63	
		Twist Drill	
	Spot Drilling Tool		res_tool_drill_002
		Machine Adapter	
		Spot Drill	
	EcoMill 350 Siemens 802C		res_machine_001

2. Create a Microsoft Excel spreadsheet that includes a column with the following keywords:

   - Add the **Relation** keyword to the **Header1** row.

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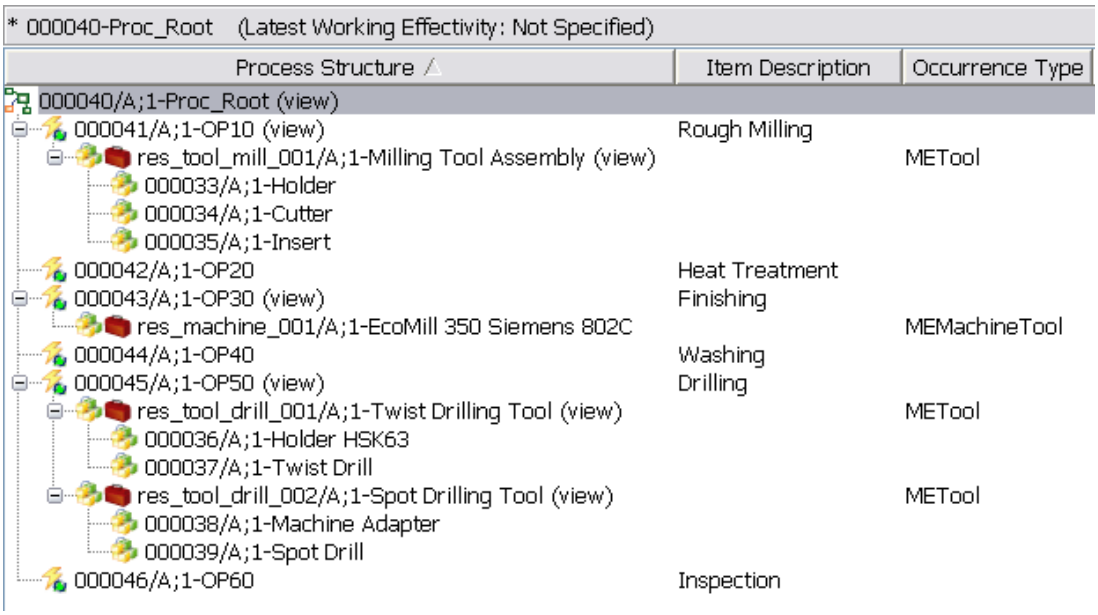
- Add the **Resource** keyword to the **Header2** row.
- In the **Header3** row, type the occurrence type of the resource, for example, **Tool** or **Resource**.

3. Assign these resources operations in the process structure as follows.

Header1	**Item**	**Item**	**Description**	**Relation**
Header2	**Process**	**OP**		**Resource**
Header3	**Process**	**OP**		**Tool**
Title	Process	Operation	Description	Resource
	Proc_Root			
		OP10	Rough Milling	res_tool_mill_001
		OP20	Heat Treatment	
		OP30	Finishing	MachineTool~ res_machine_001
		OP40	Washing	
		OP50	Drilling	res_tool_drill_001; res_tool_drill_002
		OP50	Inspection	

Importing this sheet results in the following structure.



There are several points to note about this structure:

- The **Relation** column must contain the item IDs (not the names) of the resources or work areas.
- Resources that are classified in the database are indicated as such in the structure by the classified symbol . The import utility can assign both classified and nonclassified resources.

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- The resources must already exist in the database.
- You can assign multiple resources to a single BOM line by separating them with a semicolon.
- You can specify an occurrence type in **Header3** of the **Relation** column that is then used for all the relations. If, however, you enter an occurrence type in the cells of the relation column (designated by *occurrence type~item ID*), this occurrence type is used instead of the one in **Header3**. In the preceding example, for **res_machine_001**, the **MachineTool** occurrence type is used instead of the default **Tool**.

Importing quantity and number of occurrences

You can add the quantity or number of occurrences to the process structure by adding a **Quantity** or **NumOccs** column to the **Header1** row. You can also add both simultaneously.

Header1	**Item**	**Item**	**Description**	**Quantity** **NumOccs**
Header2	**Item**	**Item**		
Header3	**Item**	**Item**		
Title	Root	Sub	Desc	Quantity Number of Occs
	Quantity_Test			
		Item10	Description 10	1
		Item20	Use 2 of Item20	2
		Item30	Description 30	1
		Item40	Add 4 of Item40	4
		Item50	Description 50	3
		Item60	Description 60	1
		Item70	Description 70	2

This produces the following output.

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000017-Quantity_Test (Latest Working Effectivity: Not Specified)

BOM Line	Quantity	Pack Count
000017/A;1-Quantity_Test (view)		1
000018/A;1-Item10 x 1	1	1
000019/A;1-Item20 x 2	2	1
000020/A;1-Item30		1
000021/A;1-Item40 x 8	8	2
000022/A;1-Item50 x 3	3	3
000023/A;1-Item60 x 1	1	1
000024/A;1-Item70 x 4	4	2

If you unpack this, you see the following.

000017-Quantity_Test (Latest Working Effectivity: Not Specified)

BOM Line	Quantity	Pack Count
000017/A;1-Quantity_Test (view)		1
000018/A;1-Item10 x 1	1	1
000019/A;1-Item20 x 2	2	1
000020/A;1-Item30		1
000021/A;1-Item40 x 4	4	1
000021/A;1-Item40 x 4	4	1
000022/A;1-Item50		1
000022/A;1-Item50		1
000022/A;1-Item50		1
000023/A;1-Item60 x 1	1	1
000024/A;1-Item70 x 2	2	1
000024/A;1-Item70 x 2	2	1

Importing release status

You can add the release status to the process structure by adding a **Status** column to the **Header1** row and assigning an existing release status to an item or item revision.

Header1	**Item**	**Item**	**Description**	**Status**
Header2	**Item**	**Item**		
Header3	**Item**	**Item**		
Title	Root	Sub	Desc	Release Status
	Status_Test			
		Item10	Description of Item10	
		Item20	Description of Item20	
		Item30	Description of Item30	
		Item40	Item-Rev with status	TCM Released
		Item50	Description of Item50	
		Item60	Description of Item60	
		Item70	Description of Item70	

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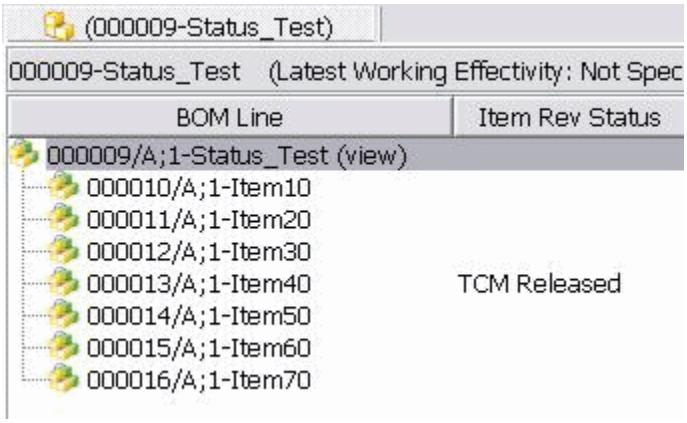
This produces the following results.

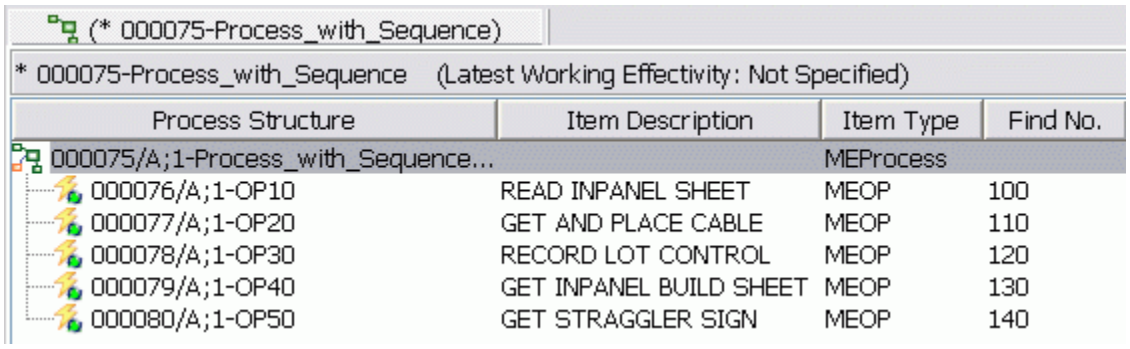


Assigning find numbers

You can use the **Sequence** heading to help you assign find numbers to the structure you are importing.

Header1	**Item**	**Item**	**Description**	**Sequence**
Header2	**Process**	**OP**		
Header3	**Process**	**OP**		
Title	Root	Oper	Description	Seq No.
	Process_with_Sequence			
		OP10	READ INPANEL SHEET	100
		OP10	GET AND PLACE CABLE	110
		OP10	RECORD LOT CONTROL	120
		OP10	GET INPANEL BUILD SHEET	130
		OP10	GET STRAGGLER SIGN	140

This results in the following output:



Attaching notes

You can use the **Occurrence** header to help you attach notes to the structure you are importing.

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Header1	Item	Item	Description	Occurrence
Header2	Process	OP		Note
Header3	Process	OP		ResourceID
Title	Root	Part no.	Description	Occ-Note
	OCC-Note-Test			
		Part1	Read	OCN1
		Part2	Get and place	OCN2
		Part3	Record	OCN3
		Part4	Get from printer	OCN4
		Part5	Get and place	OCN5
		Part6	Set Switch	OCN6
		Part7	Remove beam	OCN7
		Part8	Lock sides	OCN8
		Part9	Place Beam	OCN9
		Part10	Route	OCN10

This results in the following structure.

Process Structure	Item Description	Item Type	All Notes
000880/A-Occ-Note-Test (view)		MEProcess	
000881/A-Part1	Read	MEOP	MEResourceID: OCN1
000882/A-Part2	Get and place	MEOP	MEResourceID: OCN2
000883/A-Part3	Record	MEOP	MEResourceID: OCN3
000884/A-Part4	Get from printer	MEOP	MEResourceID: OCN4
000885/A-Part5	Get and place	MEOP	MEResourceID: OCN5
000886/A-Part6	Set switch	MEOP	MEResourceID: OCN6
000887/A-Part7	Remove beam	MEOP	MEResourceID: OCN7
000888/A-Part8	Lock sides	MEOP	MEResourceID: OCN8
000889/A-Part9	Place Beam	MEOP	MEResourceID: OCN9
000890/A-Part10	Route	MEOP	MEResourceID: OCN10

Importing transformation data

You can import transformation matrix data by specifying the data in the **Matrix** column of the Excel spreadsheet.

Header1	Item	Item	Description	Matrix
Header2	Item	Item		
Header3	Item	Item		
Title	Root	Sub	Desc	Matrix
	Transformation_Text			
		Item10	Description 10	1 0 0 0 0 1 0 0 0 0 1 0 0 0 0 1
		Item20	Description 20	1 0 0 1 0 1 0 4 0 0 1 1 0 0 0 1
		Item30	Description 30	1 0 0 1 0 1 0 7 0 0 1 1 0 0 0 1
		Item40	Description 40	1 0 0 1 0 1 0 10 0 0 1 1 0 0 0 1

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		Item50	Description 50	1 0 0 1 0 1 0 13 0 0 1 1 0 0 0 1
		Item60	Description 60	1 0 0 7 0 1 0 4 0 0 1 1 0 0 0 1
		Item70	Description 70	1 0 0 7 0 1 0 7 0 0 1 1 0 0 0 1

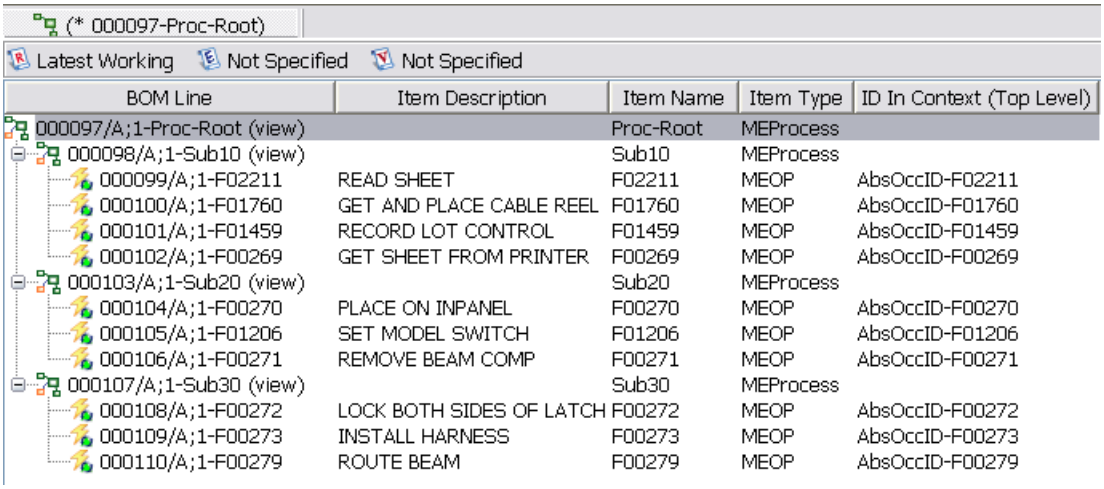
You can see the transformation data in the **Absolute Transformation Matrix** column in Teamcenter.

Assigning absolute occurrence IDs

You can use the **Occurrence** column to help you assign absolute occurrence IDs.

Header1	**Item**	**Item**	**Item**	**Description**	**Occurrence**
Header2	**Process**	**Process**	**OP**		**AbsOccurrence**
Header3	**Process**	**Process**	**OP**		**AbsOccurrence**
Title	Root	Substructure	Operation	Description	Abs-Occ-Ids
	Process-Root				
		Sub10			
			F02211	READ SHEET	AbsOccID-F02211
			F01760	GET AND PLACE CABLE REEL	AbsOccID-F01760
			F01459	RECORD LOT CONTROL	AbsOccID-F01459
			F00269	GET SHEET FROM PRINTER	AbsOccID-F00269
		Sub20			
			F00270	PLACE ON INPANEL	AbsOccID-F00270
			F01206	SET MODEL SWITCH	AbsOccID-F01206
			F00271	REMOVE BEAM COMP	AbsOccID-F00271
		Sub30			
			F00272	LOCK BOTH SIDES OF LATCH	AbsOccID-F00272
			F00273	INSTALL HARNESS	AbsOccID-F00273
			F00279	ROUTE BEAM	AbsOccID-F00279

This produces the following output.



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Assigning ownership to objects

You can change the ownership of objects you import into the database by using an **Owner** column. The first entry in this column after the title row (that is, the root entry) defines the global owner and group. If you leave any of the subsequent owner cells empty, the object's ownership is changed to the root owner and root group. In the following example, this is **Person 1** belonging to the **Mfg** group.

> Tip:
>
> Make the **Owning user** column visible in Teamcenter to verify that the owner is imported correctly.

Header1	**Item**	**Item**	**Item**	**Item**	**Description**	**Owner**
Header2	**Process**	**Process**	**Process**	**OP**		
Header3	**Process**	**Process**	**Process**	**OP**		
Title	Proc	Proc	Proc	Oper	Desc	Owner/Group
	Owner-Test				Info: usera	Person 1;Mfg
		Proc1			Info: usera	
			Subproc11		Info: usera	
				OP111	Info: userb	Person 2
				OP112	Info: userc	Person 3
			Subproc12		Info: userb	Person 2
				OP121	Info: usera	
				OP122	Info: userc	Person 3
				OP123	Info: usera	
			Subproc13		Info: usera	Person 1
				OP131	Info: userd	Person 4
		Proc2			Info: usera	
			Subproc21		Info: userc	Person 3
				OP211	Info: usera	
			Subproc22		Info: userd	Person 4
				OP212	Info: usera	
				OP222	Info: userc	Person 3
		Proc3			Info: userb	Person 2
			Subproc31		Info: userd	Person 4

Importing this spreadsheet results in the following structure in the database.

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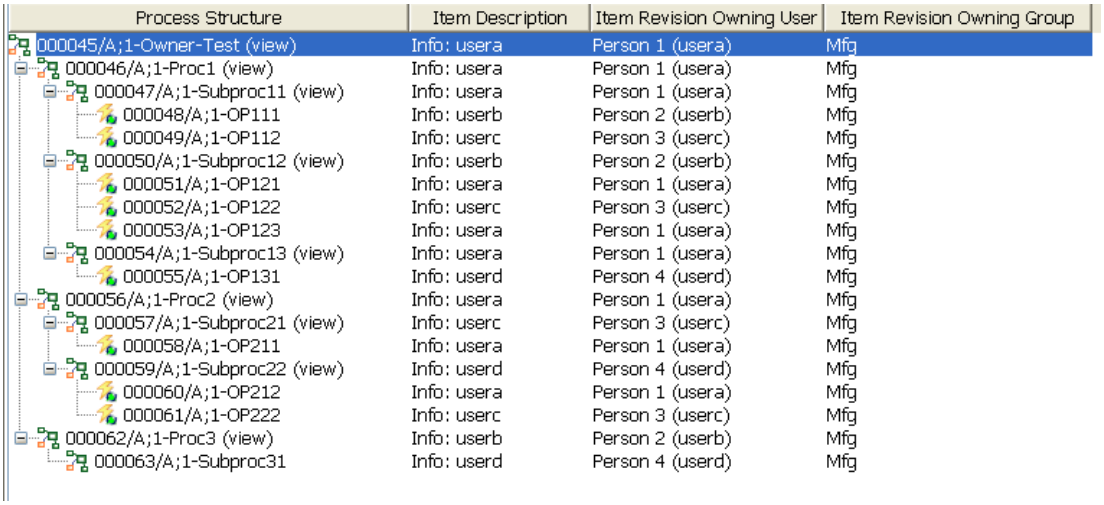

Process Structure	Item Description	Item Revision Owning User	Item Revision Owning Group
000045/A;1-Owner-Test (view)	Info: usera	Person 1 (usera)	Mfg
000046/A;1-Proc1 (view)	Info: usera	Person 1 (usera)	Mfg
000047/A;1-Subproc11 (view)	Info: usera	Person 1 (usera)	Mfg
000048/A;1-OP111	Info: userb	Person 2 (userb)	Mfg
000049/A;1-OP112	Info: userc	Person 3 (userc)	Mfg
000050/A;1-Subproc12 (view)	Info: userb	Person 2 (userb)	Mfg
000051/A;1-OP121	Info: usera	Person 1 (usera)	Mfg
000052/A;1-OP122	Info: userc	Person 3 (userc)	Mfg
000053/A;1-OP123	Info: usera	Person 1 (usera)	Mfg
000054/A;1-Subproc13 (view)	Info: usera	Person 1 (usera)	Mfg
000055/A;1-OP131	Info: userd	Person 4 (userd)	Mfg
000056/A;1-Proc2 (view)	Info: usera	Person 1 (usera)	Mfg
000057/A;1-Subproc21 (view)	Info: userc	Person 3 (userc)	Mfg
000058/A;1-OP211	Info: usera	Person 1 (usera)	Mfg
000059/A;1-Subproc22 (view)	Info: userd	Person 4 (userd)	Mfg
000060/A;1-OP212	Info: usera	Person 1 (usera)	Mfg
000061/A;1-OP222	Info: userc	Person 3 (userc)	Mfg
000062/A;1-Proc3 (view)	Info: userb	Person 2 (userb)	Mfg
000063/A;1-Subproc31	Info: userd	Person 4 (userd)	Mfg

Linking multiple structures

Linking multiple structures—overview

To link product to process, or plant to process, you must link the structures in the Microsoft Excel files to each other.

In the first Excel file, you specify some BOM lines that you want to link to in another Excel file. This is done in the column with **Header1**; **ItemID** using the syntax **M:***my_marker*.

In the second Excel file, you specify a link to this marker (again in the **ItemID** column). Instead of creating a new item for the BOM line, the system uses the existing item that is specified using the syntax **L:***my_marker*.

You can specify a specific item ID in the **ItemID** column. If you do this, the system uses an existing item with this ID. If this item ID does not exist in the database, it generates a new item with ID. If **ItemID** is not specified, the system always generates a new item and assigns the item ID automatically.

If you specify **M:any-marker-label**, the system generates a new item and assigns the item ID automatically. Additionally, the newly-generated ID and revision are stored in a text file with the name **marker.txt**. In Example A, the following **marker.txt** is generated:

```
M:op20_marker 024528 A
M:op40_marker 024530 A
```

> Note:
>
> Markers (specified using **<M:marker>** and **<L:marker>**) must be unique.

For each **M:** entry, the system writes one line to the **marker.txt** file with the actual ID and revision. If you now load the second Excel file, you must specify the additional **marker.txt** parameter . The system checks for **L:** entries in the **ItemID** column and replaces this label with the correct item ID from the

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marker.txt file causing the system to reuse the previously generated item, instead of creating a new one.

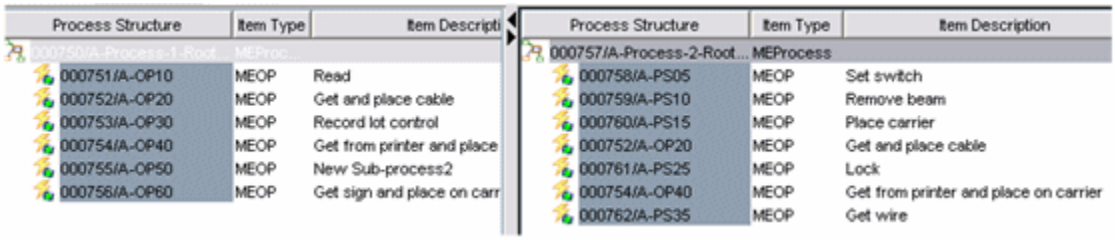
Example A

This example links operations between two structures. You can link any process step between multiple structures. Note the **M:** and **L:** entries for **OP20** and **OP40**.

Header1	Item	Item	Description	ItemID	Sequence
Header2	Process	OP			
Header3	Process	OP			
Title	Root	Root	Description	Store markers	Seq. No.
	Process-1–Root				
		OP10	Read		100
		OP20	Get and place cable	M:op20_marker	110
		OP30	Record lot control		120
		OP40	Get from printer and place on carrier	M:op40_marker	130
		OP50	New Sub-process2		140
		OP60	Get sign and place on carrier		150

Header1	Item	Item	Description	ItemID	Sequence
Header2	Process	OP			
Header3	Process	OP			
Title	Root	Root	Description	Use markers	Seq. No.
	Process-2–Root				
		PS05	Set switch		200
		PS10	Remove beam		210
		PS15	Place carrier		220
		OP20	Get and place cable	L:op20_marker	230
		PS25	Lock		240
		OP40	Get from printer and place on carrier	L:op40_marker	250
		PS35	Get wire		260

As a result, you get the following two linked structures.



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When **OP20** and **OP40** are used in **Process-2-Root**, they are the same operations that are used in **Process-1-Root** (items **000752** and **000754**).

Example B

You can also link related objects such as consumed/required parts, work areas, or resources. In this example, you link plant information (**Workarea**) to a process structure.

Header1	**Item**	**Item**	**Description**	**ItemID**	**Sequence**
Header2	**WorkArea**	**WorkArea**			
Header3	**Plant**	**Station**			
Title	Root	Station	Description	Store markers	Seq. No.
	Plant–Root			M:proot	
		OP10	Station 1	M:op10	100
		OP20	Station 2	M:op20	110
		OP30	Station 3	M:op30	120
		OP40	Station 4	M:op40	130
		OP50	Station 5	M:op50	140

Header1	**Item**	**Item**	**Description**	**Relation**	**Sequence**
Header2	**Process**	**OP**		**Workarea**	
Header3	**Process**	**OP**			
Title	Root	Oper	Description	Link to markers	Seq. No.
	Process–Root			L:proot	
		OP10	Read	L:op10	100
		OP20	Get	L:op20	110
		OP30	Record	L:op30	120
		OP40	Save	L:op40	130
		OP50	Send	L:op50	140

As a result, you get the following two linked structures.

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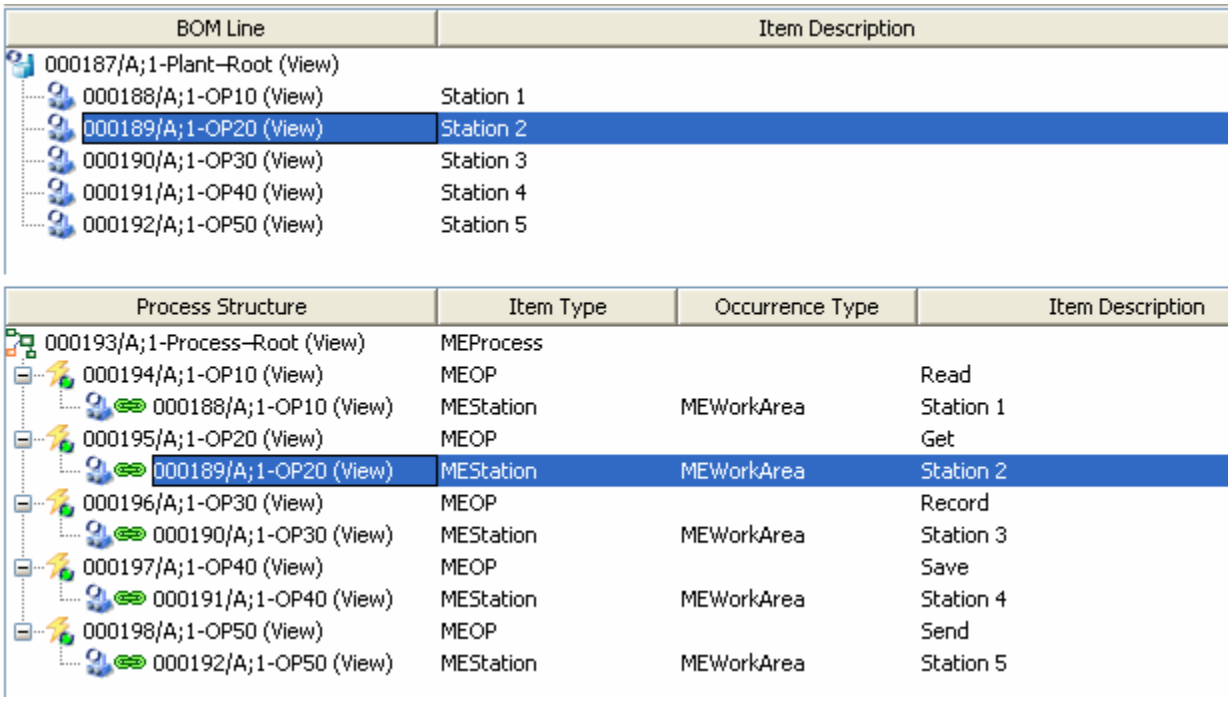

BOM Line	Item Description
000187/A;1-Plant–Root (View)	
000188/A;1-OP10 (View)	Station 1
000189/A;1-OP20 (View)	Station 2
000190/A;1-OP30 (View)	Station 3
000191/A;1-OP40 (View)	Station 4
000192/A;1-OP50 (View)	Station 5

Process Structure	Item Type	Occurrence Type	Item Description
000193/A;1-Process–Root (View)	MEProcess		
000194/A;1-OP10 (View)	MEOP		Read
000188/A;1-OP10 (View)	MEStation	MEWorkArea	Station 1
000195/A;1-OP20 (View)	MEOP		Get
000189/A;1-OP20 (View)	MEStation	MEWorkArea	Station 2
000196/A;1-OP30 (View)	MEOP		Record
000190/A;1-OP30 (View)	MEStation	MEWorkArea	Station 3
000197/A;1-OP40 (View)	MEOP		Save
000191/A;1-OP40 (View)	MEStation	MEWorkArea	Station 4
000198/A;1-OP50 (View)	MEOP		Send
000192/A;1-OP50 (View)	MEStation	MEWorkArea	Station 5

The plant objects are linked to the process structure using the specified **WorkArea** occurrence type.

Link two structures

1. Save the two Microsoft Excel files as **(Tab delimited)(*.txt)** text files.

2. Import the *first* file (containing the **M:** markers):

   tcexcel_import **-u**=*user_name* **-p**=*password* **-g**=*group_name* **-i**=*Link-Process_structure-1.txt* **-m**=*my_marker_file.txt*

   > Note:
   >
   > If you do not specify a name for the marker file using the **-m** parameter, Teamcenter outputs a file named **marker.txt**

3. Import the second file (containing the **L:** markers) with the parameter *my_marker_file.txt*:

   tcexcel_import **-u**=*user_name* **-p**=*password* **-g**=*group_name* **-i**=*Link-Process_structure-2.txt* **-m**=*my_marker_file.txt*

> Caution:
>
> If you want to repeat this procedure using the same two input files, you must delete the *my_marker_file.txt* by hand before doing so.

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Attaching variant data

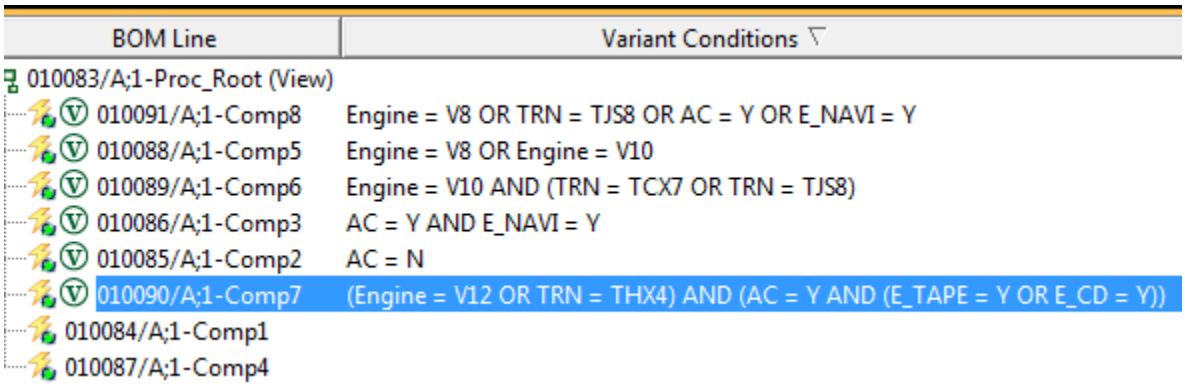
If you want to load variants, an item must exist in your database containing all the variant options. For the next example, the item revision (**v_item/A**) has the following options.

Remark	Option	Value1	Value2	Value3	Value4
Motor Engine	Engine	V8	V10	V12	
Transmission	TRN	THX4	TCX7	TJS8	TDT9
Air Conditioning System	AC	Y	N		
Entertainment System	E_TAPE	Y	N		
	E_CD	Y	N		
	E_NAVI	Y	N		

The variant item revision is specified in the **Variants** column in the **Header2** row as shown in the following example.

Header1	**Item**	**Item**	**Variants**
Header2	**Process**	**OP**	**v_item/A**
Header3	**Process**	**OP**	
Title	Root	Sub	Variant Definitions
	Proc_Root		
		Comp1	
		Comp2	AC==N
		Comp3	AC==Y AND E_NAVI==Y
		Comp4	
		Comp5	Engine==V8 OR Engine==V10
		Comp6	Engine==V10 AND (TRN==TCX7 OR TRN==TJS8)
		Comp7	(Engine==V12 OR TRN==THX4) AND (AC==Y AND (E_TAPE==Y OR E_CD==Y))
		Comp8	Engine==V8 OR TRN==TJS8 OR AC==Y OR E_NAVI==Y

Importing this sheet results in the following structure.



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Load a variant item into the database

1. Copy the following four lines into a file named **variant_options.pim**:

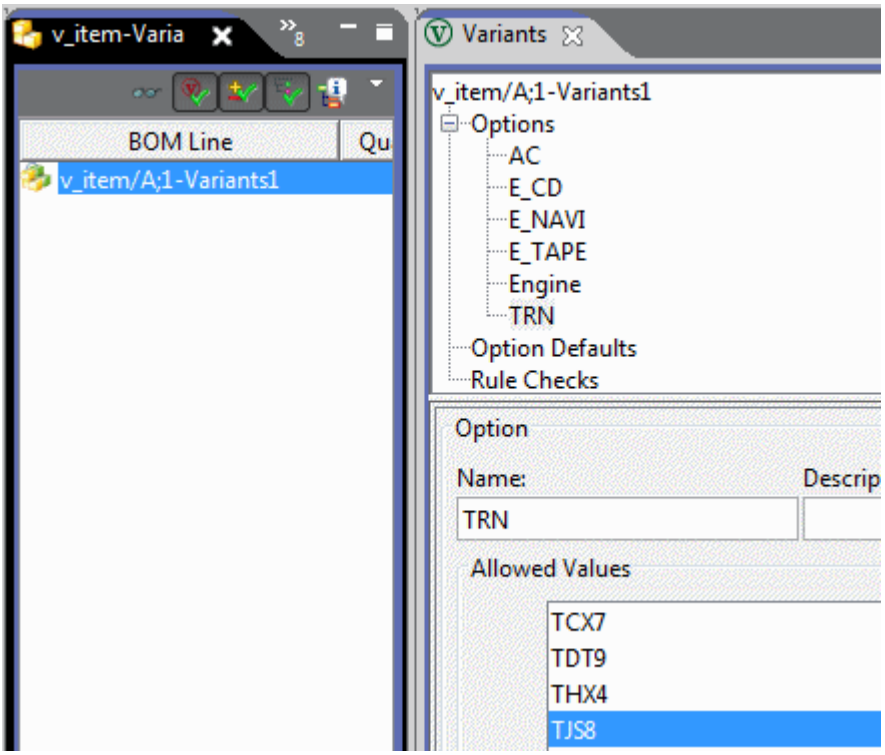
```
#COL level item rev name descr type option

#DELIMITER #

#ALT_DELIMITER ;

0#v_item#A#Variants1#Variants Option
Definitions#Item#Engine;V8;V10;V12;-;
TRN;THX4;TCX7;TJS8;TDT9;-;AC;Y;N;-;E_TAPE;Y;N;-;E_CD;Y;N;-;E_NAVI;Y;N
```

2. Change to the directory containing the **variant_options.pim** file.

3. Create **v_item/A** by using the following command to import **variant_options.pim**:

   tcexcel_import.exe **-u=***user_name* **-p=***password* **-g=***group_name* **-psfile -i=variant_options.pim**

   The variant options for **v_item/A** appear as follows.



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Importing standard text library structures from a legacy system

If you have a standard text library structure in a system other than Teamcenter, you can re-create this structure in Teamcenter using the **tcexcel_import** utility. You define the full library structure containing folders and standard text elements in a Microsoft Excel spreadsheet and save it to a tab-delineated file. This file is then used as input for the **tcexcel_import** utility that creates the structure and attaches documents to the standard text elements. In the spreadsheet, you specify the paths to the documents that are to be attached to the standard text elements. The textual content for each of the standard text elements can come from:

- TXT files containing only rich text.
- DOCX files containing tables, images, formatting, header and footer content.

After import, a standard text librarian can modify the library structure and an author can modify the documents and save the modifications.

The following is an example of an input file with a simple library structure. The first four columns represent the structure of the standard text library. The last column, the **StxFilePath** column, contains the path to the document that will be attached to the standard text element.

Header1	**Item**	**Item**	**Item**	**StxFilePath**
Header2	**Mes0MESTXLibrary**	**Mes0MESTXFolder**	**Mes0MESTXElement**	
Header3	**Mes0MESTXLibrary**	**Mes0MESTXFolder**	**Mes0MESTXElement**	
Title	Root	Sub1	Sub2	Sub3
	Library			
		Safety instructions		
			STX1	D:\temp\goggles.docx
			STX2	D:\temp\boots.docx
			STX3	D:\temp\helmet.docx
		Folder2		
			STX4	D:\temp\magnet.docx
			STX5	D:\temp\table_example.docx
			STX6	D:\temp\rich_text_example.docx
			STX7	D:\temp\helmet.docx
			STX8	D:\temp\helmet.docx

> Note:
>
> This example imports only DOCX files, but both DOCX and TXT files are supported.

You can import this structure into Teamcenter by saving the Microsoft Excel spreadsheet as a text file and import that file into Teamcenter using the following tcexcel_import utility call:

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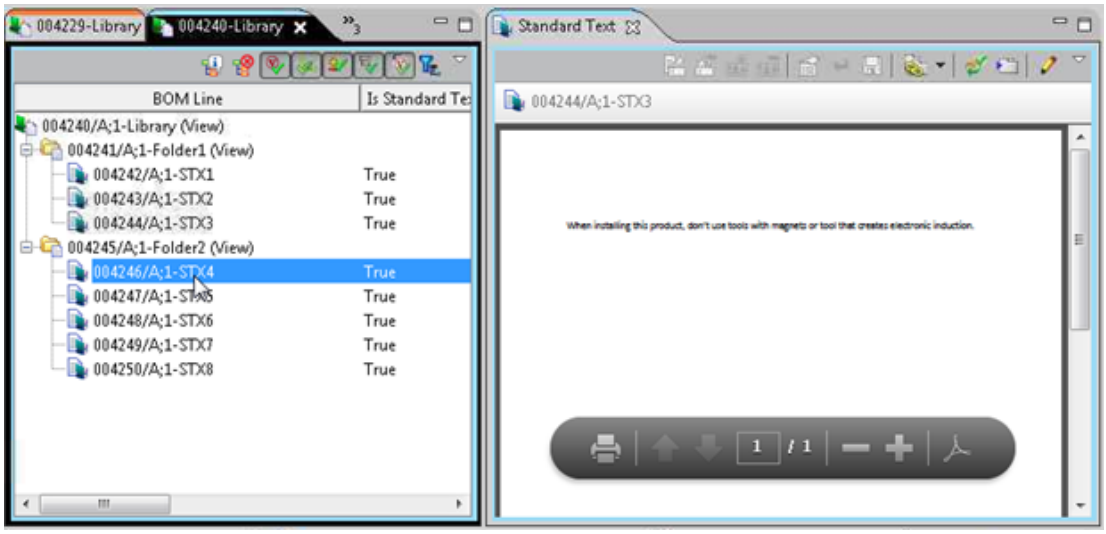
tcexcel_import -u=username -p=password -g=dba -i=*path-to-txt-file*

The resulting structure appears as follows in Teamcenter.



Note that the standard text elements have documents attached. You can modify these documents, save them, and continue to work with them in the customary fashion.

> Note:
>
> You can only use the **tcexcel_import** utility to create new library structures. You cannot use it to update structures.

Sequence processes without the process flow viewer

When you add an object to a process or plant structure, you often need to add it between existing objects. You can do this by giving the new object a find number that falls between the existing objects. When the existing objects have no number space between them, you need to resequence the structure. For example, you have the existing numbers 11,12,13 and must change these to 10,20,30. If you do not use PERT flows, or intend to use them later in the process, you can resequence the structure as follows:

1. Select the parent object of the structure that you want to resequence.
2. Choose **Tools→Re-Sequence Structure**.

   Teamcenter displays the **Re-sequence** dialog box.
3. Type a start number and increment.
4. Clear the **Consider flows** check box.

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The default state of this check box is stored in the **MEConsiderFlowsOnReSequence** preference. After the first time you open the dialog box, the check box state is stored in a cookie.

5. Click **OK**.

Sequencing processes with the PERT view

Sequencing processes and operations with the PERT view

The **PERT** view displays a graphical representation of process flow in PERT chart format. You can edit and manipulate the process flow in the graphical environment. You can also assign parts, resources, or manufacturing features directly in the **PERT** view.

The **PERT** view is used in different contexts, for example:

- When you select a process.

  The **PERT** view displays the flow of operations and processes directly under the selected process.

- When you select a work area object.

  The **PERT** view displays the physical flow on the plant floor.

- When you select an activity in the **Activities** view.

  The **PERT** view displays the flows of activities directly under the selected activity.

When you create a process, Teamcenter creates a default process flow that includes all the children (subprocesses and operations) of the process. The default flow appears in the structure view, starting at the top left and continuing down in a tree-like fashion, and in the PERT chart.

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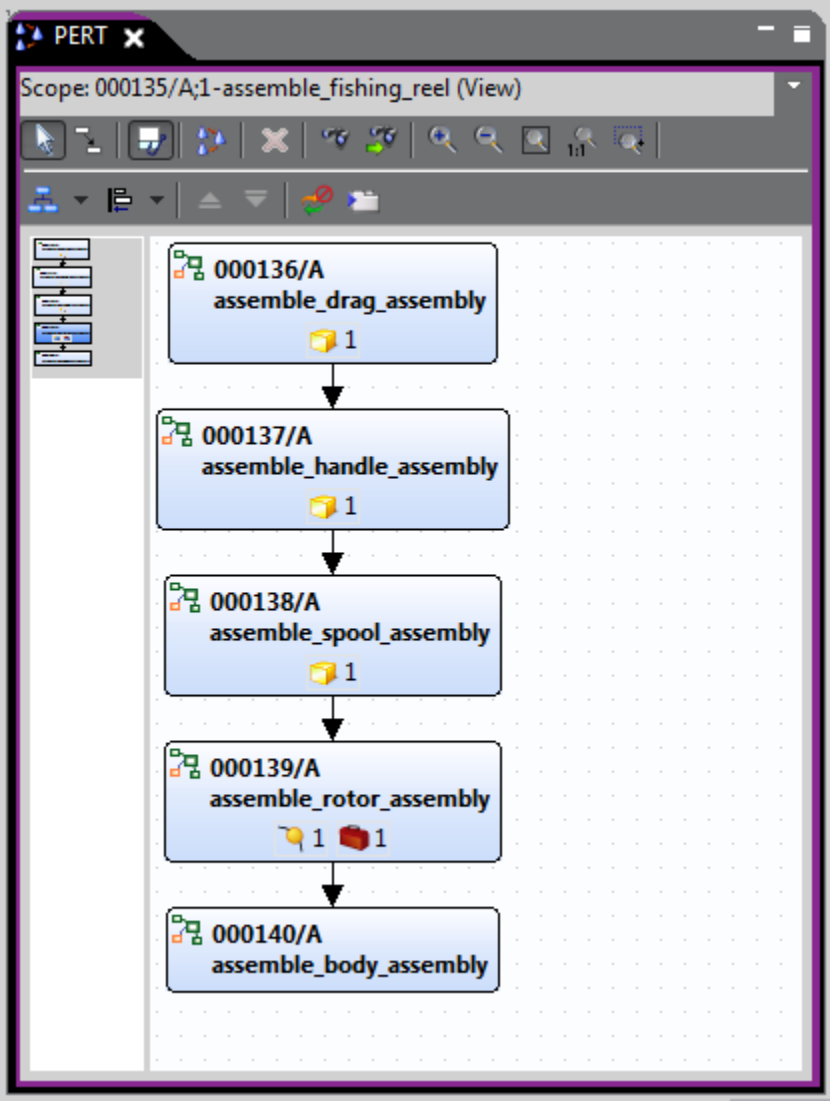

You can additionally add nodes to the PERT chart from siblings of the selected process.

You can additionally create flows to and from a node that is not a direct child of the selected parent node that you open as scope in the PERT chart. These types of flows are called *scope* flows and are displayed with a gray (configurable) background color.

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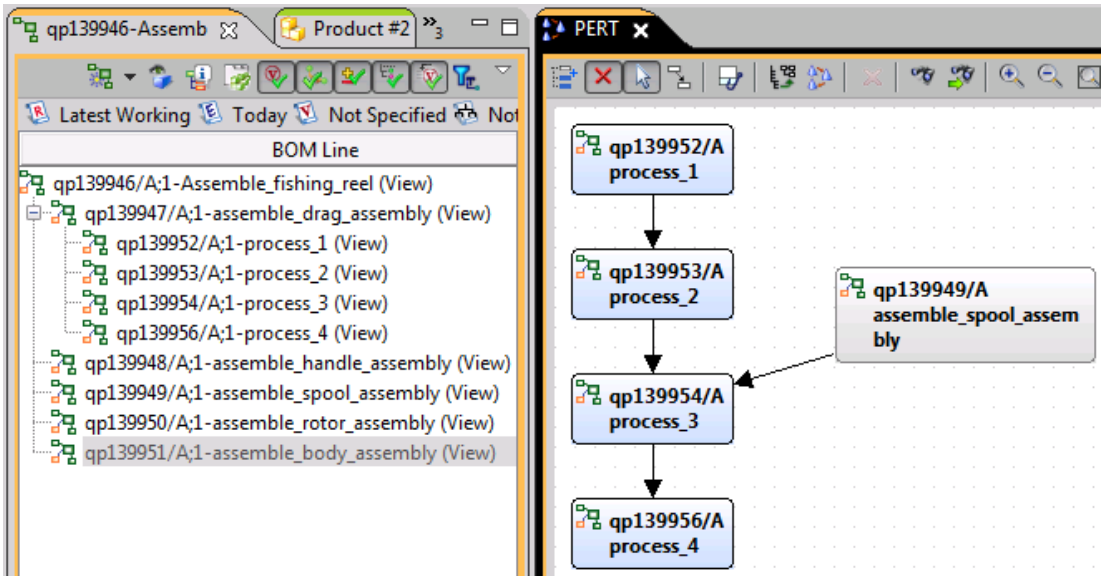

Teamcenter includes this external node when **creating dynamic in-process assemblies**.

If the **Show Assignments** button is turned on, the PERT nodes provide you with information about assigned parts, resources, and features assigned to the object. If you place the mouse over the object, Teamcenter provides more information about the assigned objects. Additionally, Teamcenter displays the Ⓥ symbol if a process has any variant information associated, as well as incremental change icons, if applicable.

Teamcenter occasionally creates implicit flows to retain necessary dependencies between objects. This can happen, for example, when you begin with process A→process B→process C, and then configure process B out of the structure using variants. Teamcenter creates an implicit flow between process A and process C. Teamcenter displays these flows in a different color, and you cannot modify or delete them.

You can configure the attributes that determine how each process, operation, or root activity node is displayed. You can override some of these configuration settings individually.

When you select a node in the PERT chart, Teamcenter selects the equivalent line in the structure view, and vice versa. If you remove a node in the PERT chart, Teamcenter removes the equivalent line from the structure.

> Tip:
>
> Use the **Manufacturing - Process Sequencing** perspective when you are performing sequencing tasks. This perspective already contains the required views for this task without you having to modify the layout of the **Manufacturing Process Planner** perspective.

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Draw flows

1. Click the **Draw Flow** button on the PERT toolbar. The draw flow mode is activated and the cursor changes to .

2. Draw flows as required by clicking the origin node, then the target node.

3. Exit the draw flow mode using one of the following methods:

   a. Press the Esc key.

   b. Click the **Select** button on the PERT toolbar.

If you select an incorrect source or target while drawing a flow, the PERT chart:

- Does not create any arrows.
- Does not display an error message.
- Remains in draw flow mode.

Create flows to and from external processes or operations

You can add processes or operations to a PERT chart that are not immediate children of the process on which you open the PERT chart. Any flows you create to and from these *external* processes or operations are called *scope flows*. This is useful when you model fishbone structures of sublines merging or leaving a main line.

You can create scope flows between the following structures:

- Processes
- Processes and operations
- Process areas
- All types of process areas

1. With a process open in the PERT chart, select an external node in the same process structure. This node can be a sibling of the process that you send to the PERT or it can be any child of a sibling.

2. Click **Add External Nodes**.

   Teamcenter adds the process or operation to the PERT chart with a gray background.

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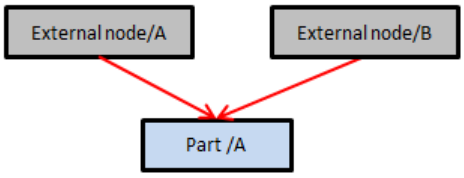
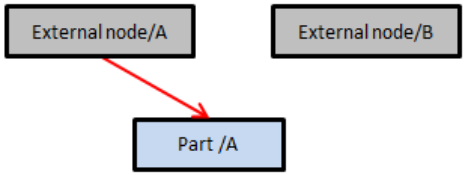
3. Create a flow to or from the external node.

4. (Optional) Select an external node and click ✕ to remove the node.

When you revise a part, any existing scope flows are copied. If you then delete the copied flow, the scope flow between the original parts still exists. This behavior means that different revisions of parts can participate in different scope flows.

Scope flows after revise	Scope flows after deleting new scope flow
	

Select objects in the PERT view

Do one of the following:

- Select a single node or flow by clicking it.
- Select multiple nodes by dragging a rectangle around them with the cursor.
- Select a mixture of flows and nodes by keeping the Ctrl key pressed and clicking them.
- Select all nodes by right-clicking in an empty area of the **PERT** view and selecting **Select PERT Nodes**.
- Select all flows by right-clicking in an empty area of the **PERT** view and selecting **Select Flows**.
- Select all flows and all PERT nodes by right-clicking in an empty area of the **PERT** view and selecting **Select All** or by pressing Ctrl+A.

Delete flows

1. Select the flow or flows you want to delete.

2. Perform one of these delete actions:

   - Click the **Delete** button ✕ on the PERT toolbar.
   - Press Delete on the keyboard.

   Deleting flows disconnects the PERT nodes from each other.

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Remove PERT nodes in a process PERT view

1. Select the node or nodes that you want to remove.

2. Do one of the following:

   - Click **Remove a Line** in the main toolbar.

   - Press Ctrl+R.

   Teamcenter removes all selected occurrences from the current structure.

   Processes and operations are BOM lines so you cannot delete them from the database, only remove them from a structure.

Resequence a process in the PERT chart

The sequence of processes in the process structure are represented by *find* numbers. Find numbers are assigned according to the predecessor relationships between the children. Children with no predecessor are all assigned the same starting find number. Children with the same predecessor are all assigned the same number—the number of the predecessor plus a defined increment. Children with multiple predecessors are assigned the highest predecessor's find number plus the defined increment.

> Note:
>
> To see the find numbers in the user interface, add the **Find No.** column.

1. Do one of the following:

   - Click on the PERT toolbar.

   - Choose **Tools→Re-Sequence Structure**.

   Teamcenter displays the **Re-Sequence Structure** dialog box.

2. Type a start number and increment, then click **OK**.

   Teamcenter changes the line find numbers and the order of the children in the structure pane according to your entries.

3. To resequence the child processes, operations, and activities of the current structure, select **Include Descendants**.

4. To resequence the lines in the structure without taking the flows into consideration using the process flow viewer, clear the **Consider flows** check box.

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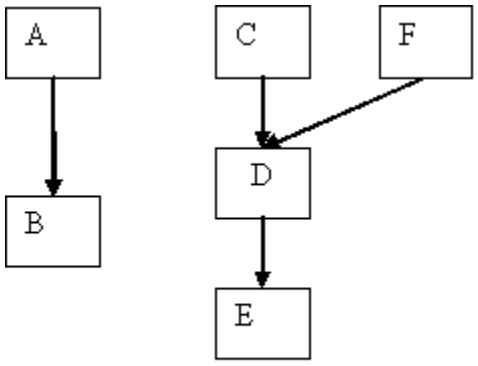
Note:

The resequence action does not work in the case of cyclical links.

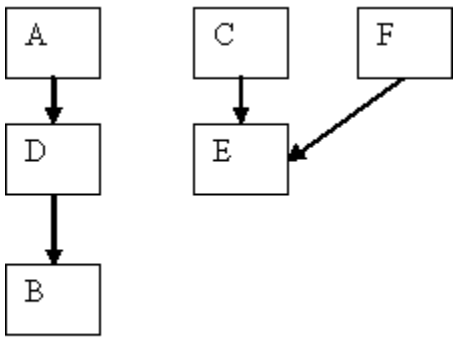
The resequence feature is applicable only to the process or work area PERT chart. If you open the PERT view on an activity, the resequence button on the toolbar is unavailable.

Resequencing by drag-and-drop on a flow

You can drag-and-drop a PERT node onto a flow to change the node order and put the dragged node in between the two nodes previously connected by the flow. For example:



Dragging the node D on to the flow between A and B results in the following order:



- The dragged node is disconnected from its old predecessors and successors.
- New flows are created between all predecessors of the dragged node to all successors of the dragged node.

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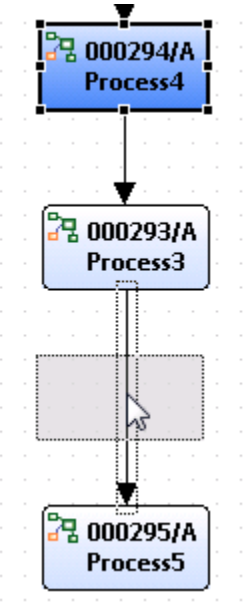
- If the dragged node has either predecessors or successors, but not both (meaning if it was either the first node in a chain or the last node in a chain), no substitute flow is created.

- The dragged node is connected to its new predecessor and successor. The only predecessor of the dragged node is the source of the flow on to which it was dragged. The only successor of the dragged node is the target of the flow on to which it was dragged.

When dragging the node over a flow, the target flow is selected to indicate that it is the target for the drop.



Analyzing circular structures

When sequencing processes with the PERT chart, you may end up with a circular structures. For example:

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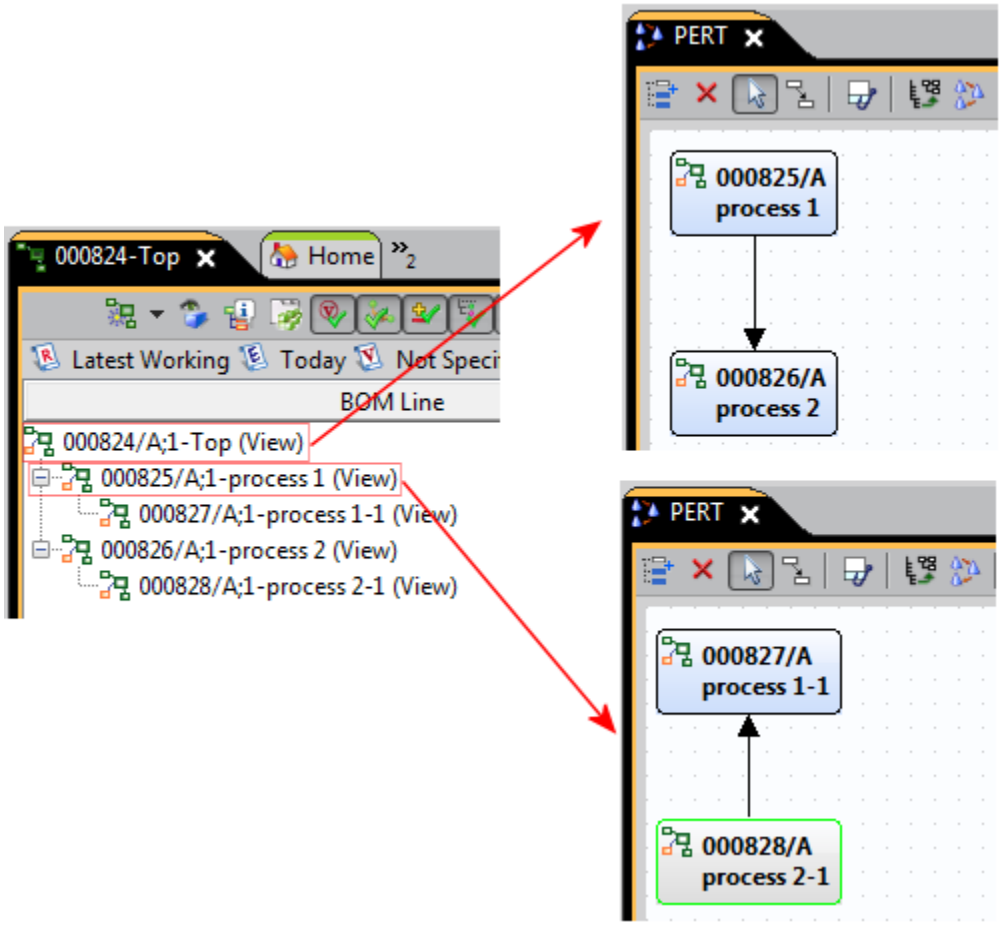

In large structures, these can be difficult to find. Using the **Circular Flow** view, you can quickly find the problem areas and rectify them.

1. Right-click a process and choose **Open With→Circular Flow**.

   Regardless of which process you select in a structure, Teamcenter considers the entire structure when searching for circular flows. The view displays one circular flow at a time.

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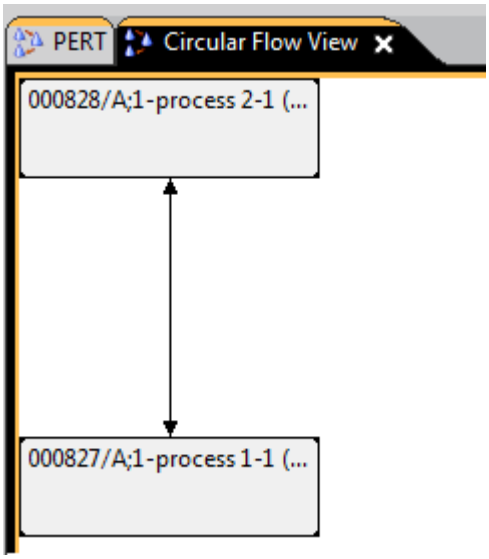

2. Correct the circular flow in the PERT chart.

3. Open the process repeatedly in the **Circular Flow** view, repairing the problems in the PERT chart, until Teamcenter does not find any more circular flows.

Reassign flows by drag-and-drop

You can modify flow source/target nodes by dragging the origin or end point of one of the flows to another target. For example, if node A is connected to node B and you want to modify this relation to go from A to C:

1. Select the end point of the flow.

2. Move the end point from B to C.

If you move the edge of the flow to a nonvalid area, the flow remains connected to the original source and target nodes.

Find objects in the PERT view

1. Click **Find** in the **PERT** view toolbar.

   Teamcenter displays the **Find** dialog box.

2. Type the desired string and click **OK**.

   Teamcenter highlights the first instance of the string in the PERT chart.

3. Keep clicking **Find again** to find the next instances of the string.

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Displaying assignments in the PERT chart

If the **Show Assignments** button is turned on, the PERT nodes provide you with information about assigned parts, resources, and features assigned to the object. If you place the mouse over the object, Teamcenter provides more information about the assigned objects.

The following preferences control the display of assignments:

MERelationTypeFeature

Specifies which types of manufacturing features are counted when showing the number of features.

MERelationTypePartsConsumed

Specifies which types of assigned objects are counted when showing the number of consumed objects.

MERelationTypeUsedEquipment

Specifies which types of resources are counted when showing the number of assigned resources.

Show or hide assignments

1. In the **PERT** view, click the **Show Assignments** button.

   Each process, operation, activity, or work area node lists the consumed parts, resources, or manufacturing features, and their occurrence types.

2. Move the cursor over the symbol of the part, resource, or feature in the PERT chart to view more detailed information.

   Notice that the part, resource, or feature symbol turns into a button when you hover over it with the cursor. You can use this to unassign consumed parts, resources, or features.

3. (Optional) Hide the assignments by clicking the **Show Assignments** button again.

> Note:
>
> Teamcenter remembers the state of the **Show Assignments** button when you close the **PERT** view.

Assign parts in the PERT chart

Do one of the following:

- Drag a part from a product, process, or work area structure to a process, operation, or activity PERT node.

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- Copy a part from a product, process, or work area structure. Right-click a PERT node and select **Paste**.

If the **Show Assignments** button is selected, the PERT node immediately displays the assignments. If the button is not selected, Teamcenter performs the assignments, but nothing is shown in the PERT node.

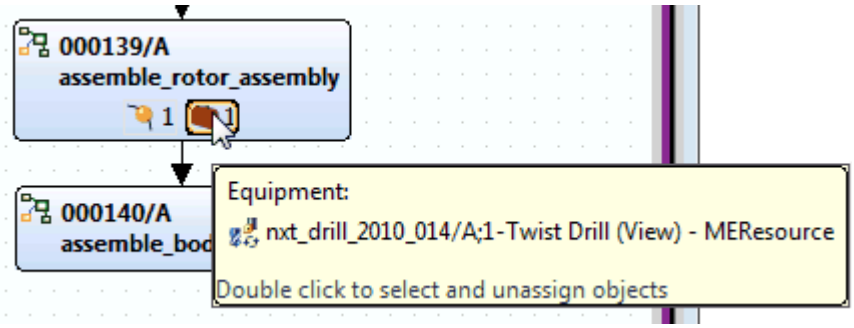
Assign a part with a specific occurrence type

1. In the structure view containing the part that you want to assign, copy the part.

2. In the associated PERT chart, right-click the node to which you want to assign the part and choose **Paste As** and select the appropriate occurrence type.

Unassign consumed parts, resources, or features

1. Move the cursor over the symbol of the part, resource, or feature in the PERT chart.



   Notice that the part, resource, or feature symbol turns into a button when you place the mouse over it.

2. Double-click the part, resource, or feature button.

   Teamcenter displays a dialog box listing the assigned objects.

3. Select one or multiple objects and click **Unassign**.

   Teamcenter removes the objects from the structure.

Assign resources using the Classification Search Dialog

1. Select a process or operation PERT node.

2. Choose **Edit→Assign Resource**, or click the **Assign Resource** button on the toolbar.

3. Expand the **Classification Root** folder entry in the Classification Search Dialog.

4. Search the various classes and subclasses to locate and select the appropriate resource.

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For more information about using the Classification Search Dialog, see *Resource Manager on Rich Client*.

5. If necessary, change the occurrence type of the resource by selecting from the **Occurrence Type** list.

   Your administrator can modify the occurrence types that are displayed by default in the **MEAssignCustomizedOccurrenceType** preference.

6. Click **OK** to close the Classification Search Dialog.

Teamcenter assigns the resource to the selected node in the PERT chart.

Zoom in and out

You can view the entire process flow or only selected operations by zooming in or out of the PERT chart as follows:

Click	To
Zoom In	Increase the magnification by 25 percent and view a correspondingly smaller area.
Zoom Out	Decrease the magnification by 25 percent and view a correspondingly larger area.
Zoom to Fit	Set the PERT chart's zoom ratio to fit all the selected PERT boxes into the PERT chart window. If you do not select anything, the command fits all boxes into the PERT chart window.
Actual Size	Display the chart in its original, as-designed size.
Zoom Window	Drag a box around an area in the PERT chart to which you want to zoom. Press Esc or click **Select** to exit the **Zoom Window** mode.

Resize nodes in the PERT chart

If the **Auto Size Pert Boxes** option is turned off in the manufacturing options, you can re-size one or many PERT nodes.

- To resize nodes manually, select one or more nodes and drag them to the desired size.

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> Note:
>
> You cannot drag a node larger than the size specified by the **PertChart.BoxAutoSizeMaxWidth** preference.

- To resize nodes automatically, do one of the following:
  - To resize one or several PERT nodes, select the nodes and choose **Autosize** from the shortcut menu.
  - To resize all PERT nodes, right-click the background of the PERT chart and choose **Autosize**.

  Teamcenter resizes the nodes to 138 x 50 pixels, or to the size specified in the **PertChart.BoxDefaultWidth** and **PertChart.BoxDefaultHeight** preferences, if they are set.

Change the layout of PERT nodes

- Click **Apply Layout Algorithm** and select one of the following:

Hierarchical→Top-to-Bottom	Highlights the main direction of a graph, beginning with a top node and flowing to the bottom.
Hierarchical→Right-to-Left	Highlights the main direction of a graph, beginning with node at the right and flowing to the left.
Hierarchical→Left-to-Right	Highlights the main direction of a graph, beginning with a node at the left and flowing to the right.
Hierarchical→Bottom-to-Top	Highlights the main direction of a graph, beginning with a node at the bottom and flowing to the top.
Hierarchical→Incremental	Displays only the changes to a particular section of the graph.
Circular	Displays group and tree structures within a network in a ring and star pattern.
Orthographic	Creates compact graphs with no overlaps, few crossings, and few bends. Most appropriate for medium-sized sparse graphs.
Organic	Creates a layout with the nodes spaced as far away from each other as possible, still while minimizing this distance. Most appropriate for undirected, complex graphs.

Align process steps

You can drag one or more selected process boxes to a different position.Teamcenter remembers the new position without the need to save changes.

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To help align the process steps:

1. Switch on a grid in the process flow viewer by clicking **Grid Mode**. The grid is displayed in the background of the PERT chart. When it is visible, each box snaps to the grid coordinates

2. Select the boxes that you want to align and do one of the following:

   - Click **Shape Alignment** and choose one of the following alignment options:

     - Left
     - Center
     - Right
     - Top
     - Middle
     - Bottom
     - Distribute horizontally
     - Distribute vertically

Drill up and down in a structure

Do one of the following:

- To drill down, select a node and click or double-click the node.

  Teamcenter displays the children of the selected node in the **PERT** view.

- To drill up one level, click .

  Teamcenter changes the scope to the parent of the previously displayed scope and displays the parent's children.

Print a PERT chart

1. With a PERT chart open in the PERT view, choose **Print** from the view menu.

2. Select a printer and click **Print**.

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Teamcenter prints the PERT chart.

Export a PERT chart

1. From the view menu, choose **Export**.

2. Choose a file type to export. You can choose from JPG, PNG, or BMP.

3. Specify an export directory.

Change the appearance of the PERT chart background

- From the view menu, choose **Change Grid Style**.

  Teamcenter changes the background. The background cycles from dotted, to line grid, to an empty background each time you select the menu command.

Show and hide PERT chart overview pane

1. From the view menu, choose **Show Overview** to turn on the menu button.

   Teamcenter shows the overview pane at the left of the PERT chart that helps you located your position within the PERT chart. You can change the size of the overview pane to suit your needs by dragging the pane divider to the left or right.

2. From the view menu, choose **Show Overview** again to turn off the menu button.

   Teamcenter closes the overview pane.

Teamcenter saves the status of this command for the next session.

View the properties of a step

1. Click the box of the process, activity, or work area in the PERT chart.

2. Click **Launch Teamcenter line properties** .

Update PERT flows

Use this feature to update pert flows according to the find number of the selected line's children, or in the case of multiple selections, of the selected lines. This is necessary if you change the find numbers of processes or operations in a structure.

1. Select the scope.

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- If the **PERT** view is open, ensure that the scope selected for the **PERT** view is the desired one.

  Teamcenter uses the **PERT** view's scope as the scope to update the flows.

- If the **PERT** view is not open, select one or more lines in a process structure.

2. Choose **Tools→Update Flows**.

3. Select **Include Structure Sub-Hierarchies** to update all sub-hierarchy flows except for activity flows.

4. Click **OK**. This command works only for processes with children. If you make multiple selections, the command works only for processes with the same parent and of the same type.

   Teamcenter removes all the flows of the selected process and creates new flows according to the find numbers.

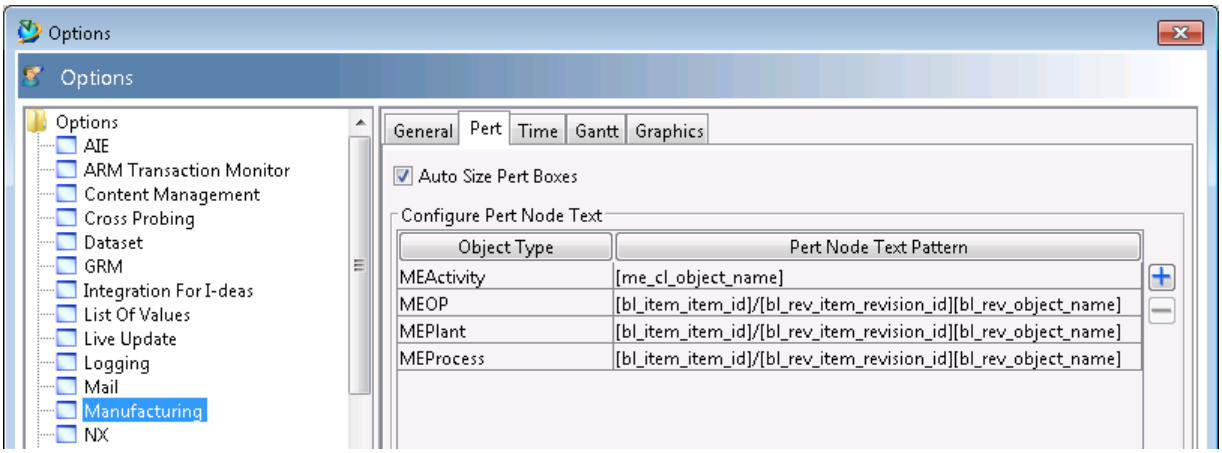
5. (Optional) Reapply a layout algorithm to clean up the PERT chart.

Configure the PERT chart

You can configure the behavior of the PERT chart in the **Manufacturing** options, as well as by using some preferences.

1. In the **Manufacturing Process Planner** perspective, choose **Edit→Options** and select **Manufacturing** from the **Options** list.

2. Click the **Pert** tab.



3. If you want Teamcenter to automatically fit the size of a new PERT node to the text it contains, select **Auto Size Pert Boxes**. If you do not select this, Teamcenter creates each new node the same size.

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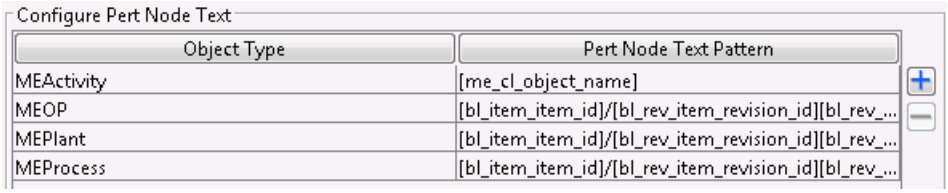
4. Configure the text that Teamcenter displays in each PERT node using the **Configure Pert Node Text** table. You can specify the contents of a PERT node that depends on which type of object is displayed.



a. Add a new object type to the **Object Type** list by clicking +.

   Teamcenter displays a new line in the table.

b. Select an object type by clicking in the **Object Type** cell.

c. Click in the **Pert Node Text Pattern** cell.

d. Type the property names that you want to appear in the PERT node. These must have the following format:

   free-text[bl_item_item_id]/[bl_rev_item_revision_id][bl_rev_object_name]

   where:

free-text	Any text except for square brackets [ ]. HTML is not supported.
[property_name]	A valid property name for the property type that must be wrapped in square brackets, for example: **[bl_rev_object_name]**.

   Putting text on a new line displays the text on a new line in the PERT node.

   For the process PERT chart and the station flowchart, the fields that comprise the formula may be selected from the BOM line properties or occurrence notes of the object. For the activities flowchart, the fields may be selected from the activity attributes.

   For example, if you enter the following for an **OP** object type:

   Revision: [bl_bomview_rev] Class: [bl_line_object_class]

   Teamcenter displays the following operation in the PERT node:

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and if you enter the following for an **Activity** object type:

Name: [me_cl_display_string]

Desc: [me_cl_object_desc]

Teamcenter displays the following activity PERT node:

Note:

These values are also stored in the **PertChart.***Object_Type***.Text** preference.

Note:

If you customized text in the PERT nodes prior to Teamcenter 9.0, you must remove the HTML tagging and use plain text.

5. On the **Gantt** tab of the manufacturing options, change the implicit flow color.

   This implicit flow color is used in the **PERT** view as well.

6. Change other pertinent preferences. Some of the preferences listed do not exist in the database; you must create them manually.

Preference	Usage
PertChart.NodeDefault.Text	Configures the default text for all types derived from operation/process and work area class.
PertChart.ActivityDefault.Text	Configures the default text for all types derived from activity class.
PertChart.BoxDefaultWidth **PertChart.BoxDefaultHeight**	Configures the default width/height to be used when new PERT nodes are created in the preference file (per site, group or user). The values of width and height are any positive integers and specify the number of pixels used for the width and height of newly created PERT nodes. If the **BoxDefaultWidth** and/or **BoxDefaultHeight** entry do not exist, 138 / 50 is used as default. Those values

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Preference	Usage
	are common for all PERT chart types. Once they are defined in the process PERT chart, the activity and station flowcharts use these values to define the size of newly created PERT nodes.
PertChart.AutoSizeMode	Turns autosize on or off. When autosize is off, the size of the all newly created PERT nodes is uniform. When autosize is on, the size of the newly created PERT nodes is automatically fitted to the displayed text, including allowing for multiple lines. This preference is applied to all PERT chart types (process, activity, and plant PERT charts). If the entry is not defined in the preference file, nonautosize mode is used as default.
PertChart.BoxAutoSizeMaxWidth	If the autosize mode is on, configures the maximum width in pixels to be used when new PERT nodes are created. For example, **PertChart.BoxAutoSizeMaxWidth=150** causes the following text to be split into multiple lines: If this preference is not set, Teamcenter uses a default value of **170**.
PertChart.*Object_Type***.BGColor**	Defines a background color for a specific object type. For example, **PertChart.OP.BGColor=40,100,240** displays the following operation node:
PertChart.NodeDefault.BGColor	Defines the background color for nodes in the process and station flow PERT chart that do not have an explicit background color definition.
PertChart. ActivityDefault.BGColor	Defines the background color for nodes in the activity PERT chart that do not have an explicit background color definition.
PertChartCreationLayout	Defines where newly created nodes are placed in the PERT chart. If the value is **Horizontal**, all newly created nodes are put at the top right corner.

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7. Close the **PERT** view and reopen it to see the changes.

Filter the process structure

You can select only certain occurrence types to display in the process structure.

1. Choose **Select Occurrence Type Filters** from the **View Menu** list.

   Manufacturing Process Planner displays a dialog box that allows you to define the occurrence types that are displayed.

2. Move each occurrence type that you want to include in the process structure display to the **Shown Types** column in the dialog box. When the required types are selected, click **OK** to implement the selections and close the dialog box, or click **Apply** to implement the selections without closing the dialog box.

3. Choose **Apply Occurrence Type Filter** from the **View Menu** list to turn on the defined filter.

Creating operations and activities

Operation types

Each process structure contains individual process operations. These operations describe one step in the manufacturing process of a product. Each operation is executed at a specific work area on the shop floor.

There are many different types of operations that can be included in a manufacturing process model. Examples of operation types include:

- Machining (NC CAM) Operations
- Painting
- Quality Control
- Heat Treatment
- Assembly
- Welding

Each operation is revision controlled independently, and can be shared by several process plans.

Each operation type is associated with different types of data. In general, this data can be classified as follows:

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Data type	Description
Input data	Results from a previous operation or activity, such as an in-process model that was generated in the previous step.
Work instruction data	Contains all information necessary to execute the work. This may include information about tooling and setup and necessary action to execute the operation. If the work area is not explicitly defined, the requirements for the work area are specified as part of the work instructions.
Output data	Generated when work instructions are applied to the input data. An example includes a resulting in-process model and any instructions to be used in the next operation or activity.
Analysis data	Derived from work instructions used to perform analysis across different process operations. This may include cost and time.
Product data	Associated with one or more products in the product structure.
Work area data	Associated with one work area.
Resource data	References resources used during completion, such as standard equipment of the work area or additional items needed.

Note:

By default, classify immediately is disabled for a root item in Manufacturing Process Planner.

Create a new operation

After you create a top-level manufacturing process, create the individual operations completed as part of the process.

Note:

You may also want to create stand-alone operations that are not part of a process structure so you can save these operations as templates and clone their structures.

1. In a process structure view, select the process to which you want to add an operation.

   If the new operation is not to be associated with a process, skip this step.

2. Choose **File→New→Operation**, or click **Create New Operation** on the toolbar.

   The **New Operation** dialog box is displayed.

3. Select one of the operation types from the list.

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For more information on creating additional operation types, see *BMIDE for Data Model Design*.

4. Click **Next**.

5. Enter the ID number to be assigned to this new operation. If this new operation is a revision of an existing one, type the ID of the existing operation. You can assign a unique revision number in the **Revision** field.

   To let the system automatically assign a unique ID, click **Assign**.

6. Type a name for the new operation. Make it unique so you can search the database using this term.

7. Select **Show as new root** to specify that the newly created operation is opened as a root object. It is not pasted to the selected object. If you do not select this option, the new operation is pasted as a child of the selected process.

   If the **Show as new root** option is selected but unavailable, Teamcenter does not allow you to create a new object under the selected object, for example, if you try to create an operation under a part.

8. Type an operation description.

   At this point, you have all the information required to create a new operation.

9. (Optional) Click **Next** to add optional information, such as filling out the operation's forms, or checking the operation out of the database.

10. Enter logical designator information.

    A logical designator is an expression associated with a process, operation or partition that captures commonality between them. This step appears only if you are creating an operation under a generic BOM, and only if your administrator has defined a logical designator class for the operation. This form may include mandatory fields. You cannot proceed until these are filled. If you create multiple operations, the information you enter in this form is passed to each logical designator in each new operation.

11. (Optional) Select **Define Options** to specify the following:

    - Select **Use item identifier as default display** or **Use revision identifier as default display** if you created an alternate identifier for the item and want to use it as the default display object.

    - Select **Check Out Operation Revision on Create** to check the newly created operation out of the database immediately upon creation.

12. Click **Finish** to create the new operation.

13. Click **Close** to close the **New Operation** dialog box.

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After the operations are created, create the individual activities that are to be performed as part of this operation.

Open an existing operation

Do one of the following:

- Expand the process hierarchy in the structure view and open an existing process structure.
- Open an operation structure by name in the Manufacturing Process Planner using the **Open Process or Operation** dialog box.
- Use the My Teamcenter application to search for operations and then send them to the Manufacturing Process Planner application.

Create operation activities using the Activities view

> Note:
>
> If you use activities for time analysis, do not use the **Activities** view. Use the **Time** view to create activities and assign times to them.

Each operation can have individual activities that break down the operation into steps describing in detail what is done as part of that operation. For example, a material procurement operation may include an activity to unload the material and another activity to move the material to a storage area. The activities are created as children of the operation.

Each activity is defined by its type, description, start time, and duration. An activity can also reference Teamcenter objects. This enables you to attach any forms to the activity that represent features and their associated tooling and instructions.

> Note:
>
> You cannot create revisions of activities.

1. In the process structure view, select the operation to which you want to add an activity.
2. Choose **Open With→Activities**.

   Teamcenter opens the **Activities** view displaying all the activities belonging to the selected operation.
3. Select the parent activity for the new activity.
4. Click the **Create New Activity** button on the view toolbar.

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The **New Activity** dialog box is displayed.

5. Select the activity type. If there are many types to choose from, you can type a search filter to narrow your choices.

6. Click **Next**.

7. Enter the required information in the activity form. The information you enter here is dependent on your business needs. Mandatory fields are designated by a red star.

8. Click **Finish** to add the activity.

9. (Optional) After adding the activities, specify the desired sequence operation activity.

To create an activity from a template:

1. In the structure view, select the operation to which you want to add an activity.

2. Choose **Open With→Activities** from the shortcut menu.

3. Select the parent object for the activity in the **Operation Activities** pane.

4. Choose **File→New→From Template→Activity from Template**.

5. Click the **Find Template** tab to search for an existing template, or select a template from the **Favorite Templates** pane.

Sequence operation activities

After you create the individual activities to be completed as part of an operation, you can modify the sequence in which these activities are performed. This sequence is called the *activity flow*.

As you sequence the activity flow, identify:

- Preceding activities (those that must be completed before others can be started)
- Parallel activities (those that can be completed at the same time as others)

To sequence operation activities:

1. Select an operation in the structure view.

2. Choose **Open With→Activities** from the shortcut menu.

3. In the **Activities** view, select the root activity.

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4. Choose **Open With→PERT** from the shortcut menu.

   Teamcenter opens a **PERT** view with the selected activity as scope.

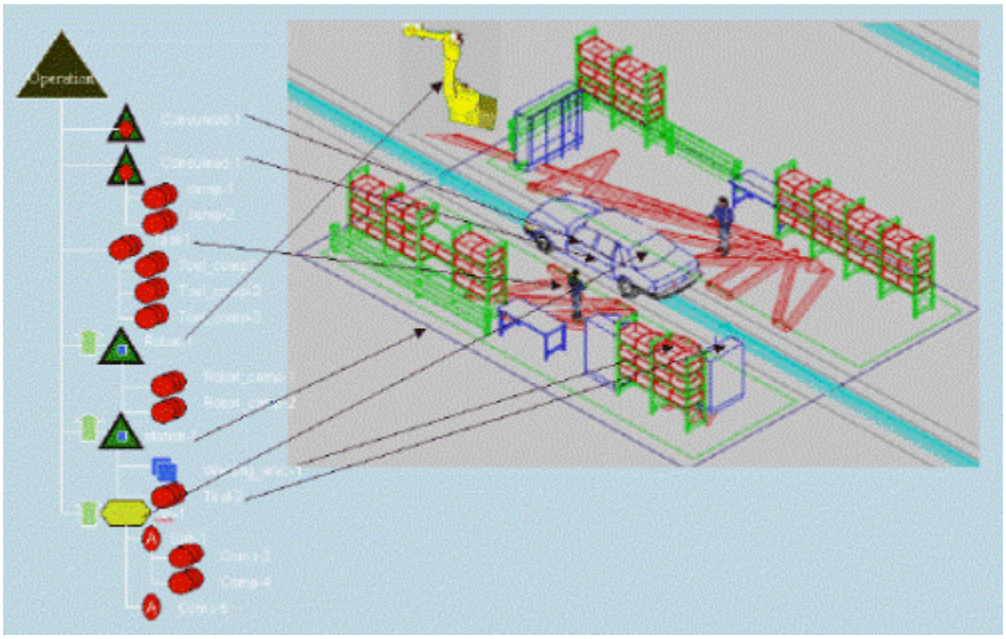
5. Sequence activities with the **PERT** view.

Understanding setup structure

The setup structure describes the assembly structure containing operations to be performed. This structure contains the tooling, resources, parts, and workpieces and their position in the work process. Many times with a large product assembly, operations may share most of the elements of the setup. In this case it is convenient to define the setup structure at the process level and have all child operations inherit that definition.

The following figure shows an example of the operation's setup as it inherits the process setup and all the elements that make up the setup structure. The setup structure mainly consists of the following:

- Operation's specific resources
- Factory resources linked to plant occurrences
- Consumed parts linked to the product occurrences
- Workpiece
- Inherited process setup structure.



Parts to operations processes

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A process structure can be created to describe the flow of processes. Each process may be a container for all operations performed in one work area. In this case, all the common work area elements from the factory and the common tooling can be defined at the process level and any specific tooling and consumed item can be defined at the operation level.

The operation setup structure inherits the elements in its loaded parent process. You must ensure that the components of the process setup structure and the operation structure are positioned correctly. Because an operation can be shared across many processes, the inheriting setup is shown only if the operation is shown in the context of its parent process. If only the operation is loaded, the process setup is not shown.

Operation setup may include additional toolings that are specific for performing the operation, consumed parts, and workpieces. When dealing with large assemblies, not all parts of the workpiece are of interest to the operation. In this case, you can define a subset of the workpiece that is of interest for details planning. This subset is another occurrence group that is assigned to the operation. Keep in mind the following:

- The operation setup includes its parent process setup.
- You can allocate consumed items from any of the manufacturing views.
- You can allocate an occurrence group as an **MEWorkpiece**.
- You can allocate any occurrence group as **MEWorkpiece** subsets. This subset is loaded into a workpiece planner session.

Create an operation setup structure

1. Create the structure.
2. View the structure and make any necessary changes.
3. Allocate workpieces to the setup structure from any product view. Each element in the setup structure can be assigned a type. A workpiece has the type **MEWorkpiece**.
4. Allocate work area elements as resources.
5. Allocate resources from the resource library.

Assign consumed items to operations

As you create a process plan, indicate the materials that will be consumed during the execution of each process operation. Consumed items can include components of the part as well as materials such as grease and gloves.

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Use the following steps to specify the items in the product structure to be consumed by the operations in your plan.

1. Expand the relevant sections of the product and process structures.

2. In the product structure view, select the component to be used by the operation.

3. Do one of the following:

   - With both product and process structure views visible, drag the selected component to the operation.

   - Choose **Copy** from the shortcut menu and paste the copied component to the operation. By default, objects are assigned using an **MEConsumed** occurrence type. To specify a different occurrence, use the **Paste As** menu command.

4. Repeat this process for each operation to consume an item from the structure.

> Note:
>
> By default, an occurrence of the **MEConsumed** type may be assigned to a process. Your administrator can change the **controllingOccsForProcessConfiguration** preference to specify another occurrence type as valid for assignment at your site. If this preference is blank, the configuration of consumed items does not affect the configuration of operations.
>
> To identify components that are already consumed and components that are not yet consumed, do a BOM comparison between the product and the process.

Assign work areas

After you create a process operation and its activities, identify where in the plant the operations take place. To do this, establish a relationship between the operation and the work area where the production occurs.

1. Expand the relevant sections of the work area and process structures.

2. In the work area structure view, select the work area or station where the operation is to be performed.

3. Do one of the following:

   - With both work area and process structure views visible, drag the selected work area or station to the operation.

   - Select **Copy** from the shortcut menu and paste the copied work area to the operation. By default, objects are assigned using an **WorkArea** occurrence type. To specify a different occurrence, use the **Paste As** command.

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4. Repeat this process for each operation to consume an item from the structure.

5. Repeat these steps for each process and operation you create.

By default, an occurrence of the **WorkArea** type may be assigned to a process. Your administrator can change the **controllingOccsForProcessConfiguration** preference to specify another occurrence type as valid for assignment at your site. If this preference is blank, the configuration of consumed items does not affect the configuration of operations.

Assign classified resources to an operation

Do one of the following:

- For rough planning, choose **Window→Show View→Classification** or click .

  Teamcenter displays the **Classification** view from which you can drag resources directly to a structure.

  If you need to paste the same resource into a structure multiple times, copy the resource and use the **Paste Duplicate** command to ensure that each resource is a separate resource with a new item ID. This allows you to position a resource without repositioning other instances of the same resource.

- For more detailed planning, open the **Classification Search Dialog**.

  1. Select an operation from an expanded process hierarchy in the structure view and select the top-level operation to which you want to attach resources.

  2. Choose **Edit→Assign Resource**, or click the **Assign Resource** button on the toolbar.

     The Classification Search Dialog is displayed.

  3. Expand the **Root** folder entry on the Classification Search Dialog.

  4. Search the various classes and subclasses to locate and select the appropriate resource.

  5. If necessary, change the occurrence type of the resource by selecting from the **Occurrence Type** list.

     Your administrator can modify the occurrence types that are displayed by default in the **MEAssignCustomizedOccurrenceType** preference.

  6. Click **OK** to close the Classification Search Dialog.

Assign unclassified resources to an operation

Assign unclassified resources (such as tools) to an operation as follows:

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1. Open the My Teamcenter application and find the resource to be assigned to the operation.
2. Select the object and click the **Copy** button on the toolbar.
3. Open the Manufacturing Process Planner application.
4. Select the operation in the process structure.
5. Choose **Edit→Paste Special**.

   Teamcenter displays the **Paste Special** dialog box.
6. Select **as component of selected assembly**.
7. Enter the number of occurrences, quantity, and find number.
8. Select **MEResource** from the **Occurrence Type** list.
9. Click **OK**.

> Note:
>
> You did not make a copy of actual data when you performed the copy and paste functions. You merely copied an object that points to the data in the database.

Managing collaboration contexts

About collaboration contexts

A collaboration context is used to save groups of data in a specific configuration. It is a Teamcenter object that holds a collection of data contained in structure and configuration contexts. This data allows you to capture multiple different Teamcenter structures in one container. You can open a collaboration context in the Multi-Structure Manager application, in Manufacturing Process Planner, in Multi-BOM Management, or in Part Planner. You can use the **Collaboration Context Tree** view to manipulate the object within collaboration contexts.

A collaboration context consists of any number of structure contexts and one configuration context. A structure context can contain any BOM or assembly structures. It holds occurrence groups, items, and item revisions. A configuration context holds the revision rule, variant rules, and closure rule applicable to the collaboration context, as well as the current state of various buttons that affect the objects seen in the structure tree and view, such as **Show Unconfigured Variants** or **Show Unconfigured Changes**.

You can also use a collaboration context to collect data to share with a third-party application.

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You can specify which type of object is pasted under the structure context using the **MESaveAsSC_PasteType** preference.

> Note:
>
> The **PS_assume_legacy_transform_units** preference determines how Teamcenter interprets the units of measure for legacy transform data. Teamcenter and NX currently use meters for transform units of measure; legacy measurements were in inches or millimeters. This preference affects all data using legacy transforms that have no database-resident indication of the unit measurement stored with them. The default setting is **Unknown**. If the preference is left in the default setting, you may see discrepancies between the model and display units when you view collaboration context structures in Manufacturing Process Planner.

Overview of creating a collaboration context

There are two methods used to create a collaboration context:

- Top down:
  1. Create an empty collaboration context.
  2. Create empty structure contexts within the collaboration context.
  3. Fill up the content of the new structure context by inserting items.
- Bottom up:
  1. Open desired objects.
  2. Save these objects as structure contexts.
  3. Save all structure contexts in the session to a new collaboration context or move structure contexts into an existing collaboration context.

You can create a collaboration context for each instance of a collaboration between applications within Teamcenter or between Teamcenter and an external application. For example, if your Teamcenter system connects to a Tecnomatix system, you must define a single collaboration context to allow the two systems to share data.

Create a new collaboration context

How you create collaboration contexts depends on the method you use to build your collaboration context structure.

- If you use a top down method:

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1. Choose **File→New→Collaboration Context**.

   Teamcenter displays the **New Collaboration Context** dialog box.

2. Choose a collaboration context type from the list.

   - Your administrator can create additional types as necessary with the Business Modeler IDE administration application.
   - Teamcenter places the types of collaboration context you previously created in the **Most Recently Used** list.

3. (Optional) Select **Open on Create**.

   If you select this option, Teamcenter opens the new collaboration context in the application directly after creation.

   > Tip:
   >
   > If you do not select this option, you can find the new collaboration context in the **Newstuff** folder in My Teamcenter.

4. Click **Next**.

5. Type a name in the **Name** box.

   Mandatory parameters are marked by a red asterisk.

6. (Optional) Type a description of the collaboration context.

7. Click **Finish**.

   > Note:
   >
   > You can create a collaboration context in Multi-Structure Manager, Manufacturing Process Planner, Part Planner, Multi-BOM Management, and My Teamcenter.

If you selected **Open on create**, Teamcenter displays the context as a top-level line.

Teamcenter always stores the new collaboration context in the **Newstuff** folder in My Teamcenter.

- If you use a bottom-up approach to creating collaboration contexts, you can also create a new collaboration context that contains an existing structure context.
  - Choose **Save as New Collaboration Context** from the **Collaboration Context Tree** view menu.

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Save objects as collaboration contexts

You can save loaded structures, including studies, to a new collaboration context. Teamcenter creates a structure context from each loaded structure that you include in the collaboration context if is not already contained in a structure context.

1. Select a root line of an object in the collaboration pane and choose **File→Save as→Save as New Collaboration Context**.

   Teamcenter displays the **Save as New Collaboration Context** dialog box.

2. Type a name and description for the new collaboration context in the **Name** and **Description** boxes.

3. Select a type of context from the list. Click **More** to see a complete list of structure context types.

   Your administrator can create new collaboration context business objects (types) in the Business Modeler IDE.

4. For each structure in the list on the left that you want to save, enter the following information. Your administrator can change the existing defaults for this information in the **Default_StructureContext_Type** preference.

   - Name of the structure context
   - (Optional) Description
   - Type of the structure context
   - Type of the configuration context to be created for this structure context

   If the structure is already a part of a structure context, you can see this information when you select the structure in the structure list. Even if a structure is already part of a structure context, Teamcenter creates a new structure context for the structure that is based on the existing one and includes any modifications made to the current structure.

5. (Optional) If you want to save loaded structures to a new collaboration context that captures linked released studies or all studies, review the **Include Studies** list and select the studies to include.

6. (Optional) Select the **Open On Create** option to open the new collaboration context.

   Teamcenter opens the new collaboration context. The participating structures appear twice: once in their previous location (as a root structure or as part of another collaboration context object) and once under the new collaboration context. Additionally, each participating structure is now displayed in two structure views—one displaying the original structure and one displaying the newly created structure context.

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If you do not choose this option, you can find the new collaboration context in the **NewStuff** folder in My Teamcenter.

7. Click **OK**.

   Teamcenter collects all of these structure contexts into the new collaboration context. In addition, it creates a configuration context within the structure context containing the revision and variant rules currently applied to the object. It clones or references the revision and variant rules of the existing structure, according to the following rules:

   - If the current revision rule is saved as public, it creates a reference to it.
   - If the current revision rule is modified and not saved, it clones the modified rule to create a private revision rule for the configuration context.
   - If the current variant rule is saved as public, it creates a reference to it.
   - If the current variant rule is modified and not saved, it clones the modified rule to create a private variant rule for the configuration context. If the variant rule is cloned, it is not linked to the top line item in the structure.
   - It does not define a closure rule.

   Each new structure context refers to all of the occurrence groups that have manufacturing views (visible tabs) when you save it.

   > Note:
   >
   > If you try to save a structure that is configured by multiple variant rules, you must set the **DisableSaveSOS** preference to **true**.

Save objects as structure contexts

1. Select the object in the **Collaboration Context Tree** view or ensure the structure view is in focus.
2. Choose **Save as New Structure Context** from:
   - The view menu of the **Collaboration Context Tree** view or the structure view.
   - The **Collaboration Context** menu command in the **File** menu.
   - The shortcut menu of the **Collaboration Context Tree** view.
3. Choose a structure context type from the list and click **Next**.

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- Your administrator can create additional types as necessary with the Business Modeler IDE administration application.
- Teamcenter places the types of structure context you previously created in the **Most Recently Used** list.

4. Type a name in the **Name** box.

   Mandatory parameters are marked by a red asterisk.

5. (Optional) Type a description of the structure context.

6. Click **Finish**.

Teamcenter creates the new structure context and displays it in the **Collaboration Context Tree** view. It moves the original structure into the new structure context in the view. In addition, the name of the structure displayed on the tab in the structure view changes to the name of the new structure context.

Exporting and importing collaboration contexts using briefcase

Overview of exporting and importing a collaboration context

Briefcase functionality allows you to transfer a complete collaboration context in an archived file format between two Teamcenter sites that are not on the same network. It supports the offline exchange of the multiple structures existing in a collaboration context (process, product, plant) including the relationship between them, as well as other manufacturing data types as studies, such as in-process assemblies (IPA, DIPA) and simulation. Export via briefcase allows you to control the data that is exchanged through the option set that is used. It also allow you to limit the scope the product data that is being exported to the relevant subassembly.

You can exchange a configured collaboration context, a partial-configured collaboration context (configured collaboration context with relevant product data only), a delta-configured collaboration context (exchange of updated data since the last exchange), or specific studies in a collaboration context based on their maturity (status).

> Note:
>
> Export of specific studies based on their maturity status is available only for studies created in a collaboration context with *Study Structure Context*. Studies created with *Composition Context* will always be exported with the collaboration context.

If you are transferring large pieces of a collaboration context, you have the option to transfer in async (background) mode, allowing you to continue working in Teamcenter without waiting for the transaction to complete. Async mode transfers are facilitated using either Dispatcher or Teamcenter Integration Framework.

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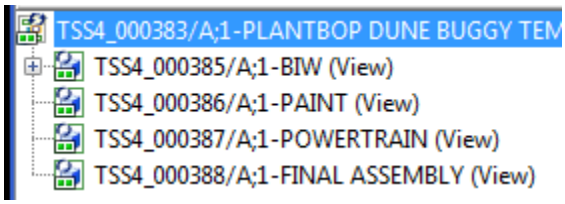
When exchanging a collaboration context, site ownership of all or certain objects within it can be transferred allowing modifications of those objects on the other site. If ownership is not transferred to another site, the edit control stays with the originating site.

Configured collaboration context briefcase export

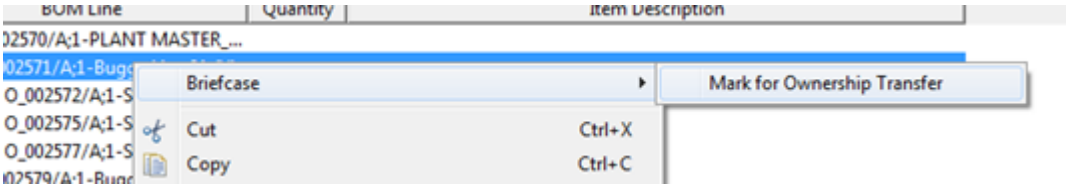
A configured briefcase export allows you to export a configured collaboration context for editing. The collaboration context contains all studies, BOP information, and so forth.

To allow users on the other site to perform modifications, site ownership must be transferred. Green dots are displayed on transferred objects indicating that the current site does not have ownership; therefore, they cannot be modified.

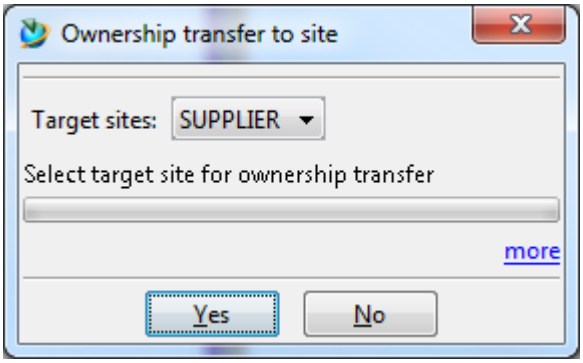


To export a configured collaboration context briefcase, do the following:

1. Mark the objects for ownership transfer by right-clicking each object and then choosing **Briefcase→Mark for Ownership Transfer**.



2. After marking the objects for ownership transfer, select the target site to which ownership should be transferred.



3. Go to collaboration context tree and select the collaboration context.

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4. Before exporting a collaboration context, make sure that the configuration is saved as the saved data will be exported. Choose **Save configuration**.

5. Select the collaboration context.

6. Choose **Tools→Export→To Briefcase**.

   The **Export Collaboration Context To Briefcase** dialog box appears.

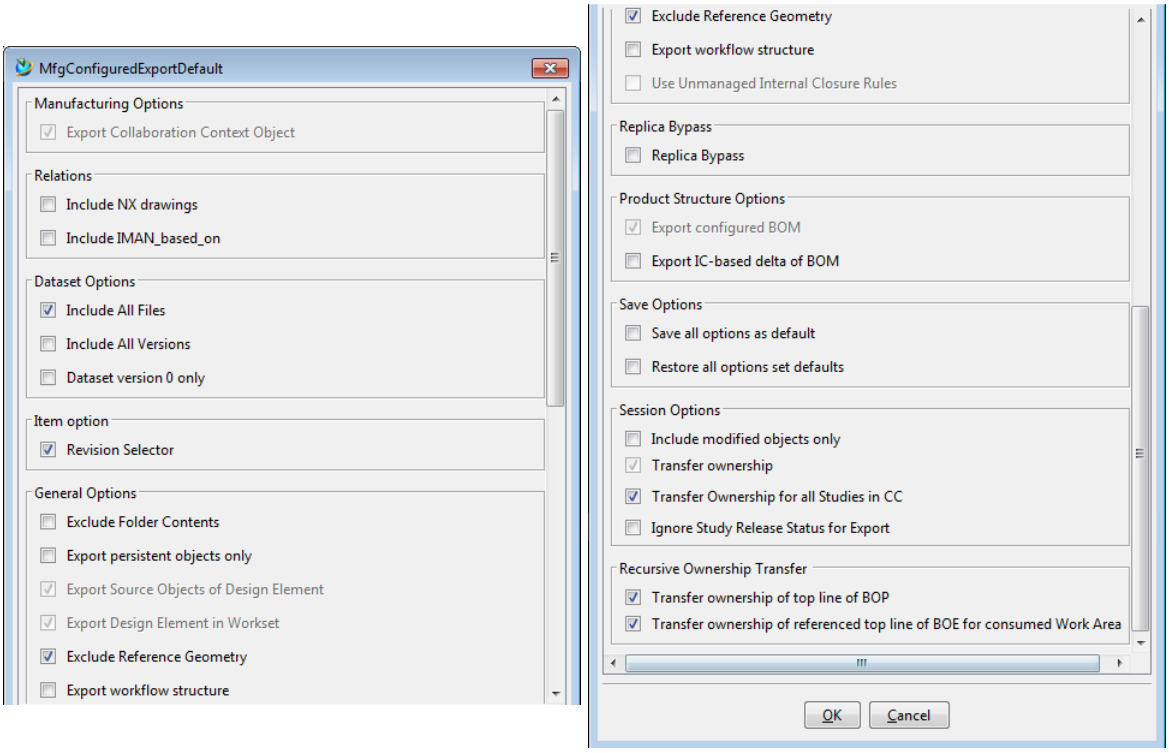
7. Identify the target site.

8. Set the option set to **MfgConfiguredExportDefault**.

9. Click .

   The **MfgConfiguredExportDefault** dialog box appears.

10. Select any options that apply, but make sure the **Include modified objects only** check box is *not* checked as it is not necessary for a full-configured export.



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Note:

Configuring what is displayed in the **MfgConfiguredExportDefault** dialog box is outlined in the *Key preferences for configuring briefcase exchange of collaboration context* section in Manufacturing Process Planning — Deployment and Administration.

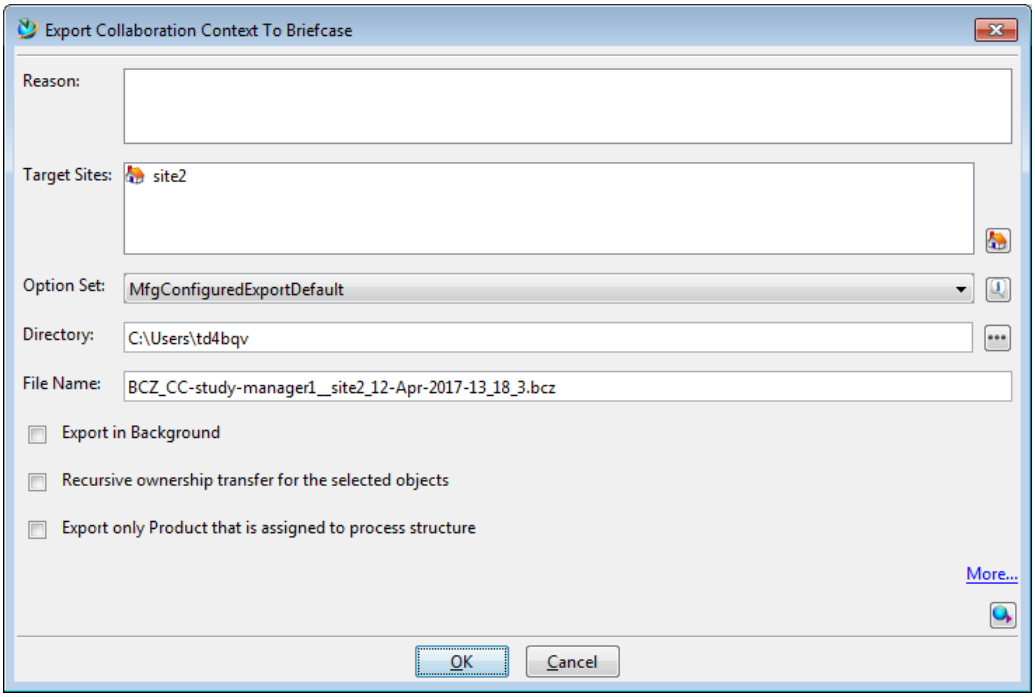
11. Click **OK** to close the **MfgConfiguredExportDefault** dialog box.

12. Set the output directory.

13. Enter the briefcase file name (with .bcz extension).

14. Depending how the **GMS_offline_use_TcGS** preference was set by your system administrator, you will see one of the following dialog boxes.

    If your system is *not* set up to export a briefcase in background mode or it is set up to use Dispatcher, you will see the following dialog box.



- Make sure the **Recursive ownership transfer for the selected objects** box is *not* checked.
- If you want to export the complete product data, make sure the **Export only Product that is assigned to process structure** box is *not* checked.
- To run in sync mode (none background), simply click **OK**. Then click **Yes** in the **Import Completed** dialog box if you want to view the log file.

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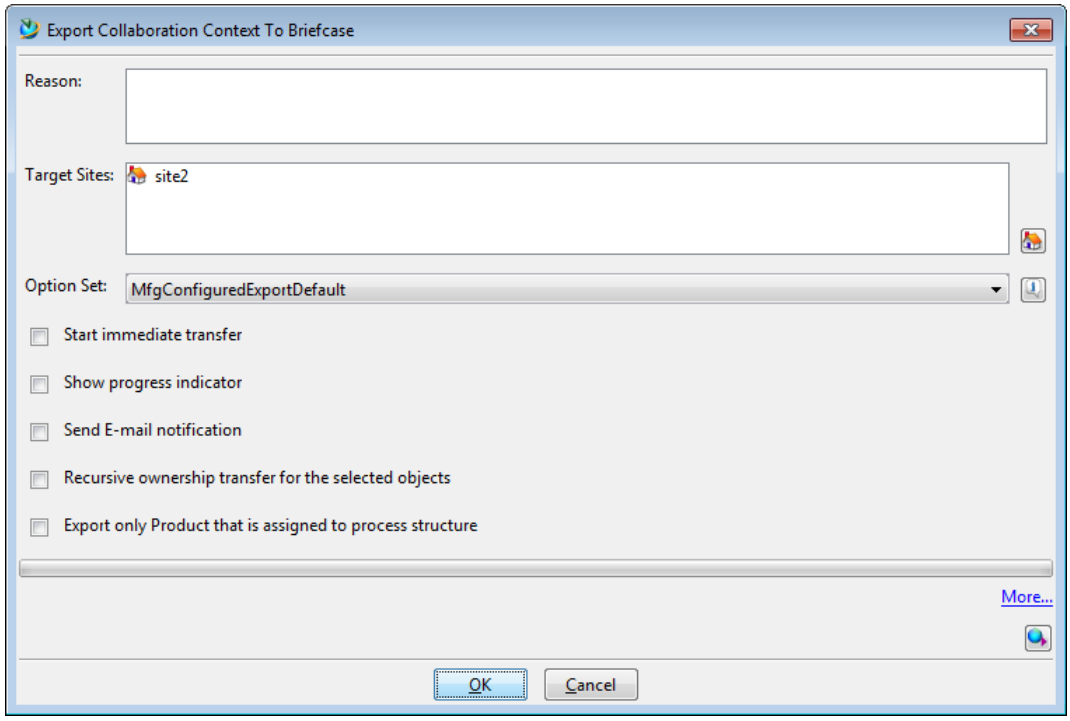
- To run in async mode (using Dispatcher), click the **Export in background** check box and then click **OK**.

If your system is set up to use Teamcenter Integration Framework, you will see the following dialog box.



- Make sure the **Recursive ownership transfer for the selected objects** box is *not* checked.
- If you want to export the complete product data, make sure the **Export only Product that is assigned to process structure** box is *not* checked.
- Click any or all of the export progress options and then click **OK**.

Teamcenter imports the full structure that was exported.

> Note:
>
> When the export finishes, green boxes will appear on ownership transferred objects.

Partial-configured collaboration context briefcase export

Partial-configured briefcase export allows you to export portions of a collaboration context. For example, a manufacturing engineer may only want to export a specific scope of MBOM from a collaboration context to a supplier based on all occurrence types consumed in a plant BOP or study.

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Note:

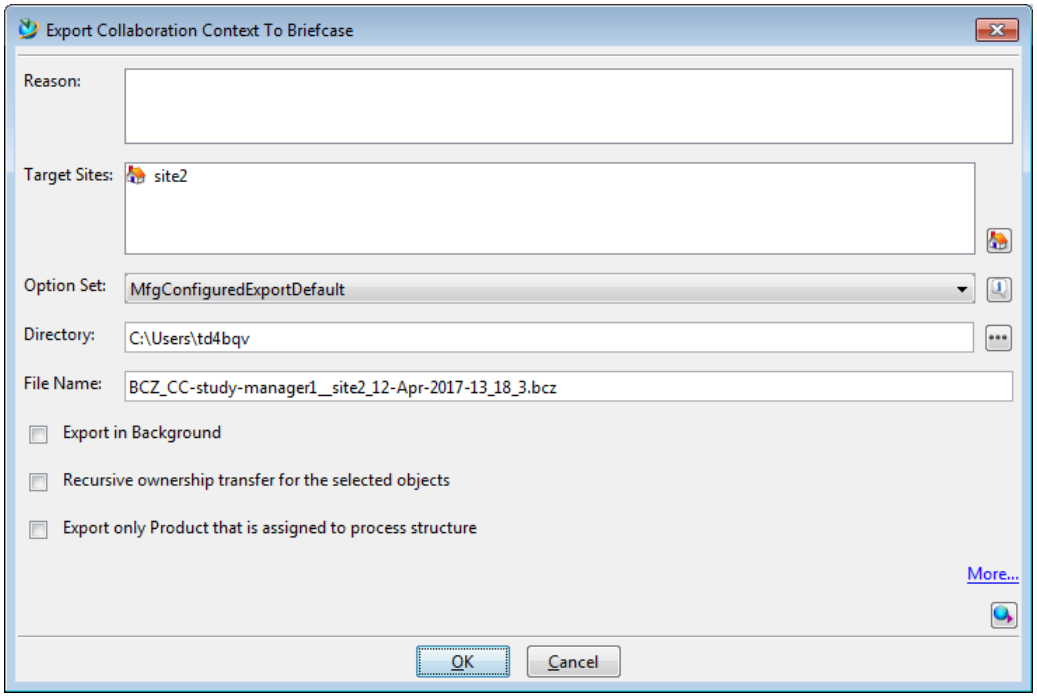
The object that is consumed, its hierarchical parents and hierarchical children, is in the scope of export.

To export a partial-configured collaboration context briefcase, do the following:

1. Select the collaboration context.
2. Choose **Tools→Export→To Briefcase**.

   The **Export Collaboration Context To Briefcase** dialog box appears.
3. Identify the target remote site.
4. Set the option set to **MfgConfiguredExportDefault**.
5. Set the output directory.
6. Enter the briefcase file name (with .bcz extension).
7. Depending how the **GMS_offline_use_TcGS** preference was set by your system administrator, you will see one of the following dialog boxes.

   If your system is *not* set up to export a briefcase in background mode or it is set up to use Dispatcher, you will see the following dialog box.



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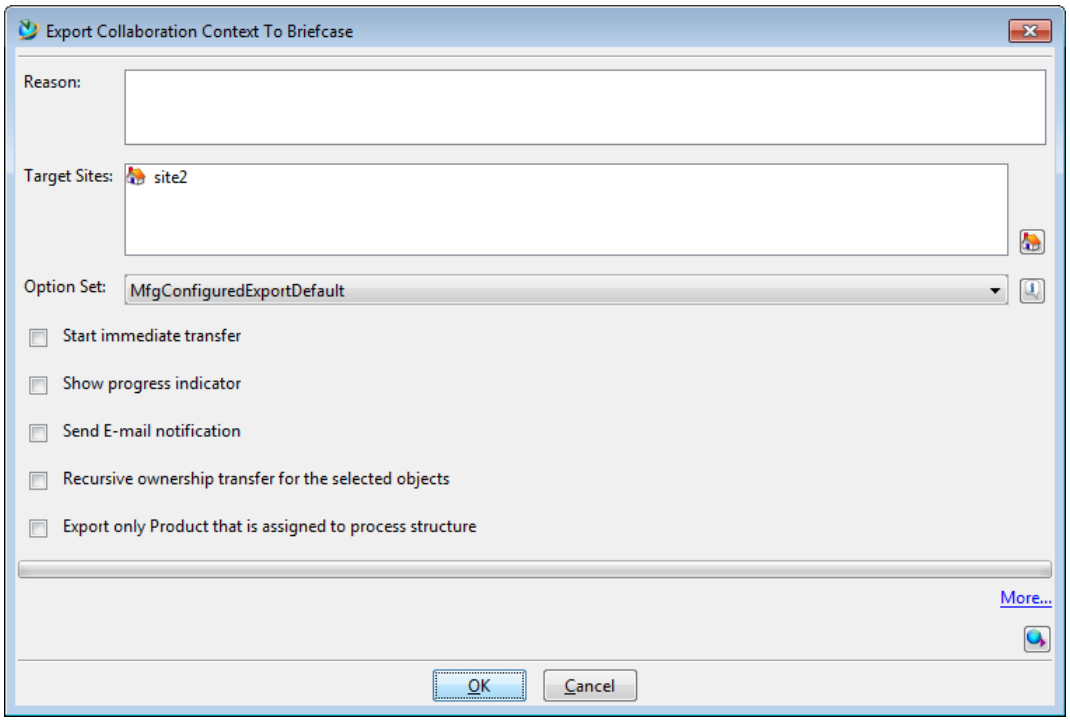
- Select the **Export only Product that is assigned to process structure** check box.
- To run in sync mode (none background), simply click **OK**. Then click **Yes** in the **Import Completed** dialog box if you want to view the log file.
- To run in async mode (using Dispatcher), click the **Export in background** check box and then click **OK**.

If your system is set up to use Teamcenter Integration Framework, you will see the following dialog box.



- Select the **Export only Product that is assigned to process structure** check box.
- Click any or all of the export progress options and then click **OK**.

Teamcenter imports the full structure that was exported.

> Note:
>
> When the export finishes, green boxes will appear on ownership transferred objects.

Delta-configured collaboration context briefcase export

Delta-configured briefcase export allows you to export or import only items that have changed in a collaboration context you have already exported or imported. As designs change during the product development process, the OEM and supplier can send updates of a collaboration context back and forth.

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A key advantage of using a delta-configured briefcase export is that the size of the export file is reduced, resulting in better performance and time savings over sending the full collaboration context.

For delta-configured collaboration context exports, there should be a structural change in at least one of the structures present in the collaboration context that is being exported. Structural changes include modification in attributes, adding a new Item, moving/removing an existing item, consuming an item, and so forth. Structural change does *not* include the change due to configuration rules only.

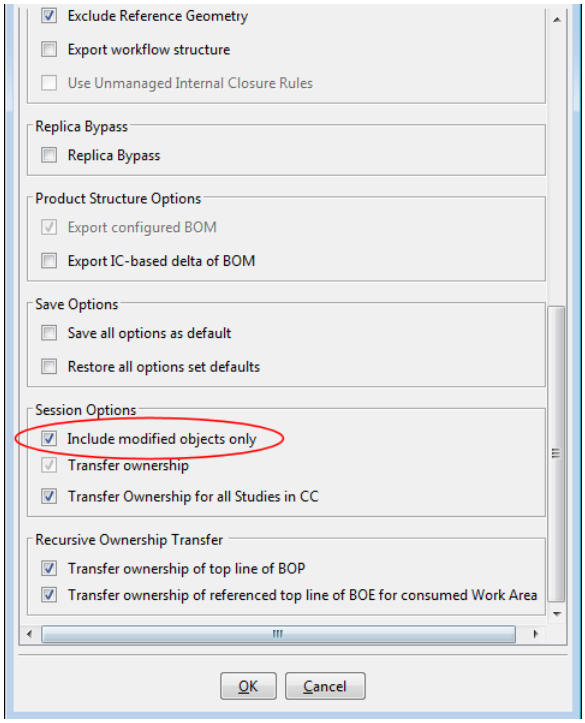
To export a delta-configured collaboration context briefcase, do the following:

1. Select the collaboration context.
2. Choose **Tools→Export→To Briefcase**.

   The **Export Collaboration Context To Briefcase** dialog box appears.
3. Identify the target remote site.
4. Set the option set to **MfgConfiguredExportDefault**.
5. Click .

   The **MfgConfiguredExportDefault** dialog box appears.

   a. Select the **Include modified objects only** check box.



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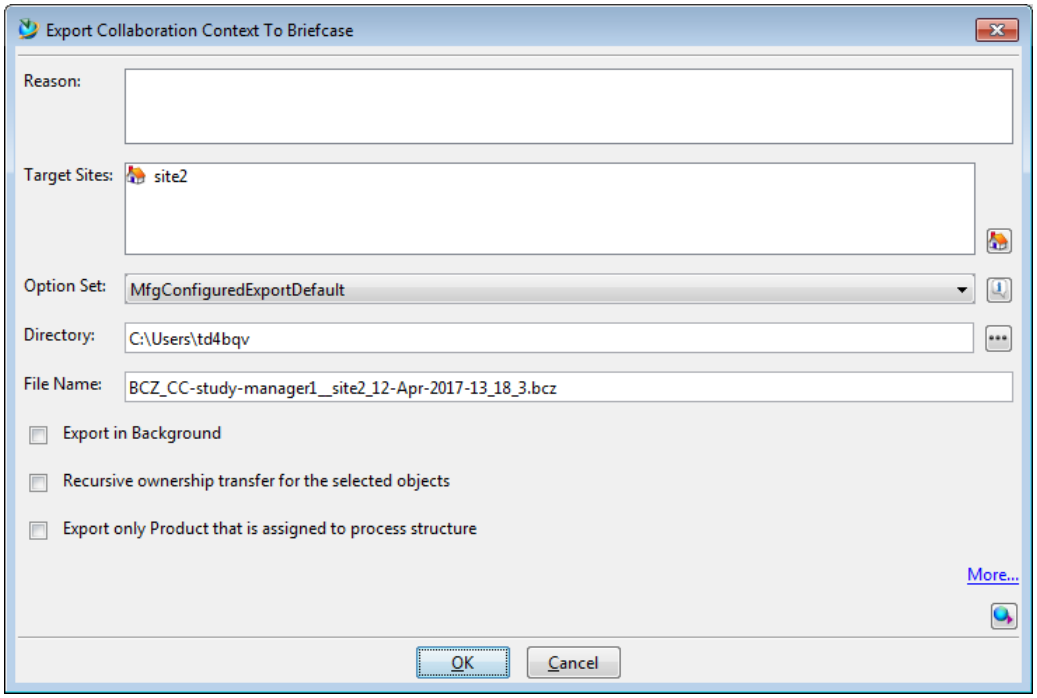
b. Click **OK** to close the **MfgConfiguredExportDefault** dialog box.

6. Set the output directory.

7. Enter the briefcase file name (with .bcz extension).

8. Depending how the **GMS_offline_use_TcGS** preference was set by your system administrator, you will see one of the following dialog boxes.

   If your system is *not* set up to export a briefcase in background mode or it is set up to use Dispatcher, you will see the following dialog box.



- To run in sync mode (none background), simply click **OK**. Then click **Yes** in the **Import Completed** dialog box if you want to view the log file.

- To run in async mode (using Dispatcher), click the **Export in background** check box and then click **OK**.

If your system is set up to use Teamcenter Integration Framework, you will see the following dialog box.

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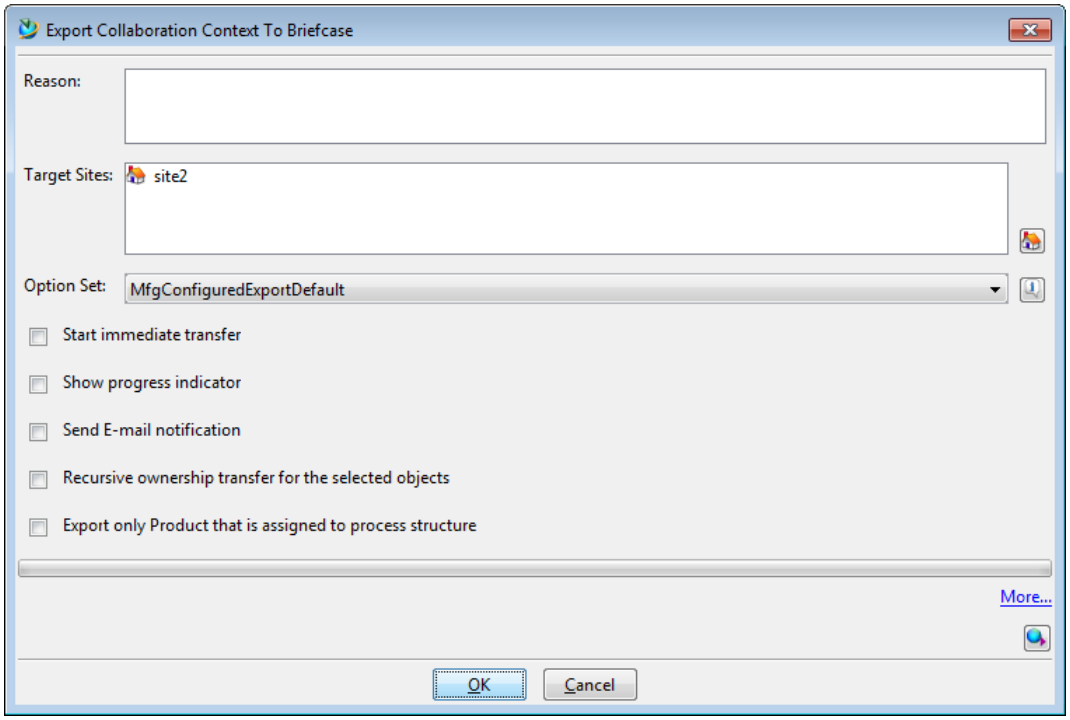

- Click any or all of the export progress options and then click **OK**.

Teamcenter imports the full structure that was exported.

> Note:
>
> When the export finishes, green boxes will appear on ownership transferred objects.

Import a collaboration context using briefcase

To import a collaboration context using briefcase, do the following:

1. In Teamcenter, choose **Tools→Import→From Briefcase**.

   The Import Briefcase dialog box is displayed.

2. Browse to the location of the exported the briefcase (.bcz) file and select it.

3. Select option set **TIEImportOptionSetDefault**.

4. Depending how the **GMS_offline_use_TcGS** preference was set by your system administrator, you will see one of the following dialog boxes.

   If your system is *not* set up to export a briefcase in background mode or it is set up to use Dispatcher, you will see the following dialog box.

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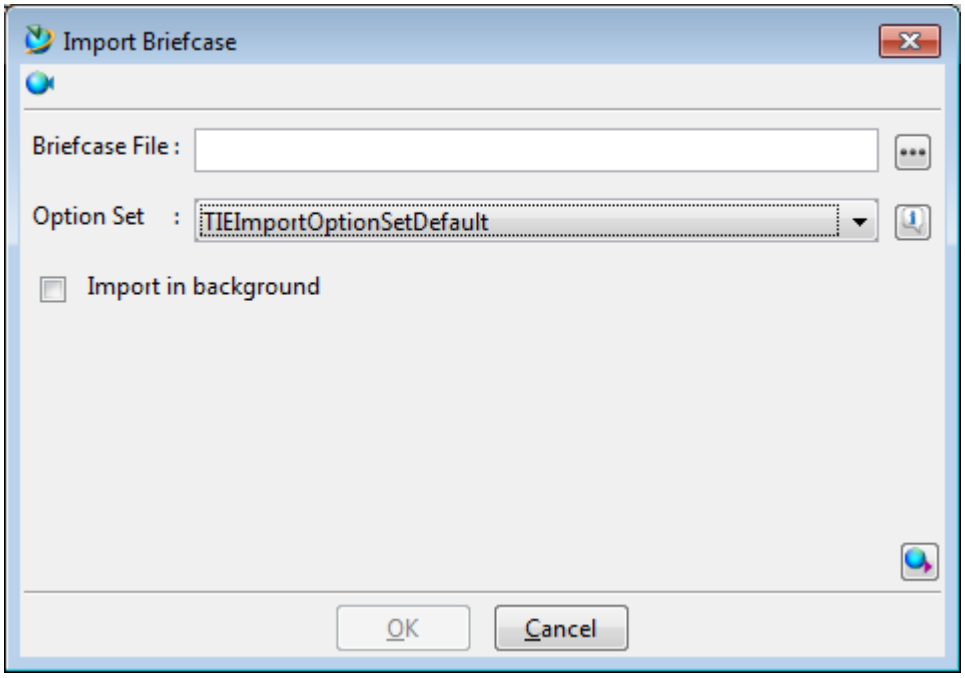

- To run in sync mode (none background), simply click **OK**. Then click **Yes** in the **Import Completed** dialog box if you want to view the log file.

- To run in async mode (using Dispatcher), click the **Import in background** check box and then click **OK**.

If your system is set up to use Teamcenter Integration Framework, you will see the following dialog box.

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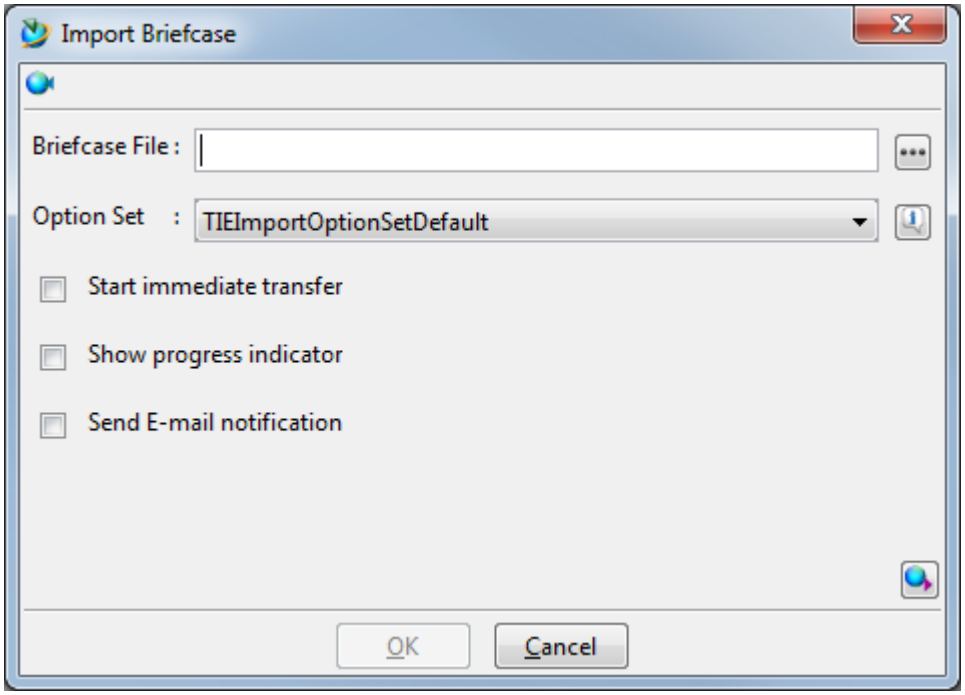


- Click any or all of the options and then click **OK**.

Teamcenter imports the full structure that was exported.

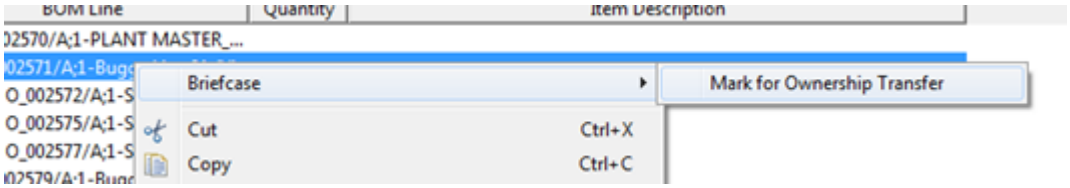
Recursive site ownership transfer for collaboration context

Recursive site ownership transfer is an option available during briefcase export of a collaboration context. It enables a user to achieve ownership transfer recursively below selected objects instead of marking them explicitly.

Recursive site ownership transfer is based on closure rules which can be easily modified/configured as per requirements. The name of the closure rule used for recursive ownership transfer is defined in the **MEAutomaticOwnershipTransferClosureRules** preference.

To export a collaboration context briefcase with recursive ownership transfer, do the following:

1. Mark the objects for which recursively ownership is to be transferred by right-clicking objects and then choosing **Briefcase→Mark for Ownership Transfer**.



2. Select the collaboration context.

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3. Choose **Tools→Export→To Briefcase**.

   The **Export Collaboration Context To Briefcase** dialog box appears.

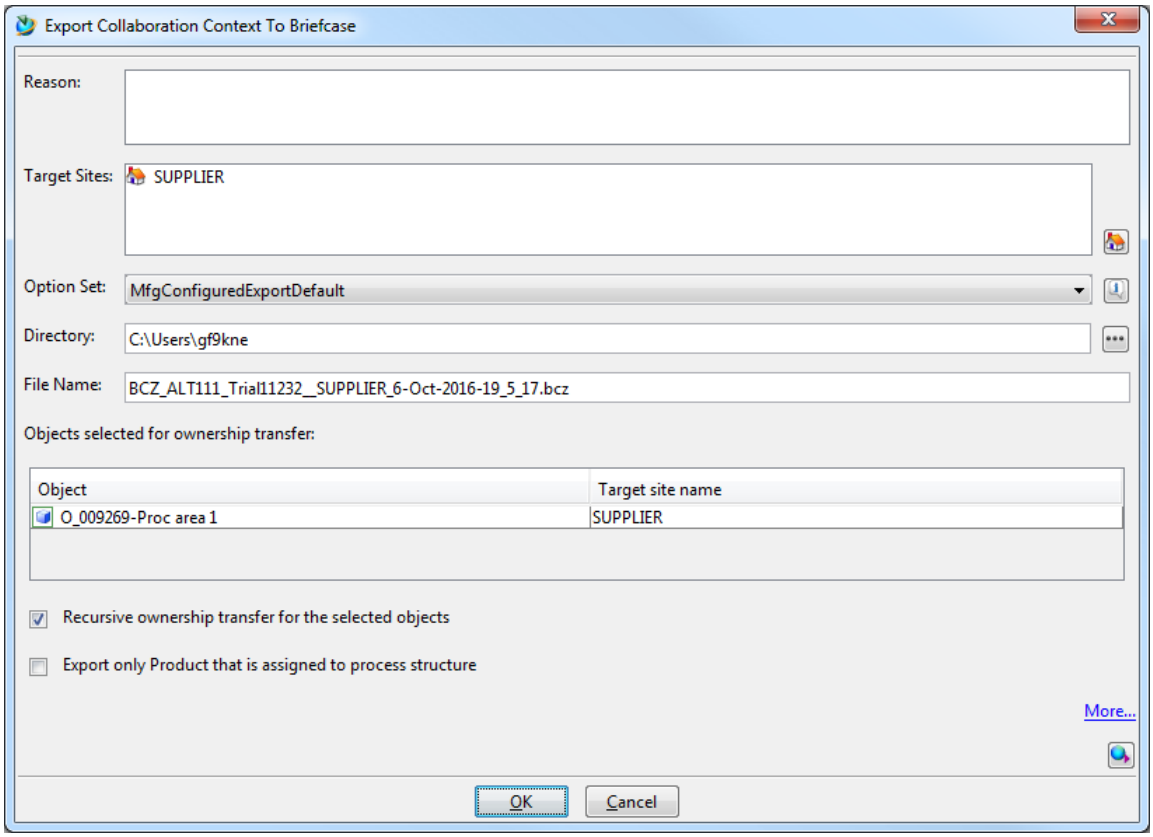
4. Identify the target remote site.

5. Set the option set to **MfgConfiguredExportDefault**.

6. Enter the output directory.

7. Enter the briefcase file name (with .bcz extension).

8. Select the **Recursive ownership transfer for the selected objects** check box.



9. When all parameters are set, click **OK**.

10. Click **Yes** or **No** in the **Export Completed** dialog box.

    The green boxes now appear on ownership transferred objects.

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Including specific studies during configured collaboration context export

Including specific studies for export

When exporting studies in a collaboration context, you have the option to include all, none, or specific studies. Specific studies are included based on their maturity (status), which is applied through an OOTB workflow template. The designated status for study export is established based on the **MEStudyMaturityStatusforBriefcaseExport** preference, which has a default value of **Approved**. This means that all studies in a collaboration context with a status of Approved will be exported.

> Note:
>
> If the value of the **MEStudyMaturityStatusforBriefcaseExport** preference is blank, all studies, irrespective of their status will be exported with collaboration context export.

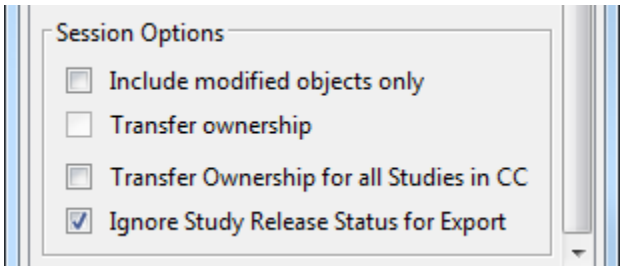
> Note:
>
> Export of specific studies based on their maturity status is available only for studies created in a collaboration context with *Study Structure Context*. Studies created with *Composition Context* will always be exported with the collaboration context.

There are two OOTB process templates that add or remove the status on studies.

- Mfg Add Study For Briefcase Export
- Mfg Remove Study From Briefcase Export

You add or remove a study status for export following the normal Teamcenter work flow process.

In the final steps of a briefcase export, you also have the option to ignore the status of a study. By default, the **Ignore Study Release Status for Export** option in the **Session Options** section of the **MfgConfiguredExportDefault** dialog box is selected, meaning the export will ignore any status on the study being exported. To include a specific study, whose status is defined in the **MEStudyMaturityStatusforBriefcaseExport** preference, you must clear the check box.



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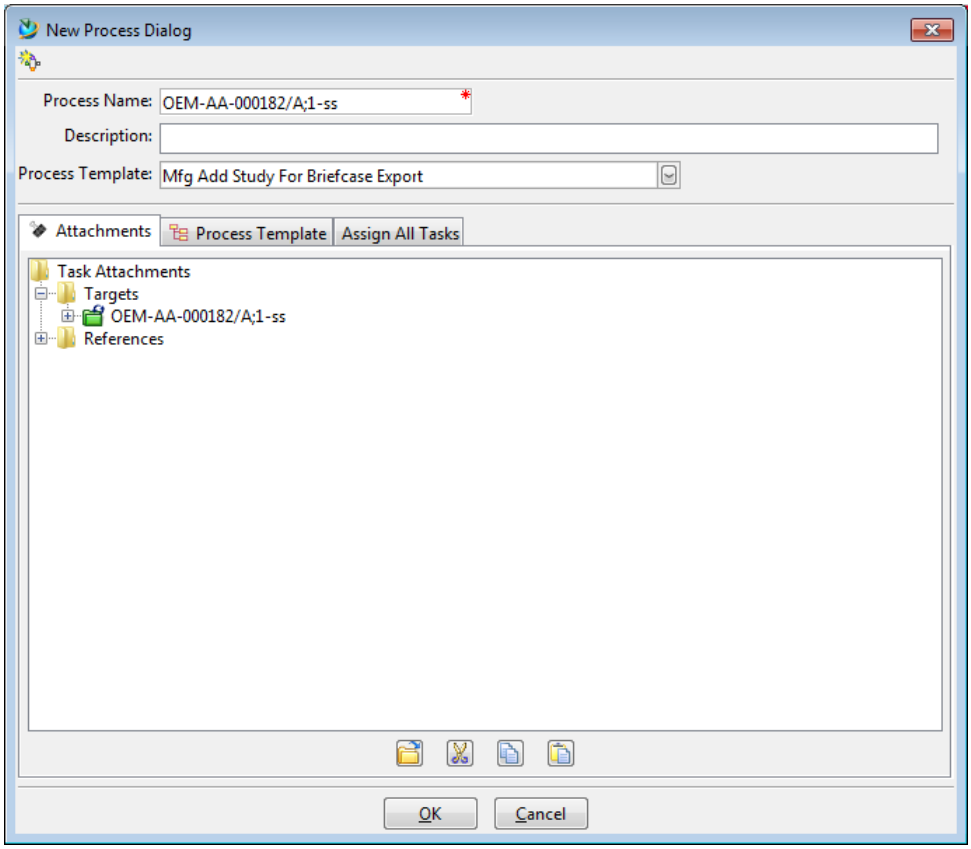
Add or remove a status to a study

Add a status to a study

1. Select the study to status for export.

2. Choose **File→New→Workflow Process**.

3. Set the Process Template to **Mfg Add Study For Briefcase Export**.



4. Click **OK**.

   The study is marked for export. Follow the normal collaboration context export steps to export the marked studies.

Remove a status from a study

1. Select the study.

2. Choose **File→New→Workflow Process**.

3. Set the Process Template to **Mfg Remove Study From Briefcase Export**.

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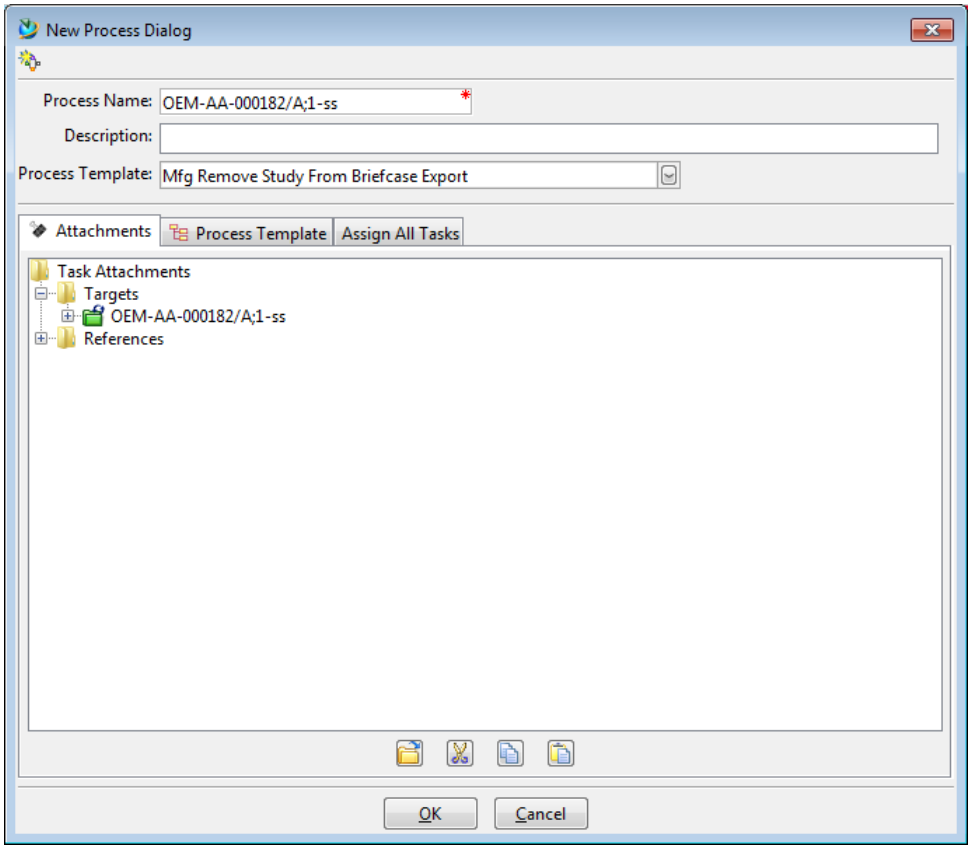

4. Click **OK**.

   The study is unmarked for export.

Opening a collaboration or structure context

When you open a collaboration context in Manufacturing Process Planner, each structure context within the collaboration context appears in a separate view. The collaboration context is listed in the **Collaboration Context Tree** view.

You can open a collaboration or structure context using any of the methods described in *Load data to Manufacturing Process Planner*.

Saving a collaboration context

Teamcenter saves any changes you make to the collaboration context automatically, except for configuration changes. You must save these using the **File→Collaboration Context→Save Configuration** menu command or choosing **Save Configuration** from the view menu in the **Collaboration Context Tree** view.

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Manipulate objects in a collaboration context

You can move structure contexts in and out of a collaboration context in the **Collaboration Context Tree** view.

- Move a structure context into a collaboration context.

  1. Select a structure context.

     The structure context that you select here must be open as a root structure (must show as a root structure in the **Collaboration Context Tree** view) and not as part of a collaboration context.

  2. Choose **Move Structure Context into CC Object** from the view menu or choose **File→Collaboration Context→Move Structure Context into CC Object**.

     Teamcenter displays the **Move Structure Context into CC Object** dialog box. The **CC Object** list displays all open collaboration contexts.

  3. From the **CC Object** list, select a collaboration context and click **OK**.

  Teamcenter adds the structure context to the specified collaboration context.

- Remove a structure context from a collaboration context.

  1. Select a structure context in a collaboration context.

  2. Choose **Remove Structure Context from CC Object** from the view menu or choose **File→Collaboration Context→Remove Structure Context from CC Object**.

  Teamcenter removes the structure context from the collaboration context and displays it as a root structure in the **Collaboration Context Tree** view.

Find collaboration contexts containing a selected line

1. Right-click a line in a structure and choose **Tools→Find Affected Collaboration Contexts**.

   Teamcenter displays a list of any collaboration contexts in the database that contain the selected line except for structure contexts that consist of occurrence groups, generic BOPs, or plant BOPs.

2. Right-click the desired collaboration context and choose **Send To→Manufacturing Process Planner** or double-click the collaboration context to open it.

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Manage configuration contexts

You can save a specific configuration to a configuration context. You can apply this configuration to a structure context at a later point. In this way, you can easily change between various configurations to see their effect on a structure.

> Tip:
>
> You can see the currently active configuration in the **Configuration Information** dialog box or in the configuration header of the structure view. If the configuration header is not visible, set the **MEShowConfigurationHeader** preference to **true**.

Do any of the following:

- Create a new configuration context.

  1. With a collaboration context selected, choose **File→New→Configuration Context**.
  2. Select a type of configuration context from the list and click **OK**.
  3. Type a name for the configuration context and, optionally, a description.
  4. (Optional) Specify the revision rule to save in the configuration context.
  5. (Optional) Specify the closure rule to save in the configuration context.
  6. (Optional) Save the state of the **Show unconfigured** buttons.
  7. Click **Finish**.

     Teamcenter saves the configuration context object in the **Newstuff** folder in My Teamcenter.

     > Caution:
     >
     > If you create a new configuration context while you have a collaboration context selected, the new collaboration context replaces the existing collaboration context.

- Save the configuration of an open structure to a configuration context.

  1. Select the structure with the configuration you want to save. You can select a root structure or a structure context.
  2. Choose **Save as New Configuration Context** from the **Collaboration Context Tree** view menu or choose **File→Configuration Context→Save as New Configuration Context**.
  3. Select a type of configuration context from the list.

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4. If you selected a structure context in step 1, select **Paste to Structure** if you want the new configuration context to replace the one currently belonging to the structure context.

5. Click **Next**.

6. Type a name for the configuration context and, optionally, a description.

7. Click **Finish**.

- Apply a saved configuration to an open structure.

  1. Select a structure context or an open structure.

  2. Choose **Apply Configuration Context** from the **Collaboration Context Tree** view menu or choose **File→Configuration Context→Apply Configuration Context**.

     > Note:
     >
     > When applying a configuration context that contains the **Preference-Driven** entry for the **Show Unconfigured** buttons, Teamcenter respects the settings of the structure to which the configuration context is being applied and does not change the state of the buttons to reflect the **MEShowUnconfigured...** preferences.

  3. Search for a configuration context by clicking **Open an object by name** .

     Teamcenter displays the configuration contained in the selected configuration context in the **Apply Configuration Context** dialog box. These entries are for informational purposes only. You cannot change them.

  4. Click **OK**.

  Teamcenter applies the new configuration to the open structure.

- Restore a configuration to the one saved in the loaded configuration context.

  1. Select the structure context.

  2. Choose **Restore Configuration** from the **Collaboration Context Tree** view menu or choose **File→Configuration Context→Restore Configuration**.

     Teamcenter applies the configuration contained in the existing configuration context to the structure view.

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Note:

When applying a configuration context that contains the **Preference-Driven** entry for the **Show Unconfigured** buttons, Teamcenter respects the settings of the structure to which the configuration context is being applied and does not change the state of the buttons to reflect the **MEShowUnconfigured...** preferences.

- Save an existing configuration.

  - Select a structure and choose **Save Configuration** from the **Collaboration Context Tree** view menu or choose **File→Configuration Context→Save Configuration**.

If you select	This happens
A structure context that has a configuration context	The configuration context is updated to reflect the current configuration.
A structure context that does not have a configuration context	A dialog box opens where you can choose the name, type, and description for the new configuration context. The new configuration context reflects the current configuration.
A collaboration context	For each structure context under the collaboration context: ■ If the structure context has a configuration context, the configuration context is updated to reflect the current configuration. ■ If the structure context does not have a configuration context, a configuration context is not created and a message lists the structure contexts for which a configuration was not saved.

Saving the state of the Show Unconfigured ... buttons

Teamcenter provides you with several buttons or menu options that show or hide objects in the structure and in the **Graphics** view. These are:

- **Show Suppressed Occurrences**
- **Show Unconfigured Variants**
- **Show Unconfigured By Occurrence Effectivity**
- **Show Unconfigured Changes**

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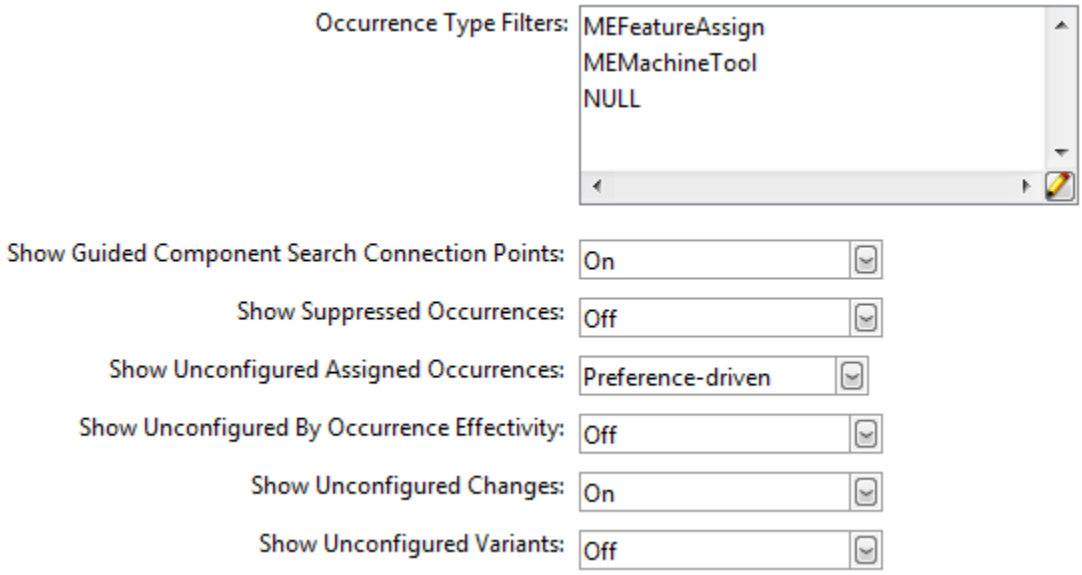
- **Show Unconfigured Assigned Occurrences** (only applicable to process assemblies)
- **Show GCS Connection Points**
- **Apply Occurrence Type Filters**

Whether these buttons are turned on or off affects what is shown in the **Graphics** view, and, therefore, affects any product view snapshots created in that view. Teamcenter saves the state of these buttons so that when a product view is restored, the same objects are displayed in the **Graphics** view as when the snapshot was created. The state of these buttons is stored in a configuration context.

When you create a new configuration context or save an existing configuration to a configuration context, you can specify the state of the first four of these buttons (**On** or **Off**), or you can specify that the state is **Preference-driven**. The following preferences specify the state of these **Show Unconfigured** buttons:

- **MEShowSuppressedOccsDefaultState**
- **MEShowUnconfiguredVariantsDefaultState**
- **MEShowUnconfiguredOccurrencesEffectivityDefaultState**
- **MEShowUnconfiguredChangesDefaultState**
- **MEShowUnconfiguredAssignedOccurrencesDefaultState**

You can also view or change the state of all options in the configuration context properties.



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Note:

When applying or restoring a configuration context that contains the **Preference-Driven** entry for the **Show Unconfigured** buttons, Teamcenter respects the settings of the structure to which the configuration context is being applied or for which the configuration context is being restored and does not change the state of the buttons to reflect the **MEShowUnconfigured...** preferences. This retains the behavior of configuration contexts that were created prior to Teamcenter 10.0, when the configuration context did not save the state of the buttons. When you open a structure or collaboration context containing a configuration context where all values are set to **Preference-Driven**, the structure view opens with the states of the **Show Unconfigured** buttons reflecting the values of the preferences.

Pasting under a collaboration context object

When pasting a structure context to a collaboration context or a configuration context to a structure context object, Teamcenter pastes it with an **IMAN_CCContext** relation. Do not use the **Paste As** command to change this relation when pasting collaboration context objects. If you change the relation, the associated contexts will no longer load when loading the collaboration context.

Associating product and process structures

Creating a relationship between product and process structures

After you define all operations and activities that comprise a manufacturing process, establish a relationship between the process and the product it manufactures. To do this, associate the product as a target item of the process.

You can also assign product parts to the process structure with a specific occurrence type. The following table lists some of the available occurrence types.

Occurrence type	Use
ME Assign	Used when assigning parts to processes.
MEConsumed	Used by the operation that takes a part out of the bin.
METool	Used to assign tools to processes and operations.
MEResource	Used to assign equipment to processes and operations.
ME Assemble	Used by the operation that attaches the part to the product.
ME Disassemble	Used by operations when they disassemble a part.
ME Handle	Used when all other relationships to an operation do not apply.

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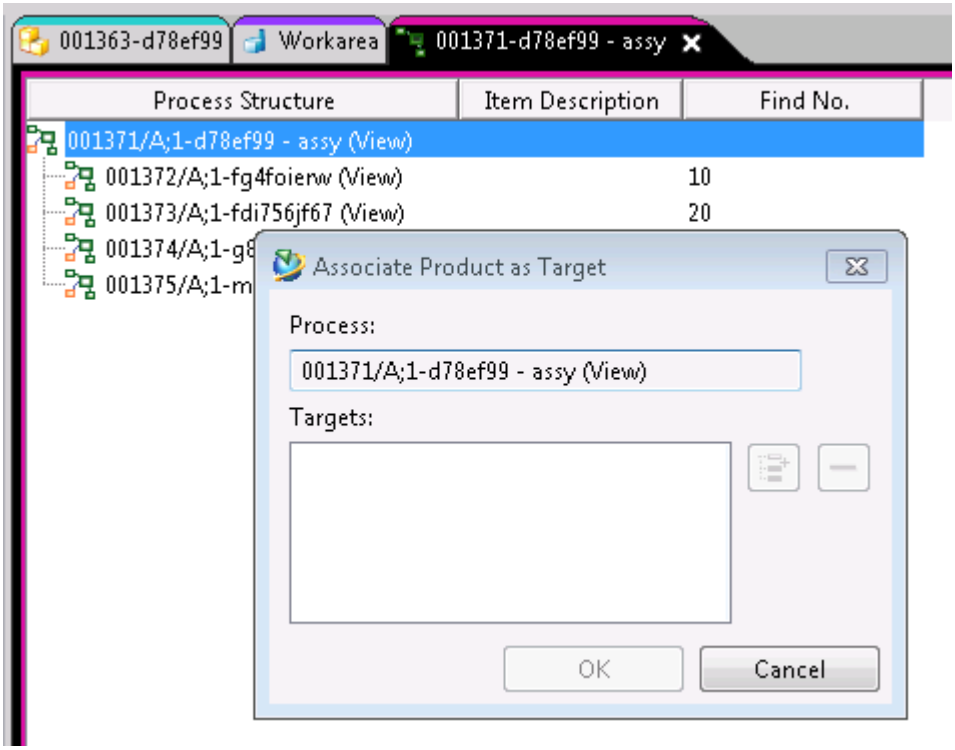
Occurrence type	Use
ME Feature Assign	Used when assigning manufacturing features to operations.
METarget and **MEOther**	Used for other types of assignments that do not involve consuming, handling, assembling, or disassembling for operations and assignment for processes.

Associate a product as target

When you associate a product as the target, you create a relationship between the product structure and the process. You can link a product and a process several times if the process is repeated.

1. Right-click the process line and choose **Link/Associate→Associate Product as Target**.

   Teamcenter opens the **Associate Product as Target** dialog box with the process listed in the **Process** box.



2. In the product structure view, select the product line that you want to associate as the target and click the **Set/add current selection** button in the **Associate Product as Target** dialog box.

   Teamcenter enters the name of the product in the **Targets** box.

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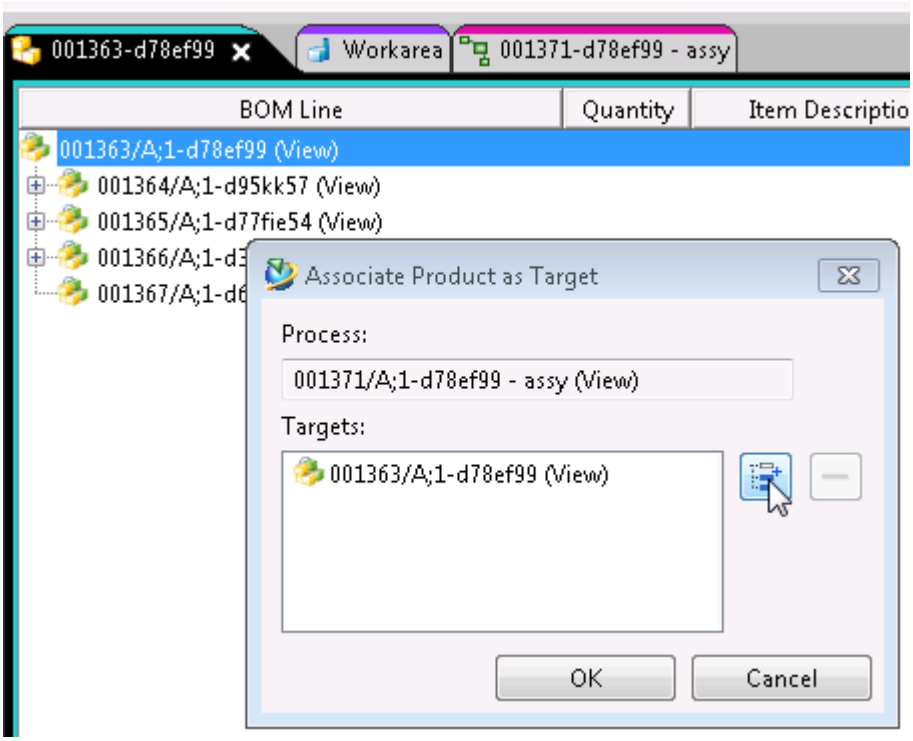
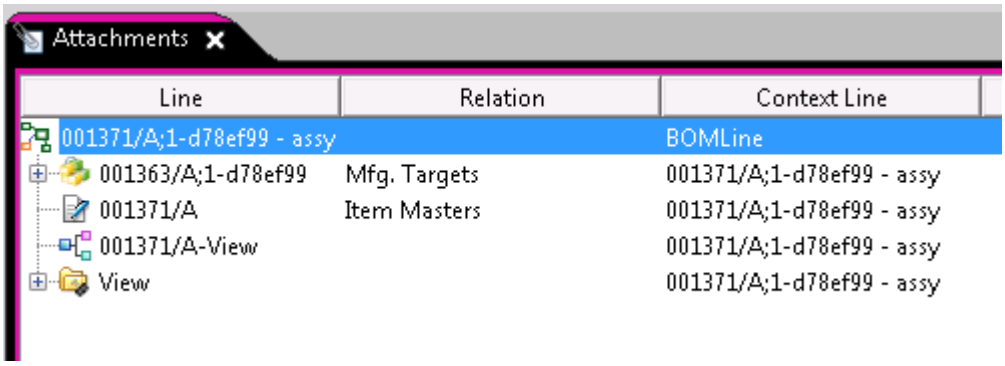


3. Click **OK**.

   This attaches the product structure as the target to the setup structure of the process. You have established the relationship between the product and top-level process used to manufacture that product.



Assign a part to a process

Do one of the following:

- Use the **Copy** and **Paste** commands.

  1. Right-click a part revision in a structure view and choose **Copy**, or click the **Copy** button on the toolbar.

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2. In the process pane, select the appropriate process and choose **Paste**.

- Drag the part to the appropriate process.

By default, if an occurrence type is defined for a BOM line and you assign the BOM line to a process or operation, Teamcenter uses the same occurrence type. However, if your administrator sets the **MEAssignCustomizedOccurrenceType** preference, you can specify a different occurrence type during the assignment.

You can specify the properties that are copied over from part to process during the assignment process using the **MEAssignProperties** preference.

Assign a product with a specific occurrence type

Do one of the following:

- Assign using **Copy** and **Paste As**.

  1. Right-click a product revision in a structure view and choose **Copy**, or click the **Copy** button on the toolbar.

  2. In the process pane, select the top-level process to be assigned to the product selected in the product pane and choose **Paste As** and one of the occurrence types listed, depending on the purpose of your assignment.

     If you assign as **MEConsumed**, Teamcenter establishes the link between a part and the process when the part is consumed in an assembly operation. A consumed item is required during a manufacturing process or operation.

     If you assign as **MEWorkpiece**, Teamcenter establishes the link between the workpiece and a process or operation. A workpiece can represent an intermediate state of the product during the manufacturing process.

     > Note:
     >
     > The occurrence types available to you are determined by your administrator using the **MEDisplayOccurrenceType** preference.

- Change the occurrence type in the **Occurrence Type** column.

Share an operation across process plans

You can share an operation across top levels of two process plans.

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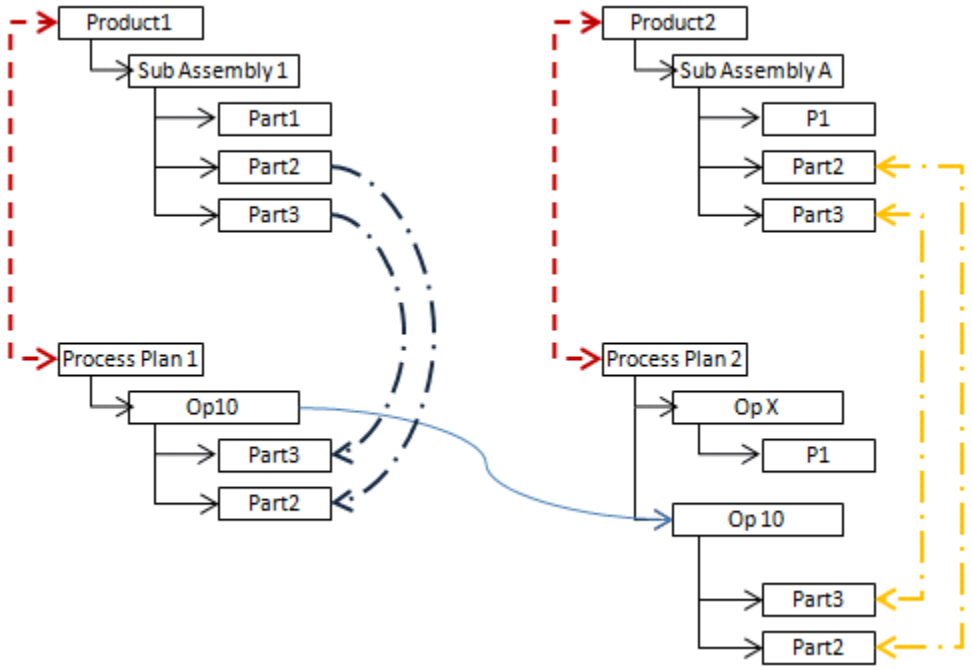

	Associate product to process
	Assign parts to process
	Share an operation
	Link to manufacturing process

Note:

You cannot use this method to share operations within the same process plan.

1. Copy the operation that you want to share to the clipboard.
2. Load the second top-level plan with which the operation is to be shared.
3. Expand the process plan to the required subprocess.
4. Paste the operation to the subprocess.

   Teamcenter does not create a new operation with a unique ID.
5. Expand the subprocess to the required items that are consumed in the shared operation for this top level.

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6. Select the consumed item in the process and choose **Link/Associate→Link to Manufacturing Process** from the shortcut menu.

   Teamcenter displays the **Link to Manufacturing Process** dialog box.

7. Select the desired part from the **Source parts** list or select the part in the product structure and click **Set/Add current selection** .

8. Click **OK**.

Reconciling broken links

About broken links

Changes to the product or plant structure are not automatically updated in the process tree where the occurrence is referenced. This results in a *broken* link. With this feature, you can identify broken links and search for the possible occurrence that was originally defined, for example, as a consumed part.

When you expand a process to display linked items, each link line includes a symbol indicating the state of the reference:

Symbol	Description
	Occurrence is linked to a product or plant structure.
	Link is broken.
	Occurrence is linked to a product or plant structure that is not currently loaded, or a product or plant structure is loaded but not currently configuring the process structure.

Note:

Teamcenter retrieves the status of a link from a run-time property, **Mfg0LinkState**.

When performing the search for broken links, Teamcenter searches through process structures that you specify and looks for broken links. It then looks through product or plant structures that you specify for likely *candidates* to repair these links. The search is based on criteria that you can specify in the **MPP_DefaultCandidateSearchCriteria** preference. Once found, you can have Teamcenter repair these links automatically, or you can choose to select candidates manually from the candidates list.

Your administrator can save search criteria for you to use. You can further modify these criteria and save your modifications to the saved criteria.

When there are many broken links and each broken link has many candidates, a large amount of memory is required for high-speed processing. If the total number of broken links and candidates is too large, for example, 32,000 lines, the memory usage may be a concern if you are performing the search

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on an underpowered computer. To speed up the search, divide the search scope into smaller pieces to reduce memory usage; for example, select subnodes instead of the root node.

If you see the white link symbol for a line, it means that the occurrence is linked to a product or plant structure that is not currently configuring the process structure. Select **Define Configuring Structures** from the view menu to specify the product or plant that should configure the process.

The following properties are supported in a search for broken links:

- A selection of BOM line properties:

  Item Id
  Find number
  Quantity
  Usage Address
  Reference Designator
  Position Designator

- All types of occurrence notes
- Any extended or custom properties your administrator creates
- Properties found on the weld attribute form

Identify broken links

1. Open the process in which you want to search for broken links.
2. Choose **Tools→Repair Broken Links** or choose **Repair Broken Links** from the shortcut menu.

   Teamcenter displays the **Repair Broken Links** dialog box.
3. Modify the scope for the broken link candidate search by adding or removing product structure lines. Do this by selecting them in the product structure and clicking **Set/Add current selection** .
4. (Optional) Modify the search criteria.
5. To set a revision rule, click **Alternative Revision Rule**.

   You can choose to view or set the revision rule, enter the end unit/date, or set an override folder.
6. Choose whether you want to perform a quick or a more thorough search in the **Structures Traversal** section.

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Click	To
Visible Structure	Search through the launched, loaded structure (all the currently expanded and visible lines). The quick search does not include nodes that have never been expanded (that is, nodes that are not loaded) or are hidden due to effectivity or variant conditions.
Full Structure	Search through the complete tree in the launched structures, loading as necessary. The search expands collapsed (unloaded) nodes; it does not include nodes hidden due to effectivity or variant conditions.

7. To search for broken links only, and not perform the more time-consuming candidate search, clear **Include Candidates**.

8. To have Teamcenter repair the links automatically, select **Automatic Repair**.

   Teamcenter searches for eligible candidates in the product or plant structure and, if only one candidate is found, automatically creates a relationship of the same type as the broken link between the process line and the lone candidate.

9. Click **Search**.

   Teamcenter searches for all broken links from the selected process node down to the leaf nodes and displays them in the **Broken Links** list. If you select **Include Candidates**, it also searches for all candidates that fulfill the search criteria and displays them in the **Candidates** list.

   If you select a line in the process structure on which to perform the search with multiple broken links in the substructure, and **Automatic Repair** is active, all broken links for which Teamcenter finds a unique candidate are repaired.

Repair broken links

1. Search for broken links.

2. Select the broken link that you want to repair from the **Broken Links** list.

3. (Optional) Click **Show in Tree** to see the line containing the broken link highlighted in the process structure.

4. Select the candidate to which you want to relink the process line in the **Candidates** list.

5. (Optional) Click **Show in Tree** to see the candidate for repair highlighted in the product or plant structure.

6. Click **Repair**.

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Teamcenter relinks the process line to the product or plant line and the symbol is updated in the **Broken Links** list to show the link is no longer broken. You can select multiple pairs of broken links/candidates before clicking the **Repair** button. Teamcenter remembers your choices and processes all the pairs that you select.

Modify search criteria

By default, when searching for candidates to repair broken links, Teamcenter examines the properties listed in the search criteria that you select from the **Stored Criteria** list. If the criteria of a perspective candidate match the values in the search criteria, the candidate is proposed as a replacement.

1. Select a search criteria from the **Stored Criteria** list.

   The choices shown are saved by your administrator.

2. Click **Edit** beside the **Stored Criteria** box and add BOM line properties by clicking the **Add** + button.

   Teamcenter adds new properties to the criteria list in the order in which they are displayed in the columns of the process view. To display more properties, you must first add new columns with the desired properties to the process view.

   > Note:
   >
   > If a property is added by a preference, its name is displayed as the internal property name.

3. Designate whether the properties should be considered as mandatory or optional by clicking in the cell and selecting a value.

4. Enter a property value.

   You can use the * wildcard symbol or a space between characters.

5. (Optional) Save the modified search criteria by clicking **Save Criteria**.

   You can only modify search criteria that were saved by your administrator. You cannot modify the **MPP_DefaultCandidateSearchCriteria** search criteria.

Break associations

To break an association between a product and a process or a work area and a process, do the following:

1. Right-click the process root and choose **Link/Associate→Associate Product as Target** or **Link/Associate→Associate Workarea**, depending on which association you want to break.

   Teamcenter displays a dialog box listing the existing associations.

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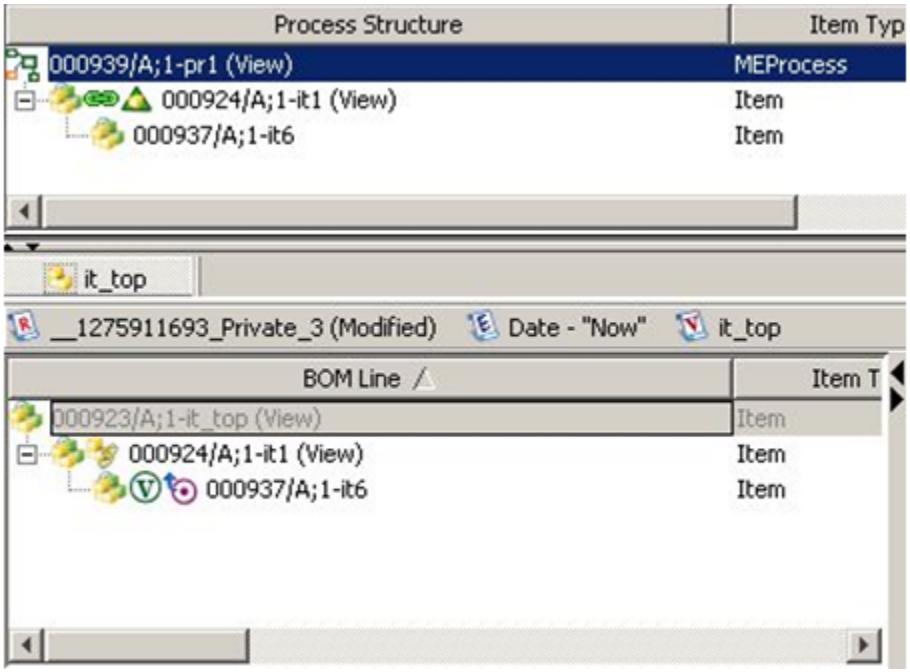
2. Select the undesired association and click **Remove selected object** —.

Teamcenter removes the association between the product and process or work area and process.

Consuming an assembly with in-context information

In the following example, an assembly part is consumed below a process structure. If a child item in the product structure contains in-context information that was edited for a part above the consumed part, you cannot see the in-context information in the process structure. In the following example, **it6** has a variant condition in the context of **it_top**. Therefore, you see the variant symbol and the target symbol in the product structure.



If the in-context information is added in the context of the consumed line or below it, it is visible. In the following example, the variant condition of **it7** is edited in the context of **it1**, which is the consumed line. Therefore, the in-context information is available in the process structure.

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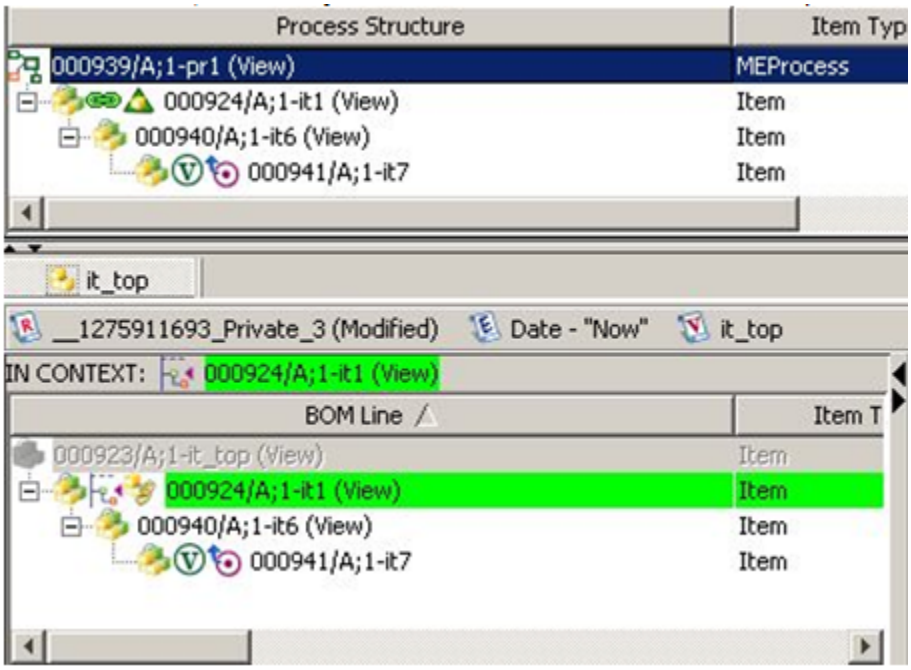

Link unconsumed items as required

You can add items to a process plan that are used by a process but not consumed by it, such as glue or heat treatment. You link these using a **MERequired** relation.

1. Open the process structure and the product structure that contains the item you want to link.

2. Right-click the appropriate operation in the process structure and choose **Link→Link As Required**.

   Teamcenter displays the **Link as Required** dialog box.

3. Select the item in the product structure that you want to link to the operation and click in the **Link as Required** dialog box.

4. Click **OK**.

5. Right-click the operation and choose **Open With→Required Items**.

   Teamcenter displays the **Required Items** view showing the item that is linked.

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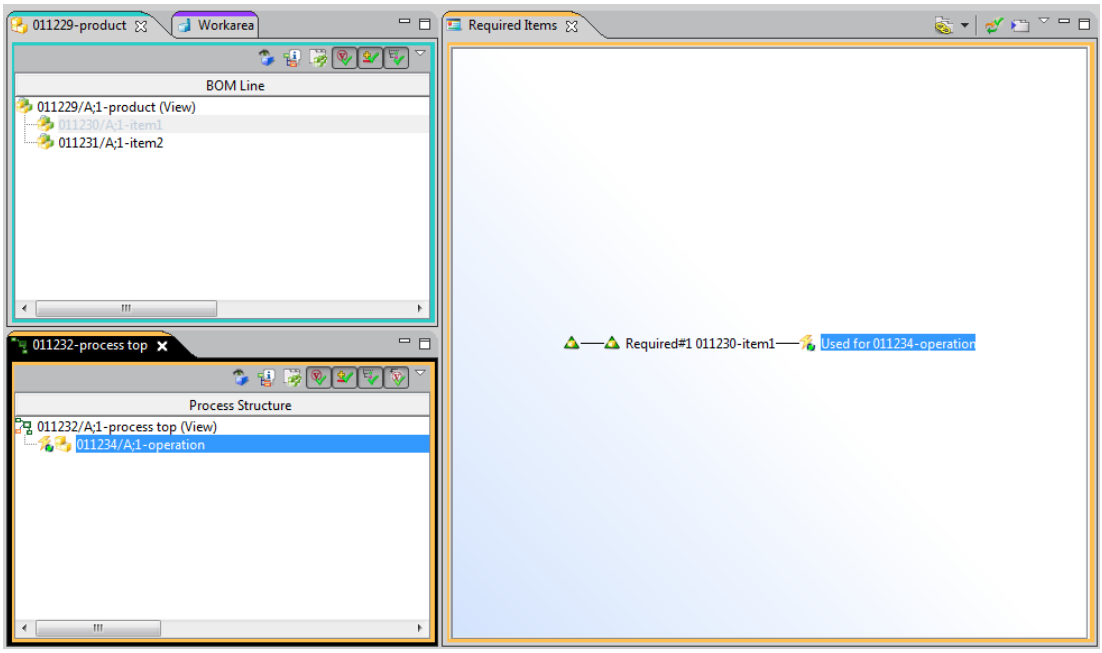
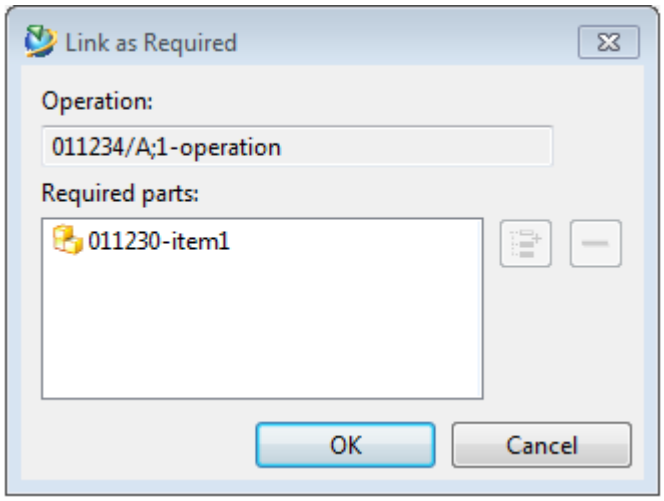


6. (Optional) Reopen the **Link as Required** dialog box as described in steps 1 and 2.

   Teamcenter displays the linked item in the list.



Modifying process plan data

Create item revisions

Use item revisions to manage changes or revisions to product, process, and work area items. When you create a new item, Teamcenter automatically creates the first item revision. You can then add additional revisions as necessary.

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Note:

There is always only one working revision at any one time.

1. Open a process or product.
2. Select the object that you want to revise.
3. Choose **File→Revise**.

   The **Revise** dialog box is displayed. The item ID is preselected so it mirrors the original item.
4. Type a new revision ID.
5. Give the revision a new name, if necessary.
6. Click **OK**.

   The new item revision is displayed in the structure view.

Creating variant configurations

Variant configuration allows you to create options (such as manufacturing locations) and allowed values (such as a specific plant within the company) and associate these options with an item revision. This is usually done at the top-level but can be implemented anywhere in the BOM.

You can use the **Show Unconfigured Variants** menu command to show any BOM lines that are configured out by variant rules. However, if you create compositions (for example, a process) where the items are assigned from another top line (for example, a product or work area), the configuration is controlled by the configuration of the original BOM line. You can configure out the original BOM line (for example, the consumed items in the product) by effectivity, incremental change or variants, and the corresponding BOM line in the composition is configured out. Thus, the line in the composition is hidden or shown if it was assigned from another top line, irrespective of the cause of its configuration in the original BOM. Such lines are also configured out if the original BOM is not loaded while you open the composition. You can show assigned objects in the structure using the **Show Unconfigured Assigned Occurrences** menu command.

You can specify which loaded BOM structure configures a process structure.

Perform where-used searches

1. Right-click an object in a structure view and choose **Open with→Impact Analysis**.
2. Set the **Where** box to **Used**.

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3. Set the **Depth** box as required:
   - **One Level** to report immediate parent objects only
   - **All Levels** to report all objects up to the top-level product
   - **Top Level** to report final objects only
4. In the **Where Used Options** area, set the **Rule** box as required:
   - Click **All** to report all revisions.
   - Select the required revision rule from those listed to report only the configured revisions.
5. Select what object is shown in the tree nodes from the **Display** list.
6. In the viewer pane, double-click the object for the search.

   The results of the search display graphically.
7. Double-click any of the resulting objects to continue the where-used search.

Perform where-referenced searches

1. Right-click an object in a structure view and choose **Open with→Impact Analysis**.
2. Set the **Where** box to **Referenced**.
3. Set the **Depth** box as required:
   - **One Level** to report immediate parent objects only
   - **All Levels** to report all objects up to the top-level product
   - **Top Level** to report final objects only
4. Double-click the object for the search.

   The results display in the viewer pane.
5. Double-click any of the resulting objects to continue the where-referenced search.

Create duplicate items

1. Open the appropriate process, product, or work area.

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2. Choose **File→Save As**.

   The **Save As** dialog box is displayed.

3. Type a new ID and revision for the new item.

4. Click **OK**.

   The new item opens in My Teamcenter.

Cutting, copying, pasting multiple processes and operations

When you cut or copy and paste multiple processes or operations in Manufacturing Process Planner, the predecessor and sequence information is moved with the processes or operations. For example, if you copy multiple operations or processes from one source process and paste them to one target process:

- Teamcenter keeps the relative find numbers of operations or processes. For example, copying **10,20,20,30** results in *X*, *X***+10**, *X***+10**, *X***+20**, where *X* is the next available find number (with increment of 10).

- Flows between the copied operations or processes are also copied.

- A new flow is not created between the last process/operation/work area and the new one. Use the **Update Pert Flows** command to achieve this.

Use **Edit→Paste Special** to designate the behavior of the copied lines. You can specify the occurrence type to use when pasting, assigning, or using drag-and-drop in the **MEAssignCustomizedOccurrenceType** preference.

Copying occurrences containing occurrence notes

When you copy an occurrence that contains occurrence notes, the **PSEOccNotesNoCopy** preference specifies the types of occurrence notes that are not copied with the occurrence. Your administrator can set this preference to be a site preference or a user preference.

- If the preference is a site preference, you cannot change the types of occurrence notes that you copy during a Teamcenter session. You can only copy occurrence notes whose types are not listed in this preference.

- If the preference is a user preference, you can change its value at any time during a Teamcenter session. Therefore, you can modify which occurrence notes are copied and which are not within a Teamcenter session.

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Add, edit, and delete text notes

You can add text notes to the various objects in your process plan that can be viewed by others in your organization as they work with the plan. These notes can also be edited and deleted, and can be printed with the Report Generator application.

To open the **Notes** dialog box:

1. Select an object using one of the following:

   - Select an object from the tree hierarchy in a structure view.
   - Click one of the boxes in the **PERT** view.

2. From the **Edit** menu, choose **Notes**, or click the **Notes** button on the toolbar.

   The **Notes** dialog box is displayed.

3. Perform one of the following:

Action	Steps
Add a new note	a. From the **Create** list, choose the type of note to be created. b. Type the text of the note. c. Click **OK**.
Edit a note	a. From the **Existing Notes** list, choose the type of note to be edited. b. Change the text, as necessary, in the description area. When you are done, click **OK**.
Delete a note	a. From the **Existing Notes** list, choose the type of note to be deleted. b. Click **Remove**.

Creating custom forms

A *custom form* is a storage mechanism that supports captured, informative, and derived data.

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Each form is associated with a database object and a viewer. The database object can be defined in the Business Modeler IDE by specifying its attributes. If a viewer is not specified, the form default viewer is used and the **Viewer** view displays the attributes of the object with its corresponding values.

Attaching objects to the process plan

Overview of attaching objects to the process plan

Each process, operation, activity, and work area can have objects associated with it. These objects can include items such as detailed work instructions, drawing sheets, and NC programs.

The following types of objects can be attached:

Object type	Purpose
Datasets	Application-specific objects used to manage data files created by other software applications. When you double-click a dataset in a BOM, the system launches the software application (tool) associated with the dataset.
Folders	Containers for objects and can reference any object type.
Forms	Objects you define that are managed by the application as a form type. The form holds any additional data you want to associate with a process, operation, or work area.
Other objects	Objects can be associated with manufacturing processes, operations, activities, and work areas by specific relationship types. These relationship types are set by your system administrator.

You can view attached objects in the **Attachments** view. If you attach datasets in another application (for example, My Teamcenter), you can use the **Refresh Window** and **Refresh Current Structure** menu commands to display them in the **Attachments** view.

Attach new datasets

1. Select an item revision:

   - For activities, select the activity in the **Activities** view.
   - For parts, processes, operations, or work areas, select the object in the structure view.

2. On the **File** menu, choose **New→Dataset**.

   The **New Dataset** dialog box is displayed.

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3. From the pane on the left side of the **New Dataset** dialog box, click the dataset type to be attached.

   Click **More** if the list does not contain the dataset type you need.

4. Type a name for the attachment.

5. (Optional) Type a description of the attachment.

6. Click the **Browse** button **...** to import a file.

   The **File Import** dialog box is displayed.

7. Search for and select the file to be attached, then click **Import**.

8. Select the relation type with which the dataset is attached to the item in the **Relation** list.

9. To open the attachment in the application window after import, check the **Open on Create** check box. Otherwise, leave this check box unselected.

10. Click one of the following buttons:

    - **OK** to add the dataset and close the **New Dataset** dialog box.
    - **Apply** to add the dataset and redisplay the **New Dataset** dialog box.

Attach existing datasets

1. Find the object to be attached using the My Teamcenter application.

2. Select the object and click the **Copy** button on the toolbar.

3. Open Manufacturing Process Planner.

4. Select the object where you wish to attach the dataset.

5. Click the **Paste** button on the toolbar.

Attach new forms

A form is a user-defined object managed in the database as a form type.

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Note:

Forms cannot be attached to operation activities.

1. In the **Attachments** view, select the item where you want to attach the form:
2. In the **File** menu, choose **New→Form**.

   The **New Form** dialog box is displayed.
3. From the pane on the left side of the **New Form** dialog box, click the form type you want to attach.
4. Type a name for the form.
5. Optionally, type a description of the form.
6. To open the form in the application window upon import of the file, check the **Open on Create** check box. Otherwise, leave this check box unchecked.
7. Click one of the following buttons:

   - **OK** to attach the form and close the **New Form** dialog box.
   - **Apply** to attach the form and redisplay the **New Form** dialog box.

Attach existing forms

1. In My Teamcenter, find the form you want to attach.
2. Select the form and click the **Copy** button on the toolbar.
3. Open Manufacturing Process Planner.
4. Select the object where you want to attach the form.
5. Click the **Paste** button on the toolbar.

Remove objects and attachments

As you design and create revisions of your product, process, and work area structures, you may need to remove objects and object attachments from the structure tree.

When you remove an object or attachment, it is removed from the current structure but not deleted from the database.

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To remove an object from the structure view:

1. Select the object in the structure view.

2. Click the **Remove a Line** button on the toolbar.

   Teamcenter removes the line from the structure.

To remove an attachment:

1. Right-click the object containing the attachment in the structure view and choose **Open with→Attachments**.

2. In the **Attachments** view, select one of the attachments.

3. Choose **Edit→Cut** or click the **Cut** button on the toolbar.

Delete objects and attachments

Before you can delete an object from the database, you must first remove all but one reference to it. This is usually done by:

1. Performing a where-referenced search on the object using the **Impact Analysis** view.

2. Removing all of the objects but one using **Cut**. Choosing **Cut** does not delete the object from the database.

> Note:
>
> In order to delete an object, you must have read, write, and delete privilege on that object.

To delete an object:

1. Select the object from the **Product**, **Process**, or **Plant** structure view.

2. Click the **Remove a Line** button on the toolbar.

3. Open the My Teamcenter application and locate the object.

4. Select the item and click **Delete** on the toolbar.

To delete an attachment:

1. Select the object in the **Attachments** view.

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2. Choose **Edit→Delete** or click **Delete** on the toolbar.

Creating substitute occurrences

As in the Teamcenter applications, the Manufacturing Process Planner application allows you to create substitute components in your product, process, and work area structures. The substitutes you create are specific to a single occurrence within an assembly.

Some key points for using substitutes include:

- One of the substitutes is the *preferred* substitute and is always displayed in the BOM.
- You can change the preferred substitute.
- You can add any number of substitute components for a particular line in the BOM.
- Substitutes are unique to the BOM. For example, if you were to identify a substitute station in the current work area structure, only the current work area structure is impacted. Other work area structures are not affected.
- To view the substitute components for a product, process, or work area, select the component in the structure view. Then click the button.

Modify object properties

1. Do one of the following

   - Double-click the property form in the **Attachments** view.
   - Right-click the property form in the **Attachments** view and choose **Open with→Viewer**.

2. Check out the property form and edit the required properties.

   For information about how to modify object properties such as names, revision numbers, and descriptions, see *Teamcenter Basics*.

3. Check the form back in.

Edit operation resources

1. In the process structure, select the resource to be removed. To select multiple resources, either hold the shift key (for contiguous objects) or control key (for noncontiguous objects) while clicking resources in the list.

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2. On the **Edit** menu, choose **Remove**, or click the **Remove a Line** button on the toolbar.

3. Assign new resources as necessary.

Resequence activities

As you modify your process plan, you may need to resequence the order or performance for operation's activities.

Edit activity resources

When you modify a process plan, you may need to add resources to an operation's activities or edit existing ones. All resources assigned to an activity are automatically assigned to its parent operation.

1. Select an operation from the process structure.

2. Choose **Open with→ Activities**.

3. Select the activity to which you want to add resources.

4. Click the **Edit Activity Occurrences** button .

   The **Edit Activity Occurrences** dialog box is displayed. All resources currently assigned to the activity or the activity's parent operation are listed in the dialog box. Add and delete resources for the activity through this dialog box.

5. Do one of the following:

To	Do this
Delete existing resources	a. Select the resource to be deleted. To select multiple resources, hold either the shift key (for contiguous objects) or control key (for noncontiguous objects) while clicking resources. b. Click **<** to remove selected resources from the list or click **<<** to remove all resources from the list.
Assign additional resources	• To assign a resource already in use by the activity's parent operation, choose the resource from the **Occurrences on Operation** list and move it to the **Occurrences on Activity** list.

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To	Do this
	• To assign a new resource from the classification hierarchy, click the **Assign Resource** button . The Classification Search Dialog is displayed.

Managing time

Managing time with the Time view

Using the **Time** view you can manage time information on activities, operations, and processes. You can start by estimating the time it takes to execute operations. Later, you can refine the time information by defining activities holding time information. You can define the category of each activity, for example, **Value Added** or **Non-Value Added**, and later analyze how much time in your overall process structure (or any other process level) is spent on each category. This view also lets you roll up the time information from lower levels to upper levels and define the allocated time of each of the leaves.

The **Time** view provides information specific to the process or operation so that its appearance varies depending on which of these you select.

Times are stored in the **Time Analysis** form on the process or operation. Activity times are stored as fields directly on the class. In contrast to process or operation, there is no additional activity time form. You can modify times in the **Time** view and these changes are then reflected in the forms.

Time units are stored in seconds in the database. You can configure which units are shown in the **Time** view.

Open the Time view

1. Select a process or operation.

2. Choose **Open with→Time**.

   Teamcenter opens the **Time** view.

   • If a process is selected, the **Time** view contains the **Time Values** and **Time Analysis** sections.

Use this section	To
Time Values	Edit allocated, estimated, and simulated times for a process or operation. Use the **Calculate** button to

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Use this section	To
	populate the allocated time and roll up the summary to upper levels.
Time Analysis	See the analysis of the activities for the selected object. The total work, total duration, and pie chart are calculated for the activities of all descendents of the selected process or operation.

- If an operation is selected, the **Time** view additionally contains the **Work Content** and **Activities** sections.

Use this section	To
Work Content	Display the work content of the operation. This is customer-specific information and is not used for any calculation. You can expand or collapse this section to suit your needs.
Activities	Edit operation activities with time information and classify them into time categories.

Edit operation activities

Activities are intended to break down an operation to define its detailed time information. Each activity can have the following time information:

- **Code**

  The code of an activity is defined in a time standard such as the Methods Time Measurement (MTM) system or in your company's standard.

- **Unit Time**

  The unit time is the time it takes to execute this activity.

- **Frequency**

  Frequency represents how many times this activity is executed. The default is 1.

- **Work Time**

  The total time it takes to execute this activity. This work time is the result of multiplying the unit time by the frequency.

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- **Category**

  The time category to which this activity belongs (for example, **Value Added**).

With the **Time** view open for an operation, do any of the following:

Use	To
Add Below	Add a new activity as a descendent of the selected activity.
Add After	Create a new sibling activity after the selected activity.
Data Card	Open the **Data Card** dialog box.
Time System	Open the **TiCon Search** view to search for elements in the TiCon time system.
Remove	Delete an activity.
Properties	Open the activities **Properties** form.
Move Up **Move Down**	Change the order of the activities. This order is also reflected in the **Activity Flow** PERT chart. Note: Use these buttons to change the order of a linear flow of activities only. If you use these on parallel flows, the changed order can lead to incorrect flows.
F2 key or select the cell	Edit the cell contents, including the name.
Shortcut menu	Obtain additional commands to perform on a selected activity: • **Cut/Copy/Paste** • **Expand** • **Expand Below** • **Collapse Below** • **Refresh** • **Properties** • **Activity Assignments**

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Note:

If an activity in the **Activities** table of the **Time** view contains child activities, the time displayed for it is the cumulative time of all the child activities. For this reason, you cannot use **Add Below** if an activity already contains a time, and you cannot use **Replace** if the activity already has children.

Adding activities based on time standards

Adding activities based on the Methods Time Measurement (MTM) system

You can add activities based on predefined time information available in the Methods Time Measurement (MTM) system to operations in the **Time** view. This system sets industry-standard times required to perform standard manual tasks. The standards include a list of time elements where each element represents a specific and short step a worker can perform as part of the execution of an operation. Typically, the time elements are organized into groups according to types, distance, and difficulty. The standards are based on repeated measurements done on real production lines.

In the **Time** view, you can open a data card and select individual tasks containing a set time. Each of these tasks is added as a separate activity, including a name, unit time, and code as defined in the data card. You can then use these standard times to run time calculations and analyses.

Note:

You must install this feature before using it.

You can also replace the MTM data card with a customized one that includes times required for tasks that are specific to your company.

Add activities using a data card

Note:

You must install the MTM data card before using it.

1. In the **Activities** section of the **Time** view, select an activity where you want to add the MTM activity.

2. If you are familiar with time codes, type the code directly in the **Code** box of an activity.

   Teamcenter automatically retrieves the time and name of the activity from the data card. In this way, you can use the time standards without needing to open the data card.

   Otherwise, click .

   Teamcenter displays the **Data Card** dialog box containing lists of predefined activities.

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3. Select one of the following:

   - **Add Below**

     Adds the new activity below the activity that is selected in the **Activities** section of the **Time** view. You cannot use this option if the activity selected in the **Time** view already has an associated time.

   - **Add After**

     Adds the new activity at the same level as the selected activity in the **Time** view. You cannot use this option if the selected activity is the root node.

   - **Replace**

     Replaces the activity selected in the **Time** view with the new activity. You cannot use this option if the activity selected in the **Time** view has children.

4. Use the tree structure on the left in combination with the tabs to navigate to the appropriate time element.

5. Select a time element in the table.

   Teamcenter adds an activity corresponding to the selected time element to the **Activities** section of the **Time** view in the manner you indicated in step 3.

6. (Optional) Select different activities and repeat these steps to continue to add or replace activities while the **Data Card** dialog box is open.

Edit data card activities in the Time view

Since time codes are common and generally known to time engineers, Teamcenter allows you to type the code directly in the **Code** box of an activity. Teamcenter automatically retrieves the time and name of the activity from the data card. In this way, you can use the time standards without opening the data card.

1. Double-click in the **Code** cell of an activity in the **Activities** table.

2. Type a modified entry into the cell.

   - When you edit the **Code** cell, Teamcenter provides you with a list of all the codes available in the data card. As you type a new code, or any part of a code, into the cell, Teamcenter reduces this list to show only those codes from the data cards that contain the characters you type. For example, if you type **kz**, the list displays all codes that contain those two consecutive letters anywhere in the string, such as **2000AKZ05**. Select a code from the list and press the Enter key. Teamcenter replaces the time information of the activity with the new time information as defined in the data card.

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- If you edit the time entry of the cell, you overwrite the predefined data card time.
- The tool tips in the **Activities** table display the complete activity data card information.

Managing activity times using the TiCon integration

Using the TiCon integration

You can access time data from TiCon, an external time management system, using a web service and assign the data to activities. You can search for time elements in TiCon, create new operations containing time activities, or overwrite existing activities with the timing data of time elements, and update activities assigned to time elements that were changed in TiCon. You can use the existing time management features to calculate time analysis based on the TiCon data.

Teamcenter automatically creates a new operation for each TiCon time activity that you add to a process structure. It calculates the allocated time of the process based on the PERT flows of the process. If you update the PERT flows using the **Resequence Structure** command, the allocated time contains the sum of all the activity times contained in the child operations. If you do not update the PERT flows, the allocated time on the process represents the maximum time of all the child operations.

You can to map your company's activity properties to the TiCon time element attributes.

> Note:
>
> The speed in which data is returned from the TiCon server is dependent on your network connection to that server.

Log on to TiCon

1. Do one of the following:
   - Select a process to which you want to add time data and choose **Open With→Time**.
   - In the **Activities** section of the **Time** view, select the activity to which you want to add additional TiCon time elements or replace existing ones.
2. Click the **Open TiCon Search** button .

   Teamcenter displays the **TiCon Login** dialog box.
3. Type your TiCon user name and password, select a data area in which to work, and click **Login**.

   Teamcenter connects to the TiCon time system and opens the **TiCon Search** view.

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Search for time elements

1. Log on to TiCon.

   Teamcenter connects to the TiCon time system and opens the **TiCon Search** view.

2. In the **Search Criteria** section, type the criterion for which you want to search. By default, you can search for code, index, or variant of a time element.

   You can use the ***** or **%** as a wildcard to assist your search.

   Your administrator can customize which search criteria are displayed in the **Search Criteria** section in the **METimeSystemSearchCriterionFields** preference.

3. Click **Search**.

   Teamcenter lists all results in the **Search Result** section of the **TiCon Search** view.

   Your administrator can customize which columns are displayed in the **Search Result** section in the **METimeSystemSearchResultFields** preference.

Add and replace activities by assigning time elements

1. Search for a time element and select an appropriate one from the **Search Result** section of the **TiCon Search** view.

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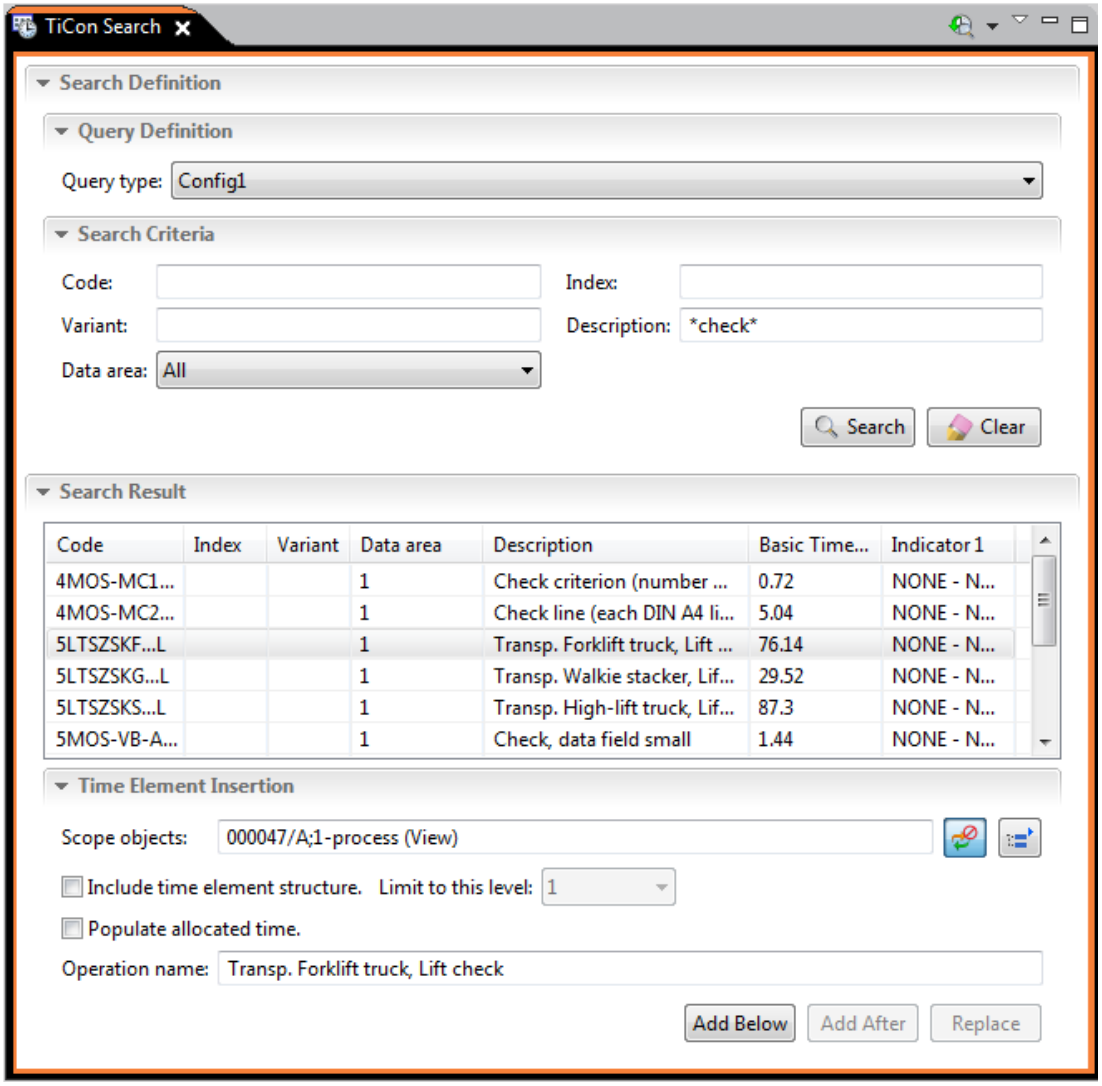

2. If the time element in TiCon contains a substructure, specify the number of levels of structure that you want to include in the activity structure. You can select from one to five levels, or all levels by selecting **Unlimited**.

3. (Optional, for a process only) In **Operation name**, overwrite the name of the TiCon activity. By default, Teamcenter assigns the description of the TiCon element as the name of the new operation containing that activity.

4. Do one of the following:

   - With a process selected as scope, click **Add Below**.

     Teamcenter creates a new operation as a child of the selected process and adds the selected search result below the operation. If you select multiple TiCon elements, Teamcenter creates a new operation for each one. You cannot use this option if the scope activity already has an associated time.

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- With an activity selected as scope, click **Add Below**.

  Teamcenter creates an activity with the selected time element and adds it under the current scope. This option is available only for a root activity or an activity that is not associated with a time element.

- With an activity selected as scope, click **Add After**.

  Teamcenter adds the selected search result at the same level as the scope activity. You cannot use this option if the scope activity is the root node.

- With an activity selected as scope, click **Replace**.

  Replaces the scope activity selected in the **Time** view with the selected search result. You cannot use this option if the scope activity has children.

5. Select **Populate allocated time** to calculate the allocated time on the parent process.

   This option is available only if the view's scope is a process.

6. (Optional) To add an element to a different activity, select the activity in **Activities** section of the **Time** view and click **Change Scope** or click **Unlock Scope** to work on the selected activity instead.

Update activities assigned to time elements

Over time, time data can change and it can become necessary to update the TiCon time elements contained in your structure.

1. Do one of the following to select the object to update:

   - Select a process or operation in the structure view.

   - Select an activity in the **Activities** section of the **Time** view.

2. Choose **Tools→TiCon→Update** from the main toolbar.

   Teamcenter displays the **TiCon Update** dialog box.

3. If the time element in TiCon contains a substructure, specify the number of levels of structure that you want to include in the activity structure and click **Start**.

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> Tip:
>
> You can use this option to remove levels from or add levels to a substructure by specifying fewer or more levels than you did when you created the activity or last performed an update.

Teamcenter compares all the time information in the activities belonging to the selected structure with the current time information for the associated time element in TiCon. If it finds differences, it lists them in the dialog box.

4. (Optional) Navigate through the changes selecting each line. For each selected line, Teamcenter displays the potential change at the bottom of the dialog box.

5. Click **Update** to apply the changes, or **Cancel** to close the dialog box without updating.

Log off the TiCon time system

Do one of the following:

- In the **View Menu** list, select **Logout**.
- Choose **Tools→TiCon→Logout**.

The next time you attempt to search in the **TiCon Search** view, you must log on again.

Performing a time analysis

When Teamcenter performs a time analysis, it calculates total work and total duration of descendents of the selected object. In addition, it calculates the time required for each category of time and displays these in a pie chart. By default, Teamcenter provides you with three categories of activities, value-added (VA), non-value-added (NVA), non-value-added but required (NVABR). Your administrator can configure the time view to suit your needs.

- If you select an operation, Teamcenter performs a time analysis automatically when you open the **Time** view.
- If you select a process, these calculations can be very time-consuming, so you must initiate them manually by clicking **Calculate**.

> Note:
>
> Teamcenter caches the time analysis calculations for a process but does not update them automatically if any changes occur. If you make any changes that affect stored times, you must click **Calculate** again to obtain the updated values.
>
> Teamcenter does not save the time analysis information to the database, it only saves it in the current session. It does this because a time analysis result depends on the current configuration of

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the structure. You can generate a report of the time analysis which is saved as an attachment to the process.

Populate allocated time

Allocated time is the *official* time of each process and operation. You can manually define the allocated time or you can populate it from other time fields. You can choose the basis on which to calculate the allocated time. This calculation updates the allocated time of all the descendents of the selected process or operation. The calculation is done from the lowest level upwards (*rollup*).

If flows between operations are created in a PERT chart, populating the allocated time will sum up the values of sub-levels and display the sum in the target process. If flows are not created between operations in PERT chart, then to sum up the values of sub-levels and display the sum in the target process, you or an administrator must update the **MECollectionTypeProcesses** preference with the process type (**Process** or the internal name of the custom process type).

1. Do one of the following:

   - In the **Time** view, in the **Time Values** section, click **Calculate**.
   - Choose **Tools** → **Populate Allocated Time**.

   Teamcenter opens the **Populate Allocated Time** dialog box.

2. Select one of the following:

Use this option	To calculate allocated time based on
Estimated Time	Time information used in the preplanning stages, before detailed time analysis data is available.
Simulated Time	Time values that are determined as a result of a simulation.
Time Analysis Duration	The total duration as calculated in the **Time Analysis** section.
Prioritized list of time properties	A configured list of data sources. Teamcenter considers these sources in order of their appearance in this list, looking for a value that does not equal zero. As soon as it finds one, Teamcenter populates the allocated time and does not consider the rest of the list. You can move data sources up or down in the list, or remove them completely. If you select only one option, for example, **Simulated Time**, in this list, Teamcenter behaves in an identical fashion to selecting **Simulated Time** on the upper part of this dialog box.

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Use this option	To calculate allocated time based on
	This list of data sources is not evaluated if the node has children whose accumulated allocated time is not equal to zero.

3. (Optional) Specify how many levels are populated by selecting a value from the **Populate up to level** list.

   All leaf objects are calculated that are of a distance from the top-level object that is greater than or equal to the number you specify in this option.

4. Select **Populate zero values** if you want to override the allocated time for a specific object with zero values, even if the object's original allocated time value is not zero.

   If you select this option in conjunction with the **Prioritized list of time properties** option, Teamcenter populates allocated time with zero values if all the values of the sources in the list are zero.

   If you do not select this option, original values that are not equal to zero are not replaced with zero values.

Filtering activity attachments from the structure

You can suppress the display of different types of attachments in the **Activities** section of the **Time** view using the **METimeTabFilteredComponents** preference. If you want to see the attachments, open the **Attachments** view on the operation activity.

Working with time reports

Creating time reports

When working in the **Time** view, you can run two reports:

- **Time Analysis Report**

  This report summarizes the time analysis for the selected object and below that object. It includes the time analysis information for each process and operation. It contains the name of the process, operation or activity, code, unit time, frequency, work time, duration, and times for different categories. You run this report from the **Time Analysis** section of the **Time** view.

- **Allocated Time Report**

  This report contains the name of the process or operation, allocated, estimated, and simulated times and the duration. You run this report from the **Time Values** section of the **Time** view.

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Teamcenter creates these reports as Excel files that are attached as datasets to the corresponding object. You can customize the reports in the Report Builder application.

Run a time report

1. In the **Time** view, do one of the following:

   - In the **Time Analysis** section, click **Report** to create a time analysis report.
   - In the **Time Values** section, click **Report** to create an allocated time report.

   Teamcenter opens a dialog box where you can specify the name of the dataset.

   - If the **TC_CRF_overwrite_existing_dataset_content** preference is set to **true**, Teamcenter replaces the contents of the dataset.
   - If the **TC_CRF_overwrite_existing_dataset_content** preference is set to **false**, Teamcenter creates a new dataset.

2. Type a new name into the box, or click **Replace** to overwrite the dataset contents.

3. Click **OK** to close the resulting dialog box and open the report.

If you create a time analysis report, Teamcenter calculates and exports the time analysis values of the selected object and all its descendents. If you generate an allocated time report, no calculation is performed. The report reflects the current state of the data.

Customizing a time report

You can customize a time report in any of the following ways.

- Change the report to be used by changing the value of the **METimeAnalysisReportDefinitionID** or **MEAllocatedTimeReportDefinitionID** preferences.
- Add one or more style sheet to the report definition by modifying the **METimeAnalysisReportStylesheet** and **MEAllocatedTimeReportStylesheet** preferences.
- Customize the report contents in the Report Builder application.
  - The **SHOW** parameter specifies which Teamcenter columns are displayed as rows in the report.
  - The **TRANSFER_MODE** parameter specifies the name of the transfer mode to be used to export additional data. You must customize the XSL style sheet to show the exported data.

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Configure the Time view

In addition to configuring the **Time** view using preferences, you can configure the following:

- Add new categories in the Business Modeler IDE application.
- Specify the color in which each time category appears. This category is reflected in the **Activities** section of the **Time** view and in the colors of the pie chart in the **Time Analysis** section.

  1. Choose **Edit→Options**.

     Teamcenter opens the **Options** dialog box.

  2. Click **Manufacturing** in the hierarchy tree.

  3. Click the **Time** tab.

  4. In the **Colors Representing Time Analysis Types** section:

     a. Click any of the displayed colors.

        Teamcenter opens the **Color Chooser** dialog box.

     b. Click a new color.

     c. Click **OK**.

     These changes are saved in the **MEActivityTypeColors** preference.

- Change the time unit that appears in the **Time Analysis** section as follows:

  1. Choose **Edit→Options**.

     Teamcenter opens the **Options** dialog box.

  2. Click **Manufacturing** in the hierarchy tree.

  3. Click the **Time** tab.

  4. Choose the time unit that you want to display in the **Current Time Unit** list. You can choose from any of the following units:

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Unit ID	Long display name (localizable)	Short display name (localizable)	Multiplier to seconds
1000th_min	1/1000 min	0.001m	0.06
100th_min	1/100 min	0.01m	0.6
10th_min	1/10 min	0.1m	6
FAC	FAC	FAC	0.18
MOD	MOD	MOD	0.129
TMU	TMU	TMU	0.036
day	Day	d	86400
hour	Hour	h	3600
minute	Minute	min	60
second	Second	sec	1

5. (Optional) Make further adjustments to the time units using the **MEAvailableTimeUnits** and **MECurrentTimeUnit** preferences.

4D planning – visualizing construction over time

4D planning overview

Adding a time component to process planning to simulate and visualize construction over an extended period of time is referred to as *4D planning*. 4D planning is used in very large structures to ascertain what parts are already assembled on a specific date in a specific part of the structure. For example, if you build a ship, you may want to begin fitting the cabins with furniture. It is necessary to know if the piping and electrical work is complete by April 30th to begin subsequent work. You can query your structure, taking the date into consideration, to see what has been assembled by April 30th.

Teamcenter uses an embedded **Schedule Manager** view to help you associate scheduling information with process planning operations. The **Manufacturing – 4D Scheduling** perspective already contains this view, in addition to structure views to assist you. This is the same view that is contained in the Schedule Manager application. Making a change in one changes the data in the other.

To help you view the precedence of work orders (processes) in the process plan, Teamcenter provides you with the **4D Gantt** view. This view assists you in setting precedence constraints between work orders and scheduling all the processes and work orders in a given scope. You can traverse back and forth over the 4D analysis results and see the development of the process highlighted in the **Graphics** view.

The following are the prerequisites for using 4D planning:

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- Spatial information must be available for all product structures associated with the process used as the scope for the 4D analysis.

  This feature uses the spatial search to narrow down the search results. The spatial search allows you to search in the vicinity of a physical point.

- A schedule with all relevant scheduling data must exist.

- A process structure that contains only **Process** and **Work Order** types.

- Use the GMT system time zone for date calculation.

You can see the start and end dates of a process by exposing the **Start Date** and **Finish Date** columns in the structure view.

When you open a schedule in Manufacturing Process Planner, a **Schedule** menu command is displayed in the menu bar.

For more information about using the commands in the **Schedule** menu list, see *Schedule Management —Deployment and Rich Client Usage*.

> Note:
>
> If the **4D Planning** template is installed, you cannot use the **Process Gantt** view, the **PERT** view, assembly tree commands, or flow-related commands.

Open a schedule

Do one of the following:

- Select a process that is associated to a schedule task and choose **Tools→Schedule→Open Associated Schedule** or right-click the process and choose **Open Associated Schedule** from the shortcut menu.

- Use the **Open by Name** feature:

  1. Click and select **Open Schedule** from the list.

  2. Type the name of the schedule and click **Find**.

  3. Double-click the desired schedule in the list.

- Select a schedule in Schedule Manager or My Teamcenter and choose **Send To→Manufacturing Process Planner** from the shortcut menu.

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Associate a process and a task

If the schedule and process plan whose tasks and subprocesses you want to link both exist:

1. Open the process and the schedule.
2. Do one of the following:
   - Associate from the schedule task to the process structure:
     a. Right-click the schedule task that you want to associate to a process and choose **Assignments→Process — Task Association**.
     b. Select the process to which you want to associate the task and click in the **Process — Task Association** dialog box.
     c. Click **Associate**.
   - Associate from the process structure to the schedule task.
     a. Right-click the process that you want to associate to a schedule task and choose **Link/Associate→Process — Task Association**.
     b. Select the schedule task to which you want to associate the process and click in the **Process — Task Association** dialog box.
     c. Click **Associate**.

   Teamcenter associates the task and the process. You can see these associations by revealing the **Associated Tasks** column in the structure view or the **Associated Processes** column in the **Schedule Manager** view. Additionally, the structure lines contain an additional icon indicating the association.

Symbol	Description
	Process that is associated with a task.
	Task that is associated with a process.

Modify task times

You can modify the scheduled work time estimated for a particular task.

1. Expose the **Scheduled Work Estimate** column in the process structure view by right-clicking the table header and choosing **Insert column(s)**.

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2. Modify the value in the column cell.

   Modifying the value of the **Scheduled Work Estimate** influences the start and end dates for the work order.

3. (Optional) Add the following columns to view more information in the process structure view:

   Calculated Start Date

   Calculated Finish Date

   Scheduled Calculated Duration

   Calculated Work Estimate

   Scheduled Work Estimate

   Scheduled Duration

Update the process-task association

You can change the process-task association at any time in the **Process – Task Association** dialog box.

1. Open the **Process – Task Association** dialog box.

   - To open the dialog box from a schedule, right-click the task and choose **Assignments→Process — Task Association**.
   - To open the dialog box from a process structure, right-click a process and choose **Link/Associate→Process — Task Association**.

2. Select the new process or task and click to add it to the relevant box.

3. Click **Associate**.

   Teamcenter associates the process and task and replaces any existing associations with the selected process-task association.

To remove the association between process and task, do one of the following:

- Open the **Process – Task Association** dialog box and click **Un-Associate All**.
- Choose **Assignments→Un-Associate All** from the shortcut menu.

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Automatically create processes from a task

If only the schedule exists, you can automatically create a process structure from it.

1. Select the task to which you want to associate a process and choose **Tools→Schedule→Detail Task**.

   Teamcenter displays the **Detail Task** dialog box.

2. Select one or more schedule tasks as the source for process creation and click to add them to the **Source Tasks** list.

   You can only select leaf tasks from which to create a process structure.

3. Do one of the following:

   - If you want to create the new process under an existing root process, select **Create process under** and select the root process in its structure view. Click to add the process to the dialog box.

   - If you want to create root processes for the source tasks, select **Create process as new root**.

     When you select this option, Teamcenter does not open the new processes in structure views. You must search for them individually in the database. You can use the entry in the **Associated Process** column to determine the name of the new process.

4. Specify the names of the new processes:

   - If you want the created processes to have the same name as the tasks from which they are created, select **Set matching task name**.

   - If you want the new processes to be assigned a number that increases by steps of one, select **Set counter number. Start at** and specify the starting number. You can combine this option with the next step creating processes with, for example, names such as **task1, task2, task3**...

5. Add a text before or after the name or count by selecting the **Add prefix** or **Add suffix** box and typing the string.

6. Click **Create**.

Teamcenter creates processes for each selected task. If you select an existing process as root, you can see the new processes under this process. The tasks and processes are associated. The names of the associated tasks or processes are displayed in the respective **Associated ...** columns. You can see these associations by revealing the **Associated Tasks** column in the structure view or the **Associated Processes** column in the **Schedule Manager** view. Additionally, the structure lines contain an additional icon indicating the association.

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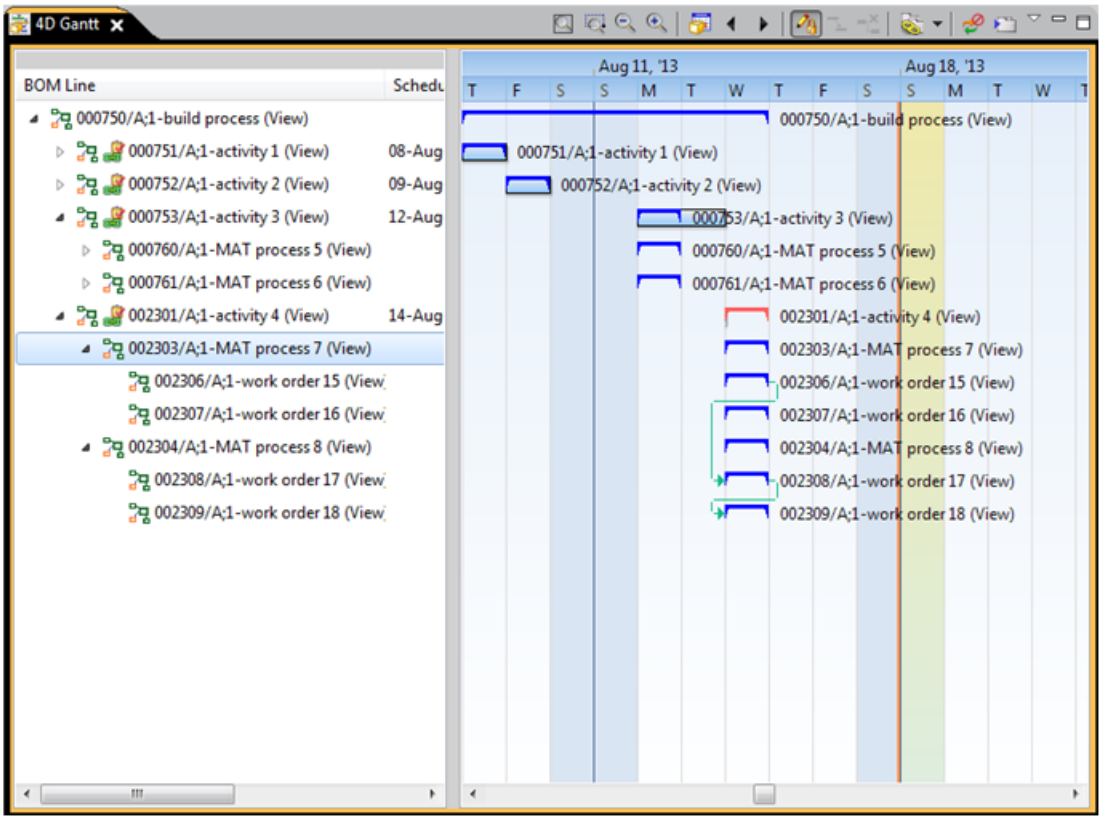
Symbol	Description
	Process that is associated with a task.
	Task that is associated with a process.

Open the process plan in the 4D Gantt view

To help you view the precedence of work orders in the process plan, Teamcenter provides you with the **4D Gantt** view. This view assists you in setting precedence constraints between work orders and scheduling all the processes and work orders in a given scope. You can traverse back and forth over the 4D analysis results and visualize the development of the process in the **Graphics** view.

1. Right-click a process that is associated to a schedule task and contains work orders and choose **Open With→4D Gantt** or **Tools→Schedule→Open With 4D Gantt**.



2. Set precedence constraints and lag and lead times between work orders.

3. Click to launch a 4D analysis of the process.

4. Traverse the results of the 4D analysis with the back and forth arrows to view the state of the assembly in the **Graphics** view.

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Teamcenter highlights each line in gray and displays the current state of the assembly in the **Graphics** view. This allows you to step through the assembly process, including viewing parts that are disassembled and reassembled.

5. Do any of the following:

Click	To
	Reduce the scale of the chart by a factor of two.
	Enlarge the scale of the chart by a factor of two.
	Scale the chart up or down to accommodate the entire process flow.
	Scale the chart up to show the currently selected time element placed in the middle of chart and taking up most approximately two thirds of the chart.
	Clear the 4D analysis results.
	Unlock the **4D Gantt** view so you can edit work order durations in the chart by dragging the sides of the bars.

Disassembling and reassembling a part

You can subtract items from the 4D scene that have been temporarily removed from the process. By assigning a unique consumption type, **Removed**, Teamcenter can remove a part and add it back.

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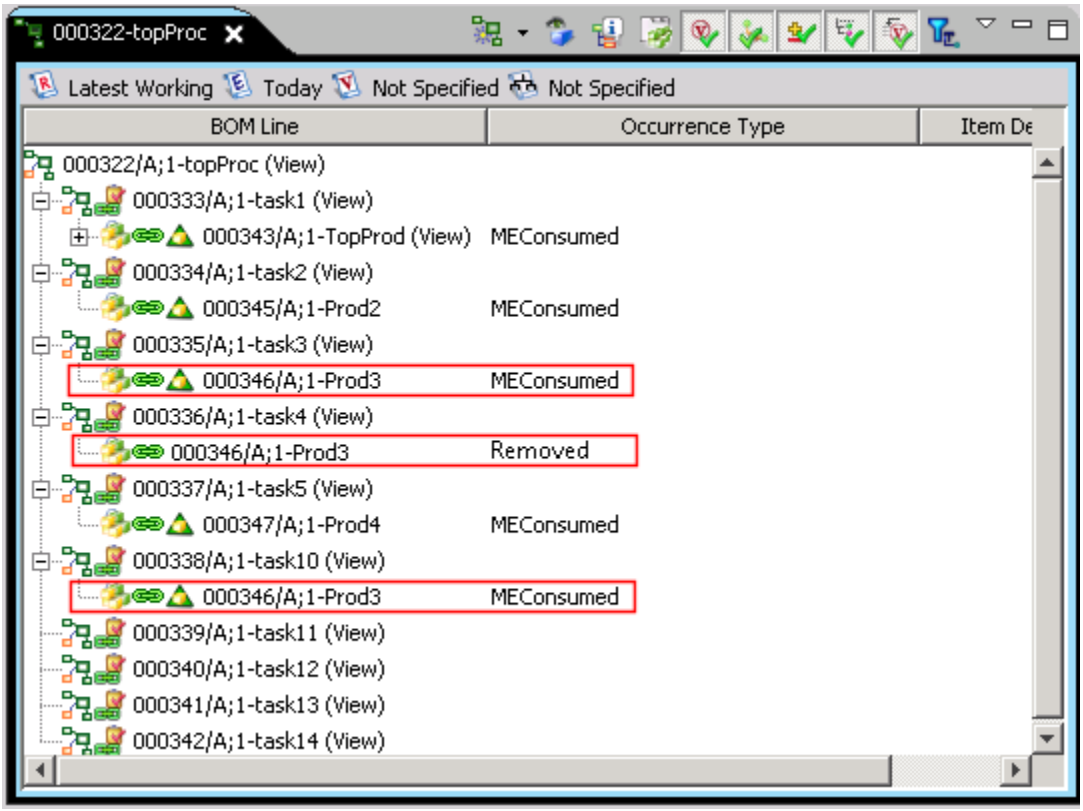

The part's presence and absence is visible in the **Graphics** view when you step through the 4D analysis results using the arrows in the **4D Gantt** view.

You can also assign the part with a different occurrence type.

Perform a 4D analysis search

By default, when running a 4D analysis, Teamcenter takes parts assigned as **MEConsumed** or **Removed** into consideration. If you want other consumption types considered, your administrator must add them to the **ME4DRelationTypePartsConsumed** preference.

1. Select a process as scope for the search in the **4D Gantt** view and click on the view toolbar.

   Teamcenter opens the **4D Analysis** dialog box.

2. Enter date information. Do one of the following:

   - Select a process in the structure view (not the root process), and click beside the **Process** box.

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Teamcenter uses the scheduled start date of the process as input for the 4D analysis and searches for all parts belonging to processes that were started on or before that start date. The type of start date that Teamcenter uses as input is specified in the **ME4DProcessStartDateFromTask** preference.

- Enter a date range by selecting a start and finish date.

  Teamcenter searches for all parts belonging to processes that were started between the given dates.

3. Select the process that is to be the scope of the search. By default, Teamcenter enters the top line of the process structure that you selected when opening the dialog box.

4. Select a product from the **Associated Product** list.

   This list displays all the products that are associated to the current process structure using the **Link/Associate→Associate Product as Target** shortcut menu command.

   You cannot associate any new structure using this dialog box.

5. Enhance the search using the following criteria:

   - Item attributes
   - Classification
   - Occurrence notes
   - Spatial search
   - Form attributes

6. (Optional) Remove graphics from the **Graphics** view each time you run the analysis by selecting **Clear existing 3D graphics**.

7. Click **Analyze**.

Teamcenter displays parts found by the search in the **Graphics** view as it finds them.

> Note:
>
> Teamcenter generally requires more time to load graphics than to complete the search. The progress bar on the dialog box completes first, but the progress bar on the main Teamcenter status bar takes longer to complete. If you stop the search, Teamcenter still loads all the parts found up

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to the time you stop the search so it may take some time before you can continue working in Teamcenter.

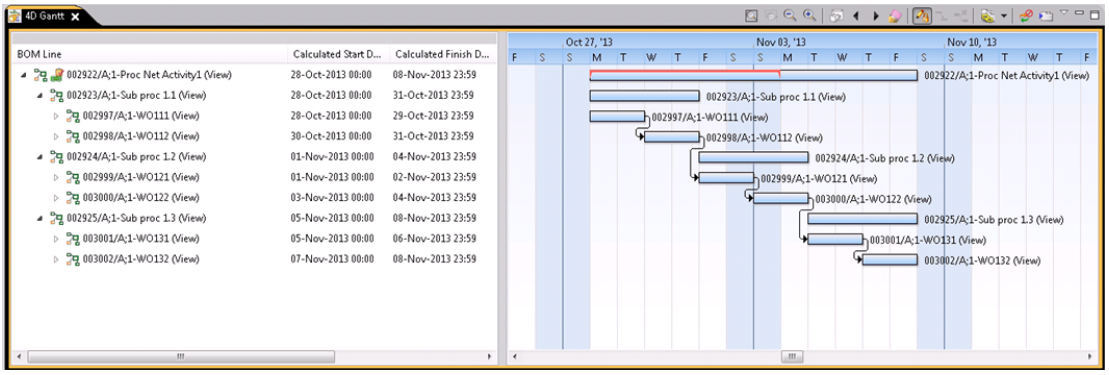
When the search is complete, Teamcenter loads the results in the **4D Gantt** view. You can see a tree structure representing the processes and operations found by the search as well as a Gantt chart displaying the start and end dates of the search results. If you are not satisfied with the search results, you can modify the tasks in the **Schedule Manager** view and re-run the search. You can compare the updated information with a baseline of the schedule prepared before the modifications.

Set precedence constraints and lag and lead times

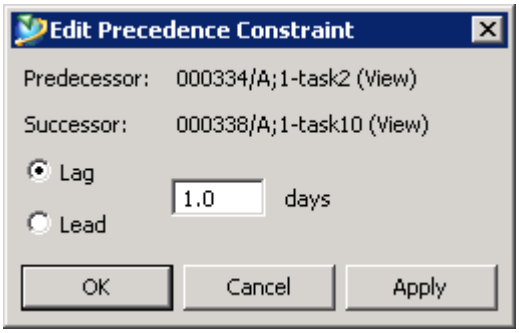
You can define detailed constraints between the work orders of a process plan. You can add lead or lag times to these constraints indicating that, for example, Work Order 2 must begin two days after Work Order 1 to allow time for paint drying or that Work Order 2 must begin one day before Work Order 1 ends.

1. Select two work orders in the **4D Gantt** view and click the **Create Precedence Constraint** button on the view toolbar.

   Teamcenter draws an arrow from the predecessor work order to the successor work order.



2. Right-click the precedence arrow and choose **Edit Precedence Constraint**.



3. Select **Lag** or **Lead** and enter the number of days in the box.

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4. Click **OK**.

Enter item ID or item attributes search criteria

To search for items whose identifiers, names, attributes, or types match a specific pattern:

1. Type an item ID or item name directly into the boxes. For example, you can type **57h*** into the **Item ID** box to find all items whose ID starts with **57h**.

   When you click outside the box, Teamcenter enters the search criteria into the **Item attributes** box.

2. Click **...** beside the **Item attributes** box to specify additional attributes to be taken into consideration for the search. The search result must fulfill all specified search criteria.

   You can also immediately open the **Item Attributes** dialog box without previously specifying an item ID or name.

3. (Optional) Filter the search with saved search criteria by clicking **Change**.

   Teamcenter displays the **Change Search** dialog box. You can choose any of your saved searches or system-defined searches to filter the basic search results.

> Note:
>
> The **Search** and the **Clear All** buttons are available only after entering criteria in the **Item attributes** box. You cannot perform a search or save one until this box is populated.

Set occurrence note search criteria

- Click the **...** button to the right of the **Occurrence Notes** box to search for specific occurrence note values.

  Your administrator can define occurrence notes and associate them with particular structure lines. You can use these mapped occurrence notes as search criteria.

  For example, a mapped occurrence note may contain an interior/exterior flag that indicates if a given part is used on the interior or exterior of the product. You could then search for all parts on the exterior of the product or, by refining the search with other criteria, for all exterior brackets.

  Similarly, a mapped occurrence note may contain a number that references an illustration in the work instruction manual that describes how to assemble the part. You can search for all parts illustrated in the appropriate section of the manual.

Set classification search criteria

1. Click the **...** button to the right of the **Classification** box.

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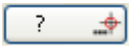
Teamcenter displays the **Classification** dialog box.

2. Click  to open the classification hierarchy.

3. Double-click a class name to select it from the tree.

   Teamcenter adds a line to the table containing the name of the class you select.

4. Specify the system of measurement.

   The systems available here (metric, nonmetric, or both) depend on the system in which the class is stored in the Classification Admin application.

5. In the **Property Name** column, click the cell containing the name of the class.

   Teamcenter displays a list of all the attributes within the class.

6. Select the class and attribute with which you want to search.

7. Click the cell containing the = sign and select an operator.

8. In the **Searching Value** column, select the cell and type a value for the attribute for which you want to search.

9. (Optional) Click + to create an additional search parameter.

   The lines of the table, each representing an individual search parameter, are joined by the **AND** operator.

10. Click **OK**.

    Teamcenter displays the classification search parameters in the **Classification** box of the **4D Analysis** dialog box.

Set form attribute search criteria

You can filter searches using the criteria of forms attached to the items or item revisions.

1. Click the **...** button to the right of the **Form Attributes** box.

   Teamcenter displays the **Form Attributes** dialog box.

2. Enter the form attributes for the search, including any mathematical operators.

   a. Select the relation, parent, and form type for which you want to search.

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b. Click + to add a line.

c. Enter or modify the property name, operator, or searching value by clicking in those cells in the table.

Teamcenter displays the form type and search values as a string in the format similar to the following example:

```
“ItemRev:BVRSyncInfo:last_struct_mod=value1 AND ItemRev:BVRSyncInfo:
last_Sync_date=value2”
```

Creating in-process assemblies

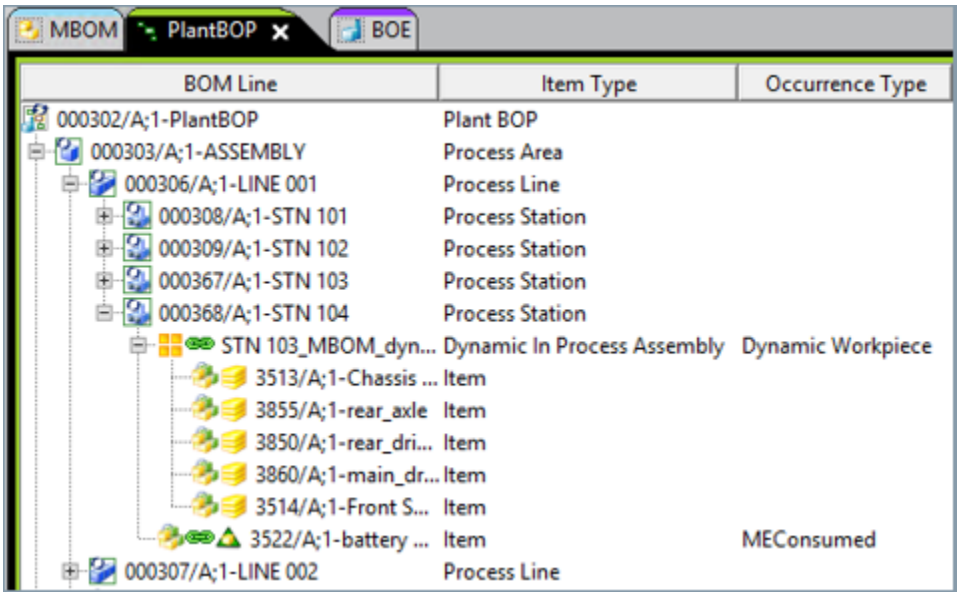
About in-process assemblies

Manufacturing Process Planner allows you to create or update an in-process assembly (IPA) structure based on consumed items in a Bill of Process (BOP).

An IPA is an aggregation of assigned parts incoming into different stations. When you generate an IPA on a specific station, you can see all the assembled parts up to and including that station. Teamcenter has two methods of IPA creation:

- Dynamic in-process assembly (DIPA)

  Teamcenter creates a flat list of all parts in incoming stations, stored in the process structure with a **Dynamic Workpiece** occurrence type and with each station's parts generated as an end item.



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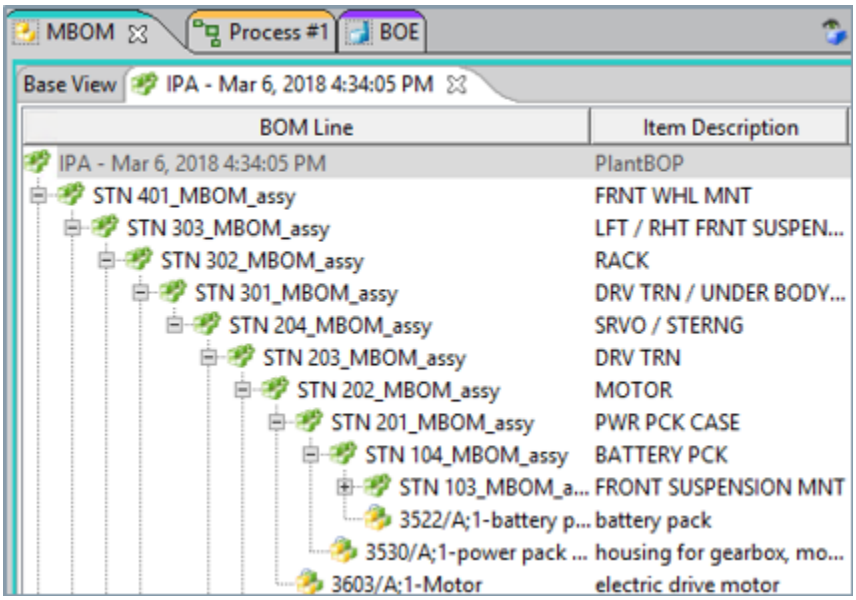
When you create a DIPA, it is not persistent (never out of date), and the process is much faster than legacy IPA creation. DIPA supports scope flows (links from a selected line in a BOP), can be used in **isolated studies** as long as it is created under the station level, and is automatically created when a structure is loaded to Process Simulate or Teamcenter lifecycle visualization.

- Legacy in-process assembly (IPA)

  When you set assembly tree creation options, Teamcenter generates a nested tree structure representing the IPA by traversing the process structure, collecting IPAs from previous process elements, and adding the selected line's consumed objects. The IPA is stored as an occurrence group and is displayed in a separate tab beside the base view of the root product.



  The system displays as many tabs as there are in-process assemblies for the different configurations. The IPA also appears as a line in the process structure in which you create it. By default, an IPA has an **MEWorkpiece** occurrence type. Your administrator can change this in the **MERelationTypeAssemblyTree** preference. Each IPA appears directly under the process element into which its corresponding process element flows if this process element type is selected in the **Selected Process Types** list in the **Generate Assembly Tree Options** dialog box. Otherwise, the IPA appears under the next process element flow that is selected in the **Selected Process Types** list. For example, if the process flow is from Station 2 to Station 3, the IPA for Station 2 is placed under the Station 3 process using an **MEWorkpiece** occurrence type.

  If a process structure consumes parts from multiple product structures, you can choose the product structure for which the assembly tree is created.

  If the **Show unconfigured Assigned Occurrences** button is turned off, only assigned IPAs from product structures that are configured for this process are displayed.

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Tip:

Right-click the IPA in the process structure and choose **Find in base view** to find the object in the assembly tree.

The in-process assembly transforms sequence length to tree depth. This is useful to model fishbone-structured assembly lines, for example, where a main line consumes the outcome of a subline. This outcome of a subline can be obtained by creating the in-process assembly tree on the subline. The resulting occurrence group can subsequently be consumed into the main line.

You can visualize the IPA in the **Graphics** view. Visualizing the IPA can cause the part to appear multiple times in the viewer. To prevent you from having to select and blank each individual instance, you can set the following preferences:

- **TCVIS_Check_For_Duplica**
- **TCVIS_Keep_Duplica_Map**
- **TCVIS_Show_Consumed_Part_Only**

If you have a process with a generated IPA structure with the **Show Unconfigured Assigned Occurrences** button turned on, and you unload the product and turn off the **Show Unconfigured Assigned Occurrences** button, some of the IPA levels are not displayed. To avoid this, when turning the **Show Unconfigured Assigned Occurrences** button on and off, do not unload the product structure.

Working with dynamic in-process assemblies

Dynamic in-process assembly overview

You can create a dynamic in-process assembly (DIPA) for a process structure. This method of IPA creation is based on lightweight BOM technology, providing a much faster way to create assemblies. You can create a DIPA for one or multiple stations and display the results in the **Graphics** view. As long as a DIPA is created beneath the station level in a process structure, it can be used in **isolated studies**.

A DIPA is valid for the exact moment it is created. If you make any changes after creating the DIPA, you must recalculate it. DIPAs are available only for the current Manufacturing Process Planner session.

Your administrator must set the **MEDynamicIPAOccurrenceTypes** preference to list all the part occurrence types that should be collected into a DIPA. By default, this preference is set to **MEConsumed**. If you use other occurrence types, such as custom occurrence types, your administrator must add these occurrence types to the preference. Otherwise the DIPA does not contain parts assigned to the process structure with those occurrence types.

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If you remove parts from an assembly by assigning them a specific occurrence type, for example, **MEDisassembled**, the DIPA does not contain the removed part. The occurrence type designated for part removal is specified in the **MEDynamicIPARemoveOccTypes** preference.

In the PERT chart, you can **link stations that are not under the same direct parent** to help you model fish-bone structures of sub-lines merging or leaving a main line. Creating a DIPA for those stations then includes parts containing scope flows to any parts involved in the DIPA.

> Tip:
>
> You can use the **Structure Search** to find all features in the search scope that are connected to parts in the incoming dynamic in-process assembly of a given process.

Create or update a dynamic in-process assembly

1. Select one or more process structures and choose **In-Process Assembly Tree** → **Create/Update Dynamic Assembly Tree**.

   > Note:
   >
   > If you want to use a dynamic in-process assembly (DIPA) in **isolated studies**, you must create it under the station level.

2. If the selected process structures contain parts from more than one product, select the configuring product structure.

   Unless you **create DIPAs recursively**, you can only create a DIPA for one configuring structure at a time.

3. If you are creating a DIPA on a node other than the root node, choose whether to include structure subhierarchies and click **Continue**.

   Teamcenter creates the DIPA containing the incoming parts in a flat list and adds it to the process structure. If the station contains more than one incoming station (*marriage* station), Teamcenter creates a separate DIPA node for each incoming path. If you selected the option to include structure subhierarchies, Teamcenter creates DIPAs for every child node in the hierarchy from the selected process downward or, if they already exist, updates them.

   If you unload and load a process structure containing a DIPA, Teamcenter displays a node in the structure representing the DIPA, but the node contains no parts.

   > Note:
   >
   > The DIPA name is set by default to **bl_rev_object_name**. The default can be changed by modifying the preference **MEDynamicIPADisplayName**.

4. (Optional) Recalculate the DIPA in response to changes in the participating structures.

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Create DIPAs recursively

You can create multiple dynamic in-process assemblies (DIPAs) recursively.

Starting from a selected plant bill of process (BOP) element, such as an area, you can create DIPAs for objects below that element in the BOP structure that are connected to the start element via a PERT flow.

Prerequisites

Your administrator must set three preferences to define where DIPAs are created.

- **MEDynamicIPARecursiveCreateProcessTypes** determines which object types are used to recursively generate DIPAs in the process subhierarchies. Default values include **Mfg0MEProcStatnRevision**, for the station, and **MEProcessRevision**.

- **MEDynamicIPARootItemTypes** specifies the types of root item allowed by the product or manufacturing bill of material (MBOM) structures that are part of a DIPA. Default value = **Item**.

  Note:

  If you create a custom item type that is subclassed instead of subtyped, or vice versa, you may have to edit the value of **MEDynamicIPARootItemTypes** and add your custom type.

- **MEDynamicIPATraversalClosureRule** determines the closure rule to be used for traversal of the process structure to calculate the DIPA. Default value = **DynamicIPAProcessOnlyWithPA**.

  Note:

  If you customize your process and add your own closure rule type derived from the item type, you may have to edit the transfer mode value of **MEDynamicIPATraversalClosureRule**.

Tip:

To define custom item types and processes so that you do not have to modify **MEDynamicIPARootItemTypes** and **DynamicIPAProcessOnlyWithPA** preferences, see the documentation on how to subclass or sybtype these elements in the *Configure your business data model in BMIDE* online help.

Procedure

1. In a plant BOP, right-click the element where you want to start to recursively create DIPAs and then choose **In-Process Assembly Tree → Create Recursively Dynamic Assembly Tree**.

   DIPAs are generated for each defined object type in the process subhierarchies. In the following example, DIPAs are created for all stations contained in the process flow beneath the selected

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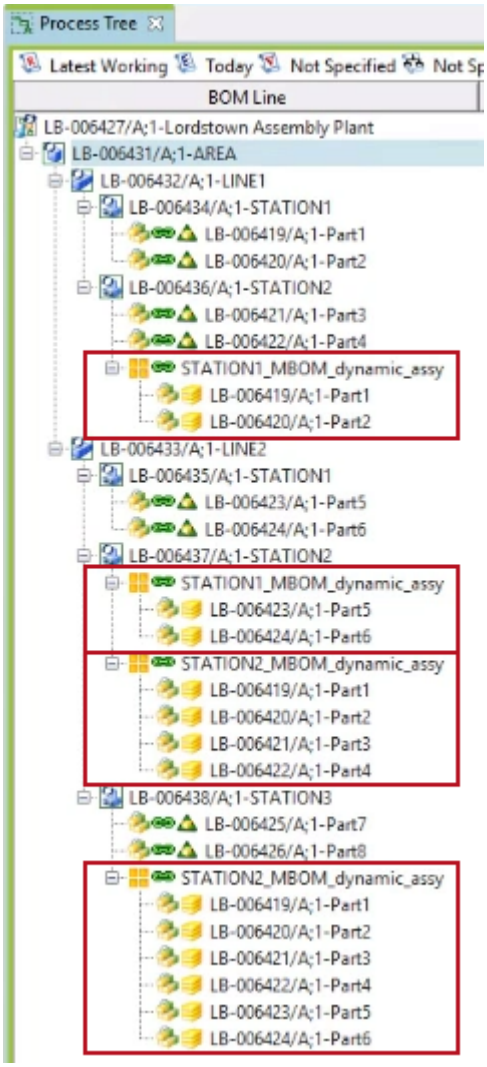
AREA. Parts included in each station's process, including any parts inherited from previous stations in the PERT flow, are displayed in each station's DIPAs.



To create a recursive DIPA, you can start on any level defined in the preferences and that level defines a DIPA at every station level below the original. Based on **MEDynamicIPARecursiveCreateProcessTypes** preference values defined by your administrator, DIPAs can be created at the plant, area, line, or station level.

Copy a dynamic in-process assembly to an operation

You can copy a dynamic in-process assembly (DIPA) into a bill of process (BOP) operation. You can also update or clear pasted DIPAs as needed.

1. If you are editing in context, hide in-context editing mode.

2. In the BOP structure, right-click a DIPA and choose **Copy**, then right-click a station and choose **Paste**.

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The pasted DIPA is displayed below the station where it was copied.

3. (Optional) Do one of the following.

   - To update the pasted DIPA, right-click it and choose **In-Process Assembly Tree→Update Dynamic Assembly Tree**.
   - To remove a pasted DIPA, right-click it and choose **In-Process Assembly Tree→Clean Dynamic Assembly Tree**.

Delete a dynamic in-process assembly

> Note:
>
> This command is not available on dynamic in-process assemblies (DIPAs) in **isolated studies**.

1. Select a process structure containing unwanted DIPAs and choose **In-Process Assembly Tree→Clean Dynamic Assembly Tree** from the context menu.

2. In the **Clean Dynamic Assembly Tree** dialog box, select the configuring structure whose parts are included in the DIPA that you want to delete.

3. Select **Include Structure Sub-Hierarchies** to delete DIPAs contained in child processes of the selected process structure. If you select the root structure before choosing the **Clean Dynamic Assembly Tree** command, the **Include Structure Sub-Hierarchies** option is selected by default

View a dynamic in-process assembly

1. Open the **Graphics** view on the process structure or **isolated study** containing the dynamic in-process assembly (DIPA).

2. Select the DIPA that you want to view.

   Because the DIPA is based on the lightweight BOM technology, Teamcenter only loads the parts into the viewer as required.

3. (Optional) Reposition the DIPA.

   Teamcenter saves the absolute transformation matrix on the DIPA node. If you unload and reload the process structure, Teamcenter remembers the changes in the absolute transformation matrix. When you recreate the DIPA, it is once again displayed in the new position.

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Creating legacy in-process assemblies

Create an in-process assembly

You should create assembly trees overnight or at a time when the processes involved are not being changed. Creating an in-process assembly (IPA) can be very time-consuming, depending on the processes involved.

> Note:
>
> To create IPAs, the **PS_Duplicate_FindNo_Update** preference must be set to **true**.

1. Select a process in the process structure. You can only select a single process at a time. The IPA is created for the root process of the structure.

2. Choose **Tools→Assembly Tree→Create/Update Assembly Tree**.

   Teamcenter displays the **Create Assembly Tree** dialog box. The next steps depend on whether there are multiple products configuring the process structure.

   - If multiple products configure the process, select the desired configuring product and click **Continue**.

   - If only one product configures the process structure, confirm the selection and click **Continue**.

   Teamcenter displays the **Create Assembly Tree** dialog box.

3. Type a name for the in-process assembly.

   Teamcenter automatically adds the name of the top-level product and appends **assy** to the end of the IPA name. You can customize this ending in the **IPA_OG_postfix** preference.

4. (Optional) Click **Options** to change the settings for the assembly tree generation.

5. Click **Generate**.

   Teamcenter creates the assembly tree and places an information file as an attachment on the process for which the IPA is generated.

   Once generation begins, you can only stop it by stopping the server process.

Update an in-process assembly

If you change a process structure, you can update an in-process assembly that already exists, but you cannot change the options that you set at creation. As with IPA creation, you should update assembly

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trees overnight, or at a time when the processes involved are not being changed. Updating an assembly tree can be very time-consuming, depending on the processes involved.

1. Select the process in the process structure containing the IPA that you want to update.

2. Choose **Tools→Assembly Tree→Create/Update Assembly Tree**.

   Teamcenter displays the **Create Assembly Tree** dialog box. The next steps depend on whether there are multiple products configuring the process structure.

   - If multiple products configure the process, select the desired configuring product and click **Continue**.

   - If only one product configures the process structure, confirm the selection and click **Continue**.

   Teamcenter displays the **Update Assembly Tree** dialog box.

3. Click **OK**.

   Teamcenter updates the existing in-process assembly.

Perform a local update

You can perform a local update after you detect and rectify errors in the generation or complete update.

1. Select a process in the process structure. You can only select a single process at a time.

2. Choose **Tools→Assembly Tree→Perform Local Update**.

   Teamcenter displays the **Perform Local Update** dialog box. The next steps depend on whether there are multiple products configuring the process structure.

   - If multiple products configure the process, select the desired configuring product and click **Continue**.

   - If only one product configures the process structure, confirm the selection and click **Continue**.

   Teamcenter displays the **Local Update** dialog box.

   Local update changes the IPA on which the command is invoked. If necessary, it also updates the occurrence pointing to this IPA in the process structure (located under the process element following the current process element in the process flow sequence).

   If the IPA has not been created and attached to the matching process, Teamcenter also changes the matching process and adds the incoming IPA as **MEWorkpiece**. This happens only if a process

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whose type is in the **Selected Process Types** list is added to the structure after the initial IPA is created.

This command works only on the currently set configuration of the loaded process or product.

Set assembly tree creation options

1. Choose **Tools→Assembly Tree→Create/Update Assembly Tree**.

   Teamcenter displays the **Create Assembly Tree** dialog box.

2. Click **Options**.

   Teamcenter displays the **Generate Assembly Tree Options** dialog box.

3. Do any of the following as necessary:

   - To specify for which process elements an IPA is created as a structure is traversed, click **Process Types** and select the process types from the **Available process types** list.
   - To specify which consumed object types appear in the assembly tree, click **Occurrence Types** and select the consumption types from the **Available occurrence types** list.
   - To specify the effectivity of the generated IPA, click the **Effectivity** tab and enter the effectivity details.
   - To specify the name of the error and problems report, click the **Log Files** tab and type the name in the **Attachment Name** box. This report contains all the problems or conflicts that occurred during generate/update that need to be addressed, for example, missing targets, locked nodes, or checked out nodes.

     Teamcenter saves this file as an attachment on the top-level process element on which the assembly tree was generated/updated. You can open this attachment, copy the problematic node name from the log file, and search for it in the process structure. You can choose to run a local update, or even a full update to correct the problem.

   - To create a run-time statistics log, select the **Create run-time statistics log file** check box in the **Log File** pane. This log is also added as an attachment to the top process revision.

   When Teamcenter creates the assembly tree, it places a configuration file as an attachment on the process for which you generate the IPA. You can see this file in the **Attachment** view.

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Receive e-mail notification of IPA generation

Before you generate an in-process assembly, you can choose to have Teamcenter send you an e-mail notification after completion of the IPA. This e-mail contains information about the IPA creation, as well as log files that are created during generation.

1. Select the top-level process for which you want to create an IPA and choose **Tools→Assembly Tree→Create/Update Assembly Tree**.

   The **Create Assembly Tree** dialog box is displayed.

2. Click **Options**.

3. In the **Generate Assembly Tree Options** dialog box, click the **Log File** tab.

4. Select **Send Email when Done**.

5. Click **Recipients** and add the e-mail addresses of those people to whom you want to send notification.

   > Note:
   >
   > No e-mail is sent when performing a local update or cleaning (deleting) the IPA.

Add effectivity when generating an IPA

You can filter the IPA tree using the effectivity mechanism.

1. Select the top-level process for which you want to create an IPA and choose **Tools→Assembly Tree→Create/Update Assembly Tree**.

   The **Create Assembly Tree** dialog box is displayed.

2. Click **Options**.

3. In the **Generate Assembly Tree Options** dialog box, click the **Effectivity** tab.

4. Set the desired effectivity.

   After generating an IPA tree using effectivity, you must specify an effectivity value in the configuration rule in order to use other IPA functionality on this specific tree.

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Tip:

Choose **Show Unconfigured by Occurrence Effectivity** from the view menu to show all the **MEWorkpiece** occurrences that were generated with effectivity, including those that are configured out in the current configuration rule.

Delete an in-process assembly tree

1. Select any process in the IPA that you want to delete.

2. Choose **In-Process Assembly Tree** → **Clean Assembly Tree**.

   Teamcenter displays the **Clean Assembly Tree** dialog box. The next steps depend on whether there are multiple products configuring the process structure.

   - If multiple products configure the process, select the desired configuring product and click **Continue**.

   - If only one product configures the process structure, confirm the selection and click **Continue**.

   Teamcenter displays the **Clean Assembly Tree** dialog box.

   Teamcenter removes the IPA workpiece occurrences from the process and deletes the IPA occurrence groups. This command works on the currently set revision rule and cleans only the IPA configured by that rule.

Show where originally assigned

1. In the **Graphics** view, right-click the graphical representation of a part.

2. Choose **Show Line Where Originally Assigned** from the shortcut menu.

   Teamcenter searches for the line in the process structure where the selected part was originally consumed. If it does not find the part in the currently loaded structure, it, if desired, fully loads the process structure and repeats the search. If the selected part is additionally used in an IPA tree, Teamcenter finds only the original consumed part and selects it. If the selected part is used only in an IPA tree, Teamcenter does not expand the tree, but selects the root.

Filtering in-process assemblies by proximity

About filtering IPAs by proximity

You can filter an in-process assembly (IPA) tree to focus on a particular area of the product, for example, when performing a study.

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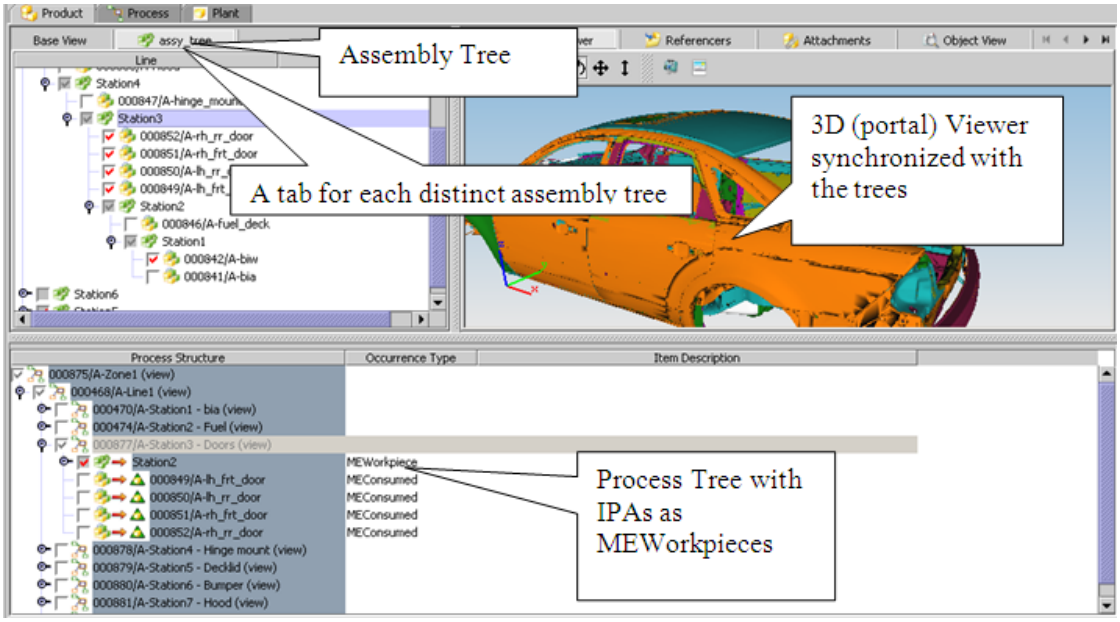
An IPA is defined for each station or other process level. It consists of an aggregation of all parts that were already assembled, for example, at previous stations. The IPA can become very large (particularly at stations near the end of the line) and may be slow to open in the assembly viewer for a study. You can use the proximity search to identify and display only neighboring objects that are relevant to the study. For example, when studying a front light assembly of a vehicle, you do not have to load the entire IPA, but can specify only parts within a 300 mm radius of the center point of the light assembly. When you do this, Teamcenter creates a persistent object that contains those parts of IPA found by the search; consequently, there is no need to search for each study.



The search ignores any modifications that were made to the parts in the IPA tree. For example, the hood may be opened to allow installation of a part in the engine and should not be included in the search results. However, if the hood is within the range of the search on the *assembled* car, it is included in the results.

You can send the search results in PLM XML format to external applications, for example, Process Simulate.

Configuring the proximity search results

Configure the presentation of manufacturing search results by setting the following preferences, as applicable:

- **ME_Proximity_search_result_occ_type**

  Defines the occurrence type that represents a proximity search result collection in the process structure. The default value is **MEFilteredIPA**.

- **ME_Proximity_search_result_occ_group_type**

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Defines the occurrence group type that represents a proximity search result collection in the process structure. The default value is **MEProximityResult**.

- **ME_Proximity_FilteredIPA_root_name**

  Defines the name of the root that holds all proximity search result groups. The default value is **Proximity_Search_Results**.

- **ME_Proximity_FilteredIPA_suffix**

  Defines the suffix of the filtered IPA names. The default value is **_fipa**.

> Note:
>
> If you change the settings of any of the preferences listed above, you must restart the server to clear cached data and restart the services.

Search an IPA

1. Select a process BOM line in the process tree and choose **Tools→Assembly Tree→Create/Update Filtered Assembly Tree**.

   Teamcenter displays the **Create/Update Filtered Assembly Tree** dialog box. The next steps depend on whether there are multiple products configuring the process structure.

   - If multiple products configure the process, select the desired configuring product and click **Continue**.
   - If only one product configures the process structure, confirm the selection and click **Continue**.

   Teamcenter displays the **Filter Assembly Tree** dialog box.

2. Define the scope of the search in one of two ways.

   - By specifying an actual proximity distance to the part or parts that you added to the **Reference Objects** list. The search returns all objects within the specified distance. You can view the list of reference objects in the **Filter Assembly Tree** dialog box by clicking the **+** button.
   - By specifying the position and dimensions of a 3D bounding box. The search returns all objects within the defined box.

     You can choose a **Centroid and Size** box, then define the center of the box and its dimensions. Alternatively, you can choose a **Two Vertices** box, then define its lower left corner and dimensions.

     You can click **Center to Selected** to center the box on the selected part.

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Note:

The **TruShape Filtering** dialog box is always checked.

3. Click **Run** to start the search.

   Teamcenter displays the **IPA Filtering Results** dialog box listing all objects found.

   The search results are displayed in tree format as a subset of the original IPA. Items out of scope of the search are skipped, but the original hierarchy of the IPA is maintained. They are stored in an occurrence group under a common **Proximity Search Results** root in the structure and are also pasted under the process as an **MEProximityResult** object.

4. Optionally, use the following buttons on the dialog window to filter the results:

   - **Find in Display**

     Allows you to search for specified lines in the results list.

   - **Display**

     Highlights the object associated with the selected line in the tree and assembly viewer.

   - **Remove Line from Results**

     Removes one or more selected lines from the results list.

   - **Add Line from Original IPA**

     If you select a bill of process (BOP) line in the tree or the assembly viewer, and then click this button, the object is added to the results list. Manufacturing Process Planner does not immediately check if the added line is indeed part of the IPA, and any errors are reported only when the results are stored.

   - **Create/Replace Filtered IPA**

     Allows you to create a new filtered IPA or replace the stored filtered IPA with the version you edited.

Creating a flat structure for filtered in-process assemblies

Filtered in-process assemblies (FIPAs) from extremely large structures can themselves become very large, with many levels of nesting. These FIPAs can then be unwieldy to work with causing performance issues when loading this data to the embedded viewer or when sending data to Process Simulate. To alleviate this situation, you can create a filtered in-process assembly that contains just three levels:

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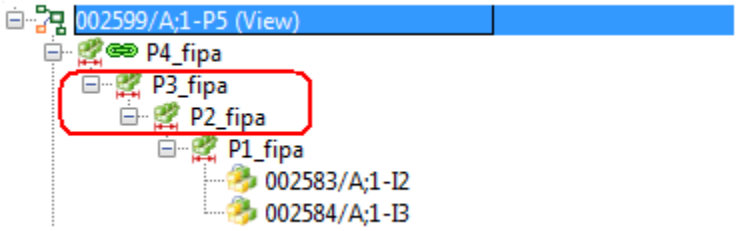
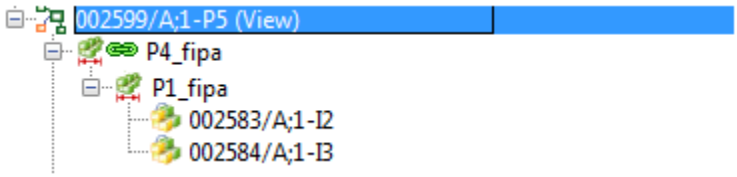
- Level 1 contains the FIPA of the station just before the current station.
- Level 2 contains the FIPAs of the stations beneath the immediate child station of the current station.
- Level 3 contains the consumed parts of each FIPA.

The following examples show nested FIPAs and their resulting flat FIPAs.



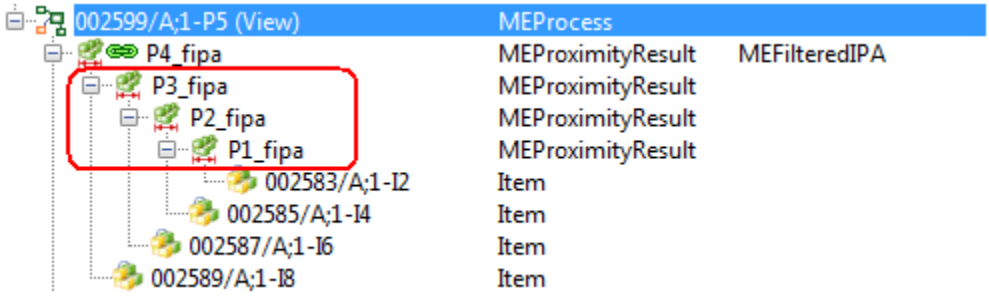
Nested FIPA



Flat FIPA

Because **P3_fipa** and **P2_fipa** do not consume any parts, they are not displayed in the flat structure.

Any FIPAs that directly consume a part at any level are shown at the same level in the flat FIPA.



Nested FIPA with consumed parts

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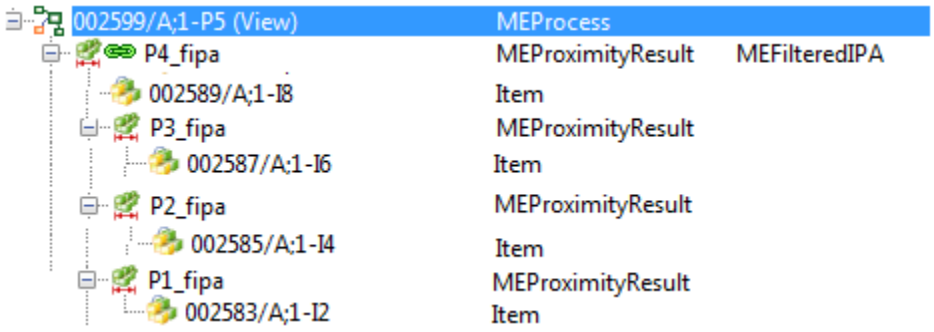
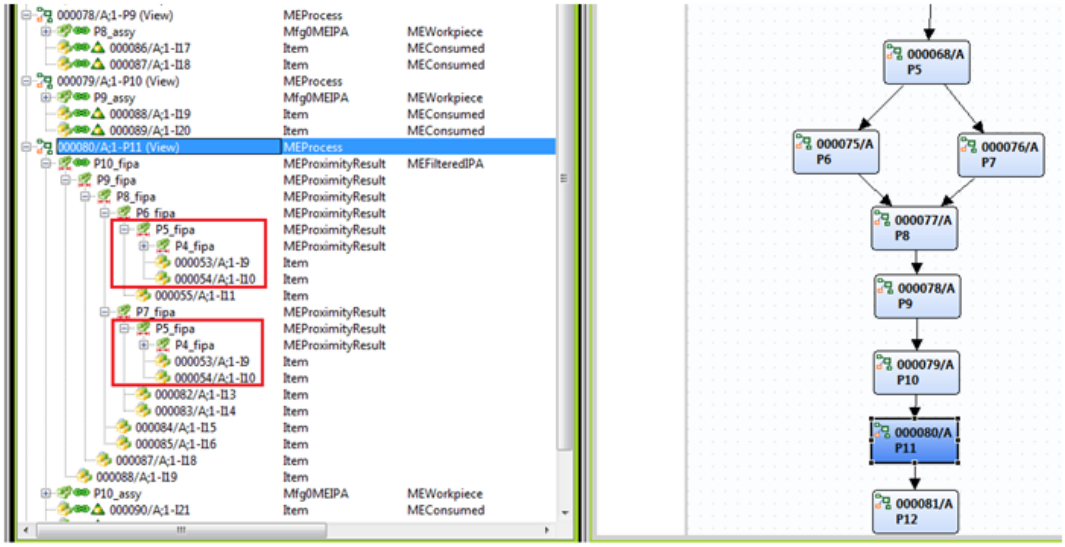


Flat FIPA with consumed parts

If a structure contains parallel stations, a particular FIPA may be contained under multiple FIPAs. Such FIPAs are shown only once in the flat FIPA at the location it is first encountered.



Nested FIPA with parallel stations

P5_fipa is contained within both **P6_fipa** and **P7_fipa**.

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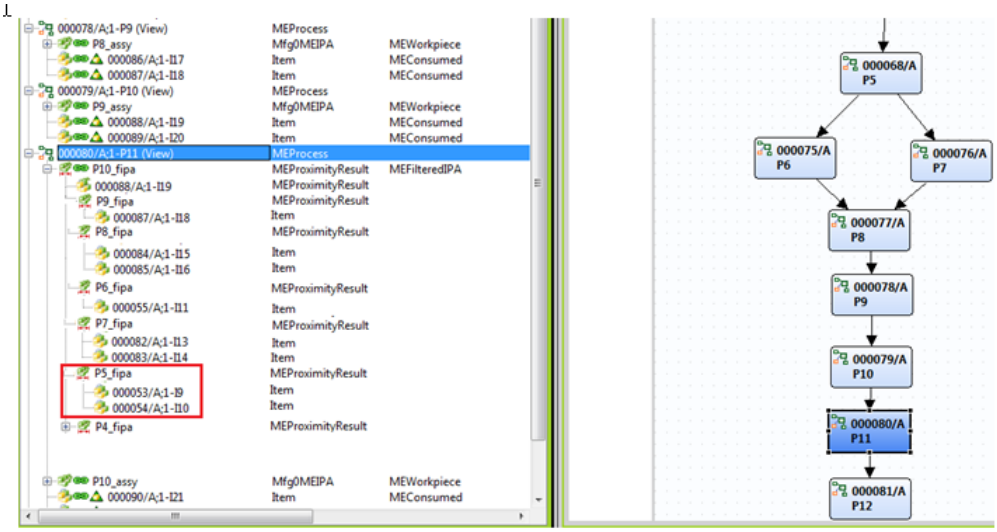
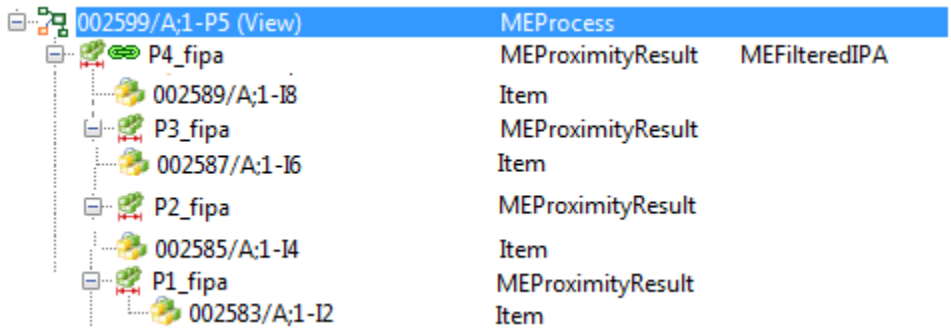


Flat FIPA for P11 with parallel stations

In the figure, you can see that **P5_fipa** is displayed only once in the flat FIPA structure.

You specify whether a FIPA structure is flat or nested in the **MECreateFipaStructure** preference. Once a FIPA is created, you cannot change its structure type. All FIPAs under a plant BOP have the same structure, either flat or nested.

If a FIPA that previously contained consumed parts, but has them removed, is updated, that FIPA is displayed in the updated FIPA, although it no longer contains consumed parts.



Flat FIPA before update

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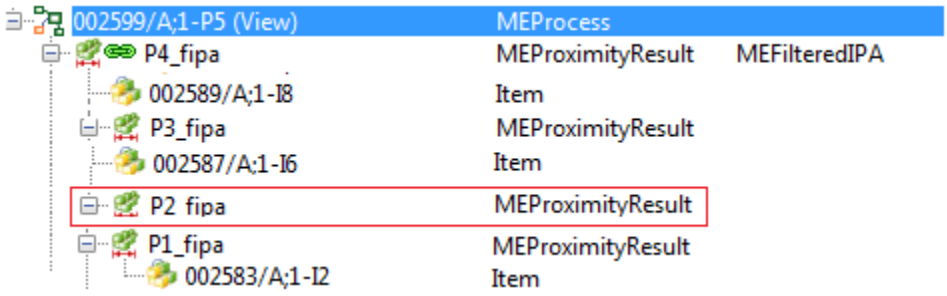

Flat FIPA after update

Although **P2_fipa** does not contain a directly consumed part, it is still shown in the flat FIPA.

When creating a FIPA, Teamcenter creates a log file that is attached to the process in which the FIPA is created. When updating, the log file is also updated. If no log file is attached at update (for FIPAs created in a version prior to Teamcenter 8.3.3), Teamcenter creates one during update.

> Note:
>
> If you want to start using flat FIPAs on existing structures that already have nested FIPAs, you must delete all old nested FIPA structures and re-create new flat FIPA structures. In this case, any attached information such as simulation datasets is lost and you must recreate it.

Delete the filtered in-process assembly tree

To delete a specific filtered in-process assembly (FIPA):

1. Right-click the process containing the FIPA that you want to delete and choose .

2. Choose **In-Process Assembly Tree** → **Delete Filtered Assembly Tree**.

   Teamcenter displays the **Delete Filtered Assembly Tree** dialog box. The next steps depend on whether there are multiple products configuring the process structure.

   - If multiple products configure the process, select the desired configuring product and click **Continue**.

   - If only one product configures the process structure, confirm the selection and click **Continue**.

   Teamcenter removes the FIPA from the process.

To delete all filtered in-process assembly trees:

1. Select the root process in the process structure for which you want to remove all FIPAs.

2. Choose **Tools** → **Assembly Tree** → **Delete All Filtered Assembly Trees**.

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Teamcenter deletes all filtered in-process assemblies from the process structure.

Running a batch update of in-process assemblies

The **ipa_b_executer** utility generates or updates in-process assemblies (IPAs) and updates filtered in-process assemblies (FIPAs) in a manufacturing process structure. By modifying the parameter file that the utility uses as input, you can update IPAs and/or FIPAs.

You can add a new line to the parameter file to indicate which FIPAs must be updated. Therefore, there are two types of lines in this file:

- The parameter line for an IPA that starts with **#Item**
- The parameter line for a FIPA that starts with **#Item_FIPA**

Given these two types of lines, three cases can exist:

- If only an **#Item** line is present in the file, Teamcenter updates the IPA only.
- If only an **#Item_FIPA** line is present in the file, Teamcenter updates the FIPA only.
- If both **#Item** and **#Item_FIPA** lines are present in the file, Teamcenter updates both the IPA and the FIPA.

You cannot create FIPAs with this utility. You can only create FIPAs from within Manufacturing Process Planner.

Configuring process structures

Set configuration for multiple structures

Use the **Configure Structure Contexts** dialog box in Manufacturing Process Planner to configure multiple structures revision rule, effectivity, and other configuration items. This function is helpful if you are configuring more than one structure to the same configuration.

To use this feature, make sure you load all structures that you want to configure in Manufacturing Process Planner.

1. In Manufacturing Process Planner, choose **Advanced→Configure Structures**.
2. In the **Configure Structure Contexts** dialog box, select **Structures and Collaboration Contexts** to bulk apply variants, effectivity, and occurrences.
    a. Select the structures to configure by selecting the check box in the **Structure Name** column.

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b. In the **Revision Rule** column, select the revision to use in the configuration.

c. In the **Variant Rules** column, select the variant to use in the configuration.

d. In the column, select the check box if unconfigured variants of the structure are to be shown in the configuration.

e. In the column, select the check box if unconfigured by occurence effectivity of the structure are to be shown in the configuration.

f. In the column, select the check box if suppressed occurances of the structure are to be shown in the configuration.

g. In the column, select the check box if unconfigured changes of the structure are to be shown in the configuration.

h. In the column, select the check box if unconfigured assigned occurances of the structure is to be shown in the configuration.

i. In the **Effectivity Groups** column, select the effectivity groups to use in the configuration for each structure.

j. In the **Effectivity** column, select the effectivity to use in the configuration for each structure.

3. To update all BOM views with the selected values, click **Apply**.

4. To save all configuration changes including changes to loaded collaboration context, click **Apply and Save.**

5. To exit, click **Close**.

About process configuration

A manufacturing process plan consists of three interconnected structures:

- Product
- Processes and operations
- Work area

Configuration management helps you define and apply variant rules to each of these structures independent of the other structures.

Because the process structure can have its own lifecycle and variability, lines in a process can configure out in one of the following ways:

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- By occurrence effectivity

  If you add an operation with occurrence effectivity, it is configured out when it is not effective. Show these lines using the **Show Unconfigured by Occurrence Effectivity** button in the structure view or choosing **Show Unconfigured by Occurrence Effectivity** from the view menu.

  The default state of this button is determined by the **MEShowUnconfiguredOccurrencesEffectivityDefaultState** preference.

- By incremental change effectivity

  If you make changes with an incremental change (IC) and if it carries effectivity, the changes related to it are configured out if it is not effective. Show these changes by choosing the **Show Unconfigured Changes** button in the structure view or choosing **Show Unconfigured Changes** from the view menu.

  The default state of this button is determined by the **MEShowUnconfiguredChangesDefaultState** preference.

- By variants/options

  If a BOM line carries a variant condition making it valid for a certain set of options, it is configured out for a different option set for which it is not valid. Show these lines by clicking the **Show Unconfigured Variants** button in the structure view or by choosing **Show Unconfigured Variants** from the view menu. Using this menu command also shows objects that were configured out using effectivity.

  The default state of this button is determined by the **MEShowUnconfiguredVariantsDefaultState** preference.

- By reference window

  If you have a composition-type process, a line (for example, a consumed item) may be configured out because it is configured out in the reference or parent window on which it is based. Teamcenter does not differentiate why it was configured out in the other window. Show these lines by clicking the **Show Unconfigured Assigned Occurrences** button in the structure view or by choosing **Show Unconfigured Assigned Occurrences** from the view menu. In this case, the lines are gone from this process window because they are configured out of the parent structure. It is irrelevant whether they are configured out of the parent structure because of occurrence effectivity, incremental change effectivity, or variants/options.

  The default state of this button is determined by the **MEShowUnconfiguredAssignedOccurrencesDefaultState** preference.

The following preferences play a role in what processes you see when child processes are configured out:

- **controllingOccsForProcessConfiguration**

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- **typeAndRuleForProcessConfiguration**

Select configuring structures

In some cases, it is unclear which loaded structures configure a loaded process. For example, a process may contain consumed items from two different product structures and you only want to see the operations containing parts from one of these product structures. Another example is when you have two product structures and two process structures loaded. You want to configure each process by their associated product structure.

You can define which loaded structures configure loaded processes.

1. Select a process.

2. Do one of the following:

   - In the process structure view menu, choose **Define Configuring Structures**.

   - Choose **Tools→Define Configuring Structures**.

   Teamcenter displays the **Define Configuring Structures** dialog box that contains:

   - The name of the selected process.

   - The name of the collaboration context containing the selected process, if applicable.

   - A list of all loaded structures.

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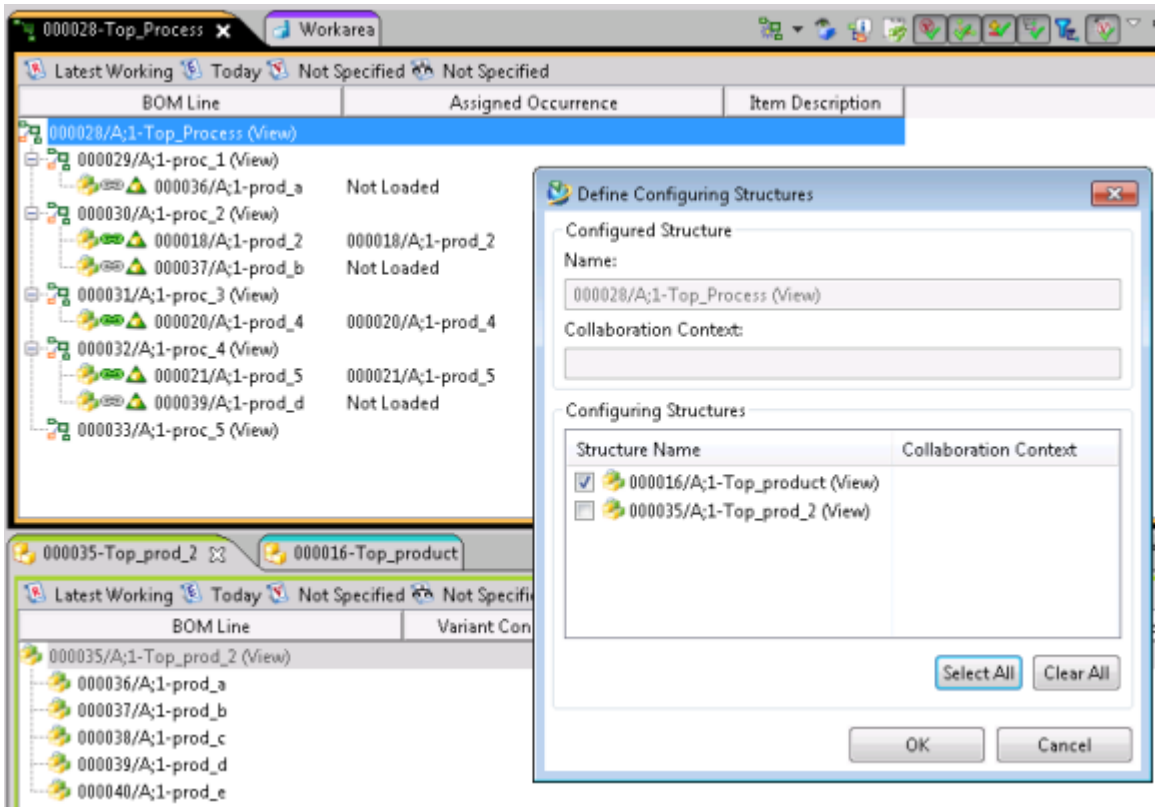

3. In the **Configuring Structures** list, select one or multiple structures that you want to configure the process. You can also clear all the selections so that the process is not configured by any structure. This behavior is equivalent to not having any product structure loaded.

   If only one structure is loaded, the **Define Configuring Structures** dialog box will not appear.

   By default, a product contained within a collaboration context configures a process located in the same collaboration context.

   If you select an occurrence group in the first step, Teamcenter carries out the command on the corresponding base view.

Tip:

- Teamcenter maintains the selection of a configuring structure until one of the structures is unloaded. To maintain the selection, save the structures to a collaboration context.
- To use the pre-Teamcenter 9.0 behavior where each loaded composition structure is configured by all loaded structures, set the **MEConfiguringStructuresMode** preference.

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Configuring structures by occurrence effectivity

About occurrence effectivity

The effectivity of an occurrence can be expressed as a date range or a range of units with respect to an *end item*. An occurrence can have multiple expressions comprising date effectivity, unit effectivity, or both. Multiple unit effectivity expressions may reference the same end item or different end items. If no occurrence effectivity is specified, the occurrence is considered to be always effective; that is, it is not constrained by any effectivity definition.

Occurrence effectivity is used principally for two purposes:

- To reflect changes to the structure over time as new parts replace old ones.
- To explicitly state the content of a unit or range of units as a means of managing the variability of the product. This technique is an alternative to using options and variants to configure the parts needed to fulfill a particular offering.

Occurrence effectivity is frequently used by manufacturers of military and aerospace products. The end item may correspond to a serial number or the tail number of an aircraft.

For example, there may be different hydraulic cylinders in the landing gear of an aircraft, depending on whether the aircraft is certified for unimproved runways. There may be additional differences to the aircraft to meet this purpose, such as debris deflectors, wheels, and tires. Using options and variants, you could define an option called **RW_Class = Paved or Gravel**, and there would be a variant rule on stouter cylinder to configure it in for the **Gravel** option. Using occurrence effectivity, the unit number of each aircraft unit that is certified for operation on gravel runways (for example, units 3-6, 17, 33-45) would be used in the effectivity specified for parts such as stouter cylinders. The effectivity of the regular cylinder would be specified using the other units (unit 1-2, 7-16, 18-32, 46-up).

Understanding occurrence effectivity

Understanding occurrence effectivity

Several occurrences may share an effectivity. When you edit the effectivity range on one occurrence, Teamcenter applies the change to all occurrences. (This is generally the reason for sharing effectivity.)

You can also pack occurrences if they share the same unit or date range and access protection status. Packed occurrences are displayed in a similar way to packed structure lines.

You cannot import or export structures containing occurrence effectivity. If you require individual structure nodes to have effectivity, consider the use of incremental change.

If an occurrence does not have an associated effectivity object, Teamcenter assumes it is always effective and it is configured regardless of the date or unit number set by the revision rule, as shown in the following figure.

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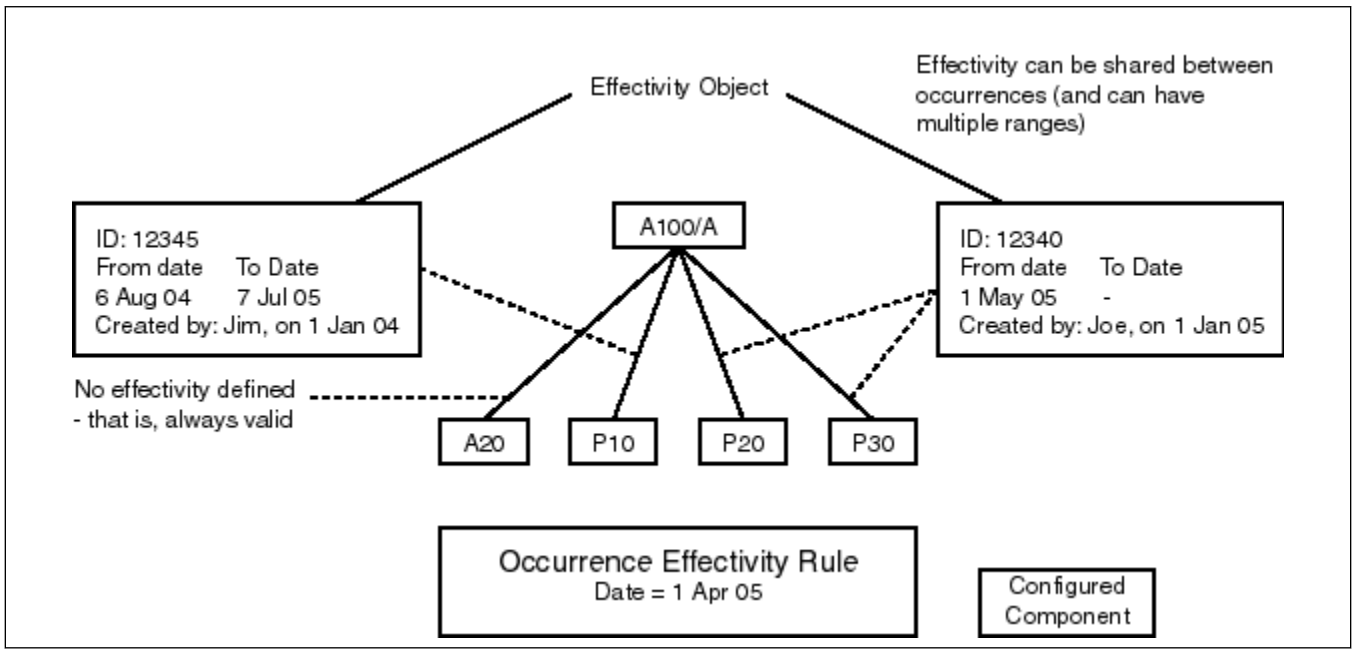
If you do not split effectivities, you can optionally use the **Configuration Item** check box to indicate the end item, although Teamcenter does not enforce this use.



Occurrence effectivity rule

When you create an effectivity condition on an occurrence, you change the parent BOM view revision. Consequently, you must have write access to the BOM view revision. However, you can make subsequent changes to the effectivity range if you have write access to the effectivity object, allowing you to edit effectivity data after the structure is released.

> Note:
>
> The import or export of a structure containing legacy occurrence effectivities is not supported. If you require individual structure nodes to have effectivity, consider using incremental change instead of occurrence effectivity. Structures managed with incremental change can be imported and exported using Multi-Site Collaboration.

Validating effectivity

You should check that effectivity ranges are consistent within the whole structure, ensuring that effectivity ranges lower down the structure lie within ranges higher up. You may not be aware of the constraints higher up the structure when you initially specify effectivity ranges at lower levels.

Teamcenter does not perform this validation automatically but you can include it as part of a workflow process that approves the effectivity ranges. In certain cases, this validation may not be appropriate, for example, when the structure is shared between different products.

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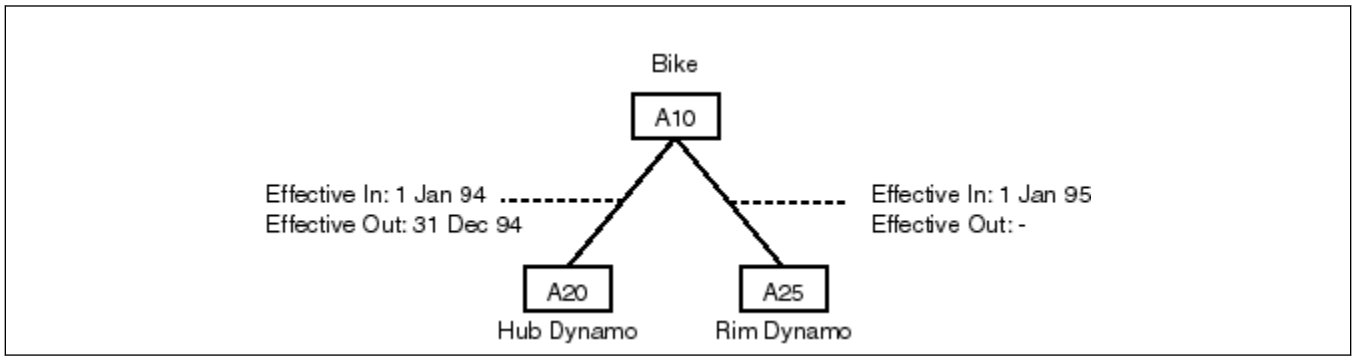
Defining mutually exclusive effectivity ranges

If you intend to define occurrences as mutually exclusive, manually check that they do not have overlapping effectivity ranges. For example, in the following figure, there are two different types of dynamo and it would be wrong to configure two dynamos at the same time.



Mutually exclusive effectivity ranges

When specifying effectivity, you can make the association between the occurrences clearer by using the same find number or attaching a special effectivity note to each.

Understanding unit net effectivity

For a large and complex structure, it is useful to understand the net effectivity of components within the structure. A lower level component may have been originally specified for any effectivity or a large range, but a narrower range applied at a higher level in the structure can reduce the net range for that component line.

Unit net effectivity can be considered as the intersection of an occurrence's unit occurrence effectivity with its parent's calculated unit net effectivity, from the specified structure line up to the top of the structure. For a line without an underlying occurrence (top line of a structure), there is no occurrence effectivity. This line is considered unconstrained and always configured. The unit net effectivity of a line that has no unit occurrence effectivity is equivalent to its parent's calculated unit net effectivity.

- If the line has only date effectivity expressions, these are ignored and the unit net effectivity is the same as its parent's calculated net effectivity.
- If there are multiple unit effectivity expressions with the same end item, these expressions are merged before intersection with the parent's calculated net effectivity.
- The intersection is taken with respect to the end item designations of the parent's unit net effectivity expressions. Unit effectivity expressions whose end items do not match any in the parent's unit net effectivity are ignored.
- If there is no intersection of the line's unit occurrence effectivity and the parent's unit net effectivity, the line's unit net effectivity is set empty (fully constrained).

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- The unit net effectivity of a line whose parent's unit net effectivity is empty also has an empty unit net effectivity, regardless of the line's unit occurrence effectivity.

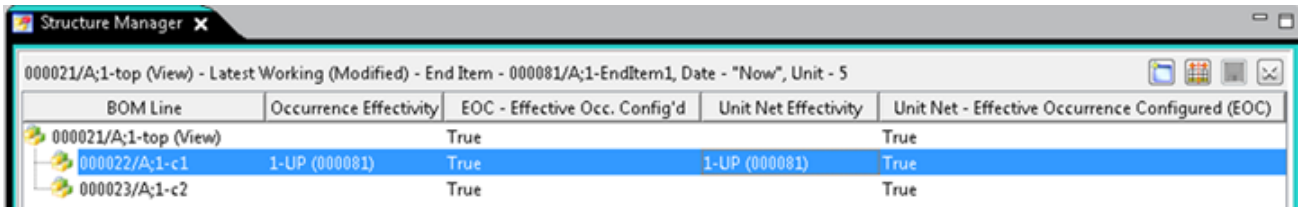
- The unit net effectivity of a particular component line is calculated when you display the line and is not persisted in subsequent sessions.

Effectivity flow-down reporting helps the user understand effectivity ranges and the impact of changes, especially as the complexity of the effectivity increases through the structure.

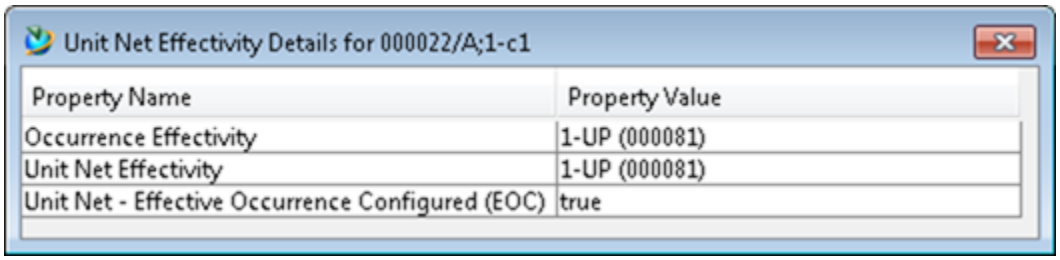
Calculate unit net effectivity

To calculate the net occurrence effectivity of a selected structure line, choose **Tools→Effectivity→Occurrence Effectivity→Calculate Net Effectivity**.

Teamcenter displays the occurrence effectivity, unit net effectivity, and net effective occurrence configured (EOC) information for the selected line.



The unit net EOC is set to **true** if the occurrence would be configured in based on the comparison of its calculated unit net effectivity with the revision rule occurrence effectivity entry. Teamcenter performs this comparison at run time and it is not persisted.



> Note:
>
> If you select a root line or more than one line, an error message is displayed.

Configuring by occurrence effectivity

If the revision rule controlling the configuration of a structure contains an entry for occurrence effectivity, occurrences for which no occurrence effectivity is specified are configured, together with occurrences whose effectivity expressions match some part of the revision rule occurrence effectivity

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entry. If **Show Unconfigured By Occurrence Effectivity** is selected, an occurrence may be shown or hidden, depending on occurrence effectivity (which may be a greater range than unit net effectivity).

The calculated net effectivity is also compared with the revision rule occurrence effectivity entry.

- If the unit net effectivity of a line is unconstrained, the unit net-EOC is **true**, regardless of any occurrence effectivity entry in the revision rule.
- If the unit net effectivity of a line is empty, the unit net-EOC is **false**, regardless of any occurrence effectivity entry in the revision rule.
- For a line whose unit net effectivity is not unconstrained or empty, its unit net-EOC is **false** if there is no occurrence effectivity entry in the revision rule.
- If there is an occurrence effectivity entry in the revision rule, the unit net-EOC is **true** only if the unit net effectivity matches some part of the revision rule occurrence effectivity entry.
- Any date effectivity expressions in the revision rule occurrence effectivity entry are ignored for the unit net-EOC comparison. A date range is not considered as a scope for unit net effectivity,

You may explicitly set an occurrence effectivity entry in the existing revision rule by choosing **Revision Rule→Set Date/Unit/End Item...**. You can then set a unit range defining the scope of effective occurrences you want to review. The **Unit Net-EOC** property shows whether the computed net effectivity is in that scope.

Using effectivity cutback

While defining a product managed with occurrence effectivity, the effectivity decisions evolve as the product content itself is developed. The design engineer makes decisions for effectivity ranges that reflect the implementation plan for when additional or replacement parts should be included in the bill of materials.

In general, there are many technical and logistical decisions that go into setting the date or unit range of the effectivity. To support this process, the engineer must understand the chain of effectivity for a given part. The engineer may choose to adjust the effectivity ranges when necessary. Over the life cycle of development and service of the product, customers using occurrence effectivity replace parts with other parts. As these changes are made, the historical chain of effectivity must remain consistent.

When a new occurrence of a part is specified as a replacement for an existing occurrence in a structure, the effectivity of the replaced part should be reduced (cut back) so that it does not overlap with the effectivity of the replacing part.

When a part with occurrence effectivity is replaced and cut back, prior generations that were replaced by the cutback part should also be considered for cutback, if the range of the newest replacement overlaps effectivity.

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> Note:
>
> Effectivity cutback is only supported with unit effectivity, not with date effectivity.

The following actions are supported by effectivity cutback:

- Replacing N parts with M replacements and updating ranges of effectivity. The historical chain of effectivity retains the N:M relationship, in case a future cutback operation needs to fully span the content of a link in the chain to cut it back.
- Validating prior replacements in the history of effectivity and updating accordingly.
- Enabling efficient updates to effectivity ranges after a replacement.

The following example shows how effectivity cutback occurs when an engineer modifies an assembly that is managed with occurrence effectivity.

1. The engineer specifies replacement parts P21, P22, and P23 for parts P11 and P12 with a unit range of 10-up.

   The system adds the occurrences P21, P22, and P23 effective unit 10-up The effectivity of P11 and P12 is cut back to the portion of the range not set on the replacements, namely units 1-9.

2. The engineer indicates parts P31,P32, and P33 are specified as replacements to P21, P22, and P23 for a range starting at unit 5.

   The system determines from the chain of effectivity and replacements that P21, P22, and P23 are replacements.

   The full range of effectivity is overlapped, so P21, P22, and P23 are no longer in effect. The span of replacement is complete, so the parts previously replaced are considered and P11 and P12 are cut back accordingly to 1-4.

3. The engineer specifies P42 as a replacement for P32 for a range within the span of effectivity of P32.

   P42 is effective for the range specified (units 20-30) and the replaced occurrence split to 5-19, and 31-up.

4. The engineer adjusts the effectivity range of P42 to units 22-32.

   The effectivity of P42 is updated to the new range.

5. A reviewer or the engineer validates the effectivity chain of P42.

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The system evaluates the effectivity of P42 against the parts it replaced or is replaced by. It identifies:

- A gap

  Unit 20,21 does not include replaced (P32) or replacing (P42) parts.

- An overlap

  Units 31 and 32 include both replaced (P32) and replacing (P42) parts.

6. The engineer replaces a part where only a portion of the historical replacement chain is changing.

   While a cutback of P33 by replacing part P43 is unambiguous, there is not an unambiguous action to take on P11 and P12 because P33 is only a subset of the historical chain:

   (P11,P12):(P21, P22, P23):(P31, P32, P33)

After replacing an occurrence and performing a cutback of the replaced part, the effectivity range of a part can be adjusted. If the new range overlaps with the effectivity of any parts in the historical chain of effectivity, the system issues a warning.

The following table shows how effectivity cutback occurs in this scenario.

Step	Task	Part P11	Part P12	Part P21	Part P22	Part P31	Part P32	Part P33	Part P42	Part P43
1	Initial state	1-up	1-up							
2	Replace P11 & P12 with P21, P22,P23 at unit 10	1-9	1-9	10-up	10-up					
3	Replace P21, P22, P23 with P31, P32,	1-4	1-4			5-up	5-up	5-up		

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Step	Task	Part P11	Part P12	Part P21	Part P22	Part P31	Part P32	Part P33	Part P42	Part P43
	P33 at unit 5									
4	Replace P32 with P42 for units 20-30	1-4	1-4			5-up	5-up	5-up	20-30	
5	Adjust effectivity of P42 to units 22- 32						Warning		22-32	
6	Replace P33 with P43 for units 3-7	Error	Error					8-up		3-7

When a link in a chain of occurrence effectivities is completely overlapped (that is, a complete cutback is made of its entire range) it is logically removed from the structure. The system informs the user there is no effectivity for that occurrence. A logically removed occurrence can be removed from the structure and removed from historical chains of effectivity used for evaluation of future cutback operations. In this situation, the change history is the only way to know the part ever existed in the structure.

Editing occurrence effectivity

To edit occurrence effectivity data, your Teamcenter user name must be included in the appropriate effectivity user group and role that the administrator defines.

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Associate existing effectivity to an occurrence

> Note:
>
> Use this approach only when you want the effectivity to be the same for all occurrences sharing this effectivity object. If you edit the effectivity object's date or unit number ranges, Teamcenter applies this change to all occurrences that reference it.

1. Select the line in the structure representing the occurrence with which you want to associate effectivity.

2. Choose **Tools→Effectivity→Occurrence Effectivity→View, Create and Edit**.

   Teamcenter opens the **Occurrence Effectivity** dialog box.

3. In the **Effectivity ID** box, type the identifier of the effectivity object you want to associate with the occurrence, and press the Enter key. Alternatively, you can search for the effectivity object by clicking **Search** adjacent to the **Effectivity ID** box.

   Teamcenter populates the date or unit number table with the ranges from the effectivity object.

4. Click **OK** and Teamcenter associates the effectivity with the occurrence.

Create effectivity on multiple occurrences

Create and associate the same effectivity with several occurrences by selecting the appropriate line in the structure and choosing **Tools→Effectivity→Occurrence Effectivity→Create on Multiple BOM Lines**. The effectivity may be:

- Shared

  Shared effectivity must have an ID. If you are creating shared effectivity, ensure the **Use shared effectivity** check box is selected.

- Unshared

  Unshared effectivity has no ID. If you are creating unshared effectivity, ensure the **Use shared effectivity** check box is cleared.

Modify the effectivity of an occurrence

> Note:
>
> Any changes you make affect all occurrences sharing the same effectivity object.

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1. Select the line in the structure representing the occurrence whose effectivity you want to modify.

2. Choose **Tools→Effectivity→Occurrence Effectivity→View, Create and Edit**.

   Teamcenter opens the **Occurrence Effectivity** dialog box.

3. In the **Occurrence Effectivity** dialog box, choose **Units** or **Dates** effectivity, as appropriate, and define the effectivity range.

   - If defining unit effectivity, type the desired effectivity range in the **Units** box. Use the **-** character within a continuous range, and the **,** character to separate discontinuous ranges. For example, the unit range **1-5,7-9** defines effectivity for units 1 through 5, and 7 through 9 (but not effective for unit 6).

   - If defining date effectivity, select a cell in the **From** or **To** column, select a date from the calendar (and optionally type a time), and click **Set Date** to place that date in the selected cell. Click the **Clear Date** button to remove the date from the currently selected cell. Repeat this step for additional cells until you have entered all the desired date ranges.

   - Click the **UP** button to add the **and up** (open-ended effectivity) condition to the end of the unit or date effectivity range. If you are defining date effectivity,

   - Click the **SO** button to add the **stock out** condition to the end of the unit or date effectivity range.

     Note:

     Teamcenter interprets **UP** and **SO** conditions as open-ended for revision configuration purposes. The revision is considered effective for any value greater than or equal to the unit or date value immediately preceding the **UP** or **SO**. *Stock out* indicates that existing stocks of a component revision should be used up before the next revision.

   - Check the **Apply Access Manager effectivity protection** check box to apply the predefined access rules to this effectivity.

   - (Optional) For date effectivity, use the **End Item** dialog box to define an end item to qualify the effectivity range. You *must* use this with unit effectivity to specify a product, module, or subsystem that carries the unit number to which this effectivity refers. You can select an end item in one of the following ways:

     - Clicking **Open by Name** adjacent to the **End Item** box and searching for an item by identifier and/or name.

     - Copying an item to the clipboard before opening the **Occurrence Effectivity** dialog box and clicking **Paste** adjacent to the **End Item** box.

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- Clicking **MRU** adjacent to the **End Item** box.

> Note:
>
> If you want to remove the entered end item, click **Clear** adjacent to the **End Item** box.

4. Click **OK** to save the occurrence effectivity data you entered.

Remove effectivity from an occurrence

1. Select the line in the structure representing the occurrence whose effectivity you want to remove.
2. Choose **Tools→Effectivity→Occurrence Effectivity→View, Create and Edit**.

   Teamcenter displays the **Occurrence Effectivity** dialog box.
3. Click **Remove** to clear all boxes, including the identifier.
4. Click **OK** and Teamcenter removes the effectivity object from the selected occurrence. Any other occurrences sharing this effectivity retain their references to the effectivity object.

Copying occurrences with effectivity

When you save a BOM view revision with a different name (perform a **Save As** action), Teamcenter copies any occurrences that reference an effectivity object to the new BOM view revision. Thus, the same effectivity ranges apply to the copied structure.

When you copy, cut or paste, Teamcenter does not reproduce any references to effectivity objects in the copy occurrences.

Setting the date for occurrence effectivity

Teamcenter configures the occurrence effectivity by the date defined in the current revision rule. Teamcenter uses an explicit date entry, if the current rule contains one. If the rule has no date entry, the effective date defaults to **today**, but you can manually set a different date using the **Tools→Revision Rule→Set Date/Unit/End Item** menu command.

You can choose to show only the configured occurrences, or all occurrences. You can toggle this setting by choosing **View→Show Unconfigured by Occurrence Effectivity**. If you display the **EOC - Effective Occ. Config'd** column in the structure properties, occurrences that are configured show a **Y**. If the occurrences are not configured, the column is blank.

Occurrences are configured if:

- The effectivity range encompasses the date specified by the current revision rule.

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- They have no effectivity object. Such occurrences are always configured, regardless of date.

Combining occurrence effectivity and variant configuration

Variant and occurrence date effectivity are occurrence-based configuration methods that operate independently. The **View** menu includes separate commands to show or hide occurrences that are unconfigured by the two methods. In some cases, you may want to view a specific variant of the product at a particular effective date. In this case, you hide occurrences that are unconfigured by *both* date and variants. Similarly, you may want to view a generic product at a particular date, in which case, you would hide occurrences unconfigured by date only. To show how a single variant changes with effective date, you can hide unconfigured variants only.

Configuring occurrences with multi-unit configuration

About multi-unit configuration

Teamcenter allows you to configure product structure occurrences of an assembly based on specified multiple end items and the unit effectivity ranges for each of those end items. You can do impact analysis and eliminate the duplicate work required to maintain different product structures and complicated manual reconciliation.

A combination of multiple end items and range of units for each end item used to configure product structure occurrences is referred to as a *multi-unit configuration*.

The administrator at your site enables this feature. It allows you to:

- Specify multi-unit configurations and save them as effectivity groups.
- Save a combination of effectivity groups and revision rule as a configurator context. You can use the saved configurator context to apply the effectivity groups and revision rule to configure occurrences.
- View the configured structure in Lifecycle Visualization, CAD tools, and the embedded viewers of appropriate rich client applications.
- Configure occurrences by matching the occurrence effectivity with the multi-unit configuration.
- Configure occurrences that are added and deleted by incremental changes by matching the incremental change effectivity with the multi-unit configuration.

> Note:
>
> Teamcenter displays the **Revision Rule Entry** value for an incremental change (IC) configured by a multi-unit configuration as **Effectivity Group**. Therefore, ignore the status of this check box in the **IC Information** pane.

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When an occurrence has occurrence effectivity and it is removed in the context of an IC, the occurrence is not configured if the multi-unit configuration matches the effectivity of the removing IC. This occurs whether the occurrence effectivity matches partially or completely with the multi-unit configuration.

Multi-unit configuration does not support nested effectivity and effectivity mapping.

Create a new effectivity group

1. In My Teamcenter, choose **File→New→Item**.

   Teamcenter displays the **New Item** dialog box.

2. Select **Effectivity Group**, enter the necessary name, description, and identifier, and then click **Finish**.

   Teamcenter creates the base revision of the new effectivity group. (Effectivity groups cannot be revised, and you are unable to create further revisions of the new group.)

Capture a multi-unit configuration and save it to an effectivity group

1. In My Teamcenter, right-click an effectivity group revision and choose **View/Edit Multi-Unit Configuration**.

   Teamcenter displays the **View/Edit Multi Unit Configuration** dialog box with the **View/Edit Multi Unit Configuration** pane visible.

   Note:

   The **Most Recently Used** option is not available in this dialog box. Also, the **Open By Name** box is not available on the **Effectivity Groups** pane in this dialog box.

   Caution:

   This is a modeless dialog box. It allows you to copy items from other locations, such as your **Favorites** folder, and paste them into the dialog box. However, it also allows you to perform other actions, such as **Revise** and **Close** commands in My Teamcenter with the dialog box open.

   If you open this dialog box using **View/Edit** in the **Set Date/Unit/End Item** dialog box (**Effectivity Groups** tab), the dialog box is modal and does not allow you to paste between applications.

2. Enter the necessary end item and unit range information, and then click **Add**, **Edit**, **Remove**, or **Undo** to update the effectivity group, as follows:

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- To add an end item unit range, enter the end item ID and the effective unit range and click the **Add** button. You can also search or browse for an end item to populate the **End Item** box. You can also copy the end item from your **Favorites** folder in My Teamcenter and paste it here. You can specify a combination of units or unit ranges in comma-separated format.

- To remove an end item unit range, select it in the table and click **Remove**.

- To edit an end item unit range, select it in the table and the system populates the **End Item ID** and **Unit Range** boxes from the selected entry. After you make the required changes, click **Modify**.

- To revert the last change made in the dialog box, click **Undo**.

  Note:

  Undo allows you to go back one level to the previous state in the dialog box. Thereafter, any subsequent clicks on the **Undo** button cause the dialog box to toggle between its current state and previous state.

Note:

You can view and edit effectivity groups with certain limitations. Use the **View/Edit** button in the **Effectivity Groups** pane of the **Set Date/Unit/End Item** dialog box to add or modify the end items by manually typing the necessary data. You cannot search for or copy and paste end items here.

Set an effectivity group to configure occurrences

You set an effectivity group or groups to configure the product structure occurrences in addition to the revision rule.

1. Load the assembly to configure and choose **Tools→Revision Rule→Set Date/Unit/End Item**.

   Teamcenter displays the **Set Date/Unit/End Item** dialog box.

2. Enter the effectivity group identifier in the **Effectivity Group** box, and then click **Replace**, **Insert**, or **Append** to update the list of groups.

   Note:

   To remove an effectivity group from the list, select it and click **Remove**.

3. (Optional) To view the multi-unit configuration on an effectivity group, select it and click **View/Edit**. The system displays the **View/Edit Multi Unit Configuration** dialog box, as described previously. If you have the necessary access privileges, you can also modify the configuration.

When you apply the configuration, the system matches the occurrence effectivities configured for each occurrence with the multi-unit configuration set in the effectivity groups. Any occurrence whose

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occurrence effectivity is valid for any of the end item and unit range entries in the effectivity groups is displayed. An occurrence is loaded only once even if its effectivity matches more than one end item entry in the effectivity groups set in the session.

Caution:

You can configure product structures with incremental changes using effectivity groups. However, only limited support is provided to configure occurrences with incremental changes using multi-unit configuration and the following limitations apply.

- You can configure only the addition and deletion of occurrences using effectivity groups. Other edits in the context of incremental change cannot be configured.
- An **add** occurrence edit is effective if the multi-unit configuration partially overlaps the effectivity of the incremental change.
- A **remove** occurrence edit is effective if the multi-unit configuration completely overlaps or is within the limits of the effectivity of the incremental change. That is, a partial overlap is not sufficient to configure the **remove** edit. If there are multiple **remove** incremental changes, Teamcenter compares each of them with the multi-unit configuration separately. (It does not calculate the total **remove** effectivity and compare a single value with the multi-unit configuration.)
- Teamcenter evaluates the configuration of an occurrence based on an incremental change independently of its occurrence effectivity.
- If Teamcenter finds competing incremental changes (one adding the occurrence and the other removing it) and both can be configured with effectivity groups, it gives precedence to the **add** occurrence edit.

The following examples show how occurrence effectivity and incremental change interact.

Structure line number	Type	Occurrence effectivity (explicit or implied)	Effectivity on removing IC1 and removing IC2	Multi-unit configuration set on BOM window	Result
1	Component	**EndItem(1-20)**	**IC1(-) → EndItem1(1-9) IC2(-) → EndItem(10-20)**	**EndItem1(1-9)**	Occurrence *not* configured.
2	Component	**EndItem(1-20)**	**IC1(-) → EndItem1(1-9) IC2(-) → EndItem(10-20)**	**EndItem1(1-20)**	Occurrence configured as Teamcenter checks occurrence effectivity, multi-

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Structure line number	Type	Occurrence effectivity (explicit or implied)	Effectivity on removing IC1 and removing IC2	Multi-unit configuration set on BOM window	Result
					unit configuration, and each incremental change individually.

Customizing occurrence effectivity

You can customize Teamcenter behavior when the user applies or sets occurrence effectivity on a BOM line.

To allow customization of the behavior when setting effectivity on an occurrence, the **bl_occ_effectivity** BOM line property is modifiable, and a setter method is provided on this property. Use the setter method of the property to attach an extension point if required.

Planning part movement – logistics

Introduction to logistics planning

Logistics planning involves organizing the movement of raw materials from an origin point to a final destination point. In the manufacturing world, logistics planning is carried out to ascertain that all required parts are available at the stations in your plant when needed.

In Teamcenter, logistics management is generally separated into categories.

- *Inbound logistics* refers to material movement from the vendor to the plant warehouse.
- *In-plant logistics* refers to material movement from the plant warehouse to a particular station.

To perform logistics planning, you build up a logistics structure that contains all relevant logistics planning information. This structure is organized around *part families*. These part families combine parts that are similar and require the same logistics handling. For example, your product line requires that two types of brake pads, standard and high quality, are both available at the same station. You obtain these from the same vendor so these two parts belong to the same logistics part family.

The following is an example of a logistics structure.

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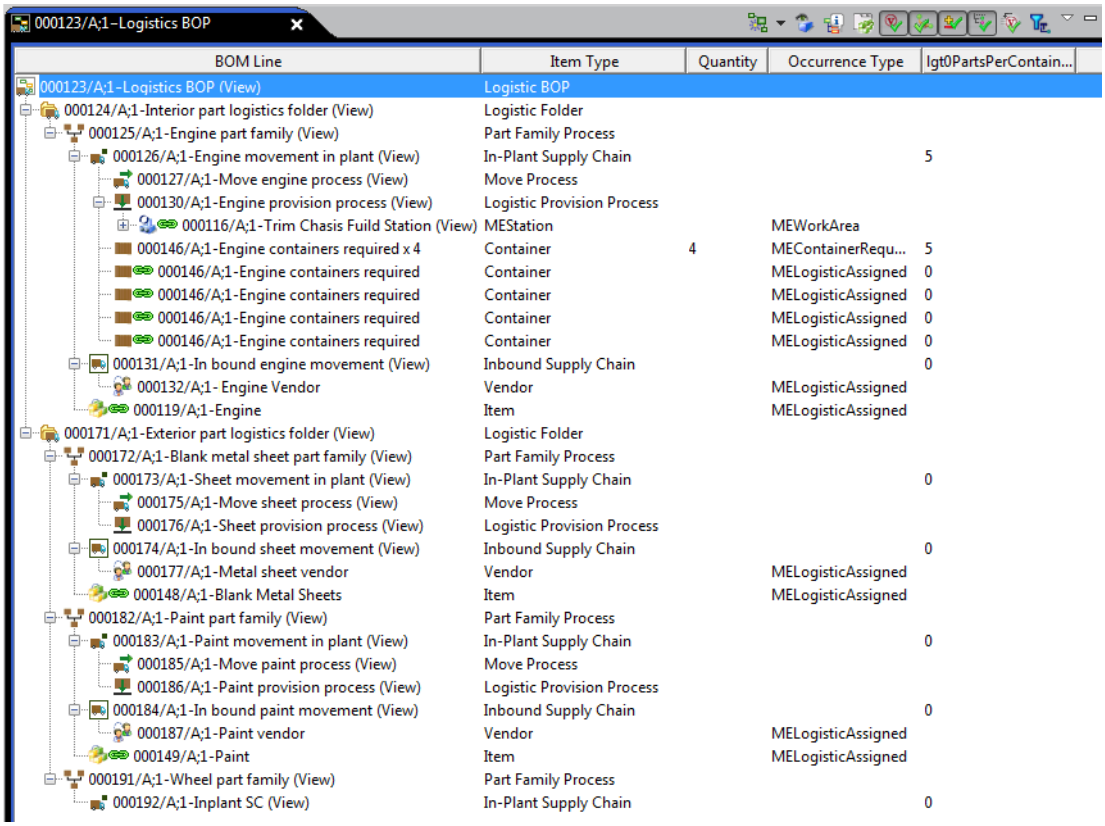

The following objects are used in logistics planning:

Logistics BOP

A logistics planner builds a logistics bill of process that helps to organize the part families and run reports to determine the logistics costs and transportation volumes for a given product.

Logistics folder

A folder assists you in organizing the logistics structure. If you are dealing with large logistics structures, it is useful to group the structure under the root level using folders.

Part family

A part family is a collection of parts that share the same logistics plan and share similar characteristics. For example, all parts in a part family may come from the same vendor. All the parts sharing the same logistics characteristics are found in the same part family.

Supply chain

A supply chain is a combination of storage and provision processes and transportation. A supply chain describes how a part is delivered from the warehouse to the provision area at the production line. The supply chain consists of:

- Inbound supply chain

  The inbound supply chain reflects the route from the vendor to the warehouse.

- In-plant supply chain

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The in-plant supply chain reflects the route from warehouse to the station.

Logistic provision process	The logistics provision process defines the station to which parts are delivered. Only one station can be assigned to a logistics provision process.
Container	A container represents a physical object that holds or transports something.
Vehicle	You assign a vehicle to supply chain transport processes to specify the type of vehicle used to transport the parts or raw materials. The vehicle object is used for various calculations such as resource demand and transportation capacity.

Because a logistics BOP is based on a plant BOP, you can only use the logistics features with enterprise bill of process structures.

Create a supply chain

In Teamcenter, the supply chain is represented using a logistics BOP.

1. Create the logistics BOP using the **File** → **New** → **Logistics** menu commands.

   a. Create the root **Logistic BOP** structure.

   b. Add the following objects as necessary:

      A. Add a logistics folder under the root logistics BOP.

      B. Add as many part families as required.

      C. Add inbound supply chains and in-plant supply chains to the part families.

      D. Add logistics processes to the supply chains. You can add any of the following logistics process types:

         - **Logistic Process**

           This is an all-purpose process.

         - **Logistic Provision Process**

           This is a specialized process used as a placeholder for the station.

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- **Move Process**

  This process represents movement from the vendor to the warehouse or from the warehouse to the station.

- **Store Process**

  This process represents the storage of parts or raw materials at a warehouse or a station.

2. Add containers and vehicles by assigning them to the supply chain.

   Your company may classify containers and vehicles. If so, you can drag them from the **Classification** view into your structure. Otherwise, you can copy them into the clipboard and paste them to the supply chain object.

3. Associate the logistics BOP with a plant BOP structure.

   a. Right-click the top node of the logistics BOP structure and choose **Link/Associate→Associate Plant BOP**.

   b. Select the root node of the plant BOP structure and click .

4. Associate the logistics BOP with a plant structure.

   a. Right-click the top node of the logistics BOP structure and choose **Link/Associate→Associate Plant**.

   b. Select the root node of the plant structure and click .

5. Assign the raw material parts to a part family within the logistics BOP using copy and paste.

   These are automatically assigned with the **MELogisticAssigned** relation.

Assign containers to a station

By assigning containers to the plant structure, you can ensure that there is enough space at the station for the planned number of containers. The **Assign Container to Station** command allows you to assign containers under the provision area in stations of a plant structure and to the in-plant supply chain where you define a container requirement. A container requirement is a container defined under the in-plant supply chain (with the **ME Container Requirement** occurrence type) and is a candidate for the assignment to the plant structure. The number of containers assigned is determined by the **Quantity** property of the container requirement.

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After running the **Assign Container to Station** command, Teamcenter checks for the station that is assigned under the provision process of the in-plant supply chain in the logistics BOP structure. Teamcenter searches for the same station under the plant structure. If there is no provision area under the station, Teamcenter creates one and assigns the containers to it. Teamcenter then copies these container lines and pastes them under the in-plant supply chain with the **ME Logistic Assigned** occurrence type.

1. Create a container using **File→New→Item→Container**.

2. Copy the created container and paste it to the in-plant supply chain.

   Teamcenter pastes the copied container as a container requirement using the **ME Container Requirement** occurrence type.

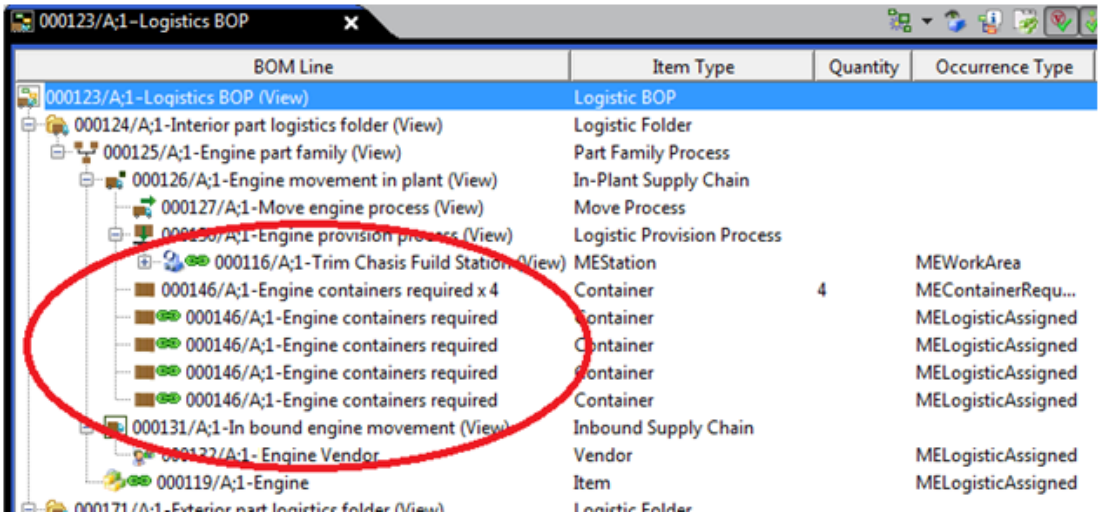
   Your administrator can modify the pasted container requirement occurrence type using the **MERelationTypeContainersLogisticRequired** preference.

3. Specify the quantity of containers by editing the **Quantity** property of the container.

4. Right-click the logistics BOP and choose **Assign Container**.

   Teamcenter creates containers in the plant structure and under the in-plant supply chain with the **ME Logistic Assigned** occurrence type.

   The following shows a logistics structure with containers.



These containers are also assigned to the plant structure:

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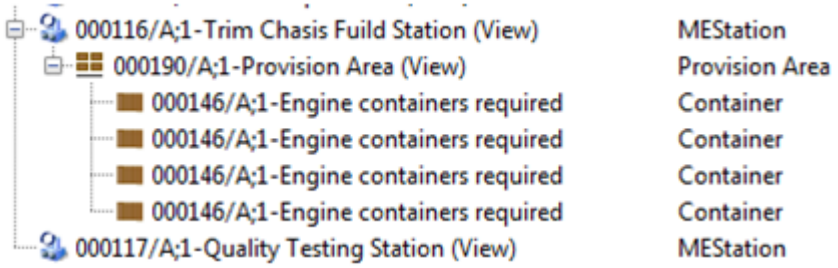
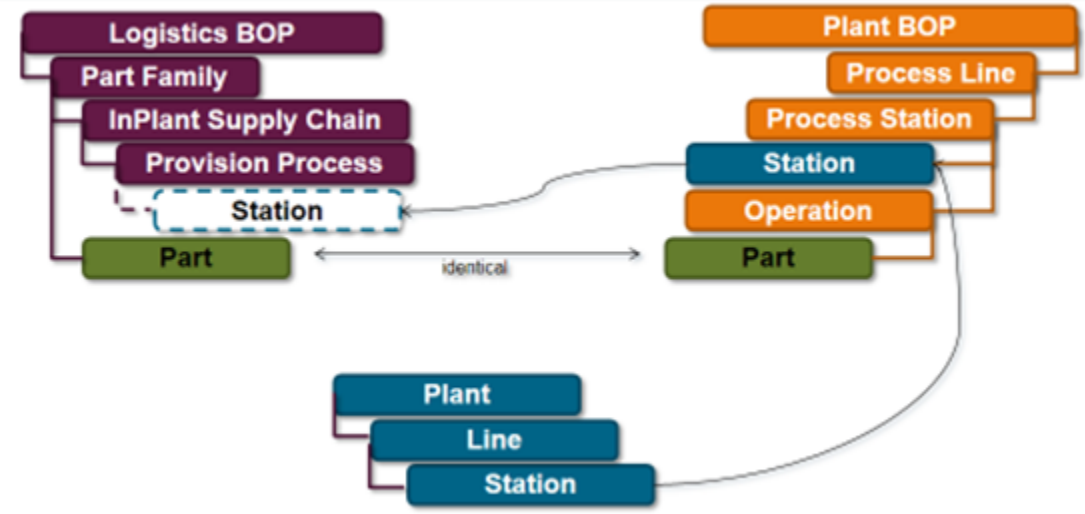


Assign stations to a provision area

To assist you in assigning a station to a provision process, you use the **Logistics Station Resolver** view. You can open this view on a variety of structures in the logistics BOP. The view helps you identify the station to which the raw material must be transported so it can be processed at a later date. The view lists the part family, supply chain, provision process, and candidate stations for the part and allows you to assign stations for the part directly in the view. When searching for candidate stations, Teamcenter searches for the part item in the plant BOP structure. When it finds the part, it looks for the assigned stations under the same parent process station. These stations are presented as candidate stations where you can assign them to the provision process. You can only assign one station to a provision process.



To assign stations to a provision area:

1. Right-click one of the following logistics structures and choose **Open With→Station Resolver** view.
   - Logistics BOP
   - Logistics folder
   - Logistics part family

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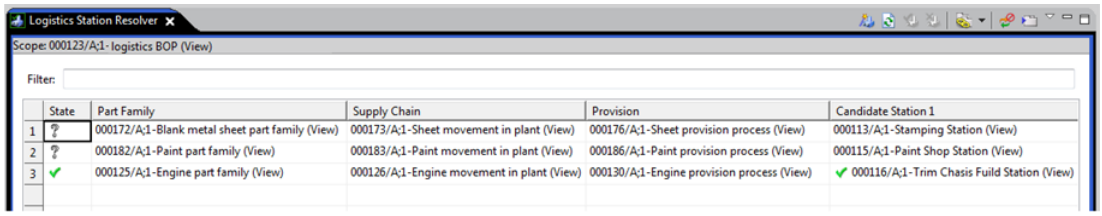
- In-plant supply chain
- Logistics provision process

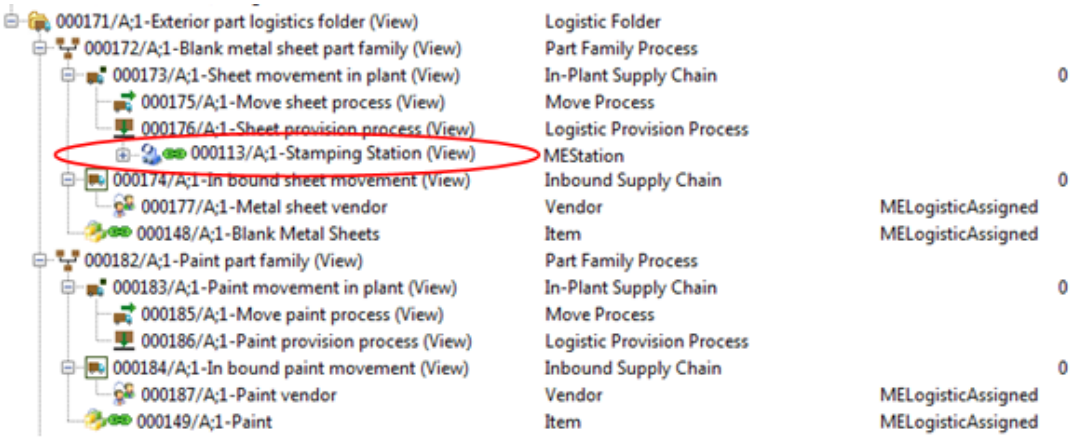
The provision areas that do not yet contain a station are marked with a question mark.



2. Do one of the following:

- If there is only one valid station listed per provision process, click **Automatically Assign Station** to have Teamcenter assign the stations for you.
- If there are multiple possible stations found, assign them manually by right-clicking the station and choosing **Assign Station** or selecting the station and clicking **Assign Station** in the view toolbar. If there is already a station assigned, Teamcenter automatically unassigns the station and assigns the selected one.

The station is added to the provision area.



Additionally, the status and the station in the **Station Resolver** view are marked with a green check mark.

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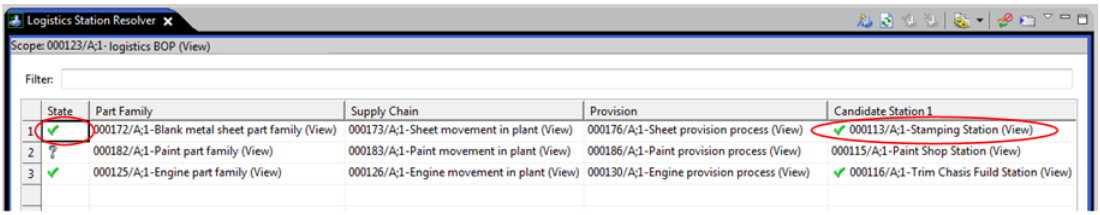

To unassign a station:

- Right-click the station in the table and choose **Unassign Station** or select the station in the table and click **Unassign Station** in the view toolbar.

To narrow the results in the table:

- Enter a search string in the **Filter** box at the top of the view.

To update the view after making changes to the logistics BOP:

- Click **Refresh** .

Display a transport network

When working on the in-bound supply chain, you can view the material flow from the suppliers and manage logistics costs in the transport network spread. The **Logistics Transport Network** view displays the location of suppliers, distribution centers, and factories on a Google map. The width of the lines connecting the geographic locations indicates the quantity of materials being transported. A tooltip provides supply chain information. This view requires the following inputs:

- A defined logistics BOP with a supply chain and vendors
- A plant associated with the logistics BOP
- Addresses for the vendors and plants
- Quantity of materials being transported

Do one of the following:

- To display a transport network, click the top node of the logistics BOP and choose **Open With→Logistics Transport Network**.

  Teamcenter displays a Google map with all the vendors and plants contained in the logistics BOP in the view. The vendors and plant are connected by transport network lines. Using these lines, you can determine how far apart your vendors are located.

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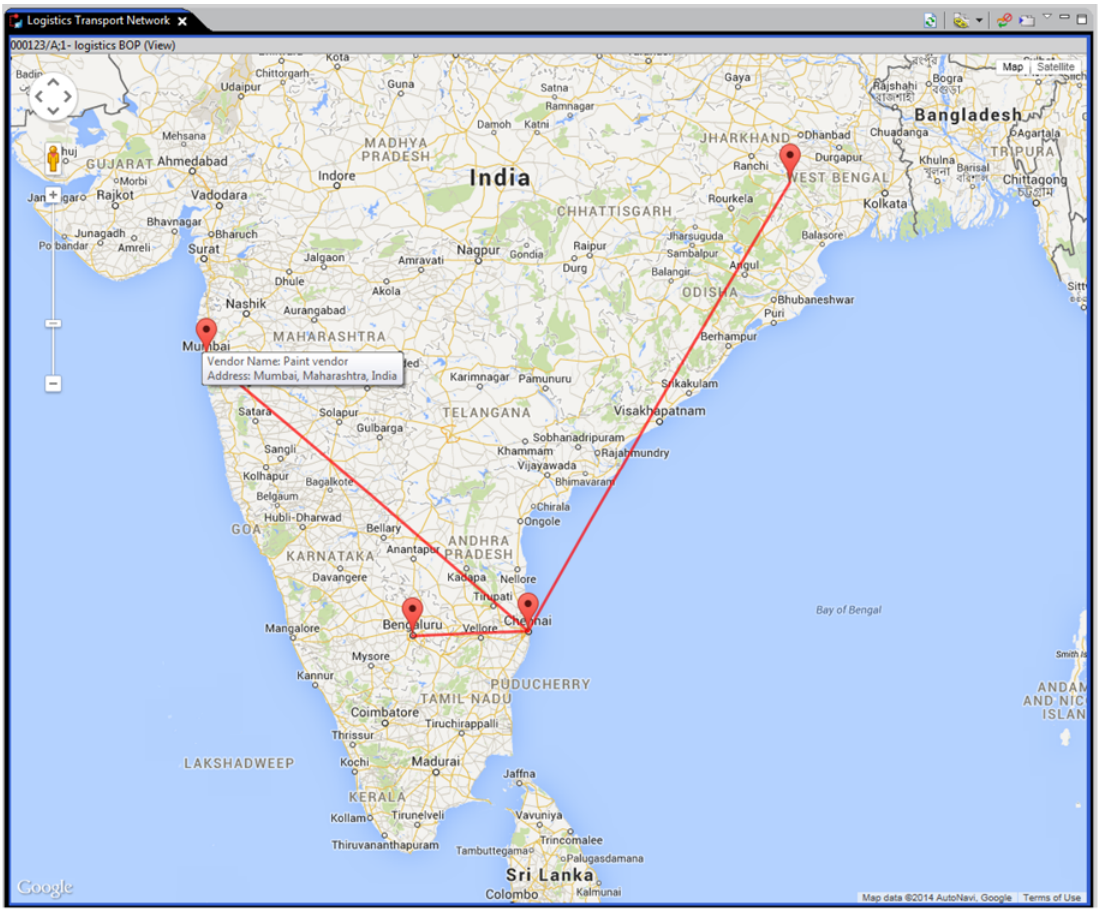

- To refresh a transport network if you make changes in the logistics BOP, click **Refresh** .

Display a logistics maturity report

The Logistics Maturity report checks the completeness of a logistics structure. The report checks that all the required elements of the logistics BOP are in place. The report is displayed in the **Logistics Maturity Report** view. The view lists all objects in the logistics BOP and determines whether they are missing.

1. Select the top node of the logistics BOP and choose **Open With→Logistics Maturity Report**.

   Teamcenter opens the **Logistics Maturity Report** dialog box that displays a list of rules against which you want to evaluate the logistics BOP.

   - **Inbound Supply Chain**

     Checks whether a part family has one or more inbound supply chains assigned. Teamcenter displays the number of assigned supply chains found in this check.

   - **In-Plant Supply Chain**

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Checks whether a part family has one or more in-plant supply chains assigned. Teamcenter displays the number of in-plant supply chains found in this check.

- **Missing Containers**

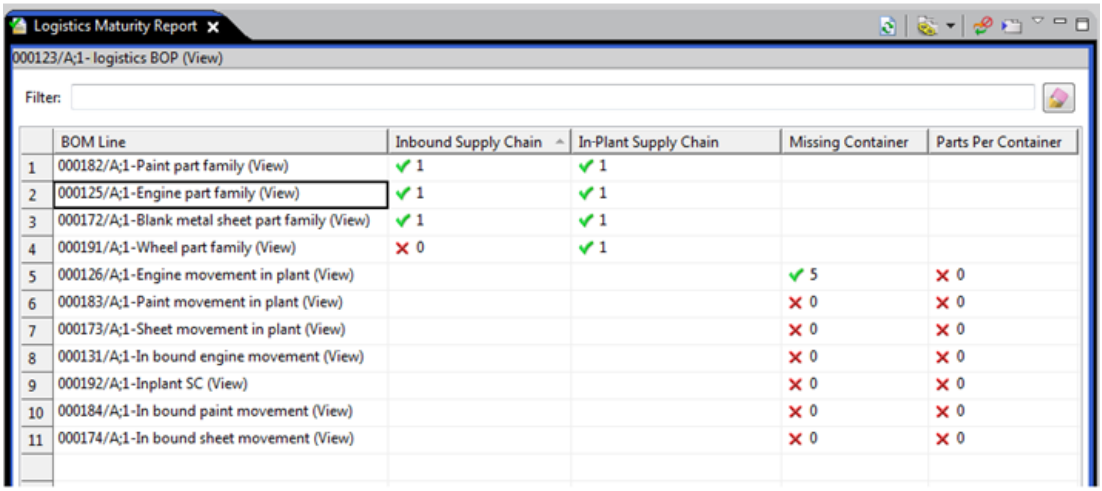
  Checks whether a supply chain contains a container. Each supply chain requires a container. Teamcenter displays the number of containers found in the supply chain.

- **Parts per Container**

  Checks whether parts are assigned to each container. Teamcenter displays the number of parts found per container.

2. Select the desired rules and click **OK**.

Teamcenter displays the **Logistics Maturity Report** view with each of the rules that you selected in the previous dialog box available as a column in the view. The rows represent evaluated objects.



	BOM Line	Inbound Supply Chain	In-Plant Supply Chain	Missing Container	Parts Per Container
1	000182/A;1-Paint part family (View)	✓ 1	✓ 1		
2	000125/A;1-Engine part family (View)	✓ 1	✓ 1		
3	000172/A;1-Blank metal sheet part family (View)	✓ 1	✓ 1		
4	000191/A;1-Wheel part family (View)	✗ 0	✓ 1		
5	000126/A;1-Engine movement in plant (View)			✓ 5	✗ 0
6	000183/A;1-Paint movement in plant (View)			✗ 0	✗ 0
7	000173/A;1-Sheet movement in plant (View)			✗ 0	✗ 0
8	000131/A;1-In bound engine movement (View)			✗ 0	✗ 0
9	000192/A;1-Inplant SC (View)			✗ 0	✗ 0
10	000184/A;1-In bound paint movement (View)			✗ 0	✗ 0
11	000174/A;1-In bound sheet movement (View)			✗ 0	✗ 0

The view provides the following visual indications:

✓	The evaluated object satisfies the rule.
✗	The evaluated object does not satisfy the rule.
An empty cell	The rule is not applicable to the evaluated object.

3. Add the missing objects to the logistics BOP where necessary and refresh the Logistics Maturity report by clicking **Refresh** .

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Customization of maturity reports

Maturity reports can be customized, allowing you to define the custom rules, validation criteria, and display this on the client.

Rule validation

There are many potential rules used for validation.

- The custom rule is defined in a XML rule definition file.
- You can implement and register a custom API that validates the rule.
- You can define validation rules in an XML file using XML tags.
- The validated rule is displayed on the maturity check report view. One of the results is displayed:

  indicates that a rule validation passed.

  indicates a rule validation failure.

  indicates a rule validation error.

Rule validation using a custom API

This option requires writing a custom API, registering the API, and specifying the API in the XML rule definition file.

Writing custom API

The first step is writing the rule validation API. This is the API that the maturity report feature calls to validate a rule. The only supported programming languages are C/C++. Refer to header file **mfg_maturity_rule_interface.hxx** on the signature of the API. A sample program using the custom API is specified as follows.

Once the custom API is implemented, the program must be built using the Teamcenter documented compiler and linker settings for customization with output as DLL. The generated library must be copied to the Teamcenter server machine at **%TC_ROOT%\bin**. The variable name in the program must match that available in the user documentation.

Example: Material report .hxx

```
//File: Mat_report.hxx
//Custom program: Header file
```


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```
#include        <mfg/mfg_maturity_rule_interface.hxx>
#include        <algorithm>
#include        <vector>
#include        <list>
#include        <map>

using namespace std;

#ifdef __cplusplus
extern
"C" {
    #endif

    extern__declspec(dllexport) int
MaturityReport_ToolRequirementTest(
       const int
ruleID,
       const tag_t
objectScope,
       const tag_t
targetObject,
       const std::map<std::string, std::string>&
ruleAttributes,
       std::vector<MFG_maturity_property_data_t>&         values
    );

    #ifdef __cplusplus
    }
    #endif
```

Example: Material report .cxx

```
//File: Mat_report.cxx
//Custom program: Source file.

#include "Mat_report.h"
#include <algorithm>
#include <vector>
#include <list>
#include <map>
#include <iostream>
#include <mfg/mfg_maturity_rule_interface.hxx>
#include <tccore/aom_prop.h>
#include <tccore/grm.h>
#include <pom/pom/pom.h>
```


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```
#include <base_utils/Mem.h>

using namespace std;

int toolRequirement_defined (
    const tag_t                                          targetObject,
    std::vector<MFG_maturity_property_data_t>&           values
);


int MaturityReport_ToolRequirementTest(
    const int
ruleID,
    const tag_t
objectScope,
    const tag_t
targetObject,
    const std::map<std::string, std::string>&
ruleAttributes,
    std::vector<MFG_maturity_property_data_t>&           values
)
{
    int err = 0; // No error

    if(ruleID ==2) //Rule ID defined in XML rule definition file
    {
        err = toolRequirement_defined(targetObject,values);
    }
    else (ruleID == 3 )
    {
    // Some implementation
    }
    return err;
}
```

Example: Initialization tool requirement

```
int toolRequirement_defined (
    const tag_t targetObject,
    std::vector<MFG_maturity_property_data_t>&         values
    )
    {
    MFG_maturity_property_data_t status, display;
    std::vector<std::string>     statusValues, displayValues;
    int count = 0;
    tag_t *_values = 0;
    AOM_ask_value_tags(targetObject, "Mfg0tool_requirements",
&count, &_values);
```


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```
    status.dataType = "string";
    status.propertyName = "status";
    display.propertyName = "displayValue";

    std::string displayValue =  "";
    if (count > 0)
    {
    char* tool_name = NULL;
    int stat =
        AOM_ask_value_string(_values[0], "Mfg0assignment_name",
&tool_name);

            if (tool_name != NULL ){
                displayValue = tool_name;
                status.value.push_back("pass");
            } else {
                displayValue = "Tool name not
          defined";
                status.value.push_back("fail");
            }
          }
          else
          {
            display.dataType = "string";
            status.value.push_back("fail");
            displayValue = "TR Not Defined";
          }
          display.value.push_back(displayValue);
          values.push_back(status);
          values.push_back(display);

          return 0;
    }
```

Registering the custom API

The custom API for the maturity report must be registered to allow the maturity report feature to locate the API. Use the **install_callback** utility to register the API with the tabulated parameters:

Parameter	Value
type	*MATURITY_REPORT*
library	Name of library that has the API , without dll extension.

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Parameter	Value
function	Name of custom API.
name	Any unique name. It could be the same as the API name. The name must be used as function identifier value in the maturity rule definition file (section XML schema).

Sample usage of utility

install_callback -u=*Tc-admin-user* **-p**=*pasword* **-g**=*group* **-mode**=*create* **-type**=*MATURITY_REPORT* **-library**=*Mat_report* **-function**=*MaturityReport_ToolRequirementRule* **-name**=*MaturityReport_ToolRequirementRuleIdentifier*

The value provided in the name must be added to XML rule definition file so that the maturity report feature can identify the API that it is calling.

Rule validation using XML tags

The maturity rule can also be validated using the XML tags in the rule definition file. This approach allows you to specify a target object on which the rule needs to be validated. The result must be obtained for the target object and the result checked against a defined value to validate the rule. Refer to the following table of XML tags to define and validate the rule.

XML tag	Description	Valid values
MaturityReport	The root element of the XML document.	
MaturityReportContext	The structure context of the maturity report. Rules defined under the context are picked and validated. An XML file may have multiple contexts defined.	**Mfg0PlantBOP** **ProductBOP** **Lgt0LogisticBOP**
Rules	Contains rules.	
ruleID	The unique rule ID. It must be a positive integer.	**1, 2, 3, 4,....**
ruleName	The name of the rule that is displayed on the maturity report.	Any string
targetObjectType	The target object type against which rules are evaluated and displayed on the report. A persistent object type name must be used. Example: In a process structure, if a rule needs to be validated on the process line, provide the value	**Mfg0ProcArea** **Process** **Process|OP ...**

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XML tag	Description	Valid values
	as **Process**. All process lines under the scope of the line selected for report is picked as the target object. The rule is validated on this object. The exact object type name is considered to ignore the subtype. Multiple values can be provided using |. The valid format is *<Object Type1>|<Object Type2>*.	
ChildrenType	The children of **targetObjectType** that are to be picked as part of the rule validation. A persistent object type name must be used. Example: The number of children obtained is compared with the defined number as part of validation. The exact object type name is considered and the subtype ignored. However, if **propertyName** is also specified, the property is evaluated on the first child object and compared with the defined value. Multiple values can be provided using |. The valid format is *<Object Type1>|<Object Type2>*. The number of children obtained is compared with the defined number as part of validation. The exact object type name is considered and the subtype ignored. However, if the **propertyName** is also specified, the property is evaluated on the first child object and compared with the defined value. Multiple values can be provided using |. The valid format is *<Object Type1>|<Object Type2>*.	**OP** **Process** **ITEM**

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XML tag	Description	Valid values
ChildrenOccType	Children of **targetObjectType** are validated against the occurrence type and are relevant for consumed items. Example: When **ChildrenOccType** of **Consumed** is specified, it is validated to determine if the **targetObject** child is available as an **Consumed** occurrence. The number of children obtained is compared with the defined number as part of validation. Note that **ChildrenType** must be specified. If **ChildrenType** is not specified, **ChildrenOccType** values are ignored. Multiple values can be provided using |. The valid format is *<Occurrence Type1>|<Occurrence Type2>*.	**Assigned** **Consumed** **Assigned|Consumed** **...**
propertyName	Any valid property to be evaluated on the target object line. Note that the property is on the line that represents the persistent target object type. For instance, if allocated time on **Process** and **OP** are to be validated, you must provide the **TargetObjectType** as **Process|OP**. If the property on a child is to be evaluated, then provide **ChildrenType** data. The property is evaluated only on the first child line of **TargetObject**.	
operator	Comparison operators to validate calculated value with defined value (operand) in the XML. For instance, to validate that allocated time on a **OP** is ≤ **60**, use **LESS_THAN_EQUAL_TO** and provide **Operand** as **60**.	**LESS_THAN** **GREATER_THAN** **EQUAL_TO** **LESS_THAN_EQUAL_TO** **GREATER_THAN_EQUAL_TO** **NOT_EQUAL_TO**
operand	Value to compare against the calculated value using the defined operator.	Valid values are in string form that may be a real number, string or Boolean.

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XML tag	Description	Valid values
	For instance, for a rule, if **Operator** is **LESS_THAN_EQUAL_TO** and **Operand** is **60**, for a value > **60**, validation fails.	Valid values for Boolean are **true** and **false**.
FunctionIdentifier	Function identifier to call the custom API registered using **install_callback** utility. The value must be the same as the **name** parameter provided in the **install_callback** utility while registering the custom API.	For example, **ToolRequirementDefinedCheck**

Sample XML file

```
<?xml version="1.0" encoding="UTF-8"?>
    <MaturityReport>
      <MaturityReportContext contextName="Mfg0PlantBOP">
        <Rules>
          <Rule ruleID="1"
                ruleName= "Time
          Rule"
                targetObjectType="Process|OP|Mfg0ProcStatn"
                propertyName="Mfg0allocated_time"
                ChildrenOccType=""
                operator="LESS_THAN_EQUAL_TO"
                operand="60"
          />
    <!-- Empty value will be ignored
        -->

          <Rule ruleID="2"
                ruleName="Tool Requirement
          Defined"
                targetObjectType="Process|OP"
                FunctionIdentifier="MaturityReport_ToolRequirementTest"
          />

          <Rule ruleID="3"
                ruleName="Tool Requirement
          Resolved"
                targetObjectType="Process|OP"
                FunctionIdentifier="MaturityReport_ToolRequirementTest"
          />

          <Rule ruleID="4"
                ruleName= "Operation
```


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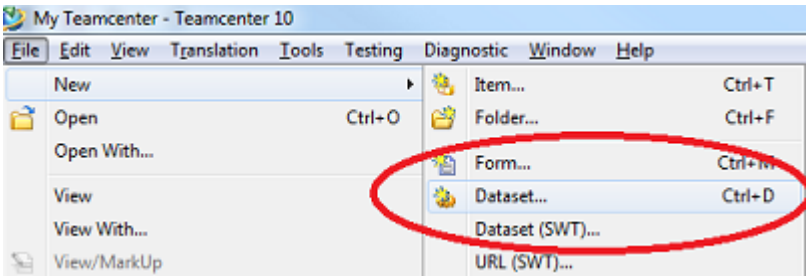
```
        Available"
              targetObjectType="Process|Mfg0ProcStatn"
              ChildrenType="OP"
              operator="GREATER_THAN"
              operand="0"
        />
      </Rules>
    </MaturityReportContext>
  </MaturityReport>
```

Loading XML rule definition file in Teamcenter

Maturity rule definition file must be loaded to Teamcenter to allow the maturity report feature to read the file. Create a dataset object using the maturity rule definition XML file. Use the following steps to attach a dataset:

1. Select the desired folder in which you want to create the dataset.

   Use menu option **File→ New→ Dataset**. This will open **New Dataset** Dialog.



2. On the **New Dataset** dialog, perform the following:

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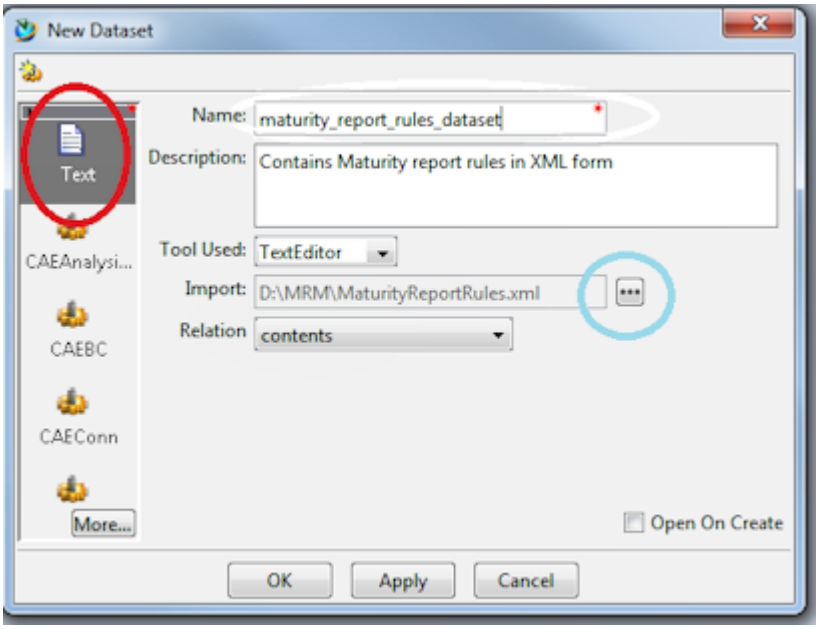

- Choose **Text** as dataset type.
- Provide dataset name as **maturity_report_rules_dataset**. This is the exact name that must be used.
- Provide your own description. This an optional field.
- Click the Import button , browse to and select the rule definition file.
- Click **OK** to create the dataset.

If this dataset is not created or loaded then maturity report will show system defined rules, if available.

1. Once dataset for rule definition file is created and custom API is registered (if rule is validated using custom API), the maturity report can be run on a line (scope) of a structure.

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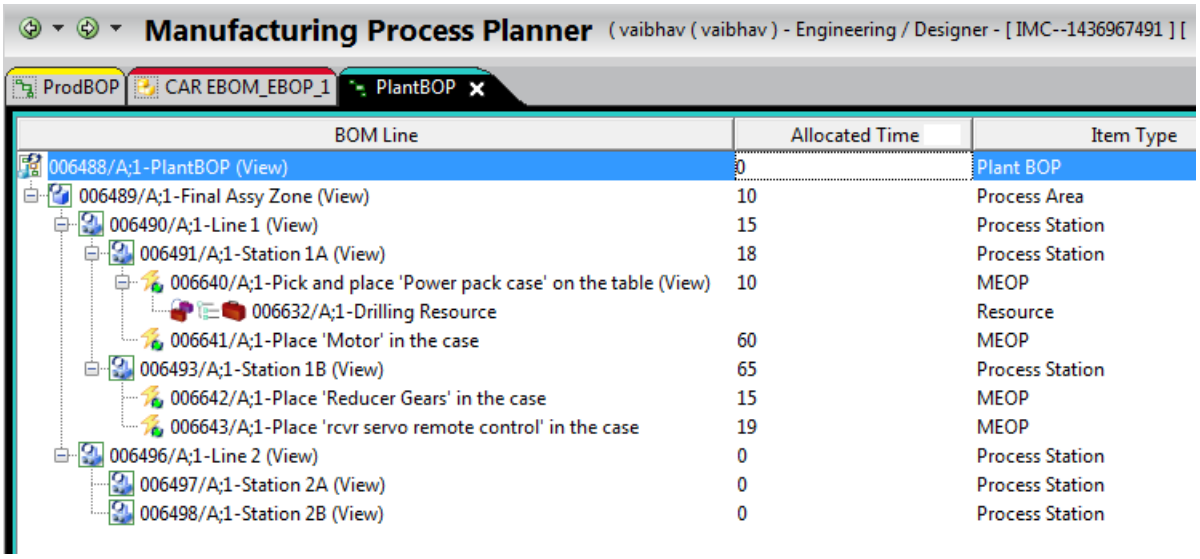
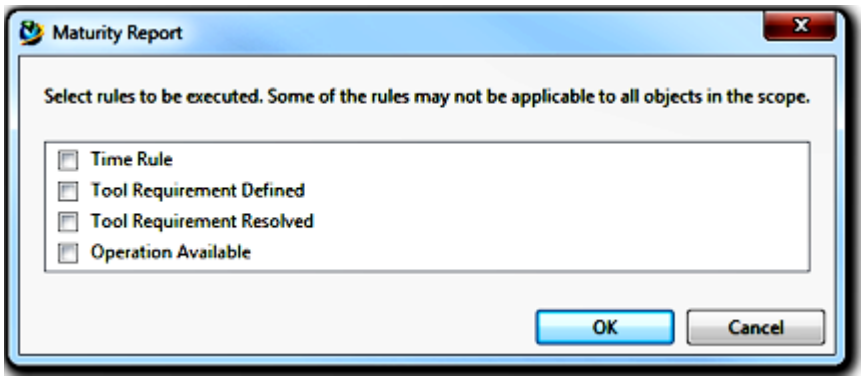
On the line, use menu option Open with →Maturity report on right click mouse button.



2. Based on the context of the structure and associated rule definition file, rule names are displayed on the rule selection form. Select the rules that need to be validated and click **OK**.



3. Right-click the desired BOM Line and choose **Open With→ Maturity Report**.

4. The Maturity report is then displayed in a manufacturing view

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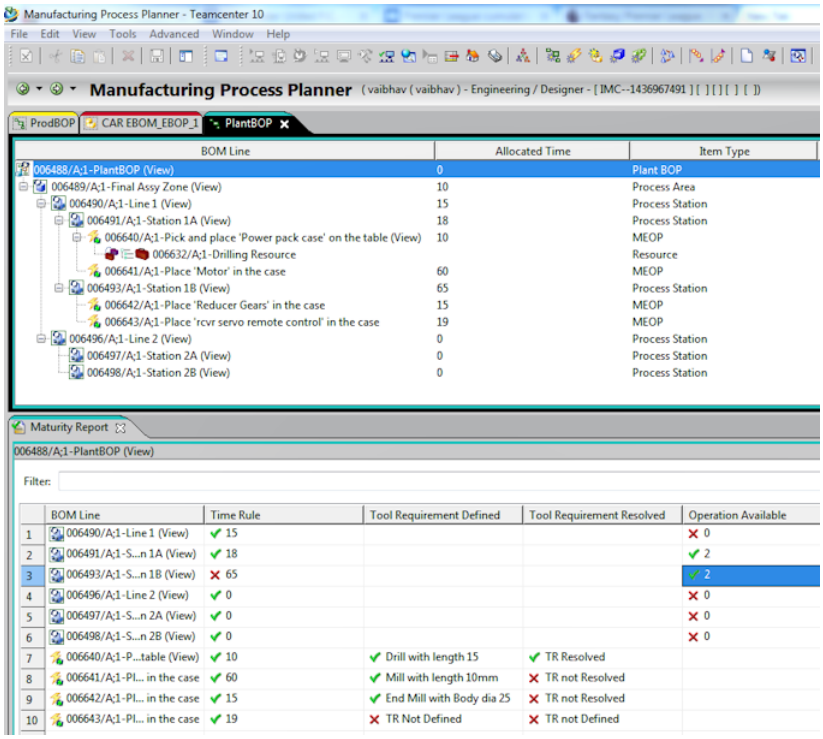

Managing requirements, trace links, and notes

Requirements, trace links, and notes overview

Product requirements are identified and developed at a project's inception, so that problems are revealed and understood before the actual product development begins. Then, requirements are associated with the product design, and that connection is maintained through all successive stages—while drawings, parts, and assemblies are developed, tested, and changed.

Requirement types:

- Requirements

  Teamcenter Systems Engineering provides two types of requirement items, **Requirement** and **Paragraph**. The term requirement is used for both types.

- Parametric requirements

  Represent the requirements established by the Standards Engineering organization that conform to the design practices of a program. Parametric requirements are often maintained in a library for use by all designers.

Teamcenter provides you with features to manage requirements using *trace links*. Through trace links, requirements are connected to objects in other Teamcenter applications, as appropriate for the product design.

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Custom notes can be created in the context of another object such as a requirement, a part, or a manufacturing object such as a process or operation. Notes are used to capture issues, actions, questions, or other ad hoc types of information.

For more information about managing requirements, see *Systems Engineering — Deployment and Rich Client Usage*.

Linking objects using trace links

About linking objects

A trace link establishes a path in which one object takes precedence over another. The trace link creates a directional relationship between the two objects, a relationship conveyed by the terms *defining* and *complying*. The predecessor, the defining object, is the trace link source. The successor, the complying object, is the target.

- A defining object specifies a condition that a product or a component must fulfill.
- A complying object partially or completely fulfills a condition specified by a defining object. Such a relationship establishes a traceable path in which one object precedes the other.

Only one trace link of a given subtype is allowed between the same two objects in the same direction. However, in a given direction between two objects, you can create as many trace links as the number of available trace link subtypes.

> Note:
>
> Trace link is a subclass of the allocation class.
>
> For more information about allocations, see *Getting Started With Product Structure*.

Enable trace link display

You can enable display of trace link menu and toolbar commands and, if objects already have trace links, display trace link icons in the navigation pane.

1. Choose **Edit→Options** to display the **Options** dialog box.
2. Click **Systems Engineering**.
3. Select the **Tracelink Mode** check box.
4. Click **OK** to apply the changes.

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Selecting defining and complying objects

When creating a trace link, you can select the defining and complying objects as follows:

- One defining object and one complying object.

  The source has one defining trace link to the target, which has one complying trace link from the source.

- One defining object and multiple complying objects.

  The source has one defining trace link to each target. Each target has one complying trace link from the source.

- Multiple defining objects and one complying object.

  Each source has one defining trace link to the target, which has one complying trace link from each source.

> Note:
>
> - You cannot select multiple defining objects and multiple complying objects for one trace link.
> - You must make multiple object selections from only one structure at a time. You cannot select an object in one structure, and then switch to another structure and select additional objects.
> - To link one defining object to multiple complying objects in different structures, you must create a separate trace link to the complying objects in each structure.

Source and target objects can be:

- Elements of requirement specification structures, functional models, logical models, and physical models in Systems Engineering.

  The source and target objects can reside in the same structure or in different structures.

  > Tip:
  >
  > Defining and complying trace links can exist also between Systems Engineering objects and subsets in 4th Generation Design. Using the *cross-domain tracing* feature, collaborative designers can analyze these elements for change impact both downstream and upstream.

- Objects in other Teamcenter applications, such as My Teamcenter, Structure Manager, and Multi-Structure Manager.

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Customizing trace links with subtypes

Teamcenter administrators can create custom trace link subtypes in the Business Modeler IDE. The default trace link subtype is **Trace Link**.

- Only one trace link of a given subtype is allowed between the same two objects in the same direction.
- In either direction between two objects, you can create as many trace links as the number of available trace link subtypes.

When you create a trace link, you can accept the default subtype, **Trace Link**. Or, you can assign a custom subtype, created in the Business Modeler IDE by a Teamcenter administrator.

- Custom subtypes let you create two or more trace links between the same objects in the same direction, if you assign a different subtype to each trace link.

  For example, a trace link from defining requirement **A** to complying requirement **B** has the **Trace Link** subtype.

  A second defining trace link, with the custom subtype **S**, can be created from requirement **A** to complying requirement **B**.

- Trace links of the same subtype are allowed in both directions between the same objects. For example:

  Defining requirement **A** is linked to complying requirement **B**, with the **Trace Link** subtype assigned to the trace link.

  You can create a trace link of the same subtype to link requirement **B**, as the defining object, back to requirement **A** as the complying object, completing circular trace links.

Create trace links

1. Select one or more source objects, for example, a requirement.

   > Note:
   >
   > If you select only one source object, you can create trace links to multiple target objects. If you select multiple source objects, you can create trace links to only one target object.

2. Choose **Tools→Trace Link→Start Trace Link**, click the **Start Trace Link Creation** button on the toolbar, or right-click the selection and choose **Trace Link→Start Trace Link**.

   You can also choose **Edit→Copy**, click the **Copy** button on the toolbar, or right-click the selection and choose **Copy**.

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3. Select one or more target objects, for example, an item, item revision, or absolute occurrence.

4. Specify the trace link subtype and name by doing one of the following:

   - To accept the default subtype and name, choose **Tools→Trace Link→End Trace Link**, click the **End Trace Link Creation** button on the toolbar, or right-click the selection and choose **Trace Link→Trace Link→End Trace Link**.

   - To assign a custom subtype and name:

     a. Choose **Tools→Trace Link→End Trace Link**, click the **End Trace Link Creation with Subtype** button on the toolbar, or right-click the selection and choose **Trace Link→End Trace Link...**.

        The **Create Trace Link with Subtype** dialog box appears.

     b. In the list of subtypes on the left, select the subtype to assign to each trace link.

     c. In the **Name** box, type the name to assign to each trace link.

        In the **Description** box, you can type plain text as additional information.

   A trace link icon is shown in the **Trace Link** column for each defining and complying object. View a defining or complying path in the **Trace Links** view.

   > Tip:
   >
   > You can change the business object icon so that when an object has an associated trace link, the trace link icon appears overlaid on the object's icon in Structure Manager.

Viewing downstream and upstream paths

There are several methods for displaying the trace link assignments that you make among and between structures:

- The **Traceability Matrix** view displays the assignments between two selected structures.

- You can run an accountability check to compare two structures to ensure all lines in the source structure are consumed in the target structure.

  For example, you can compare a requirement structure against a product structure, or compare a requirement structure against a manufacturing process structure.

- In the Teamcenter **Relation Browser** view, you can view the trace link hierarchies in a requirement structure.

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- In the requirement's **Properties** dialog box, you can view trace link assignments if the **Calculate Defining/Complying Objects** option is selected.

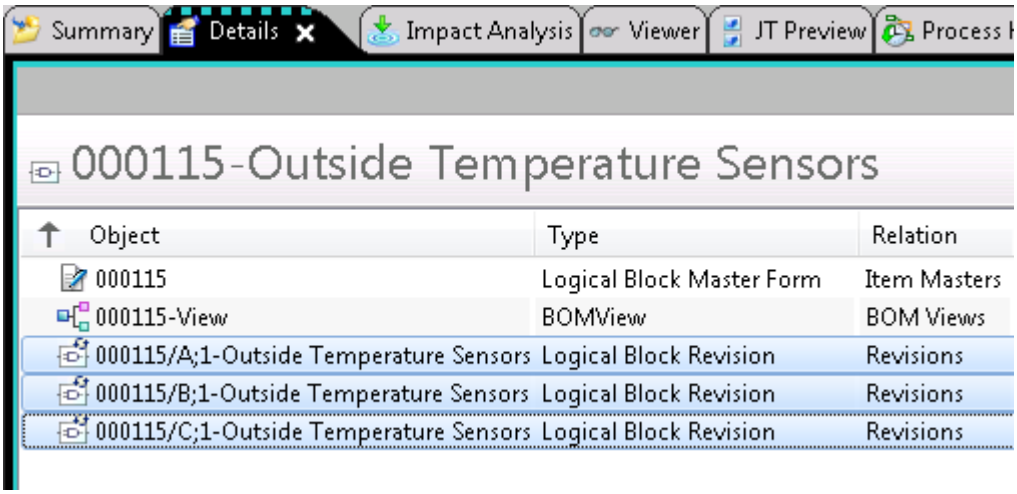
> Tip:
>
> Defining and complying trace links can exist also between Systems Engineering objects and subsets in 4th Generation Design. Using the *cross-domain tracing* feature, collaborative designers can analyze these elements for change impact both downstream and upstream.

Run a traceability report

- This procedure is for occurrences only, not for workspace objects.
- You do not need to select the context for an absolute occurrence object to run a traceability report on the object.

1. In My Teamcenter or a structure application, select the occurrence or absolute occurrence object or objects for which you want to run a report.

   - In My Teamcenter, select the object or objects in the **Details** view.



   - In a structure application, select the object or objects in the structure view.

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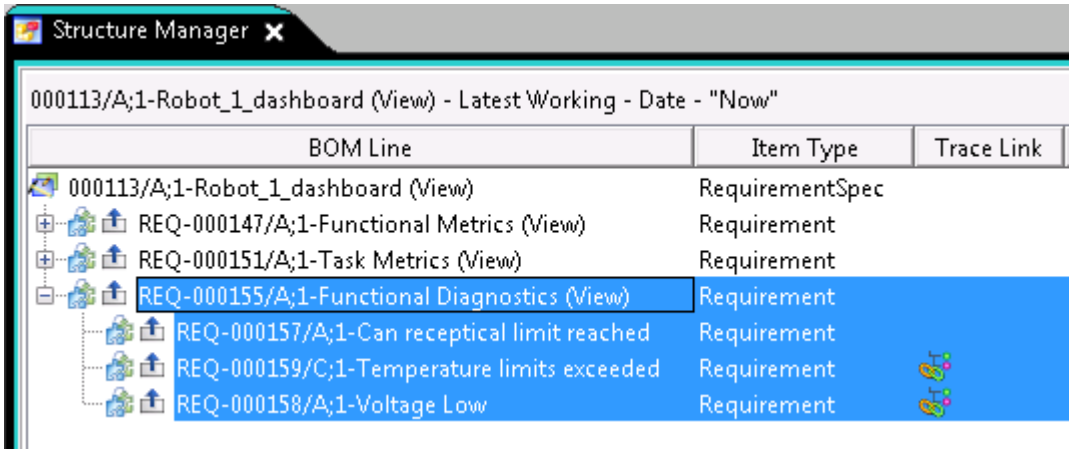
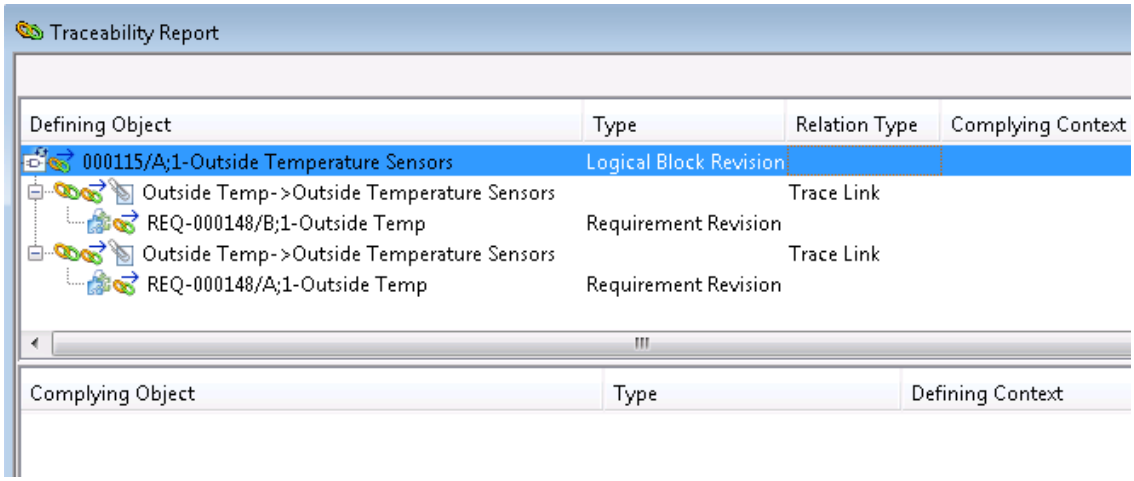


2. Click **Generate a Traceability report** .

   The **Traceability Report** window appears.

   - Example report for objects selected in the My Teamcenter, **Details** view, shown above:



   - Example report for objects selected in the structure view, shown above:

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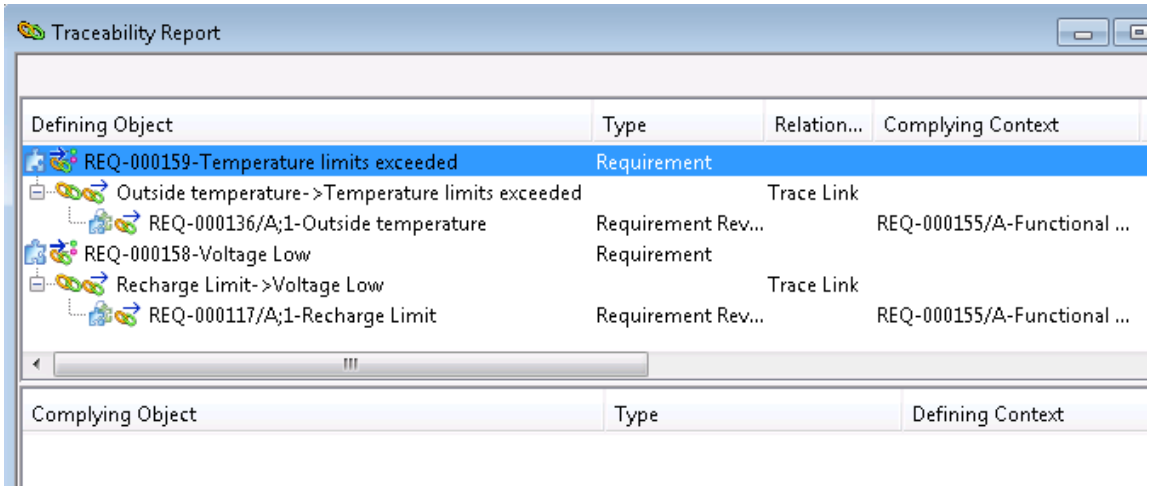

- If multiple objects are selected in the structure view or the **Details** view, the traceability report includes a separate root corresponding to each selected object.
- Only the objects with related trace links appear in the traceability report. If no trace links are related to a selected object, that object does not appear in the report.
- The report shows the defining and complying objects for any trace links related to the selected objects.
- The report shows the defining and complying objects for any trace links related to the parent, or revisions of, the selected objects.
- Columns showing the context for trace links on absolute occurrence objects are also included on the report.

Note:

- The direct trace link symbol indicates that the trace link relates to the selected object itself.
- The indirect trace link symbol indicates that the trace link relates to a revision or item that is associated with the selected object.
- The symbols for direct trace link on an absolute occurrence and indirect trace link on an absolute occurrence indicate the trace link was created on the object, in-context.

Export traceability information to Excel in a structure view

1. Open the structure with trace links in a structure view.

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For example, send a structure to the **Structure Manager** view, the **Requirements** view, or another structure view.

2. Choose **Tools→Export→Objects To Excel**.

   Teamcenter displays the **Export To Excel** dialog box.

3. Under **Output**, do one of the following:

   - For a standard Excel file that is not connected to Teamcenter, click **Static Snapshot**.
   - For an interactive live Excel file that is connected to Teamcenter, click **Live integration with Excel (Interactive)**.
   - For a live Excel file that is not connected to Teamcenter, click **Live integration with Excel (Bulk Mode)**.

     You can accumulate changes and later connect the file to Teamcenter.

4. Under **Output Template**:

   a. Select **Export All Visible Columns** to export all the columns in the applicable structure view.

   > Note:
   >
   > Verify the **Trace Links** or **Trace Link** column property appears in the structure view.

   b. Select **Use Excel Template** to activate the template list.

      In the list, select the template that specifies the data that you want to export.

5. Click **Copy URL**.

> Note:
>
> - **Copy URL** is unavailable if you select more than one object to export.
> - **Copy URL** is unavailable if you select any of the following dialog box options:
>   - **Work Offline and Import**
>   - **Export All Visible Columns**
>   - **Export All Objects in View**

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The export file is generated and the `URL Generated` message is displayed, confirming that the URL is in your Windows Clipboard and showing the URL details.

6. Click **OK** to generate the export Excel file.

Excel opens a temporary file. You can create a permanent file by choosing **File→Save As** in Excel to display the **Save As** dialog box.

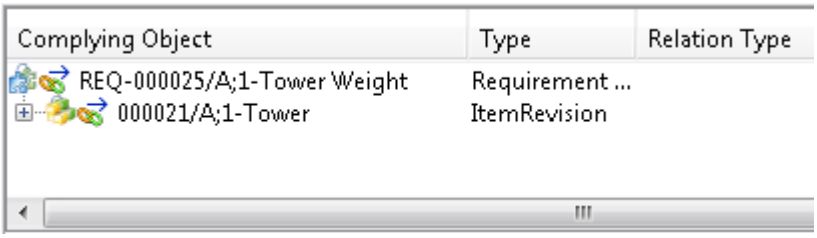
If you save a live Excel file, you can open it later in My Teamcenter to reconnect it to the database.

Note:

Values that you cannot change in Teamcenter are unavailable in the cells of the live Excel file.

Delete a trace link

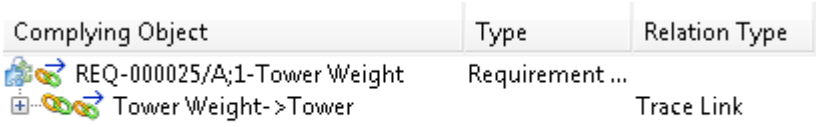
1. Open in the **Traceability** view, or generate a traceability report, that includes the trace link object you want to delete.



Note:

For occurrence objects, be sure to select the occurrence object in the correct context.

2. Click the **Show Trace Link** button at the bottom of the report or **Traceability** view.



3. Expand the object to view all trace links.

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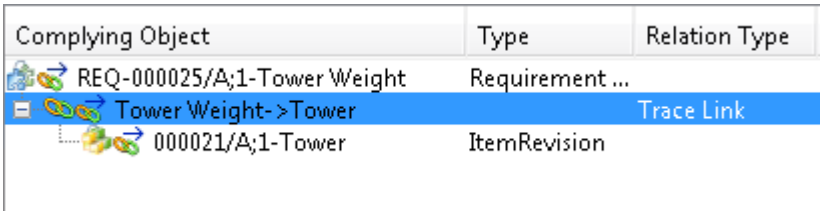


4. Select the **Trace Link** object you want to delete.

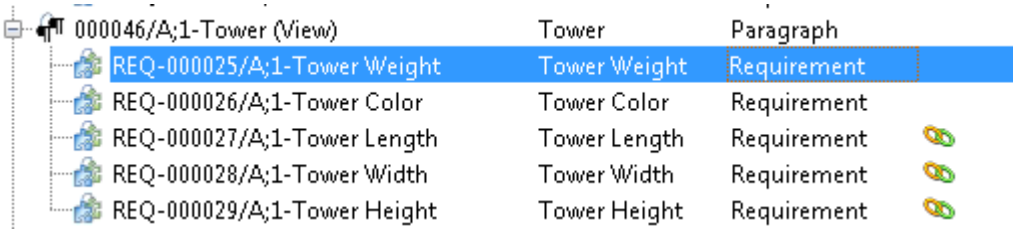
> Note:
>
> The **Relation Type** column indicates **Trace Link** as the type.

5. Click the **Delete Trace Link** button ✕ at the bottom of the traceability report or **Traceability** view.

6. Click **Yes** to delete the trace link.

   The trace link is deleted from the workspace object or from the occurrence object, in context, and from the Teamcenter database.

7. Click **Yes** to refresh the window.

> Note:
>
> You may need to do one of the following also:
>
> - Right-click the object with the trace link symbol and choose **Refresh**.
> - Press the F5 key
> - Choose **View→Refresh**
>
> 
>

Creating trace links for manufacturing objects

You can create trace links between requirements objects and manufacturing objects. The manufacturing source or target can be a regular structure line, or you can store the trace link on an absolute occurrence. An absolute occurrence is an occurrence that contains additional information that is only relevant in the context of another structure line higher in the structure. Absolute occurrences are

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created by setting a parent or grandparent line as the context of an edit, and adding information specific to this relationship.

If you create a trace link on an absolute occurrence, this trace link exists in all structures containing both the context line and the trace link object in the same hierarchical relationship. If multiple revisions of the structure containing the related structures exist, the trace link exists in all the revisions. If you delete the trace link from one revision, it is deleted from all revisions.

When creating trace links with manufacturing objects, either the source or the target must be a requirements object.

Create trace links on absolute occurrences

When creating trace links with manufacturing objects, either the source or the target must be a requirements object. The following procedure describes creating a trace link between a source manufacturing absolute occurrence and a target requirement object. You can also perform the linking in the opposite direction.

1. Right-click the structure line that is the context of the edit. This line must be an ancestor of the structure line that will be the source line for the trace link.

2. Choose **Set In Context**.

   Teamcenter displays the symbol in front of the line and colors the line green to show that the item is the context for the creation of absolute occurrences. In addition, Teamcenter grays out all siblings of the selected context and you cannot create absolute occurrences for these lines. The in-context item is also identified in the title bar of the structure tree.

3. Select the source line, or select multiple objects by using the standard Windows functions.

4. Choose **Tools→Trace Link→Start Tracelink**, click **Start Trace Link Creation** on the toolbar, or right-click the selection and choose **Trace Link→Start Tracelink**.

5. From the **Requirements** view, select the target requirement(s) for the trace link and specify the trace link subtype and name by doing one of the following:

   - To accept the default subtype and name, choose **Tools→Trace Link→End Tracelink**, click the **End Trace Link Creation** button on the toolbar, or right-click the selection and choose **Trace Link→End Tracelink**.

   - To assign a custom subtype and name:

     a. Choose **Tools→Trace Link→End Tracelink**, click **End Trace Link Creation with Subtype** on the toolbar, or right-click the selection and choose **Trace Link→End Tracelink**.

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The **Create Trace Link** dialog box appears.

b. In the list of subtypes on the left, select the subtype to assign to each trace link.

c. In the **Name** box, type the name to assign to each trace link.

d. (Optional) In the **Description** box, type additional information.

You can view trace links in the **Traceability** view or by creating a traceability report.

Recording supplemental information

What are custom notes?

Custom notes are used to capture issues, actions, questions, or other ad hoc information. They act much like *sticky notes* on an object. For example, as issues arise a user can attach a note to the object to capture or document the issue.

Notes come in two types (although users can define other subtypes): custom notes and standard notes. Standard notes contain parameters and are typically the types that would show up as standard notes on drawings. Custom notes are edited with Microsoft Word.

- A custom note can be related to a single object or to multiple revisions of an object.
- Custom notes can be created in the context of another object such as a requirement, a part, or a manufacturing object such as a process or operation.
- Custom notes are attached directly to an object, and not underlying occurrences.
- After custom note content has been edited in Word, it can no longer be edited by modifying the **Text** property value.
- To see custom notes in a manufacturing structure, you must add the **Custom Requirements Lists** relation to the **Shown Relations** list for each manufacturing item revision type in the **General** options.

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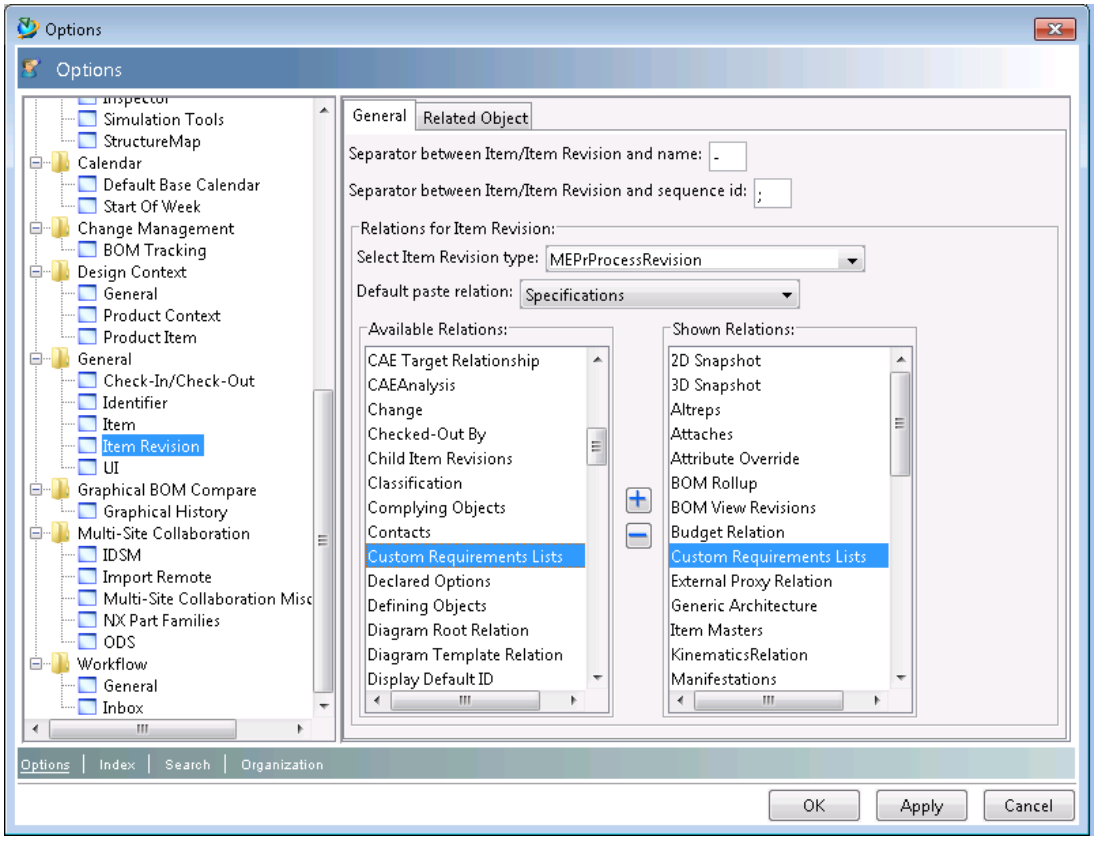

The custom note item consists of the following objects.

- **CSMTNOTE-01–Mtg min** ← custom note master
- **CSMTNOTE-01–Mtg min** ← custom note master form
  - **CSMTNOTE-01/A;1–Mtg min** ← custom note revision
    - **CSMTNOTE-01/A–Mtg min** ← custom note revision form
    - **Mtg min** ← custom note full-text dataset

You can view additional information about the custom note by displaying the **Custom Notes** view. To display the custom notes using the **Custom Notes** view, select the custom note or the object with the custom note and choose **Window→Show View→Other→Systems Engineering→Custom Notes** or click **Custom Notes Manager** on the toolbar.

Create a custom note

1. Select the object to which the custom note applies.

2. Choose **File→New→Custom Note** or click the **Custom Note** button .

3. Select **Custom Note** as the type, and then click **Next**.

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Caution:

The **TcAllowedChildTypes_Requirement** preference must include the **Fnd0CustomNote** value. Otherwise, an error message is displayed and the note is not created.

4. Type the revision ID, revision, and name for the custom note.

Note:

You must type a name for the custom note in the **Name** box. If you leave the **Requirement ID** and **Revision** boxes blank, the values are filled in automatically when you click **Finish** to create the custom note.

5. (Optional) Type a description for the custom note.

6. Click **Finish**.

The custom note symbol appears in the **Custom Notes** column for the selected item.

Attach a custom note to an item or item revision

1. Open My Teamcenter.

2. Right-click the custom note or the custom note revision that you want to attach and click **Copy**.

3. Select the item or item revision and choose **Edit→Attach Requirements/Notes→Custom Note**.

The custom note revision is attached to the selected object (item or item revision) through the **Custom Requirements Lists** relation.

Note:

If the note is not visible under the item or item revision, you must specify **Custom Requirements Lists** as a shown relation for the item and item revision.

1. Choose **Edit→Options**.

2. Expand the **Options** tree and expand the **General** folder.

3. Click the **Item** or **Item Revision** node.

4. In the **General** options tab, choose **Custom Requirements Lists** from the **Available Relations** list.

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5. Click + to move it to the **Shown Relations** list.
6. Click **OK**.
7. Choose **View→Refresh** or **View→Refresh Window** to refresh the display.

Add or edit custom note text

1. Open My Teamcenter.
2. Specify the custom note text in one of the following formats.

Plain text format

a. Right-click the custom note revision and choose **Edit Properties**.

The **Check-Out** dialog box appears.

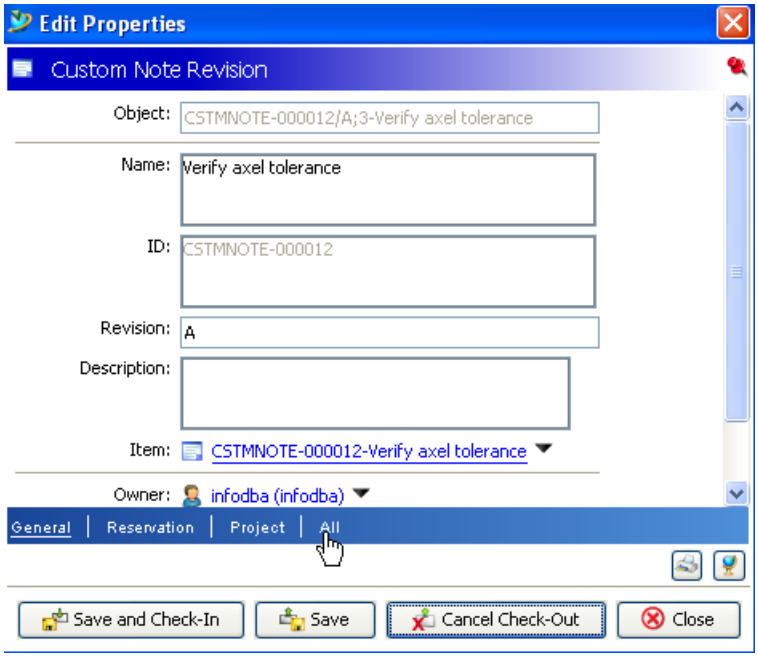
b. In the **Change ID** box, type the change ID.

c. In the **Comments** box, type notes for checkout.

d. Click **Yes**.

The **Edit Properties** dialog box appears.

e. Click the **All** link in the **Edit Properties** dialog box.



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f. Scroll to the **Text** box and type the custom note. For example:

```
Verify axel tolerance using company standard test
methods.
```

g. Click **Save and Check-In**.

The **Check-In** dialog box appears.

h. Click **Yes**.

The custom note is checked in and the new text appears in **Body Cleartext** property displayed on the **Overview** tab in the **Summary** view.

Rich text format

> Note:
>
> To open the dataset in rich text format, you must have Microsoft Office 2007 installed on your machine.

a. Double-click the **Full Text** dataset associated with the note revision, or select the dataset and choose **File→Open**.

The note opens in Microsoft Word 2007.

> Note:
>
> Before you can create full text dataset, Teamcenter must be configured correctly.

b. Type the note text and then click **Save**.

c. Close the Microsoft Word document.

> Note:
>
> After a note has been specified or updated in rich text format, it cannot be edited in plain text format.

Create a new revision of a custom note

1. Select the custom note revision for which you want to create a new revision and choose **File→Revise**.

   The **Revise** dialog box appears.

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2. (Optional) In the **Define the basic information for the new item revision** pane, type the name of the new revision.

3. (Optional) Type a description of the revision and choose a unit of measure for the revision.

4. Click **Next**.

   The **Define additional item revision information** pane is displayed.

5. (Optional) Enter values for the note revision attributes.

6. Click **Next**.

   The **Define attached objects** pane displays the source revision and attachments and the destination revision and attachments. By default, all objects are copied forward to the new (destination) revision.

7. (Optional) Click the **Copy as object option set** button to the right of each object in the revision tree and select the desired copy option.

   Don't Copy

   Allows you to selectively copy objects from one revision to another. Objects that are designated as **Don't Copy** appear with a line through them in the **Destination** tree.

   Copy as Object

   Creates a new object of the same type and relation to the parent object. Objects created by this method are totally independent of the parent object. Therefore, any changes to the copied object are not reflected in the original object.

   Copied objects appear in bold in the **Destination** tree and can be renamed.

   Copy as Reference

   Copies the object as a reference to the original object. All changes to the reference copy affect the original object. The names of attachments that are copied as references cannot be modified.

8. Click **Next**.

   The **Select projects or programs that you want to assign new object to** pane is displayed.

9. (Optional) Assign the new revision to a different project or program.

10. Click **Next**.

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The **Select open option and alternate id display option** pane is displayed.

11. (Optional) Set the open, display, or checkout option for the new revision.

12. Click **Finish**.

    The new revision is created as a copy of the previous revision object. The new revision is independent of the source revision. Modifications to the new revision are not reflected in the source revision, which allows you to edit the note text for each revision.

Delete a custom note

> Note:
>
> This procedure removes the custom note object from the Teamcenter database.

> Note:
>
> You must be in the My Teamcenter application to delete the note. If you are in the Systems Engineering or Manufacturing Process Planner application, cut the note and send it to the My Teamcenter application.
>
> To delete a note, you must remove all references to it. To do so, cut the custom note from the attached revision object and click **Delete**.
>
> You cannot delete the note from the **Custom Notes** view in the Systems Engineering application. However, you can remove it from the **Custom notes** view by using the **Cut** command.

1. Select the custom note or custom note revision object you want to delete.

1. Choose **Edit→Delete** or click the **Delete** button on the toolbar or press the Delete key.

   Teamcenter displays a request for confirmation.

2. Click **Yes**.

> Note:
>
> The standard rules for deleting an item or item revision apply to deleting a custom note or custom note revision.

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Managing product and manufacturing information (PMI)

Using PMI objects for inspection planning

Creating and maintaining inspection documentation can be a tedious and manual task. Product and manufacturing information (PMI) is usually authored in a CAD system and saved with the part. Using the **PMI Manager** view, you can:

- Import product and manufacturing information (PMI) data into Teamcenter and use it to directly generate inspection points. PMI created in NX part (PRT) files can be imported from:
  - An XML file exported from **BCT Inspector**.
  - A Teamcenter lifecycle visualization JT file exported from NX 7.5 or later using JT Open Toolkit V7.1.5.0 or later. You can import all data from the JT file or select the data you want to import from the list or visual area of the **Graphics** view. PMI that can be imported from JT includes GD&T modifiers and feature control frames (both single and composite), upper and lower surface finish roughness values and related ISO details, linear, angular, and radial dimensions, upper and lower specification limits, nominal values, and dimensional text notes. Set the **Mci0ExtractPMISurfaceProperties** preference to **true** to retrieve surface properties that can be displayed as columns in bill of materials (BOM) or bill of process (BOP) views.

Surface location X	Surface axis K	Primary datum reference
Surface location Y	Surface radius	Secondary datum reference
Surface location Z	Surface entity	Tertiary datum reference
Surface axis I	Surface type	Characteristics type
Surface axis J	Surface name	Tolerance description

> Note:
>
> You can also import PMI created in Catia and converted to JT using NX, the official PLM translator for Catia, which provides a unique accountability ID for each PMI object. If you use other CAD translators, the accountability ID of each PMI object must be larger than 0 and unique under the part to import correctly.

Except in the **Graphics** view, GD&T is reported using readable text. No special symbols are provided.

You can also:

- Assign PMI objects to operations so that they become inspection points.
- Create new inspection points, known as Data Collection Definitions (DCDs), on parts in a BOM and copy and paste them to processes and operations so that they are consumed in a BOP. You can also directly create DCDs on processes and operations in a BOP.

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- Edit and add manufacturing parameters to PMI objects and DCDs to better support your process.
- View the acquired PMI objects per .prt (stage) file from NX.
- Indicate on some PMI objects that they are not to be inspected.
- Delete PMI objects.

Caution:

The following limitations exist:

- Assembly PMI objects are only connected to the assembly (.jt) and not to stage (.prt) parts.
- When importing PMI from a JT using JT Open Toolkit, the API must be installed externally from Teamcenter.
- Weld objects on JT are not supported.

After assigning PMI objects to operations, you can export the inspection parameters with PLM XML information in a work package to a manufacturing execution system (MES), where data can be used to assure inspection results meet PMI parameters during inspection operations.

Working with product and manufacturing information (PMI)

If you use product and manufacturing information and want to ensure that effectivity works correctly, you must set the following preferences:

- **MEStockAbleBomLinePropertyName**
- **MEValidStockAbleValues**
- **MEPostAssignIDICMaker**

To ensure that effectivity functions properly in your environment when using PMI, you can create a pre/post extension on the **BOM__line_assign_child_line** operation and implement your own business logic. This operation is used to form connections between two objects, for example, to connect (assign) a part to a process or the engineering bill of materials (EBOM) to the manufacturing bill of materials (MBOM). Additionally, this operation copies some attributes from source object to target. Your custom extension computes the effectivity of the source occurrence in the EBOM and sets it as the effectivity of the target occurrence under the PMI context.

Note:

You should not set an in-context ID manually if you are working with PMI and effectivity.

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Inspection planning workflow

1. PMI annotations are authored in NX.

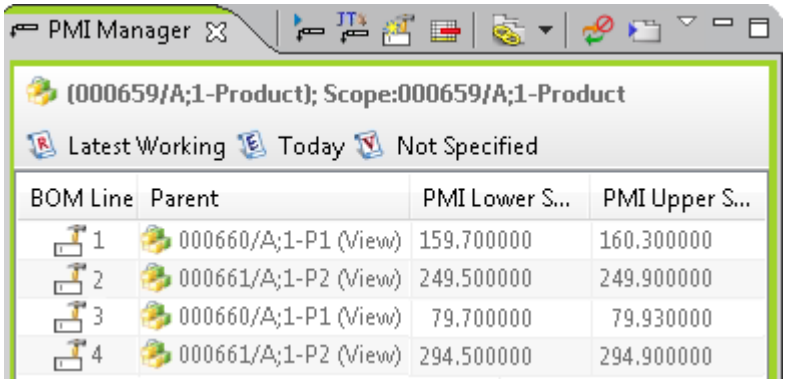
2. PMI objects are either:

   - Captured and ballooned using BCT Inspector Suite software, then exported from BCT Inspector Suite in XML format for use in Teamcenter.

   - Or exported from NX in JT format using JT Open Toolkit.

3. PMI objects are imported into Teamcenter.

   Objects appear as lines when you open them in the **PMI Manager** view.



4. You assign PMI objects to operations by copying from the **PMI Manager** view and pasting to a process view so that they become inspection points.

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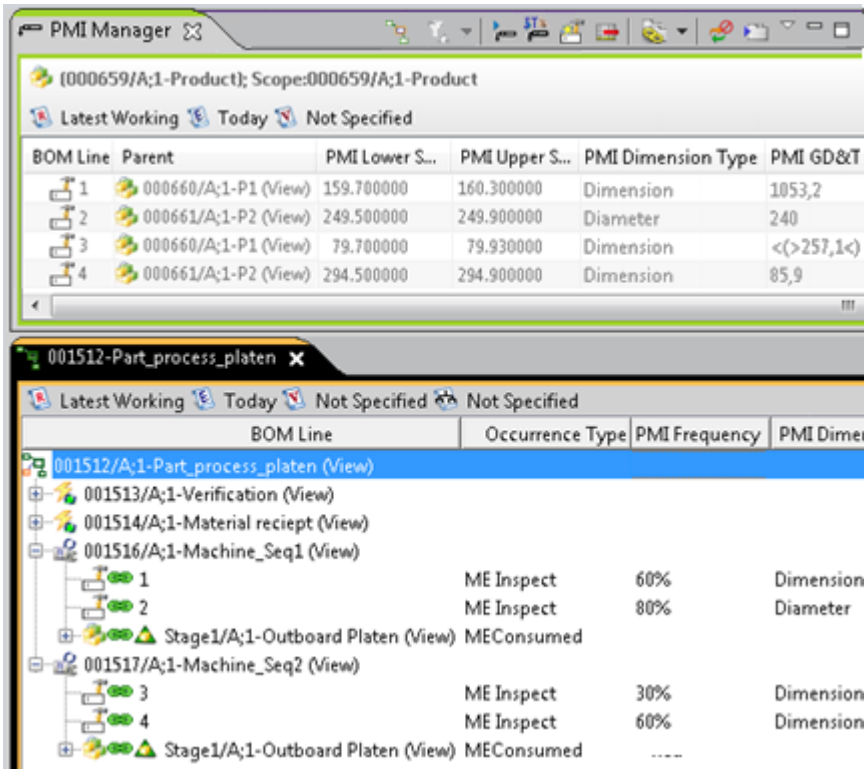
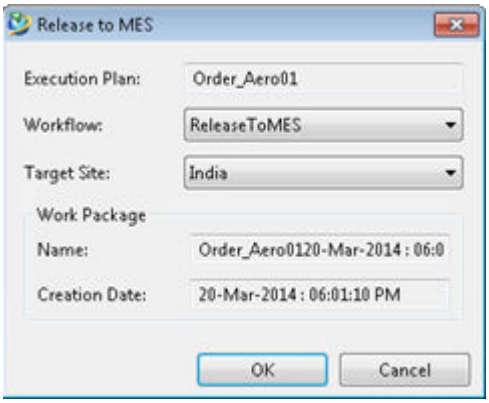


Tip:

You can add additional inspection points in Teamcenter by creating Data Collection Definitions (DCDs). You can also edit process-specific attributes for PMI objects or DCDs, and remove any unwanted PMI objects or DCDs.

5. Finally, you release the structures to your MES system.



6. The operator can now execute work instructions and retrieve the required data collection values.

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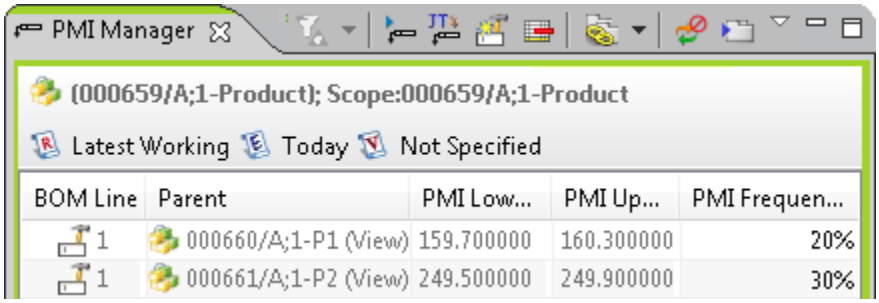
Using the PMI Manager

Customize the **PMI Manager** view to display a wide variety of PMI attributes as columns, many of which are editable and let you add process information not included in the PMI that derives from NX source data. Many PMI columns are also available from bill of material (BOM) and bill of process (BOP) views.

PMI data flows differently when you set the view scope by selecting a part in the product or process structure and choosing **Open with→PMI Manager**.



From **PMI Manager** views launched from the product structure, you can:

- Import new PMI or update PMI objects in Teamcenter from NX models using the third-party BCT Inspector Suite plug-in or exported in JT format from NX or other translators, provided unique accountability IDs exist for each PMI object .
- Remove PMI objects and Data Collection Definitions (DCDs) from the product structure.
- Filter PMI objects and DCDs that are assigned or not assigned to the process structure.

From **PMI Manager** views launched from the process structure, you can:

- Create additional DCDs not included in the NX data.
- Edit PMI attributes not defined in the NX source.

> Note:
>
> To assign PMI, you may still copy and paste structures containing DCDs from the **PMI Manager** view to the process view.

If part JT information that contains the PMI information is imported from NX to Teamcenter using the BCT Inspector Suite, a link between the BOM line PMI entities and JT PMI tags is created to synchronize the **PMI Manager** and **Graphics** views. Selecting a PMI object in the **PMI Manager** view highlights it in the **Graphics** view, and vice versa.

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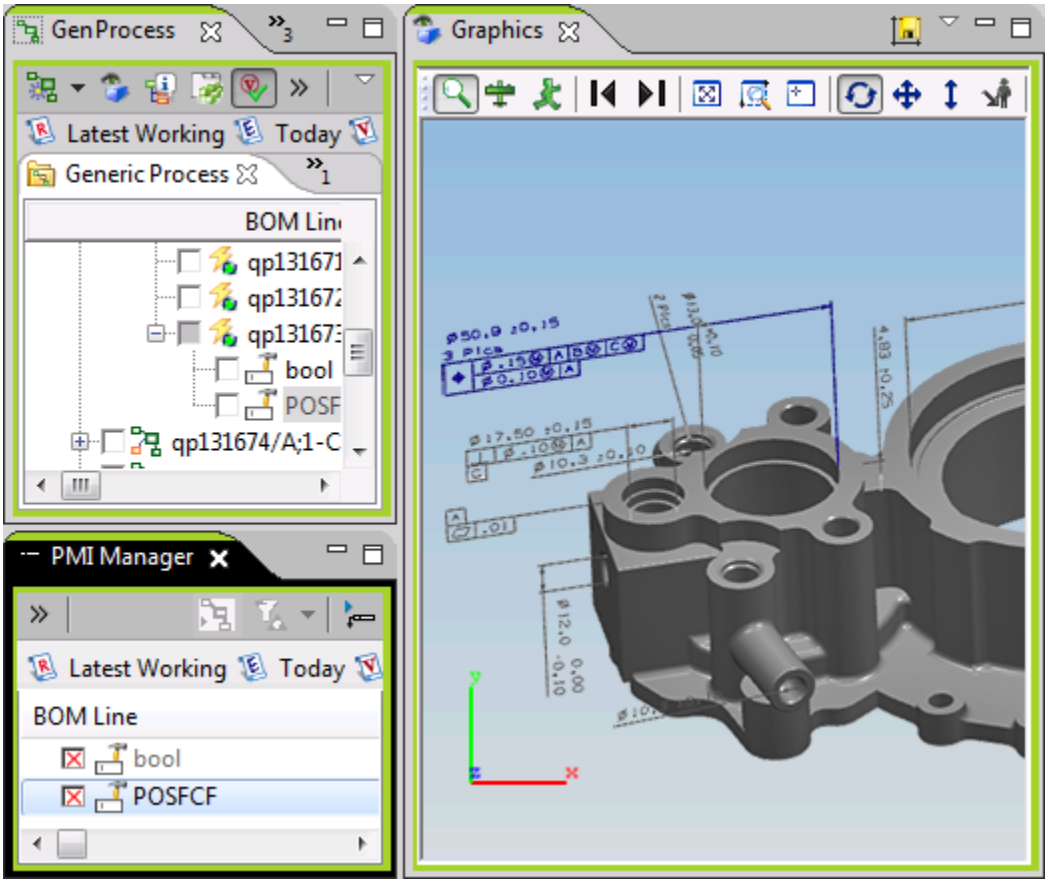

Support for GD&T composite FCFs and modifiers

Composite feature control frames (FCFs)

Composite FCFs consist of two or more feature control frames tied to a single feature, or to a pattern of multiple features of the same type. The example below applies a diameter tolerance to the positions of four holes (4X), relative to datums A, B, and C.

> Note:
>
> You or your administrator must set the value of the preference **Mci0ExtractPatternPMI** to **true** to extract a GD&T callout for multiple features associated to the same callout, as defined by a pattern (for example, 4X below). If the preference is set to the default value of **false**, only a single callout is extracted. This preference also applies to composite linear dimensions.

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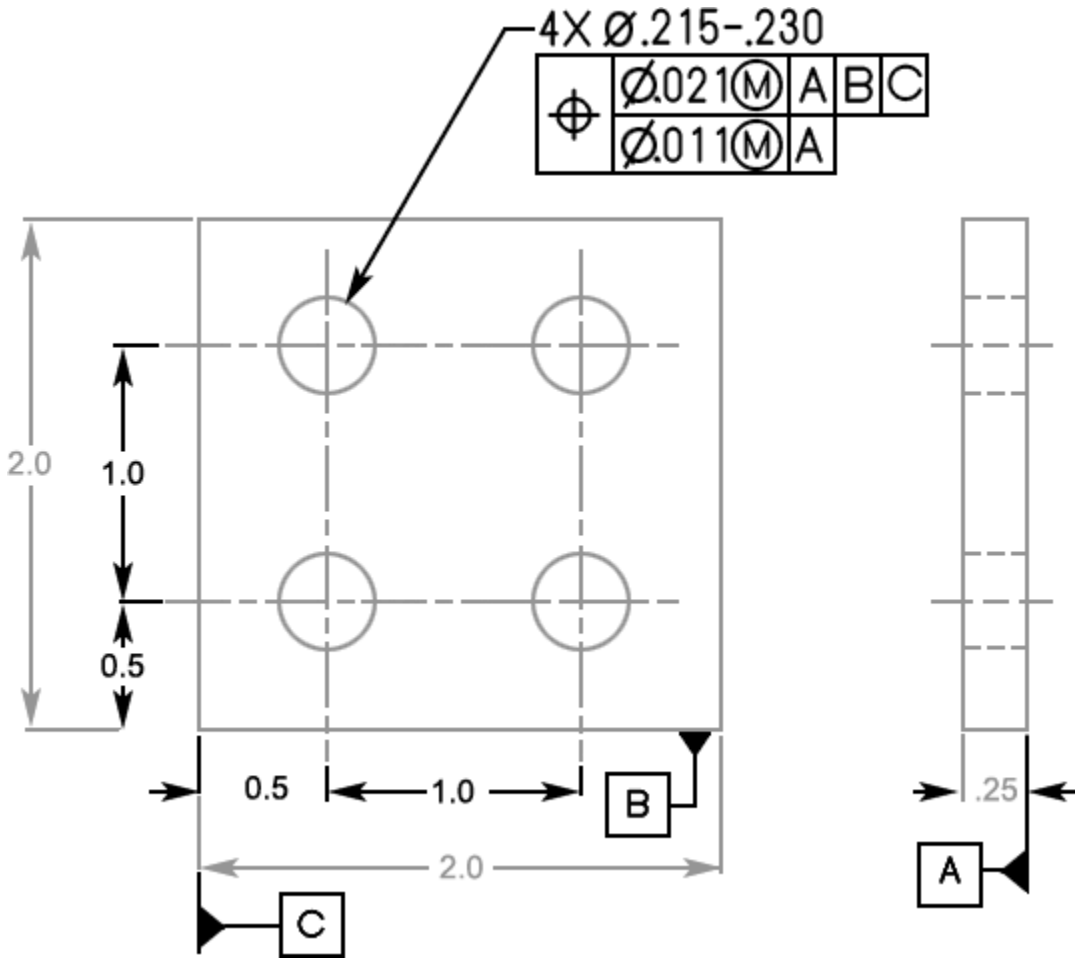
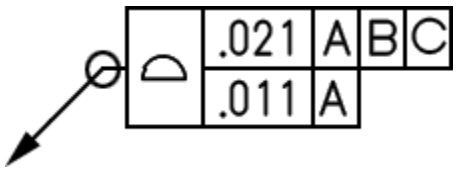


Below is an example of a composite surface profile tolerance. Many web sites contain more detailed information on GD&T and composite FCFs.



Note:

Composite FCF refinements, such as a third FCF that defines parallelism or perpendicularity tolerances for a pattern of holes, are not supported.

Like NX, Teamcenter uses a simple numbering sequence for each composite FCF. NX uses, for example, 11 and 11_1 to indicate FCFs that make up a composite FCF top to bottom, while Teamcenter uses 11 and 11.1 in the **PMI ID** column to show that these two FCFs are related to the same feature. The **PMI Is Composite FCF** column also displays a 1 to indicate that an FCF is part of a composite.

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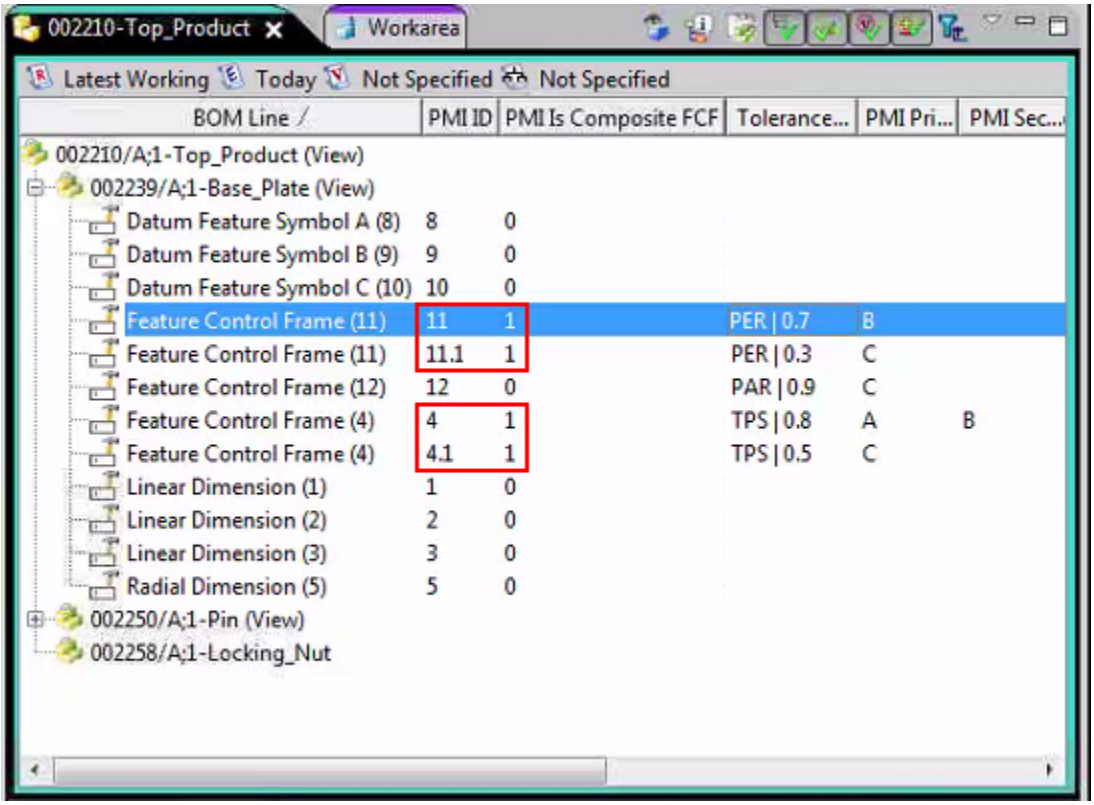

Note:

- When consuming composite FCFs in an operation—for example from a **Product** view to a **Process** view—you must press Ctrl and select all composite FCFs in the **Product** view before you copy and paste them to the **Process** view.
- To remove a composite FCF from an operation, you must also select both parts.
- You cannot assign one part of a composite FCF to one operation and the other to a different operation.

Modifiers

Modifiers added to tolerances and datums are extracted from JT files in relation to their tolerance and/or datum. The most common modifiers are Ⓜ for maximum material condition (MMC) and Ⓛ for least material condition (LMC). Supported modifiers are defined below.

Modifier symbol	Description
Ⓜ	Maximum material condition
Ⓛ	Least material condition
Ⓕ	Free state

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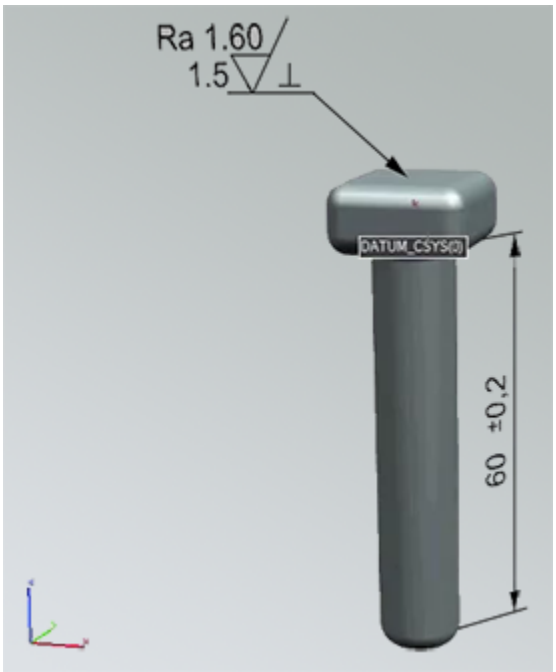
Modifier symbol	Description
Ⓣ	Tangent plane
Ⓟ	Projected
Ⓤ	Unilateral
Ⓢ	Regardless of feature size (RFS, discontinued after Y14.5, 1994)

Support for surface finish roughness

You can import upper and lower surface finish roughness values when importing PMI objects. This capability supports direct mapping of these values, as well as GD&T code properties, to system integration testing (SIT) data collection interfaces.



Once you create data collection definitions (DCDs) and assign them to operations in **PMI Manager**, you can view surface roughness values in your Manufacturing bill of materials (MBOM) and your bill of process (BOP) by enabling both the **PMI Upper Specification Limit** and the **PMI Lower Specification Limit** columns. You can view PMI GD&T code by enabling the column **PMI GDT Code**.

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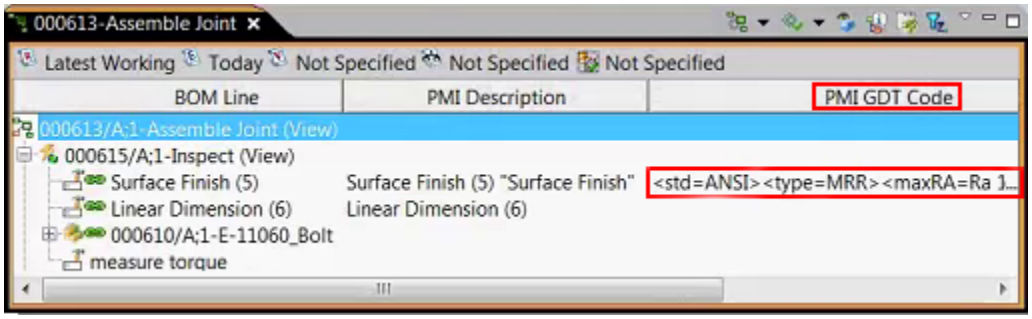

Note:

If the roughness is a simple Ra value (the value of all absolute distances of the roughness profile from the center line within the measured length), that value is applied to the **PMI Upper Specification Limit** property.

Import PMI objects from a BCT Inspector file

BCT Inspector exports PMI objects from NX in an XML format that you can subsequently import into Teamcenter.

Note:

You must use the following configuration settings:

- In the NX session, in the .ipxml file from BCT Inspector, set the PMI XML relation as a relation type to enable PMI import.
- A PMI dataset of the type **ipxml** should be attached with a PMI XML relation.
- In the BCT configuration file *bct_inspector_cfg.xml*, use the following settings:

  ```
  (<ExportProject Enable="1" DatasetType="Mci0PMIXml"
  DatasetNamedRev="Mci0ipxml" FileExtension="ipxml" batchProcessing="0"
  IgnoreBalloons="0" />)
  ```

- In Teamcenter, set the value of the preference **INSPECTOR_DATASET_RELATION_TYPE** to **Mci0PMIXmlRel**.

1. From a product structure, right-click the part to which you want to import PMI information and choose **Open with→PMI Manager**.

2. In the **PMI Manager** view, click **Import PMIs**.

   Teamcenter imports the PMI objects, places them on the appropriate parts, and extracts PMI information into the PMI property cells. You can now assign the PMI objects to operations.

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Import PMI from a JT file

You can import PMI from a Teamcenter lifecycle visualization JT file. PMI can include linear, angular, and radial dimensions, upper and lower specification limits, nominal values, dimensional text notes, upper and lower surface finish roughness values and ISO details, and both regular and composite GD&T feature control frames (FCFs) derived from JT. Set the **Mci0ExtractPMISurfaceProperties** preference to **true** to retrieve surface properties such as position X, Y, and Z, and direction I, J, and K.

You can import all data from a product structure or specific data from the part table or 3D window of the **Graphics** view.

1. If you have not already done so:

   a. Install JT Open Toolkit *that is supplied with Teamcenter* externally from Teamcenter.

   > Note:
   >
   > The JT Open Toolkit supplied with Teamcenter is stamped with a Manufacturing license, and any other toolkit package will fail to work.

   b. In NX 7.5 or greater, define the PMI information—for example, features, datums, tolerances, and FCFs—to be imported.

   Use the JTTK Inspector to verify which properties can be extracted.

   c. In NX, use JT Open Toolkit to export the JT file as documented in the NX help.

   d. In Teamcenter, create a product structure and apply the JT file to a Direct Model dataset.

2. In Manufacturing Process Planner, from the product structure, select a BOM line containing child lines as well as the directModel dataset.

3. From the product structure, right-click a BOM line containing child lines as well as the directModel dataset to which you want to import PMI information and choose **Open with→PMI Manager**.

4. Click to open the **Graphics** view.

5. From the product structure, show the JT image, right-click the image, and in the **Graphics** view, choose **Show PMI**.

6. Do one of the following.

   - To import all PMI data, in the **Graphics** view, right-click the part and choose **PMIs→Import PMI from JT**.

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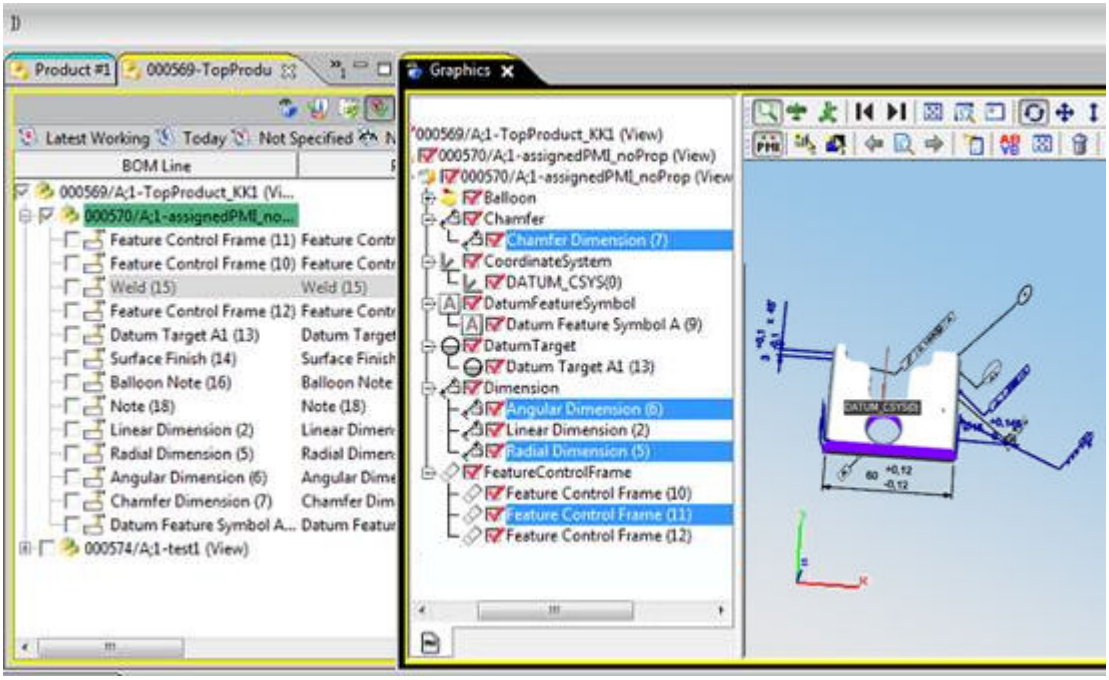
> Tip:
>
> You can also import PMI from the **PMI Manager** toolbar.

- a. To import specific PMI data, in the list or 3D viewer of the **Graphics** view, press Ctrl and select each PMI element you want to import.



- b. In the product structure, right-click the part and choose **PMIs→Import selected PMI from JT**.

Because the JT toolkit provides different ways to store information on JT files (assembly, part, monolithic), PMI objects are imported under the part the JT was created with, without any validation that those objects are attached to the part in the **Graphics** view. You can move, update, and delete PMI objects as necessary after import. The information is read from the JT and no changes are applied to the JT file. You can now assign the PMI objects to operations.

> Note:
>
> If the JT is updated and you reimport PMI, new PMI objects are added, existing PMI objects are updated, and missing PMI objects are deleted.

Assign a PMI object to an operation

1. In the **PMI Manager** view, assign PMI objects to operations by doing one of the following.

   - Use the **Copy** and **Paste** commands.

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a. Right-click a PMI object and choose **Copy**.

> Note:
>
> To assign composite feature control frames (FCFs) to an operation, press Ctrl and click all FCFs that make up that composite.

b. In the process pane, select the appropriate operation and choose **Paste**.

- Drag the part to the appropriate operation.

Assigning the PMI to an operation shares the values of specified properties with the operation. Any changes in these values in the structure automatically changes the values in the process.

2. Edit PMI object information.

Create data collection definitions (DCDs)

In addition to assigning PMI objects imported from CAD to operations, you can add your own DCDs to items such as parts, or to a process or operation, to better define the inspection plan. These DCDs share the same behavior as those that were generated from the PMI objects.

1. From a part or process structure, right-click a part, process, or operation and choose **Open with→PMI Manager**.

> Note:
>
> You can also create a DCD from a part in a bill of materials (BOM) structure, or a process or operation in a bill of process (BOP) structure, by right-clicking the element and choosing **PMIs→Create DCD**.

2. In the **PMI Manager** view, click **Create DCD** .

3. Select the type of data collection definition (DCD) you want to create.

   You can choose from:

   - **Boolean**
   - **Buyoff**
   - **Duration**
   - **Image**
   - **Integer**

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- **Procedure Completion**
- **Real Number**
- **String Data**
- **Time Stamp**
- **List of Values**

4. Click **Next**.
5. Add the properties required by the DCD type you are creating and click **Finish**.
6. If necessary, assign the DCD to an operation.

Edit PMI object information

You can add additional information to a PMI object to define attributes that pertain specifically to your process. This information, which does not exist in the CAD model, is saved only in the context of your process.

1. In the **PMI Manager** view, select **View Menu→Columns**.
2. In the **Available Columns** box, type **PMI**, and then add the columns for which you want to add information.
3. Click **Apply**, and then click **Close**.
4. Review or add PMI information.

Note:

You can edit the following columns.

Property	Description
Key Characteristic	Supports aerospace and defense enterprises that must adhere to the SAE AS9103 standard. You can identify features that must be controlled during production and that when changed, require a first article inspection. You can select the values **DKC** (Design Key Characteristic) or **PKC** (Process Key Characteristic).

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Property	Description
Occurrence Effectivity	Lets you hide or show assembly parts and PMI objects associated with those parts based upon occurrence effectivity settings.
PMI Criticality	Allows you to select values such as **Critical**, **Major**, **Minor**, or **Documentation Only** to indicate each PMI object's degree of importance when you are defining inspection operations.
PMI Description	Specifies a description that can be presented in the work instructions.
PMI Dimension Type	Specifies the type of the dimension, such as radius or diameter.
PMI Frequency	Specifies information for the MES system representing the frequency of the inspection, for example, whether it applies to every instance, once in a lot, first and last, and so on. The precise semantics of this property are project-specific.
PMI GD&T Code	Specifies XML code representing geometric dimension and tolerancing information.
PMI Marked As Deleted	Indicates whether the PMI object is deleted in NX.
PMI Not For Inspection	Prevents the PMI object from being included in the accountability check and also from being exported to MES.

Filter assigned and unassigned PMI objects

If you have a large number of PMI objects in the product view and want to verify which are or are not assigned in the process view, you can filter them in the **PMI Manager** view.

1. Open the **PMI Manager** view from the product structure by right-clicking the line that includes the PMI objects shared with the process structure and choosing **Open with→PMI Manager**.

   Tip:

   If you already have a different **PMI Manager** view open, you can change to the product view by clicking in the **PMI Manager** view.

2. In the process structure, select the structure that includes the same PMI objects.

3. In the **PMI Manager** view, click **Set selected process/operation as target process** .

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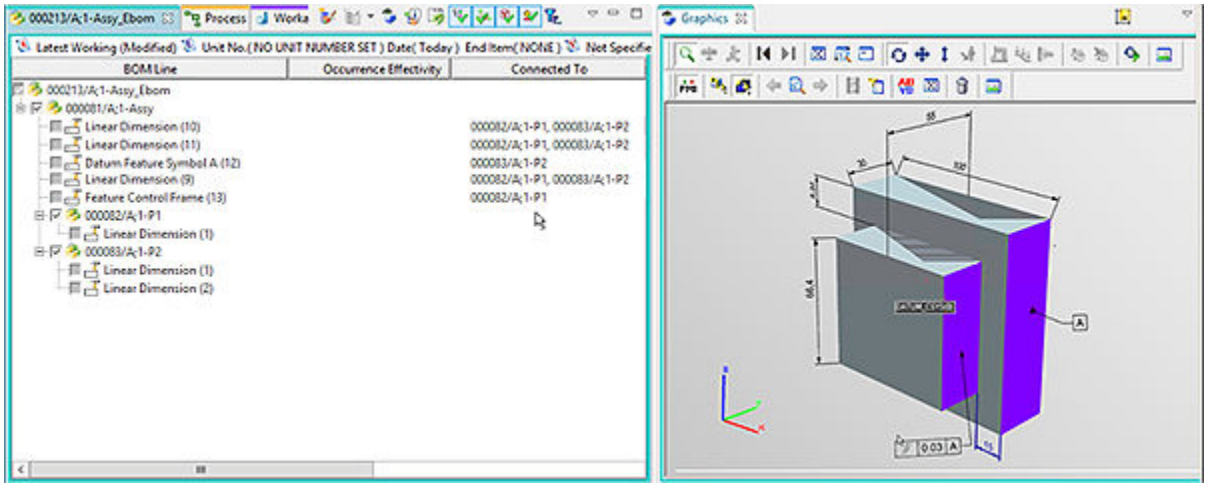
The process structure sets the scope of the command.

4. Select **Filter data based on assignment indication** and choose **Assigned** or **Unassigned**.

Hide or show PMI assembly parts and objects using occurrence effectivity

In Teamcenter Visualization, you can use **All Associated Parts are Configured** date-based or unit-based effectivity settings to hide or show assembly parts and PMI data. When you define this global setting in Teamcenter and apply occurrence effectivity, parts can be configured out and all assembly-level PMI associated to those parts are no longer displayed in the **Graphics** view. Additionally, if the assembly PMI is consumed in an operation, it is configured out as well.

In this example, some PMI objects are associated with multiple parts in an assembly, some are associated with a single part, and some are associated with no parts. Associations are reflected in the **Connected To** column in the assembly EBOM.



When you define occurrence effectivity settings for the part or parts you want to hide or show, those parts are hidden as well as any PMI specific only to those parts. In this example, part 000082/A-P1 is configured to be excluded from viewing on the current date. The PMI objects specific to this part are also excluded. Any PMI objects not connected to a specific part remain displayed. If a dimension is also connected to another part, it remains in the **Graphics** view.

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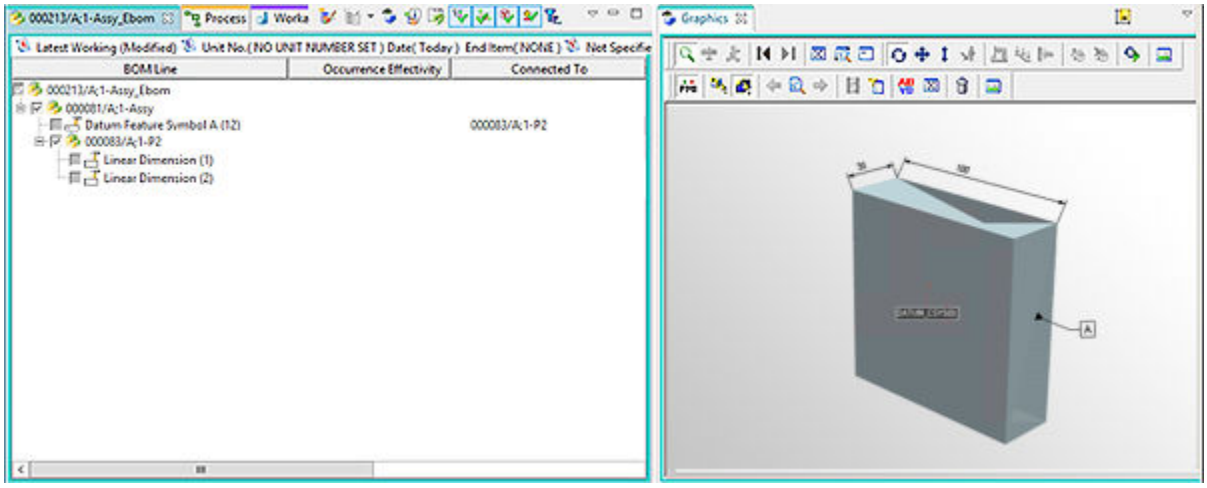

Remove PMI objects

To avoid data loss during synchronization, PMI objects that are removed in NX are not deleted in Teamcenter. They are marked for deletion in the **PMI Marked As Deleted** property, and you can then remove them manually.

1. In the **PMI Manager** view, select the PMI object or DCD to be removed and click **Remove**.

2. Remove the PMI line from the manufacturing BOM.

When you run an accountability check, you can include the **PMI Marked As Deleted** property in the partial match criteria. Teamcenter then displays the removed PMI objects as a partial match, and you can delete them manually.

Run an accountability check on PMI objects

You can run an accountability check to validate completeness (whether all PMI objects are part of an inspection plan) and to discern changes to them.

- If a part is revised and corresponding PMI objects change, the accountability check highlights all changes (additions, modifications, deletion) by comparing two revisions of the part (MBOM-MBOM compare). The MBOM must be configured differently for the two revisions (for example, **working** and **released**).

- If a part is modified without revising it, the accountability check detects all modifications for the PMI objects that are assigned to operations in the plan (using MBOM-BOP compare).

> Note:
>
> Changes done in operation-level properties are not reported by the accountability check.

1. **Run an advanced accountability check.**

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2. Select the **AccountabilitySkipPMINotforInsp** as the source filtering rule.

3. When you reach the step where you are choosing comparison properties in the **Partial Match** tab, add the desired properties.

> Note:
>
> If you want to prevent a PMI object from being included in the accountability check and also from being exported to MES, use the **Not For Inspection** property to exclude it from consideration.

Creating Process Assembly Documents (PAD)

About process assembly documents (PADs)

The Process Assembly Document (PAD) user interface in Manufacturing Process Planner is a tool to define and document a product-oriented bill of process. The product-oriented bill of process holds the value-added operations required to assemble the product. These operations are independent of the plant they are executed in. The tool enables assigning of product, resource, illustrations, quality, and time information to the operations and outputs a sophisticated report. This tool was defined for specific customer requirements and may not fit a generic workflow. It is best used when installed with GM Overlay and the Teamcenter Automotive Edition. For more details, consult your Siemens Digital Industries Software representative.

> Note:
>
> Some of the procedures provided in the PAD documentation relate to item types that are installed with GM Overlay. If you have not installed GM Overlay, you can use other equivalent item types or skip these steps depending on their relevancy to your process.

Creating PAD data

About creating PAD data

When creating process assembly documents, Teamcenter uses specific item types such as **MEPAD** and **MEPSD** for process structures and **CORP_PART** and **CORP_PROC_PLAN** for product structures.

If GM Overlay is installed, the symbols for these objects are different, but the object behavior is the same.

Create a new MEPAD item

1. Choose **File→New→Process**, or click the **Create a New Process** button on the toolbar.

   Teamcenter displays the **New Process** dialog box.

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2. Select the **MEPAD** process type from the list.

3. Click **Next**.

4. Enter the ID number to be assigned to this new process. If this new process is a revision of an existing one, type the ID of the existing process. You can assign a unique revision number in the **Revision** box.

   To let the system automatically assign a unique ID, click **Assign**.

5. Type a name for the new process. Make it unique so you can search the database using this term.

6. Type a process description.

7. Click **Next**.

8. Add process assembly document information in the item revision master form by typing values for the following attributes into the corresponding boxes.

Attribute	Value
Process_number	PAD number Note: This value cannot exceed seven characters.
bk	Book
bk_year	Book year

   Note:

   If you do not enter this information at this step, you can populate additional MEPAD information to the item revision master form at a later date.

9. Click **Finish** to create the new process.

10. Click **Close** to close the **New Process** dialog box.

Populate additional MEPAD information

Normally, you should add this information when creating a new **MEPAD** process. If you do not, you can edit the **MEPAD** information as follows.

- Add a revision description.

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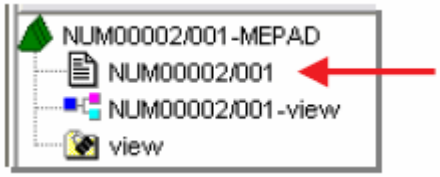
1. In the process view, right-click the column header and choose **Insert column(s)**.
2. From the **Available Columns** list, select **Description** and then click + to add the column to the **Displayed columns** list.
3. Click **Apply** and **Close**.
4. In the new **Description** column, type a new description for the **MEPAD** process item.

- Add process assembly document information.

1. Select the desired **MEPAD** process item.
2. Choose **Open with→Attachments**.
3. Double-click the item revision master form.



4. Type values for the following attributes into the corresponding boxes.

Attribute	Value
Process_number	PAD number Note: This value cannot exceed seven characters.
bk	Book
bk_year	Book year

5. Click **OK**.

Create a new MEPSD item

1. Select an **MEPAD** item revision.
2. Create a new **MEPSD** process item as you create any new process structure. When doing so, select **MEPSD** as the item type.

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> Note:
>
> Alternatively, you can create a new **MEPSD** item in the **PAD** view.

Create a new MEPADElement item

1. Select an **MEPSD** item revision.

2. Create a new **MEPADElement** item as you would create a new operation. When doing so, select **MEPADElement** as the operation type.

> Note:
>
> Alternatively, you can create a new **MEPADElement** item in the **PSD** view.

Create a new process item using templates

- Create a new process from a template as you would create a structure from a template.

> Note:
>
> If you are using a template for an **MEPSD** item, type the title into the description box.

Create a PAD image under the MEPSD item

There are two methods to add an image to a **MEPSD** item. The first method is the recommended one.

Do one of the following:

- Add an image in the **Process Short Description** section of the **PSD** view.

  - In the **Process Short Description** section of the **PSD** view, click **...** beside the **Illustration** box.

  - Select the image you want to add.

  - Click **OK**

  Teamcenter creates a dataset containing the image and attaches it to the selected **MEPSD** item with the **TC_PADPreferredImage** relation.

- Add the dataset manually.

  1. Select the **MEPSD** item and choose **File→New→Dataset**.

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2. In the left pane, choose **PADImage** as the dataset type. If you do not see this entry in the pane, click **More**.
3. Type a name for the new dataset.
4. Click **...** to open the **Import File** dialog box.
5. In the **Reference** list, select the image format that you are attaching.
6. Select the file and click **Import**.
7. Click **OK**.
8. Open the **Details** view.
9. Select the new PAD image line.
10. In the **Relation** box, choose **TC_PADImage** .
11. Click **OK**.
12. Select the newly created dataset and click **Cut**.
13. Right-click the **MEPSD** item again and choose **Paste Special**.
14. Select the **TC_PADPreferredImage** relation and click **OK**.

    Teamcenter adds the image dataset to the **MEPSD** item with the correct relationship.

    Note:

    You can also associate images using the **TC_PADImage** relation. These images are not displayed in the preview of the **PSD** view but are included in the PAD report.

You can now view the associated image.

Note:

The preferred image size is 14.4 x 14.9 centimeters. This is approximately 544 x 563 pixels.

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Working in the PAD pane

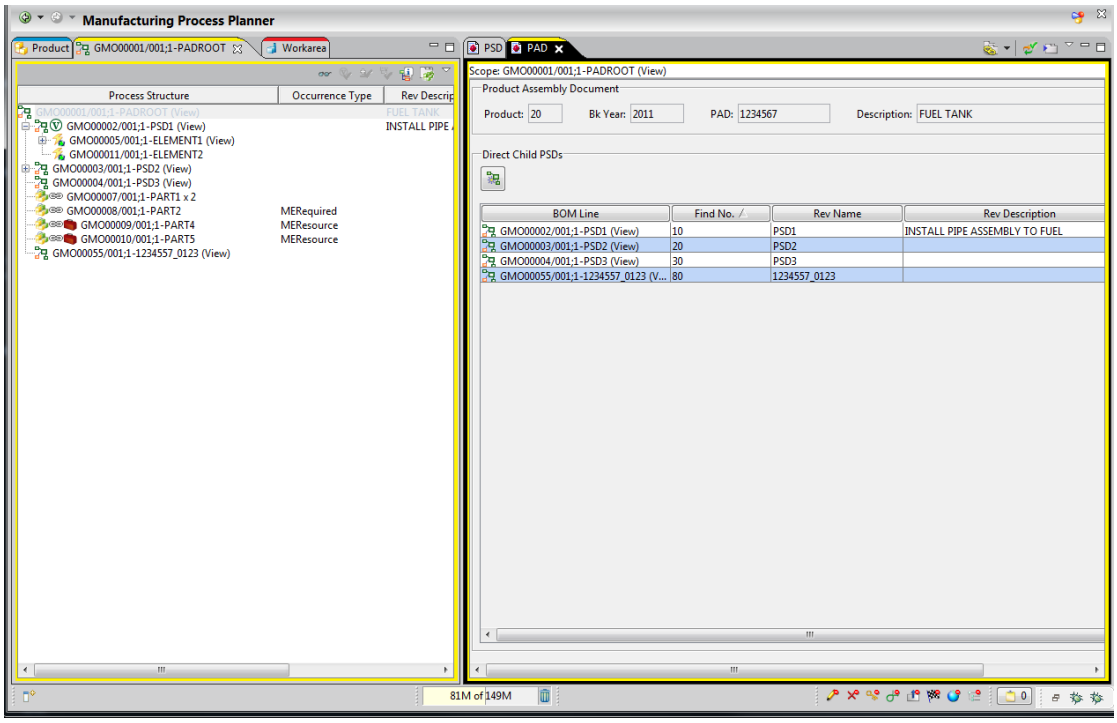
Open the PAD view

You can use the **PAD** view to display **MEPAD** information and create and manage **MEPSD** items. This view displays the current state of PAD data. If you modify PAD structures in other views or perspectives, for example, in Structure Manager, Teamcenter displays these changes in the **PAD** view as well.

1. Right-click a top-level **MEPAD** process item.

2. Choose **Open with→PAD**.

   Teamcenter displays PAD information and the corresponding direct child **MEPSD** processes. Information related to the **MEPSD** items such as **BOM line**, **Description**, **Find Number**, and **Variant Condition** is displayed in columns in the **Direct Child PSDs** section. In this view, you can also create new **MEPSD** process items.



Create a new MEPSD item in the PAD view

1. In the **Direct Child PSDs** section of the **PAD** view, click **Create a new PSD**.

   Teamcenter opens the **New Process** dialog box. The **MEPSD** item type is already selected. You can also click the **New Process** button on the main toolbar, but the **MEPAD** process item is not preselected in the **New Process** dialog box.

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2. Enter the necessary information to create the **MEPSD** item.

3. Click OK.

   Teamcenter creates the new **MEPSD** item as a child of the **MEPAD** item and displays it as a new row in the **Direct Child PSDs** section.

Open the PSD view

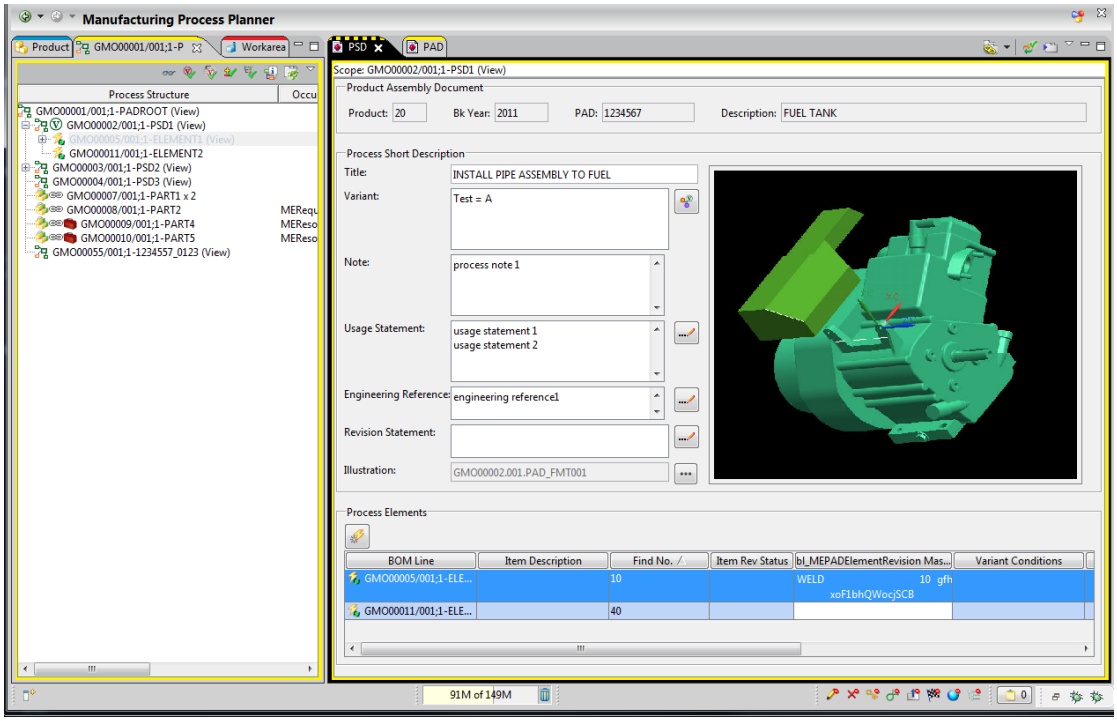
You can use the **PSD** view to display information about an **MEPSD** process item. Teamcenter displays the **Product Assembly Document** section, the **Process Short Description** section, and displays the process elements in tabular form. In this view, you can create new **MEPADElement** items.

1. Open an **MEPAD** process item containing some **MEPSD** items.

2. Right-click one of the **MEPSD** process items.

3. Choose **Open with→PSD**.

   Teamcenter displays the **PSD** view containing the **Product Assembly Document** section. In addition, you can enter information in the **Process Short Description** section. Teamcenter displays the process elements in tabular form. In this section, you can also create a new **MEPADElement** item.



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Using the Product Assembly Document (PAD) section

The product assembly document attributes are automatically populated. They are assigned to predefined areas in the process by an administrative user.

Attribute	Location
Product	This attribute is also known as **bk** or **Book**. It is located in the **MEPAD** item revision master form that is the parent of the **MEPSD** item.
Bk Year	This attribute is also known as **Book Year**. It is located in the **MEPAD** item revision master form that is the parent of the **MEPSD** item.
PAD	This attribute is also known as **Process_number** or **PAD Number**. It is located in the **MEPAD** item revision master form that is the parent of the **MEPSD** item.
Description	This attribute is also known as **Rev Description** or **Revision Description**. It is located in the properties of the **MEPAD** item revision master that is the parent of the **MEPSD** item.

Create a new MEPADElement item

1. In the **Process Elements** section of the **PSD** view, click **Create a new MEPADElement operation** .

   Teamcenter opens the **New Operation** dialog box. The **MEPADElement** item type is already selected. You can also click the **New Operation** button on the main toolbar, but the **MEPADElement** operation is not preselected in the**New Operation** dialog box.

2. Enter the necessary information to create the **MEPADElement** item.

3. Click OK.

   Teamcenter creates the new **MEPADElement** item as a child of the **MEPSD** item and displays it as a new row in the **Process Elements** section. For columns with header names longer than the width of the columns, you can hover with the mouse over the column header to see the full name of the column.

Using the Process Short Description section

The **Process Short Description** section is user-defined. After the **MEPSD** object is created, the PAD engineer completes the information in this section. The engineer enters values in the **Title**, **Note**, **Variant**, and **Engineering Reference** boxes. Any illustrations attached are displayed.

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Add variants

Variant options must exist in the database prior to creating variant conditions.

1. With the **MEPSD** object selected and the **PSD** view open, click in the **Process Short Description** section.

   Teamcenter opens the **Variant Condition** dialog box.

2. Create variant conditions.

3. Click **OK**.

   Teamcenter adds the variant and displays it in the **Variant** box in the **Process Short Description** section of the **PSD** view. It also displays the variant symbol on the **MEPSD** item in the process structure.

Rearrange the order of variants

1. With the **MEPSD** object selected and the **PSD** view open, click in the **Process Short Description** section.

   Teamcenter opens the **Variant Condition** dialog box.

2. Select a variant condition from the list.

3. Use the **Move Selected Line** arrows beside the variant list to move the variant up or down in the list.

4. When you are satisfied with the list order, click **OK**.

Delete a variant

1. With the **MEPSD** object selected and the **PSD** view open, click in the **Process Short Description** section.

   Teamcenter opens the **Variant Condition** dialog box.

2. Select a variant from the list.

3. Click the **Remove a Selected Line** button.

4. Click **OK**.

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View an associated image

The **Process Short Description** section displays an image of the **TC_PADImage** type that is associated to the **MEPSD** item with a **TC_PADPreferredImage** relation.

Do one of the following:

- To enlarge the image, click it.

  > Note:
  >
  > You must have Lifecycle Viewer installed to use this feature.

- To close the image viewer, click the image in the **PSD** view or close the window.
- To add a new image, click ••• beside the **Illustration** box and select a new image.

  Teamcenter adds an image or replaces the current image with the newly selected one.

  - If the image is larger than the recommended size (14.4 x 14.9 cm; approximately 544 x 563 pixels), Teamcenter shrinks the image to fit the viewing area. If it is smaller, the image is displayed in the actual size; Teamcenter does not stretch it.
  - The image preview is not available for TIF/TIFF image formats. You must enlarge the image to see it.
  - If there are multiple PAD image datasets associated with an **MEPSD** item, Teamcenter displays the first available one.

Using the PAD Element view for process element

Open the PAD Element view

Do one of the following:

- In the process structure, right-click an **MEPADElement** item and choose **Open with→PAD Element**.
- In the **Process Elements** section of the **PSD** view, right-click an **MEPADElement** item and choose **Open with→PAD Element**.

Teamcenter displays the **PAD Element** view.

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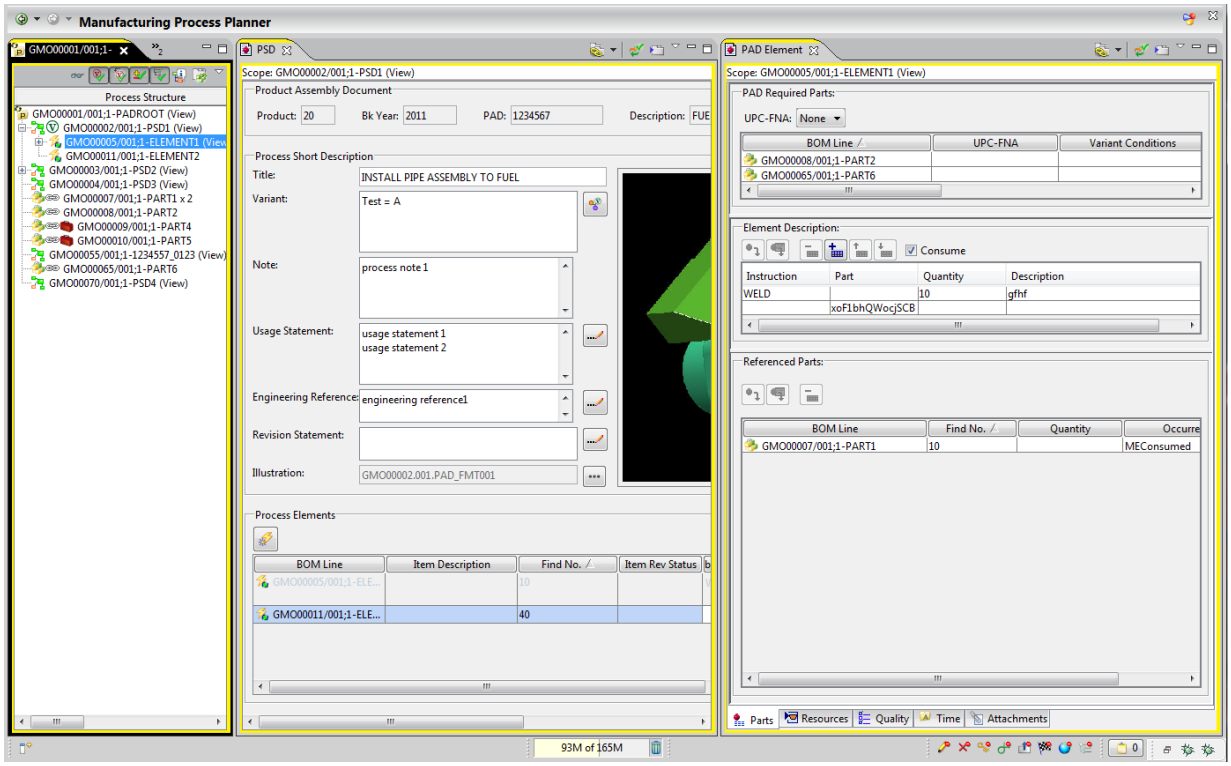
Using the Parts pane

About the Parts pane

The **Parts** pane of the **PAD Element** view allows you to list required parts, see an element description, and work with referenced parts. The **PAD Required Parts** section displays all the **MERequired** type parts under the parent **MEPAD** item of the selected **MEPSD** item.



Consume a part

1. Make sure that the correct structure is configuring the PAD structure.
2. Open the **PAD Element** view for the desired **MEPADElement** object.
3. Select one of the **CORP_PART** line items in the **PAD Required Parts** section of the **Parts** pane.

   Items are visible in the **PAD Required Parts** section of the **Parts** pane only if the root **MEPAD** item consumes these parts with an **MERequired** relationship.
4. Select the **Consume** option in the **Element Description** section, if it is not already selected.
5. Select the **Paste** button in the **Element Description** section.

   Teamcenter performs the following actions:

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- Depending on the values in the **UPC-FNA** box on the **Parts** tab in the **PAD Element** view, highlights the selected line of the product in the **PAD Required Parts** section in green.

  Note:

  The values in the **UPC-FNA** box are only populated if the **MECopyIDinContextToAssignedLine** preference is set to **true** before you consume products and resources to the PAD structure.

- Adds a new line to the **Element Description** section.
- Displays the product in the **Referenced Parts** section.
- Displays a consumed part in the tree structure under the **MEPADElement** object.

Filter required parts based on UPC-FNA

- In the **Parts** pane, select the desired UPC-FNA combination from the **UPC-FNA** list.

  Teamcenter displays the list of parts based on the selected UPC-FNA in the **PAD Required Parts** section.

  Note:

  This list is populated only if the **MECopyIDinContextToAssignedLine** preference is set to **true** before you consume parts onto the **MEPAD** root item.

Manually add an element description line

1. In the **Parts** pane, click the **Add New Line** button to add a blank line.
2. Select an instruction from the list in the **Instruction** column or type an instruction in the box.
3. (Optional) Type a value for **Part**, **Quantity**, or **Description**.

Remove an element description line

1. In the **Element Description** section of the **Parts** pane, select the line to be deleted.
2. Click the **Remove Lines** button.

Reorder the element description line

1. In the **Parts** pane, select a line in the **Element Description** section.
2. Click the **Move Up** or **Move Down** button.

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Add an element description line without part consumption

1. In the **Parts** pane, select the part to be used.
2. Clear the **Consume** option.
3. Click the **Paste** button.

   Teamcenter adds the element description line.

Consume a part without an element description line

1. In the **Parts** pane, clear the **Consume** option.
2. Select the part usage in the **PAD Required Parts** section.
3. Click the **Paste** button.

   Teamcenter displays the consumed part in the **Referenced Parts** section.

Remove a part usage from the Referenced Parts list

1. In the **Parts** pane, select a part usage to be removed.
2. Click the **Remove Lines** button.

   Teamcenter removes the consumed part from the **Referenced Parts** list.

Using the Resources pane

About the Resources pane

Use the **Resources** pane to add and remove resources from the **MEPADElement**. The **PAD Available Resources** section displays all the **MEResource** type resources that are consumed under the **MEPAD** and **MEPSD** items with a **MEResource** relation.

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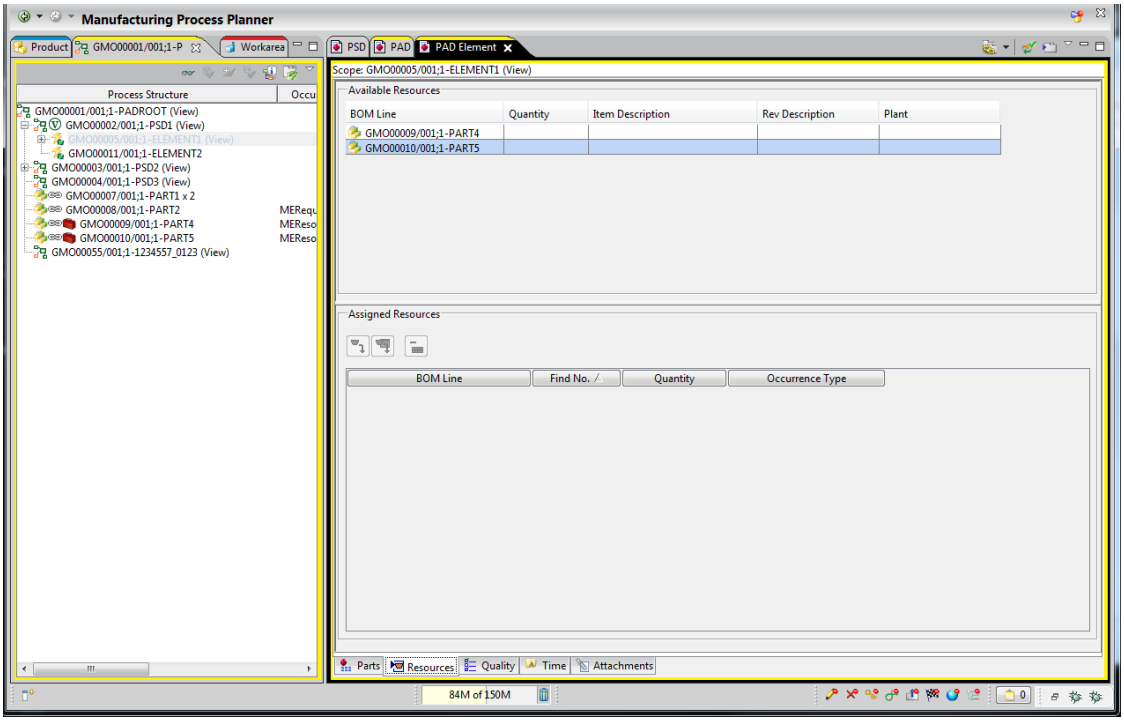

Add a resource to the MEPADElement

1. With the **PAD Element** view open, click the **Resources** tab.

2. In the **Available Resources** section, select a resource line.

3. Do one of the following:

   - To add the resource to the tree structure with an **MEResource** relation, click **Paste** in the **Assigned Resources** section.

   - To add the resource with a different relation, click **Paste As** in the **Assigned Resources** section and select the relationship from the list.

Remove an assigned resource

1. In the **Assigned Resources** section, select a resource line.

2. Click the **Remove Lines** button .

   Teamcenter removes the resource line from the **Assigned Resources** section and from the tree structure.

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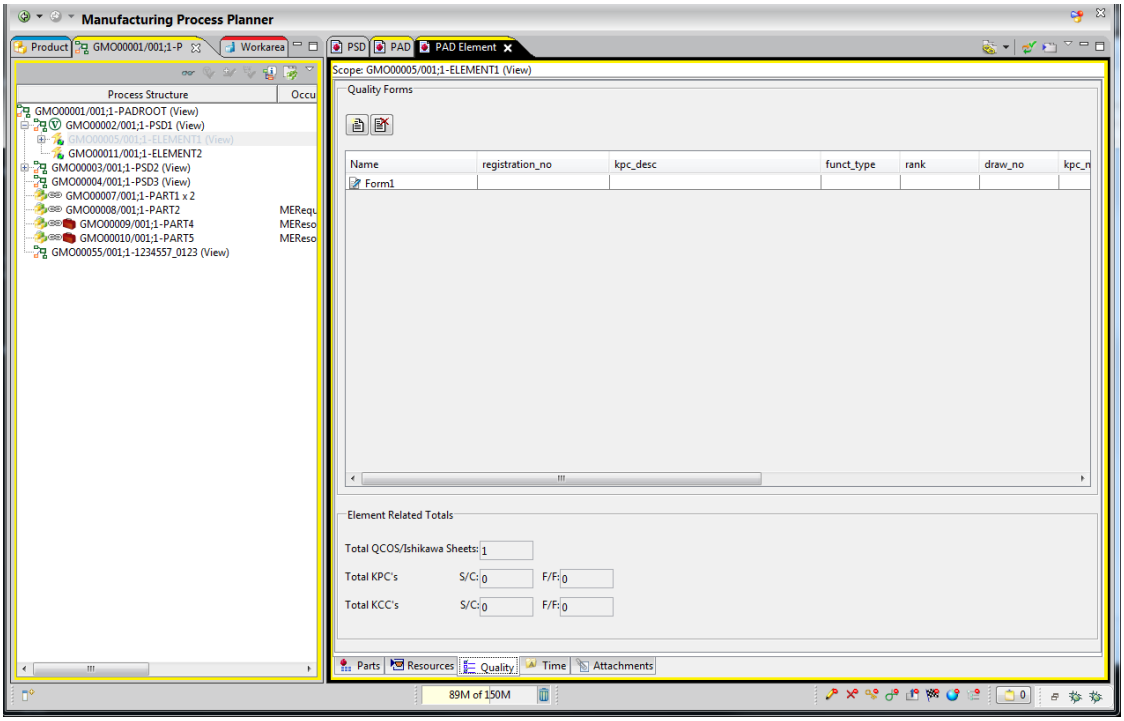
Using the Quality pane

About the Quality pane

Use the PAD **Quality** pane to add quality information to the selected **MEPADElement**.



Add a quality form

1. With the **PAD Element** view open, click the **Quality** tab.
2. Click the **Add New Form** button .

   Teamcenter displays the **New Form** dialog box.
3. Click **More** in the form list and select **PADQualityForm** or **PADIshikawaQualityForm**.
4. Type a new form name in the **Name** box.
5. (Optional) Add a description in the **Description** box.
6. (Optional) Confirm that the **Open on Create** check box is selected.
7. Click **OK**.

   Teamcenter displays the selected form.

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8. (Optional) Copy the relevant information from an existing quality system and paste it into the boxes as required by clicking the **Paste from System Clipboard** button.

9. Click **OK**.

   Teamcenter adds the new form to the **Quality Forms** list.

Delete a quality form

1. Select a form from the list in the **Quality Forms** section of the **Quality** pane.

2. Click the **Delete Forms** button.

   Teamcenter displays the **Delete** dialog box.

3. Click **Yes**.

   Teamcenter deletes the form from the **Quality Forms** list.

Using the Time pane

About the Time pane

Use the **Time** pane to add activities with durations to PAD elements. You can open the **PERT** view from this pane to visualize the activity flow graphically.

> Note:
>
> There is no selection synchronization between the **Activities** view and this **Time** pane.

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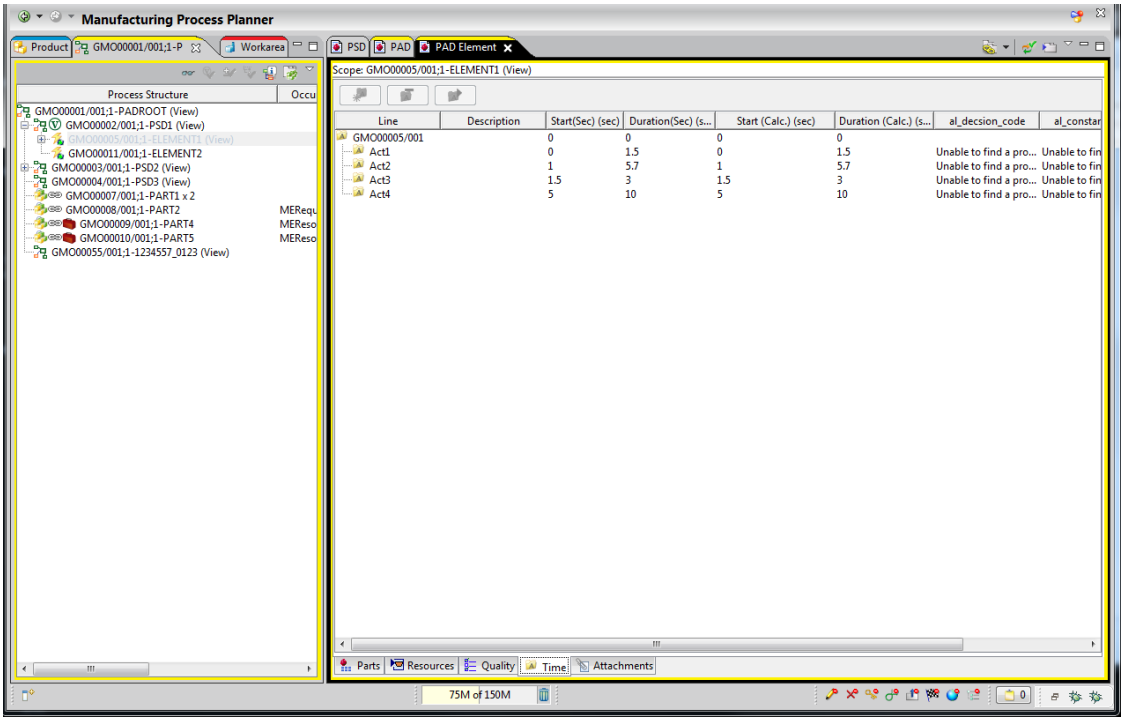

Create an activity

1. With the **PAD Element** view open, click the **Time** tab.
2. Select the **Root Activity Line**.
3. Click the **Create a New Activity** button .

   Teamcenter opens the **New Activity** dialog box.
4. Select the **MEActivity** activity type from the list on the left.
5. Copy the relevant information in the appropriate format from an existing time analysis system and paste it into the boxes by clicking the **Paste from System Clipboard** button .

   > Note:
   >
   > The **Name** attribute is required.

6. Click **OK**.

   Teamcenter adds the new activity to the **Time** pane
7. Expand the new activity to display additional information on the form. If you copied multiple lines from the existing time analysis system, Teamcenter creates multiple forms under the new activity.

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8. Double-click the form under the new activity to display additional information.

Remove an activity

1. In the **Time** pane, select an activity.
2. Click **Remove an activity** .

   Teamcenter removes the activity from the list in the **Time** pane.

Export activity time information to system clipboard

1. In the **Time** pane, select an activity.
2. Click **Export Activity to system clipboard** .

   Teamcenter exports all the time information from all the **PADTimeAnalysisForm** type forms attached to the activity to the system clipboard. The format on the clipboard is:

   Description Decisions Chart C/V Frequency Total Time

Using the Attachments pane

Using the Attachments pane

Use the **Attachments** pane to view information associated with an **MEPADElement**, such as the **PAD Quality Form**.

This **Attachments** pane is the same as the **Attachments** view in Manufacturing Process Planner.

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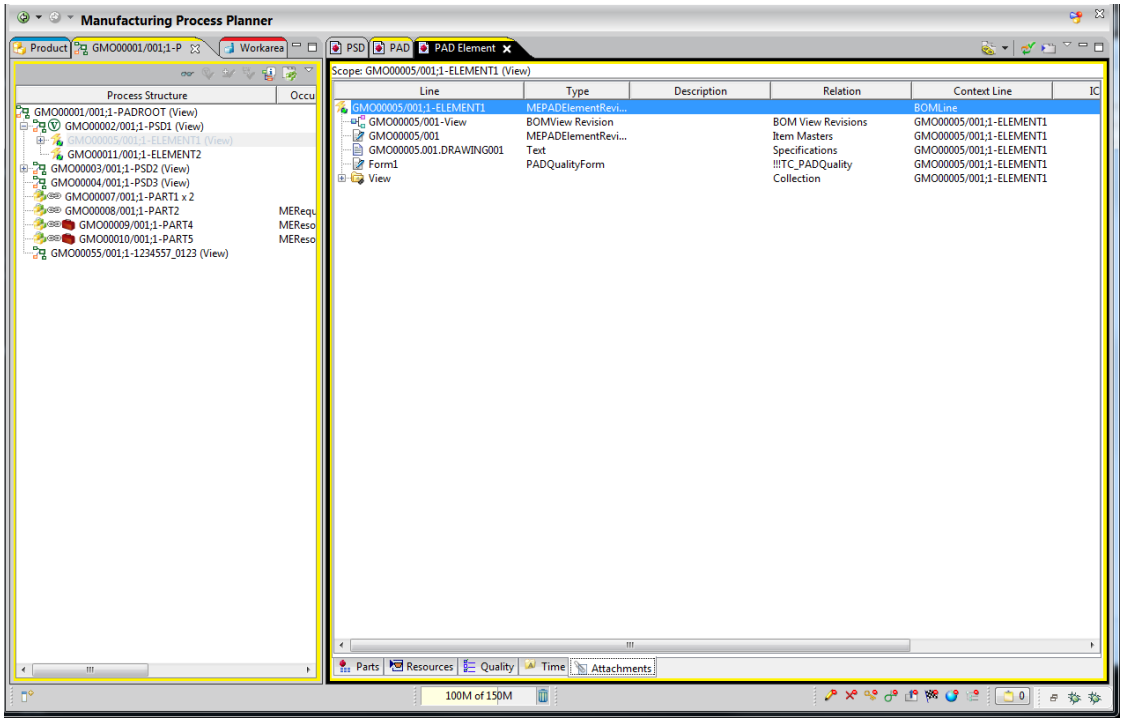

Open the Attachments pane

- Click the **Attachments** tab in the **PAD Element** view.

  Teamcenter opens the **Attachments** tab embedded in the PAD user interface.

View engineering assembly document attachments

You can view assembly documents related to manufacturing that are attached to an engineering bill of materials (EBOM) as "reflective" attachments for EBOM line items assigned to a manufacturing bill of materials (MBOM) and a bill of process (BOP). A variety of preferences let you reflect datasets from an MBOM install assembly item level.

1. To enable engineering assembly document attachments, use the preference **MEDatasetsToBeReflectedOnBOP** to set dataset-relation pairs to **Dataset_internal_name:relation_internal_name** (one per line).

   This preference defines the dataset type and relation pairs that should be reflected from EBOM to MBOM and BOP lines. If there is a root relation between the EBOM and BOP with **METarget**, document attachments are reflected from the EBOM root to the BOP root.

   Example:

   PDF:Iman_Specification

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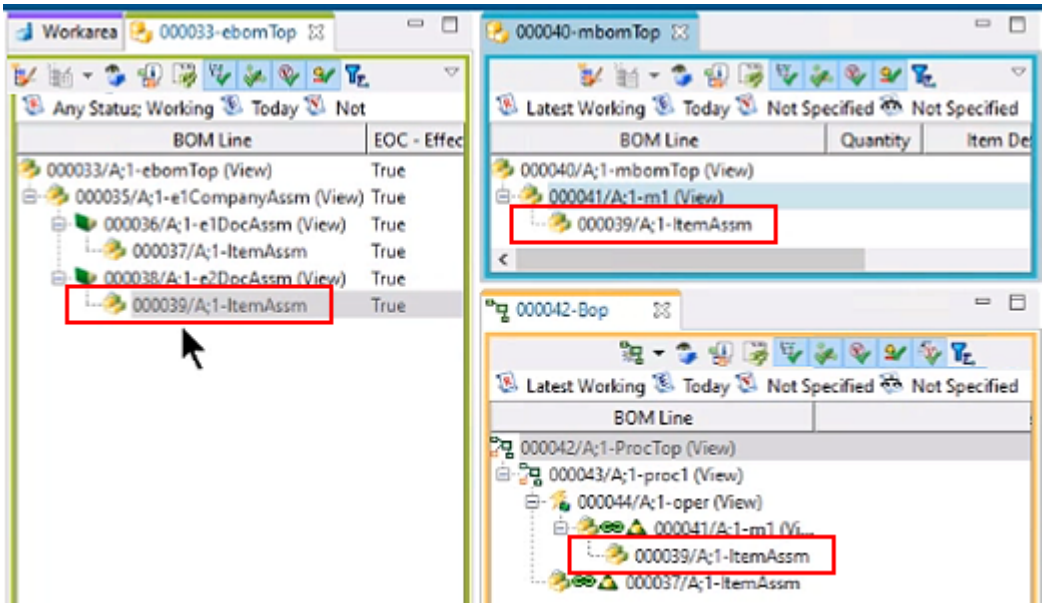
PDF:IMAN_reference

2. Open a collaboration context (CC) Teamcenter object that contains an EBOM and an MBOM, as well as a BOP that contains line items with engineering assembly document attachments consumed from the EBOM or MBOM.

   In this example, line item 39 is consumed from the EBOM to the MBOM and from the MBOM to the BOP.



Note:

Line item 37 in the EBOM is directly assigned to process 43 in the BOP, skipping the MBOM. Assembly document attachments are reflected in the BOP whether they are assigned from EBOM to MBOM to BOP, or from EBOM to BOP.

Attachments to a parent in the EBOM are reflected to be displayed one level up in the BOP hierarchy. For example, an attachment to EBOM line item 36, **A_ref_pdf_e1...**, shown in the EBOM **Attachments** tab below left, is reflected as the attachment **A_ref_pdf_e1DocAss...** to new line item 43 in the BOP **Attachments** tab, below right, because 37 is one level lower than line item 43.

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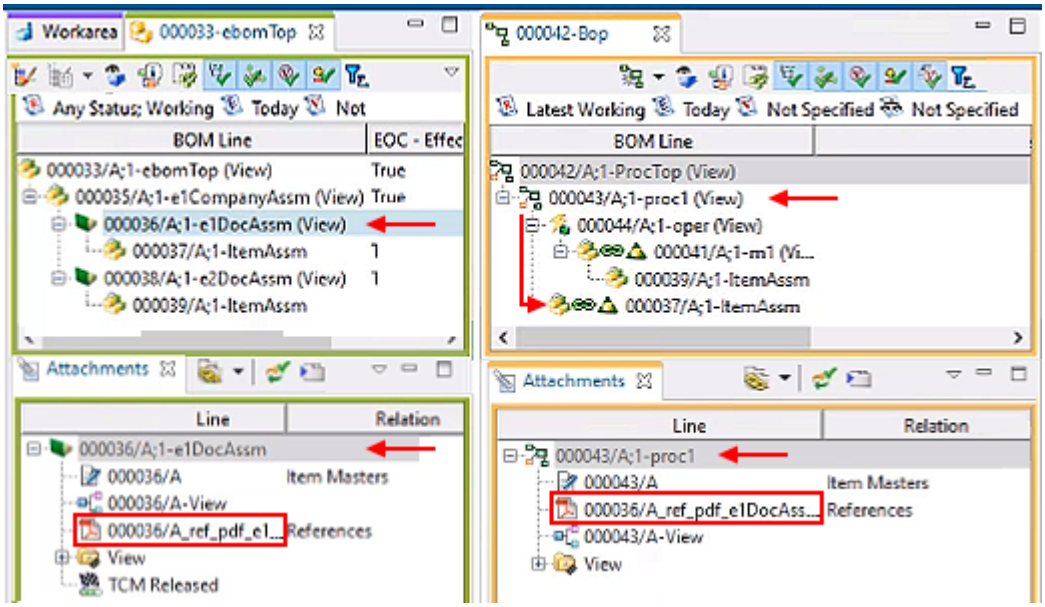
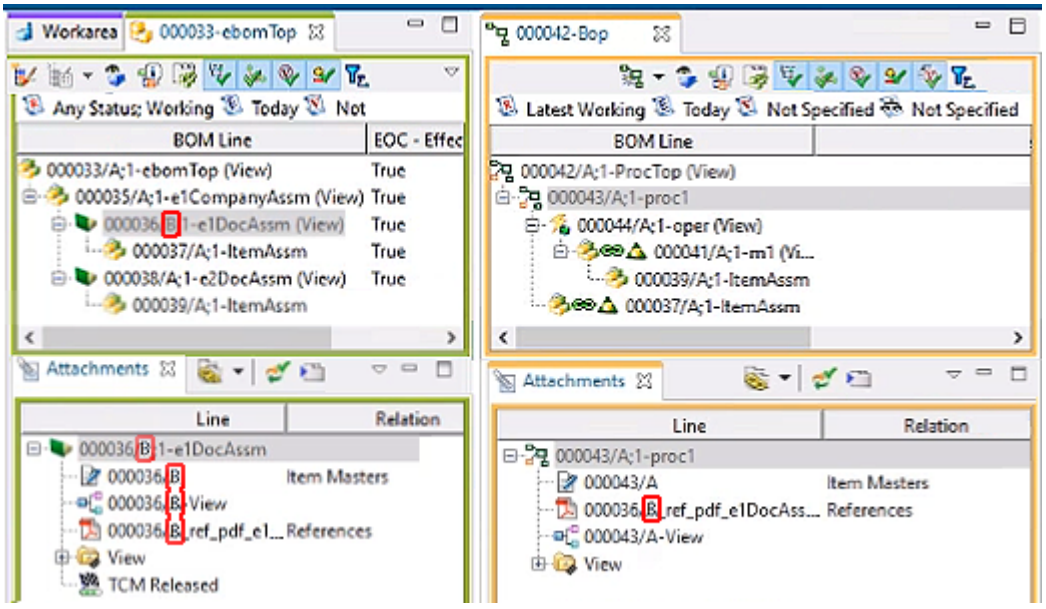


Note:

- If a relation between the EBOM root and BOP root was created using the **Link/Associate** command, the attachment is displayed at the same level of each structure's root.
- If the revision number of an EBOM assembly line changes, attachments reflect the new revision name in the EBOM, MBOM (if applicable), and BOP.



3. To reflect datasets for specific parent item types, use the preference **MEAssemblyItemTypesForDatasets**.

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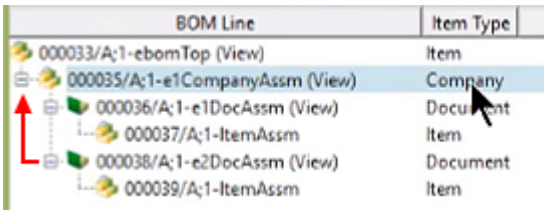
The value format **Item_type_internal_name** (one internal item type per line) defines the preferred types of installable assemblies for a parent type. Instead of picking the documents from the immediate parent assembly, Teamcenter retrieves them from the closest parent whose type matches the preferred type, or a subtype of the preferred type.

To further filter this preference, define the additional preference **MEParentAssemblyItemTypesForDatasets**. For the datasets to be retrieved, the closest parent and "grandparent" types must match the combination defined in both preference **MEParentAssemblyItemTypesForDatasets** and prefererence **MEAssemblyItemTypesForDatasets**.

> Note:
>
> The MBOM assembly is traversed only one level below to find the EBOM line.

In this example, the grandparent value is **Company**. Under parent assembly 38, the **MEAssemblyItemTypesForDatasets** value **Company** shows document EBOP datasets for the grandparent company on line item 35. **MEAssemblyItemTypesForDatasets** goes to the closest parent of the immediate parent that matches the preference.



Reporting

About reporting

After you collect all the necessary information, you can generate reports from various levels within the PAD structure.

To view these reports, your default Web Browser must have an Adobe PDF viewer installed.

Generate a report from an MEPAD item revision

1. In the structure pane, right-click the **MEPAD** item revision for which you want to generate a report.
2. Choose **Open with→Report**.
3. From the **Type** list at the bottom of the pane, select **PAD Report (PLMXML)**.
4. Click **Generate report** ✨.

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Teamcenter generates a report in PDF format. A report generated at the PAD level includes information on the required parts for that PAD. The required parts are displayed in a different format on separate pages.

Generate a report from an MEPSD item revision

1. In the structure pane, right-click the **MEPSD** item revision for which you want to generate a report.
2. Choose **Open with→Report**.
3. From the **Type** list at the bottom of the pane, select **PAD Report (PLMXML)**.
4. Click **Generate report**.

   Teamcenter generates a report in PDF format. A report generated at the PSD level includes information only for that **MEPSD** item revision and its **MEPADElements** items.

Save the report

- After you create a report, click the **Save** button in the **Report** view.

  Teamcenter places the report in the attachments of the **MEPAD** or **MEPSD** item revision for which it was generated.

Creating a workflow for a process

You can put **MEPAD** processes through a workflow to have specific individuals or teams approve particular stages of development. Your administrator can build a template process containing the tasks required to bring a manufacturing process to an approved state.

For more information about using workflow processes, see *Workflows and Tasks on Rich Client*.

Export an image or report

The **PAD Report Export** transfer mode allows you to export reports from any level in the overall Master Process Document (MPD) structure out to a system defined directory. You can also export out a single report by opening the **Attachment** view on the **MEPSD** item and opening the Named Reference, select export.

Do one of the following:

- To export all reports from an **MEPAD** structure:

  1. In My Teamcenter, find and select the PAD report that you want to export to the operating system.

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2. Choose **Tools→Export→To PLMXML**.

   The **PLM XML Export** dialog box appears.

3. Type the name of the directory where the files are to be stored in the **Export Directory** box or choose the directory by clicking the **Select export directory from system** button.

4. Select the **PAD Report Export** transfer mode from the **Transfer Mode Name** list.

5. Click **OK**.

- To export a single report:

  1. Right-click the item for which you want to export a report.

  2. Choose **Open with→Attachments**.

  3. In the **Attachments** view, right-click the dataset containing the report.

  4. Choose **Named References**.

  5. In the **Named References** dialog box, click **Export**.

New object dialog box commands

When creating a new object using a variety of commands in Manufacturing Process Planner, you will view different dialog boxes. While they appear the same, the most recent dialog box moves the **Show As New Root** check box from the last screen to the first screen, and lets customize the dialog box stylesheet for different types of objects as you require. Commands include:

- **File→New→Item**, **Process**, **Process Area**, **Operation**, **Plant BOP**, **Workarea**, **Product BOP**, **Generic BOP**, **Logistic BOP**, **Study**, and all items under **Logistics→**.

- **File→New→From Template→Logistic BOP from Template**, **Process from Template**, **Product BOP from Template**, **Plant BOP from Template**, **Operation from Template**, **Workarea from Template**, and **Item from Template**.

- **Edit→In Context→Replace Assembly with Any Item Type**.

The following rules apply to this behavior.

- If you create an object without selecting a line in a view, the **Show as New Root** check box is checked and the new object is loaded automatically as a root line in a new view.

- If you create an object without a non-root line selected, you can open the item as a new root in a new view by selecting the **Show as New Root** check box.

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- If for some reason the object cannot be created as a new root, the **Show as New Root** check box is disabled.

> Note:
>
> To set a manufacturing object to use the old dialog box, set the value of the preference **TC_Enable_Legacy_Create** to the internal name of the manufacturing object.

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8. Managing bills of equipment

Creating plant structures

About plant structures

A *plant structure* is a hierarchy of work areas, as illustrated in the *Sample plant structure*. The work areas describe the locations existing in a plant in which manufacturing operations are performed. The hierarchy of the work areas can be very different from one plant to another.

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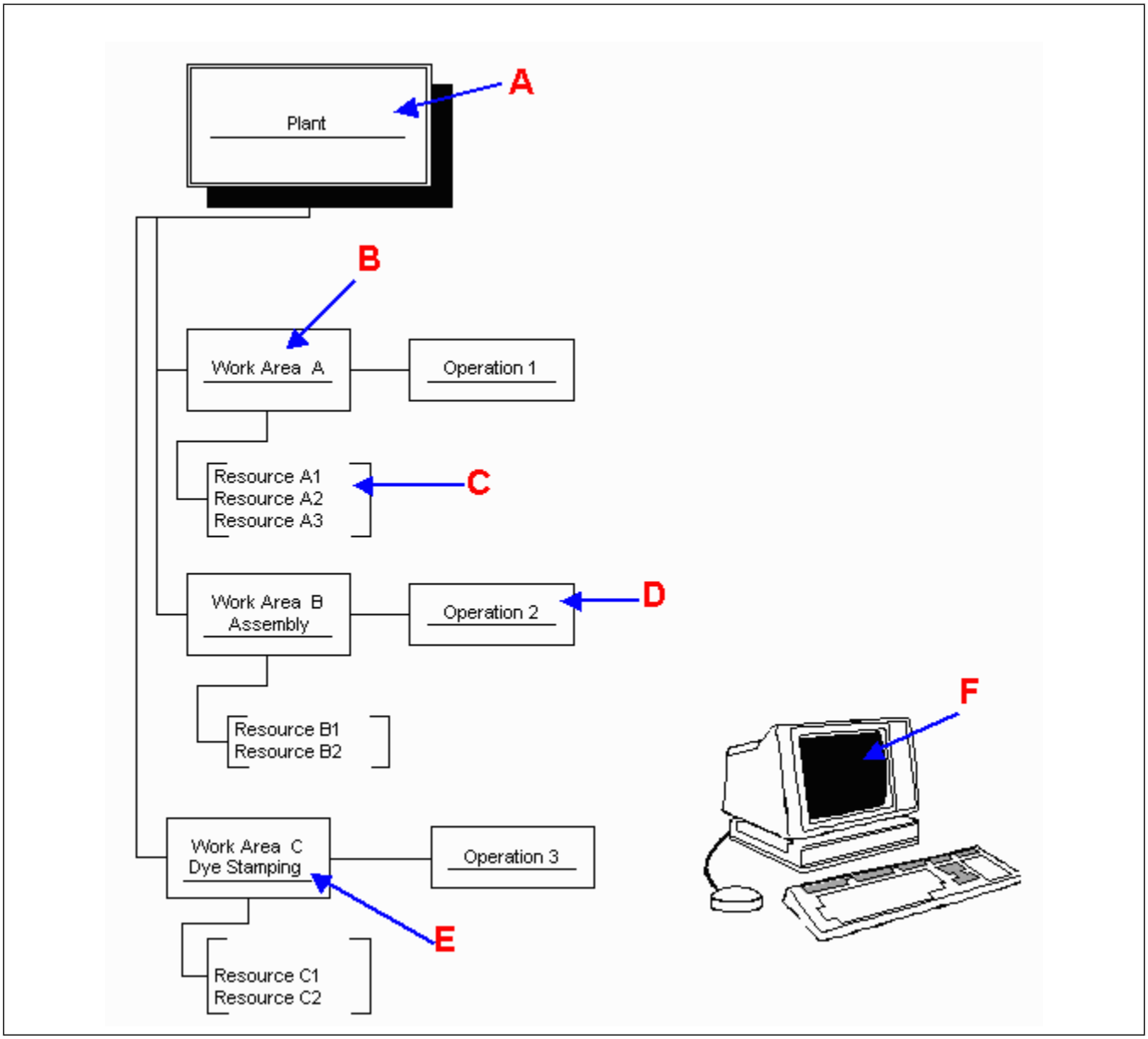
Sample plant structure



Plant architecture example

A The plant structure can represent the entire plant.

B The plant structure can also represent work areas, sections, line cells, or stations within the plant.

C Each work area can include resources that are permanently positioned at the work area.

D Individual process operations used to manufacture a product are assigned to the work areas in which they are performed.

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E Each work area is typically configured with standard equipment but also can be specially configured with any equipment necessary to execute a specific operation.

F If special resources are needed, create work instructions that explain how to configure the work area to meet an operation's special needs. If appropriate, create a workflow process to release the work instructions.

For example, if a process operation requires tools that are not already at the assigned work area (such as those that are part of work area C), work instructions are generated to identify which tools need to be available and installed when the process operation is executed.

> Note:
>
> You cannot create a plant in a plant structure. The plant structure represents the plant itself.

Plant layout tools such as FactoryCAD are generally used to populate the work area structure within your plant. Using a plant layout tool lets you create detailed designs of each work area.

Create a new work area structure

The physical layout of equipment in each work area and the relative locations of these areas throughout the plant are the scope of the work area structure definitions. Standard equipment is organized hierarchically into work areas depending on their location on the shop floor.

1. Open a plant structure in a structure view.

2. Choose **File→New→Work Area**, or click **Create Work Area** .

3. In the **New Work Area** dialog box, select one of the work area types from the list.

   For more information on creating additional work area types, see *BMIDE for Data Model Design*.

4. Click **Next**.

5. Enter the ID number to be assigned to this new work area. If this new work area is a revision of an existing one, type the ID of the existing work area. You can assign a unique revision number in the **Revision** field.

   To let the system automatically assign a unique ID, click **Assign**.

6. Type a name for the new work area. Make it unique so you can search the database using this term.

7. Select **Show as new root** to specify that the newly created work area is opened as a root object. It is not pasted to the selected work area. If you do not select this option, the new work area is pasted as a child of the selected work area.

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If the **Show as new root** option is selected but unavailable, Teamcenter does not allow you to create a new object under the selected object, for example, if you try to create a work area under a process.

8. Type a work area description.

   At this point, you have all the information required to create a new process.

9. (Optional) Select a unit of measure from the **Unit of Measure** list.

10. (Optional) Click **Next** to add optional information, such as filling out the work area item's forms, or checking the work area item out of the database.

11. (Optional) Click **Define Options** to specify the following:

    - Select **Use item identifier as default display** or **Use revision identifier as default display** if you created an alternate identifier for the item and want to use it as the default display object.

    - Select **Check Out Workarea Revision on Create** to check the newly created work area out of the database immediately upon creation.

12. Click **Finish** to create the new work area.

13. Click **Close** to close the **New Work Area** dialog box.

Open an existing work area structure

Do one of the following:

- Open a work area revision in Manufacturing Process Planner using the **Open Work Area** dialog box.

- Find the work area revision item in My Teamcenter. Using the mouse, drag it to the **Manufacturing Process Planner** button in the navigation pane; or use the shortcut menu and choose **Send To** to send it to the Manufacturing Process Planner application.

- Open a process revision in Manufacturing Process Planner. The work area most recently assigned as a target by the process is opened by default.

  The process revision most recently assigned as a target item by this product opens by default if the **MSE_load_related_product_process_plant** preference is set to **true**.

Sequence the work area flow

The work area sequence represents the line of work areas a product passes through during the manufacturing process. As you develop your work area structure, you may need to modify the sequence of the individual work areas in your plant. Set both parallel and linear sequences as necessary using the

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PERT view. While this sequence is independent of any process flow, it does impose constraints on the process flow through the plant.

Managing tool design packages

Creating a tool design package

In a manufacturing environment, tool design is often outsourced to other companies. These companies work with native NX to design custom tooling. You can create a tool design package in Manufacturing Process Planner that contains information from NX, Teamcenter, and Process Simulate required for tool design. The information is imported into NX at the tool design supplier. Tool design is performed in the context of a station in the plant. The tool design package can include:

- Consumed parts
- Work area data
- In-process assemblies coming from a previous stations
- Consumed welds
- Assigned datums
- Weld projections (coming from Process Simulate)
- Datum direction and type (defined in the context of the BOP)
- Resources
- Welds consumed by a particular resource

Occurrences can also be suppressed so that they do not appear in the package or during an export.

After completion, the tool designer sends the completed tool back to the manufacturer where it is imported into Teamcenter from NX.

In Teamcenter, a tool design package is a kind of study. When you create such a study, you must consider whether you want to use a shared study or a simulation study.

Suppressing objects in a tool design package

You can hide lines in a structure that are not relevant to the tool design package that you create. These suppressed lines are then not included in the exported tool design package.

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Before you suppress a line in a tool design package, you must make the root line in the study the context for the change.

Export a tool design package

1. Select the tool design study and choose **File→Tools→Export→To PLM XML**.

2. In the **Export Directory** box, select the directory in which to place the PLM XML file. Click **Browse** to locate the directory.

3. In the **PLM XML Export** dialog box, select the **ToolDesignPackageExport** transfer mode from the list.

   This transfer mode exports the contents of the tool design package, including the in-context forms that are processed to modify the BOM line transforms of the welds. The content includes the XML file along with part files in subdirectories.

4. (Optional) Click **Select Languages** to display the **Language Selection** dialog box for the languages configured at your site.

5. (Optional) Select **Open PLM XML File** to view the file when the export operation is complete.

6. (Optional) Select the **Perform Export In Background** check box to perform an asynchronous export.

7. Click **OK** to export the objects in the **Object List** list and close the dialog box.

   When the export completes, a dialog box is displayed.

   If the export was successful, click **Yes** in the dialog box to view the log file for the export.

   If there were errors during the export, the dialog box lists the errors. Click **Yes** to view information on the errors that occurred.

Body in white integrated workflow

1. Design engineers design the product in NX. This is done in the Teamcenter Integration for NX environment, meaning they pull files from the Teamcenter database and save them back interactively. Only design engineers can modify the assembly that includes part and JT files.

2. Body in white (BIW) manufacturing engineers run Teamcenter rich client. They open the engineering BOM (EBOM) using a revision rule that lets them see the approved (released) content. They create a body BOM skeleton with precise revisions. They assign only the sheet metal parts from the design BOM. Any multiple lines for the same part in the EBOM (for example, for different variants) are distilled to a single line in the body BOM. The body BOM is modifiable only by the body-in-white engineers.

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3. BIW engineers in NX add welds and datum points to the body BOM assembly. Because all the revisions are precise, the body BOM has exact revisions of everything from the EBOM.

4. BIW engineers import a plant structure with JTs to Teamcenter.

5. BIW engineers create a process structure. Generally each process represents a workstation in a factory. The process references the in-process assembly (the state of the product to date), the parts to be welded, and the plant structure's workstation. All of it can be seen in the assembly viewer. BIW engineers add child operations representing weld guns. Weld guns and the welds to be created by the gun are attached to the operation as resources and as consumed lines, respectively.

6. BIW engineers create a **Tool Design Package** study and copy the process containing the workstation, IPA, consumed objects, guns, and welds into it that they want to send to Process Simulate.

7. In Process Simulate, BIW engineers analyze the welds and modify the approach angles on them. The results are exported back to Teamcenter.

8. The user suppresses some of the lines under the process in the study that do not need to be sent to the tool supplier, including some of the product and work station contents. In the assembly viewer, the user sees the location of the parts, workstation, and weld guns in the process structure. Teamcenter does not display the weld angles graphically.

9. BIW engineers use PLM XML export to export the tool design study to a directory on a local disk. The engineers specify the **ToolDesignPackageExport** transfer mode specifically designed to export the desired content, including the in context forms that are specially processed to modify the BOM line transforms of the welds. This content includes the XML file along with part files in subdirectories.

10. BIW engineers zip the export directory that contains the XML and associated files and sends the compressed file to the supplier.

11. The supplier unzips the NX assembly and uses the **nx_import_tool_design_package** utility to load the data into an NX installation running in native mode. The supplier sees an assembly structure that resembles the original structure but is not the same. Manufacturing features are opened as parts and additional coordinate system objects are added to represent the projected position (the orientation) of the locations created in Process Simulate. The supplier designs the tool in the product assembly's coordinate system producing part files on a local disk.

12. The supplier moves the weld gun to each weld and aligns it to the weld angle to visually ensure that the gun does not collide with the tool in each weld position.

13. The supplier zips up the part files and sends them back to the BIW engineer.

14. BIW engineers, running Teamcenter Integration for NX, import the tool assembly sent by the supplier to the Teamcenter database.

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15. In the Teamcenter rich client, BIW engineers load the process structure and attaches the tool assembly to the process. By using the same transform as the IPA, it is located correctly in the assembly viewer relative to the rest of the objects in the study.

16. The process is sent to Process Simulate for validation of the tool design against the robot tool paths.

Confirm product parts are in proper tool position

When you perform a design review, you can visually identify consumed product parts in their absolute coordinate system (CSYS) tool position. This lets you confirm that they are properly located when a supplier returns them. The **Use Reference Frame Position** command moves parts to their assigned CSYS.

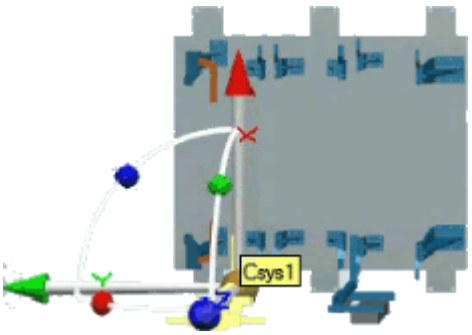
1. Open a plant bill of process (BOP) and the **Graphics** view.

2. In the plant BOP, select a process station and choose **File→New→Station Reference Frame**.

3. In the **New Reference Frame** dialog box, in the **Item Information** group, type a name for the frame and click **Assign** to create an ID and revision name.

4. In the station work area, select a tool design, and next to the **Use position of** text box, click .

5. Click **Finish** to view the absolute **CSYS** location of the tool design in the **Graphics** view.



> Note:
>
> You cannot copy and paste station reference frames to other process stations. They must be manually created for each station.

6. With the plant BOP process station selected, in the plant BOP toolbar, click **Use Reference Frame Position** .

   A message reports that consumed objects will be temporarily moved relative to the reference frame.

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7. (Optional) To avoid this message in the future, select the **Don't show this message again** check box.

8. Click **OK**.

The frame and CSYS are turned on and consumed parts move to the absolute frame position. If you created any dynamic process assemblies (DIPAs), or create DIPAs in the future, they also move to the absolute frame position.

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9. Validating manufacturing process plans

Managing studies

About studies

Studies provide an environment where you can scope data to perform trial activities. There are two types of studies:

Isolated study	Teamcenter creates cloned processes and operations, creates references for any products or resource, and places them in the isolated study. An isolated study is a partially isolated structure where you can make changes to the process-related data that are not reflected in the source structures. Isolated studies create a different item revision and occurrence. When you are ready, you can choose to synchronize your changes from the source structure to the study or publish them from the study back to the source structure. Isolated studies can include dynamic in-process assemblies (DIPAs) that are created beneath station levels in a process structure.
Shared study	Teamcenter copies the objects from the source to the study. Any changes you make in a source structure are automatically reflected in the shared study.

Both types of studies can be included with event-based simulations in an **alternative planning project**. You can also send studies to Process Simulate.

> Note:
>
> You cannot add enterprise bill of process (EBOP) structures to studies.

Create an isolated study

An isolated study is a trial structure or *sandbox* where you can perform structure studies without affecting source structures. Depending on your studies preferences, when you create an isolated study from a process structure, Teamcenter:

- Creates clones of some object types with new IDs.
- Creates references to others with the same IDs as those in the source process structure.
- Ignores others, excluding them from the study.

1. Accept the default cloning rules or have an administrator with DBA privileges set up study synchronization rules or custom preferences as detailed in *Manufacturing studies preferences*.
2. From a plant BOP, create a linked process structure.

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3. In the process structure, select the structure that contains the objects you want to clone or reference, based on the cloning rules.

   > Note:
   >
   > If no line is selected when you create a study, or if you select the top line of the process structure, Teamcenter creates a new study with no content.

4. Choose **File** → **New** → **Study**.

   > Note:
   >
   > **File** → **New** → **Study** should only be used if study manager is not installed with Teamcenter Manufacturing Access. While provides limited access to some **study manager functionality**, studies created in Manufacturing Process Planner will not work in the Teamcenter Manufacturing Access version of study manager. If it is installed, you should always **use study manager** to create new studies. For more information, see the *Teamcenter Manufacturing Access User Assistance* documentation.

5. Select **Isolated Study** and click **Next**.

6. Type an ID for the study or click **Assign** to let Teamcenter assign one automatically.

7. Type a name for the study and click **Finish**.

   Teamcenter creates a new study in a **Study** view, with structure objects cloned or referenced based on cloning rules. Cloned objects have new IDs that do not match their source objects, while referenced objects have the same IDs as they do in the source BOP.

8. Populate the study with structures by creating new structure objects or copying and pasting from the process structure.

   New structures in the study do not appear in the source BOP, nor vice versa, until you synchronize the two.

9. If the source structure changes and you want to bring those changes into your study, synchronize from the source to the study.

10. When finished, synchronize or publish from the study to the source.

Create a shared study

When you create a shared study from a process structure, any changes you make in the source structure are automatically reflected in the shared study and vice versa.

1. From a plant BOP, create a linked process structure.

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2. In the process structure, select the structure that contains the objects you want to clone or reference.

   Note:

   If no line is selected when you create a study, or if you select the top line of the process structure, Teamcenter creates a new study with no content.

3. Choose **File→New→Study**.

   Note:

   File→New→Study should only be used if study manager is not installed with Teamcenter Manufacturing Access. While Manufacturing Process Planner provides limited access to some **study manager functionality**, studies created in Manufacturing Process Planner will not work in the Teamcenter Manufacturing Access version of study manager. If it is installed, you should always **use study manager** to create new studies. For more information, see the *Teamcenter Manufacturing Access User Assistance* documentation.

4. Select **Shared Study** and click **Next**.

5. Type an ID for the study or click **Assign** to let Teamcenter assign one automatically.

6. Type a name for the study and click **Finish**.

   Teamcenter creates a new study in a **Study** view. All shared objects are referenced and have the same IDs as they do in the source process structure.

7. Populate the study with structures by creating new structure objects and by using copy and paste or drag and drop.

   New structures appear in the shared study as well as the source BOP.

8. When finished, synchronize or publish from the study to the source.

Search for studies

You can search for all studies that include a referenced object in a structure.

1. Select the line in a structure.

2. Choose **Tools→Search Study**.

In the **Search Study Results** view, Teamcenter displays all studies that reference the object.

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Synchronize to study or publish from study

When updating or finishing an isolated study, you can synchronize specific changes from the source process structure to the study, or publish changes from the study to the source structure. To save time, you can also synchronize or publish selective process stations or operations.

> Note:
>
> - An administrator with DBA privileges must set up study synchronization and publishing.
> - Due to the closure rule preference **IsolatedStudySyncPublish**, the ability to synch or publish between study and the bill of process (BOP) structure does not work for custom process or operation types. To synch or publish between study and BOP, change the value the of preference **MEClosureRuleNameForIsolatedStudySyncPublish** to **AccountabilityAll**.

1. Do one of the following:

   - In the BOP, either select the top line to synchronize the entire BOP structure to the study structure, select a process station to synchronize only that station and its children, or a single operation, and then click **Synchronize to Study** .
   - In the isolated study structure, either select the top line to publish the entire study structure to the BOP structure, select a process station to synchronize only that station and its children, or a single operation, and then click **Publish from Study** .

   > Note:
   >
   > You can also publish changes from studies to a source structure from a collaboration context (CC) tree by right-clicking the top line in the CC and choosing **Propagate All Studies**.

2. If you are synchronizing from the BOP structure to the study structure, in the **Synchronize to Study** dialog box, select **Time-Based** to perform a full synchronization or **Event-Based** to perform a partial synchronization, and then click **OK**.

Teamcenter propagates the change to the other structure.

Set up study synchronization

You must set up the study synchronization rules before publishing or synchronizing a study.

> Note:
>
> You must have DBA privileges to perform this task.

The synchronization rules are set up using a combination of object type and property that are to be considered.

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1. Choose **Advanced→Study Synchronization Rules**.
2. Select the synchronization mode.
   - **Event-Based**

     Performs a partial synchronization or publish of only the selected properties.
   - **Time-Based**

     Performs a full synchronization or publish.
3. Select the direction in which the changes are synchronized.
   - Select **To Study** to set up synchronization changes from the source process structure to the study.
   - Select **From Study** to set up publish changes from the study to the source process structure.
4. Choose whether to include or exclude the properties you select in the list.
   - To exclude properties from synchronization:
     a. Select **Exclude the following properties. Include the rest**.
     b. Press Ctrl and select the object type and property name of each property you do not want to include.

     > Tip:
     >
     > To perform a full **Time-Based** synchronization, select **Exclude the following properties** and remove all entries from the properties list.
   - To include properties in synchronization:
     a. Select **Include the following properties**.
     b. Select the object type and property name.
     c. Click **Add**.
     d. Click each newly highlighted cell and open the list of entries by clicking the down arrow.
     e. Select the desired object type and property name.

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> Tip:
>
> To synchronize children of selected structures, select the object type and the **Mfg0sub_elements** property.

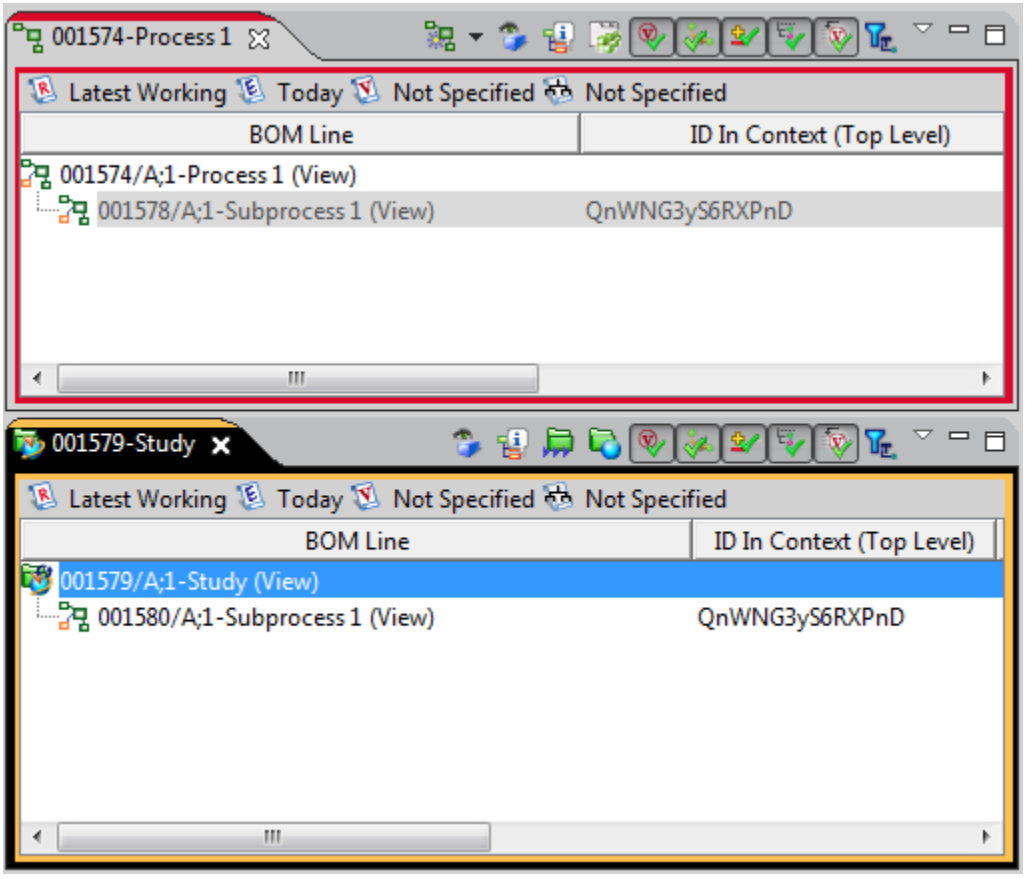
5. Click **Save**.

Teamcenter saves the settings in study preferences. You do not need to modify these preferences manually.

> Note:
>
> You can set up custom synchronization rules by adding modes to the **Mfg0SimStudyRuleMode** global list of values (LOV) in the Business Modeler IDE. By default, this LOV contains only **Time-Based** and **Event-Based** entries. Your new mode is then displayed in the **Manage Synchronization Rules** dialog box, and you can create corresponding synchronization and publish rules for the custom mode.

Example of synchronizing studies

The following example shows an isolated study created from the subprocess of a process structure.



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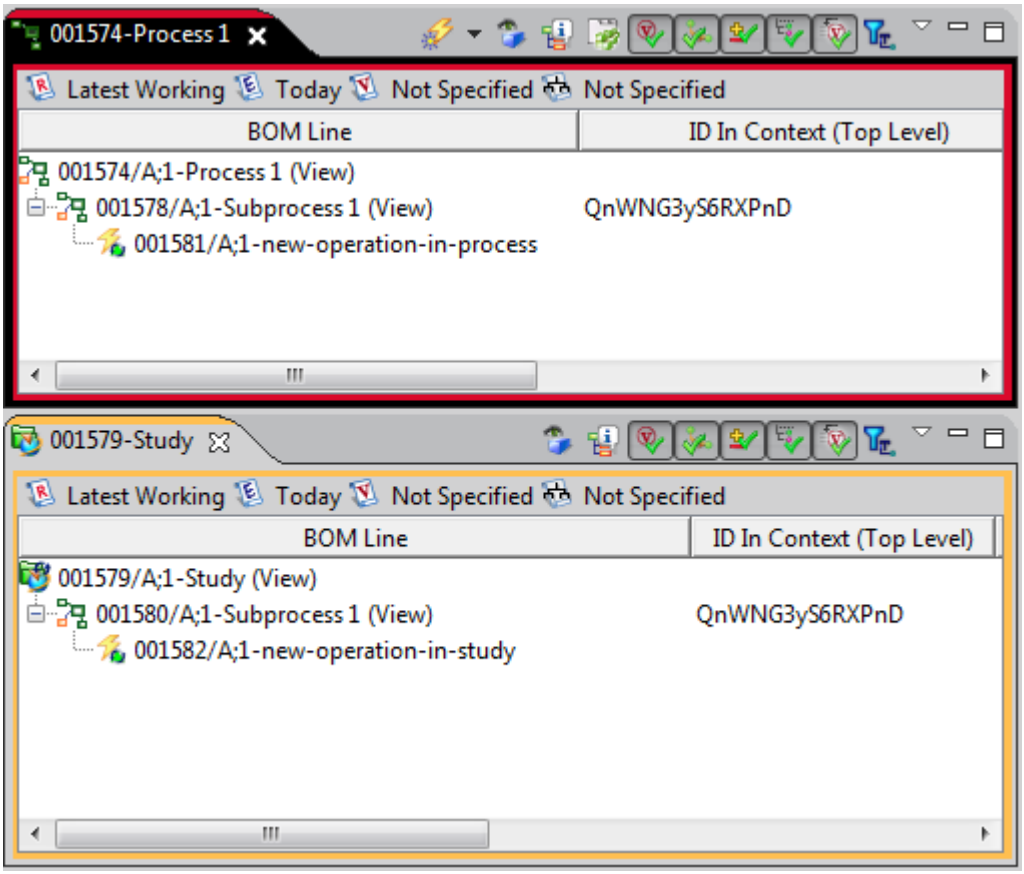
1. Create a new operation in the study and in the original structure.



2. Set up the synchronization settings to publish from the study to the source process structure.

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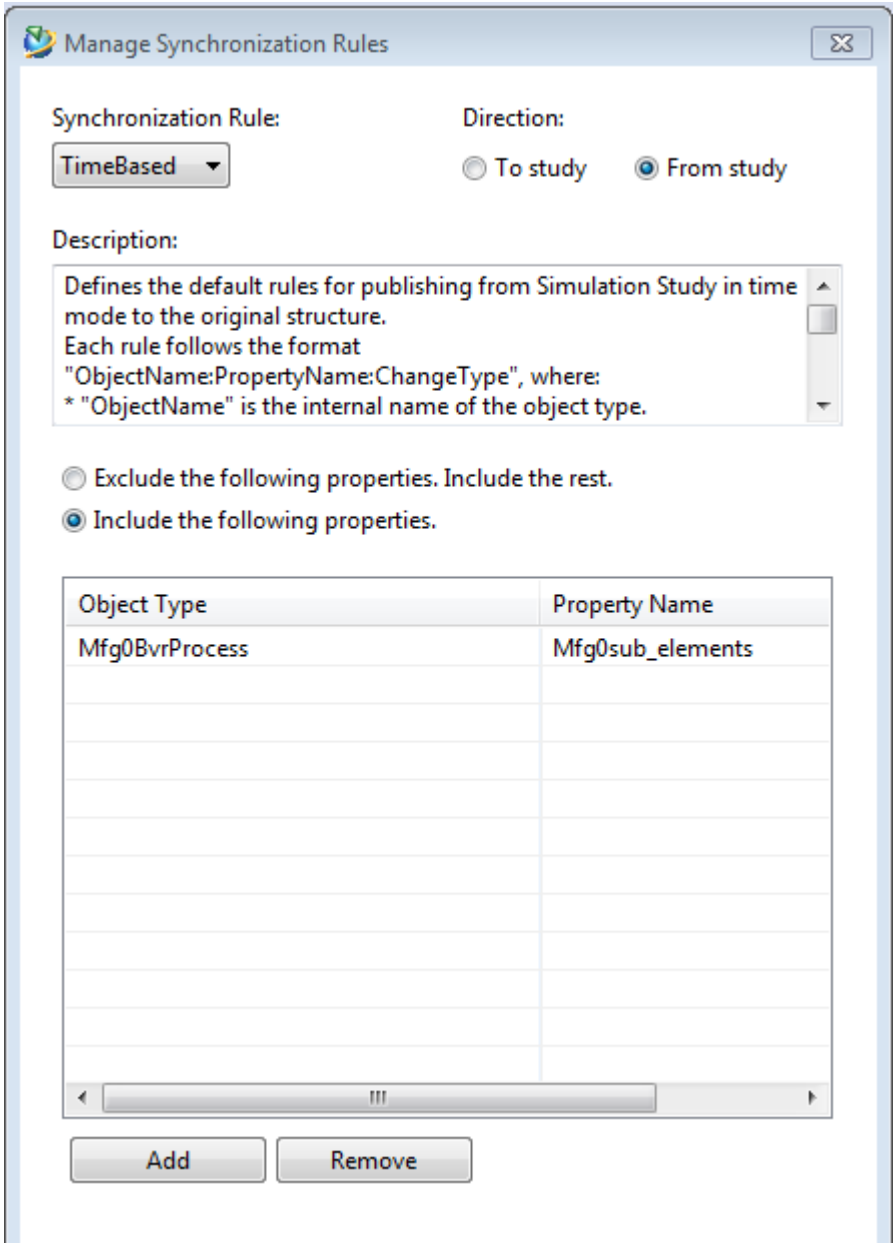

3. Publish from the study to the source process structure by clicking in the study and selecting **Time-Based** in the **Publish From Study** dialog box.

   Teamcenter synchronizes both structures so that source and target are the same.

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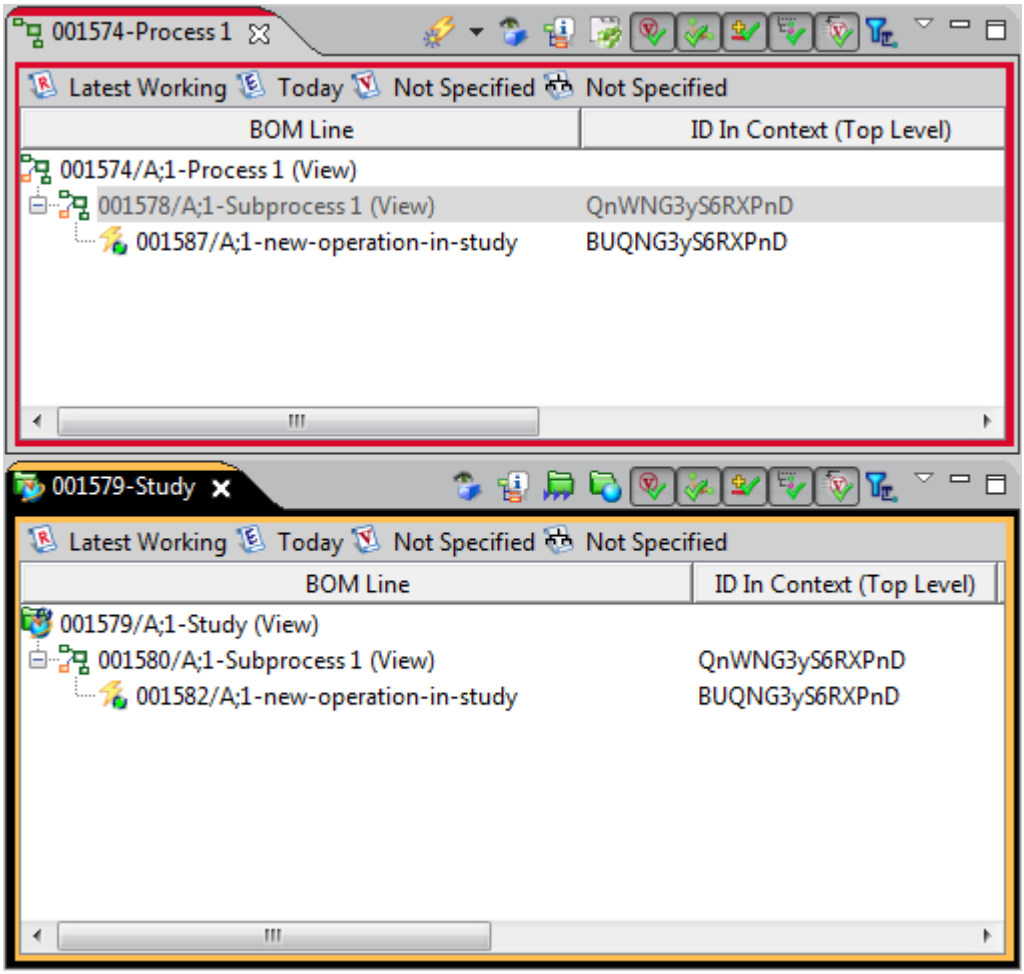

The children of **Subprocess 1** are published from the study to the original **Subprocess 1** line in the source process structure. The study and source contain the same substructure.

Ensure that the configuration context of shared studies in a CC matches that of the BOP

In Teamcenter Manufacturing Access, you can ensure that shared studies and the classic or plant bill of process (BOP) share the same configuration context. This is vital especially when you save the study as a new configuration context (CC) so that the BOP and shared studies in the new CC have the same configuration context.

> Note:
>
> This option does not apply to isolated studies.

1. Make sure you or your administrator have set the value of the preference **MEShareConfigurationContextToStudy** to **Mfg0MEShdStudy**.

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2. Load your working CC to Manufacturing Process Planner and configure the configuration context of the BOP to a desired revision.

3. Select **File** → **Collaboration Context** → **Save as New Collaboration Context**.

4. In the **Save as New Collaboration Context** dialog box, type a name for your new CC, and from the **Include Studies** list, select **All** to include all shared studies, or **Released** to include only released studies.

5. Save the shared study and load the new CC to Manufacturing Process Planner.

6. In the **Collaboration Context Tree** dialog box, right-click the top line of the shared study CC and choose **Open with** → **Study Manager**.

The shared studies have the same configuration context as the BOP.

Using Study Manager

Add and hide studies in a collaboration context tree for viewing in Study Manager

In many cases, large numbers of studies open in a collaboration context tree for use in Study Manager can become difficult to manage. While you can avoid this problem by **organizing studies** into multiple collaboration context trees that use unique study structure contexts, you can also add studies to a single collaboration context tree if your administrator has enabled Study Manager. Using this method, studies are no longer visible in the collaboration context tree, but can be opened in Study Manager from the structures contained in that collaboration context tree or from specific structure zones.

Note:

- You can also **save objects as collaboration contexts** with studies.
- You can also save a study as a **structure context** by choosing **Study Structure Context** from the **Complete List**. Once the structure context is created, you can copy and paste the structure context to the top line of the collaboration context tree.

1. Open a collaboration context (CC) that contains structures (for example, a process structure, product BOP, and plant BOP) and create studies that use objects within those structures (for example, processes and operations).

   The studies open in Manufacturing Process Planner in the CC tree but are not yet part of the CC.

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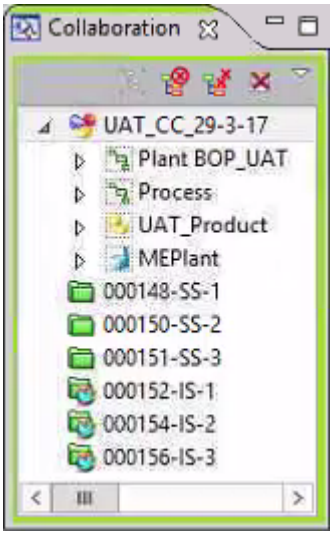
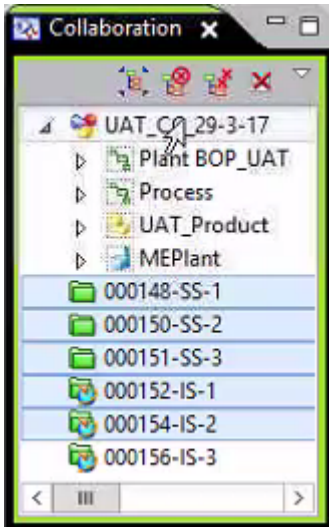


2. Press Ctrl, select each of the studies, and then select the top line of the CC.



3. Choose **File→New→Workflow Process**.

4. In the **New Process Dialog** dialog box, on the **Attachments** tab, the studies and top line are displayed in the **Targets** folder.

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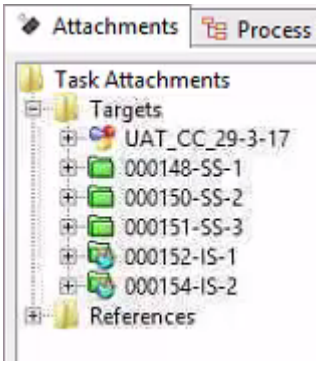
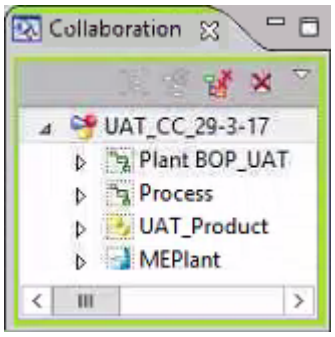


5. From the **Process Template** list, select **Attach_studies_to_collaboration context** and click **OK**.

6. Select **File→Unload All**, and then reload the CC.

   The studies are no longer visible in the CC.



7. (Optional) **View** studies in CC or in a specific structure zone.

Organize studies for Study Manager use

If you have many small studies in a collaboration context (CC) tree, the tree can become difficult to manage. To better organize your studies into smaller trees, you can create new CC trees that use a unique study structure context. If your administrator has enabled Study Manager, you can launch Study Manager from this type of tree.

1. Do one of the following:

   - **Open** the CC that contains the studies and related structures to be organized.
   - **Create** a new CC, open it, and create the isolated or shared studies you want to add to it.

2. Select any line in the CC and choose **File→Collaboration Context→Save as New Collaboration Context**.

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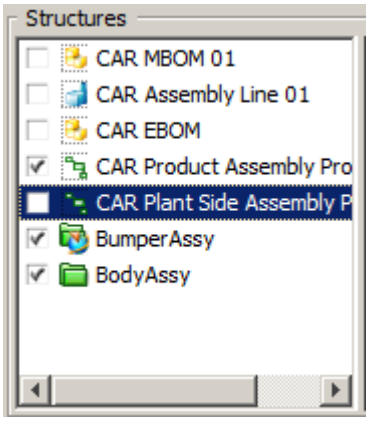
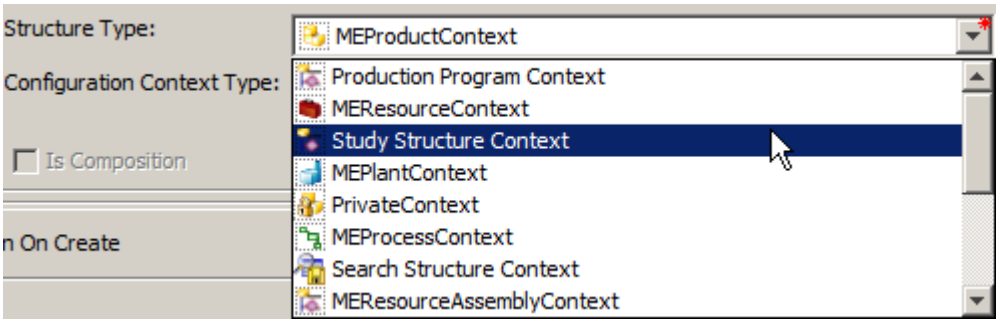
3. In the **Save as New Collaboration Context** dialog box, in the **Name** text box, type a name for your study collection.

4. In the **Structures** list box, clear the check boxes next to any structures you do not want to include in your study collection.



5. In the **Structures** list box, select each study, and from the **Structure Type** list, select **Study Structure Context**.



6. Select the **Open On Create** check box and click **Save**.

   The CC is created and opens.

View studies in Study Manager

If your administrator has enabled Study Manager, you can use Study Manager to view:

- All studies in a collaboration context (CC) tree.
- Only those studies in a particular process or plant structure contained in that tree (the structure or zone itself, the stations within it, and operations inside those stations).
- Multiple structures in separate Study Manager views.

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These views are useful when you creating a new study and want to verify if an existing study might already meet your needs.

1. If you have not already done so, **hide** studies in a CC tree for viewing in Study Manager or **organize** your studies for Study Manager use.

2. Right-click the top row of the new CC and choose **Open with** → **Study Manager**.

   The CC study content opens in Study Manager. The scope of the command is such that all studies attached to all structures in the CC tree are displayed. The scope—in this case, the CC tree itself—is displayed at the top of Study Manager, with the CC tree name displayed in smaller type beneath it.

3. In a structure view that contains processes or operations used in one or more studies—for example, **Process**—select a top line and in the Study Manager and click **Set input to recent selection** .

   The structure study content opens in Study Manager. The scope—in this case, the process structure **000092/A;1 - Process**—is displayed at the top of study manager, with the CC tree name still displayed beneath it.

4. To open an additional Study Manager view, right-click the top line of another structure view and choose **Open with** → **Study Manager**.

Search and filter studies in Study Manager

If your administrator has enabled Study Manager, you can search and filter studies in Study Manager.

1. **View** Study Manager from a study collaboration context in Teamcenter.

2. In the **Search** text box, type part or all of the study names the Study Manager results should contain and click **Search**.

   > Note:
   >
   > You can use wildcards (*) in your search (for example, **Isolate***).

Open a study in Teamcenter from Study Manager

If your administrator has enabled Study Manager, you can open a study and send it to Teamcenter from within Study Manager.

1. In Study Manager, in the **Studies** section, select the study to be opened.

2. Click **Open** .

   The study opens in Teamcenter.

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Add a study from Study Manager

While you can create an **isolated** or **shared** study from a linked process structure, you can also create either study type from Study Manager itself if your administrator has enabled Study Manager.

1. In Study Manager, click **Create Study** .

2. In the **Create Study** dialog box, select **Isolated Study** or **Shared Study** and click **Next**.

3. Type a name and optional description and click **Create**.

The new study opens in its own tab and appears at the bottom of the collaboration context tree, but is not yet part of that tree. It can be seen in Study Manager when you click the top line of the collaboration context, but you need to add processes or operations from the structures (for example, processes from a **Process** structure) to make the new study relevant to a collaboration context tree. Similarly, you need to **add/hide studies** in a collaboration context tree or **organize studies** into multiple collaboration context trees for viewing in Study Manager.

Managing alternative planning projects

Alternative planning overview

Alternative planning lets you work with a variety of products with different order quantities, attributes, or due dates. These products may differ in small or large ways and often require setup and cycle time before the actual manufacturing starts.

You can clone a plant bill of process (BOP) and bill of equipment (BOE) from a working production plant BOP (master), and the cloned alternative plant BOP and BOE maintains a relationship with the original structures. The alternative plant BOP serves as a replica of part or all of the master plant BOP that you can use to plan for a new manufacturing program without affecting the working production program. The alternative program can be used with Process Simulate without harming any simulations being run on the master and the information stored to Teamcenter as you add new resources and data.

As you change items, processes, **isolated and shared studies**, and other objects, you can run an accountability check between the trial and production plant BOPs for comparison and update them as necessary. When finished and ready to apply the trial structure to production, you can synchronize it to the production structure.

> Note:
>
> You can also propagate studies from a collaboration context (CC) tree by right-clicking the alternative CC's top line and choosing **Propagate All Studies**.

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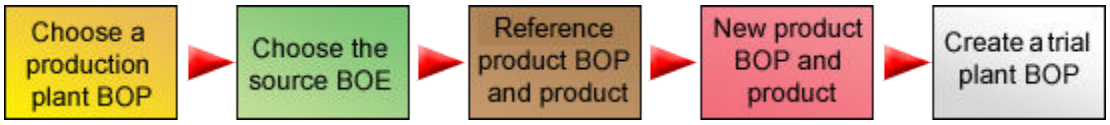
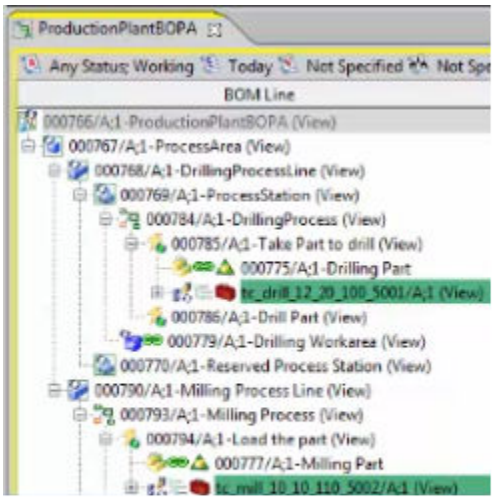
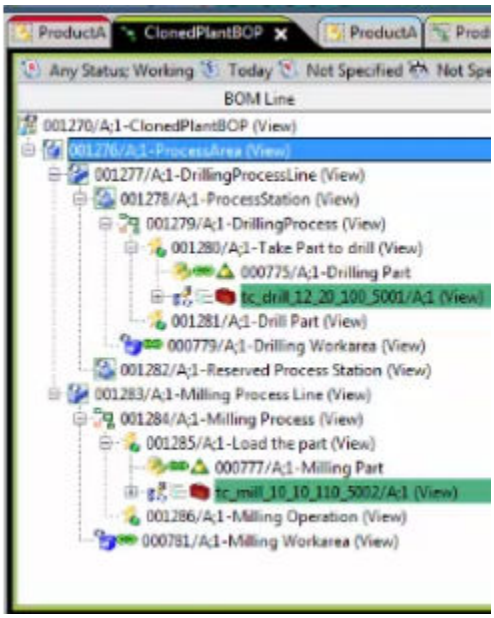
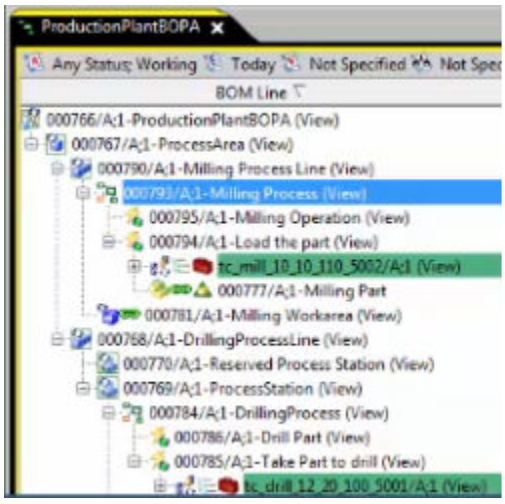
The process of creating a trial plant BOP with an additional product BOP and product may be as follows.

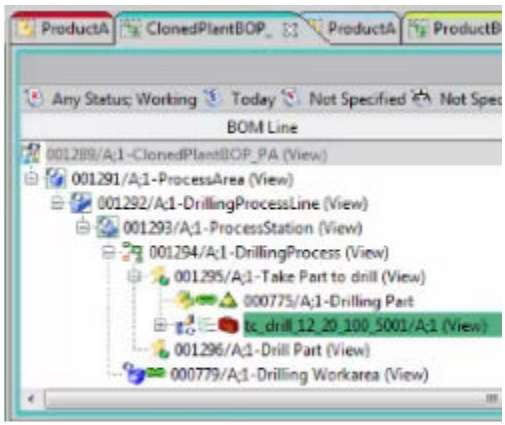


You can similarly use a part or all of an existing plant BOP as a template to create a new alternative planning environment for supplier collaboration and other processes outside production. Planning environments can be created by cloning selected work structures in a plant BOP rather than cloning the entire plant BOP and BOE.









You can also update structures from a production plant BOP to a cloned plant BOP, or vice versa, using an advanced accountability check. You can update structures in several ways. You can quickly:

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- Propagate operation changes to a production or alternative plant BOP.
- Update moved elements in an alternative BOE.
- Update moved elements in an alternative plant BOP.
- Update a production plant BOP from a cloned plant BOP and vice versa.

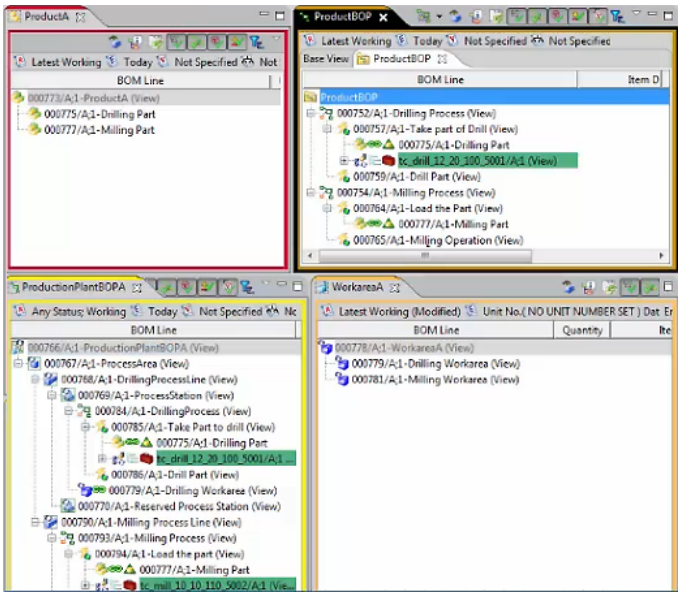
Create an alternative planning project

When you create an alternative planning project, you are creating it in a container known as a collaboration context (CC) object. The CC contains a production environment that you can use for supplier collaboration and other processes outside production, such as developing a new plan for a line or station. Production planning often requires many sets of data and views, so grouping the data under a CC umbrella is necessary.

1. Open the production structures you want to use in your alternative planning project.

   Creating an alternative planning project involves cloning a complete or partial production plant bill of process (BOP) while referencing a bill of equipment (BOE), product, and product BOP. You can choose to include or exclude all but one of these structures. For example, you could create an alternative planning project that clones only a plant BOP and then create additional plant BOP projects. Cloning a plant BOP also includes automatically cloning Dynamic In-Process Assembly (DIPA) data.

   This example shows a product and process BOP at the top, and a production plant BOP and related BOE at the bottom (**WorkareaA**). The process BOP **ProductBOP** contains processes and operations. The production plant BOP shows the part and tool consumption from the product BOP.



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2. In the plant BOP, select the top line and choose **Tools→Update Flows**.

3. In the **Update Flows** dialog box, select the **Include Structure Sub-Hierarchies** check box ☑ and click **OK**.

4. Select the objects to clone or reference from each production source or library and choose **File→New→Alternative**.

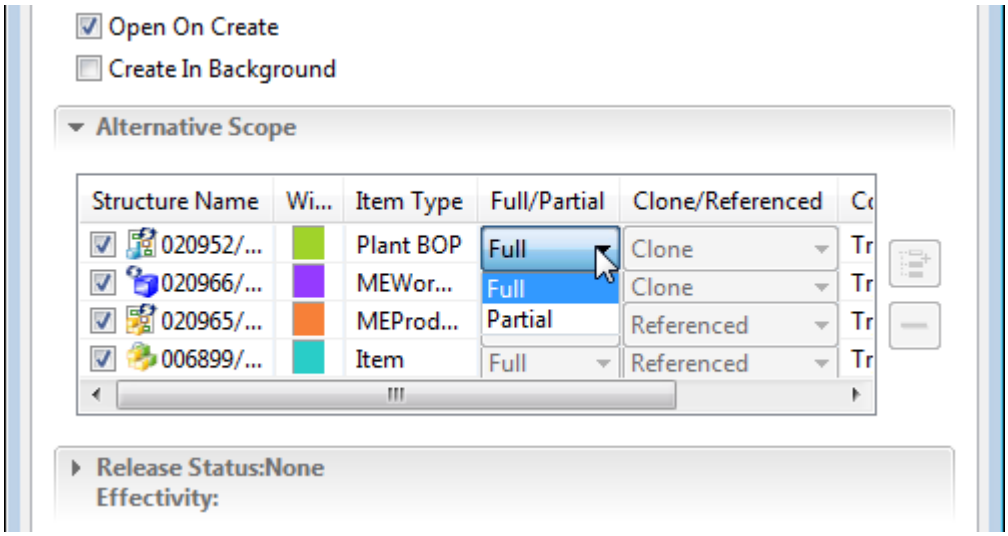
   Example:

   Selected objects might include a process station containing a **shared or isolated study**.

5. In the **New Alternative** dialog box, in the **Alternative Name** text box, type a unique name for the alternative process plan (this will be the alternative CC name) and select the **Open On Create** ☑ check box.

6. If your administrator has set up dispatcher settings to create the alternative at a later time or in the background, select the **Create In Background** ☑ check box.

7. In the **Alternative Scope** list, clear any check boxes ☐ next to structures you do not want to include in your alternative project, and choose whether to partially or fully clone or reference structures.



Note:

- When **Full** is selected, you need not select partial steps further in the alternative planning creation process.
- Product and product BOP require a full structure, though both can also be referenced structures.

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- If you create an alternative planning program with only a cloned plant BOP, the product BOP is excluded from the new alternative CC.
- Resources can only be referenced.

8. (Optional) If your system is set up to apply statuses, do one of the following to your alternative program:
   - In the **Release Status** group, select a release status.
   - Click **Set Unit/Date Effectivity** and define an **effectivity** for the process plan.
9. (Optional) To force the release status that you selected in step 8 upon any structure name in the **Alternative Scope** list with an existing status, select the **Forced Release Status** ☑ check box.

   Note:
   - If you did not select a release status in step 8, any existing statuses in the source CC are removed or cleared in your alternative CC and those objects will have no status. If you did select a release status, all existing statuses in the source CC are overwritten with that status in your alternative CC.
   - You can select a release status before or after selecting the **Forced Release Status** ☑ check box.
10. Click **Next**.
11. On **Process Plan and Bill of Equipment Scopes**, do the following.
    a. In the relevant process plan or BOE structure, select the line that you want to clone or reference, and in the relevant **Scopes** section, click to define the scope.

       Tip:

       When creating a production environment, you need not select the top line. For example, you could select a process line as a plant BOP's scope, or a station or resource as a BOE's scope. BOE nodes such as stations, zones, and lines are cloned, while item-type resources are referenced. You can select multiple objects in your CC structures by pressing Ctrl and selecting them one at a time.

    b. Optionally, create a persistent in-process assembly (**IPA**).

       A. Select the **Create Persistent IPA** ☑ check box.

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> Tip:
>
> You can also **create or update a dynamic in-process assembly** (DIPA) outside the **New Alternative** dialog box. The DIPA is cloned.

B. Select a persistent IPA from your process plan and click to define its scope.

C.

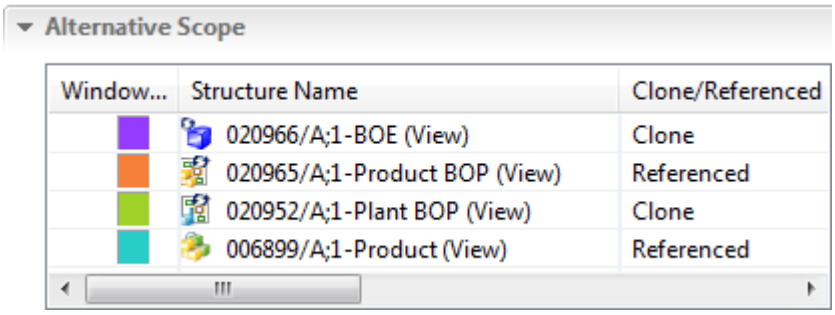
c. Click **Next**.

12. On **Process Plan and Bill of Equipment**, review your alternative structures' details and in the **Name** boxes, type unique names for the alternative process plan and BOE.

> Note:
>
> Unique names are automatically provided if the **ME_Alternative_Scope_Suffix** preference is set to add a suffix to each source structure's default name. In this example, the selected product structure **DUNE BUGGY BODY BOM** is displayed as the **Product Scope Name** along with the **ME_Alternative_Scope_Suffix** preference value **_Alter**.
>
>
>

13. In the **Summary** group, review the structure summary.

The **Alternative Scope** list shows the structures to be cloned or referenced in your project. In this example, the BOE and plant BOP structures are to be cloned, while the product BOP and product are to be referenced. The revision rules, variant rules, and effectivity of the original structures are carried over.



The **Configuration** section reports the project's default release status and cloning rules, release status, and effectivity.

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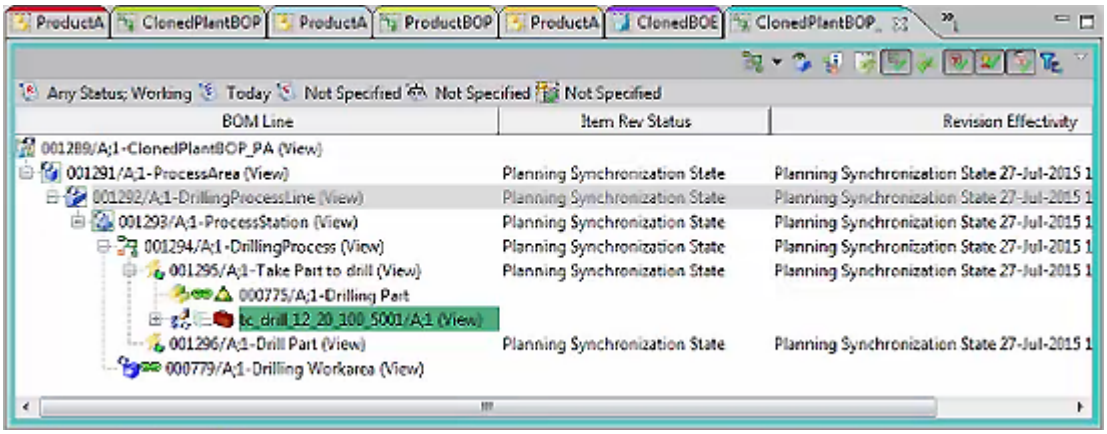
> Note:
>
> Your administrator can define release statuses in the **MEAlternativeDefaultReleaseStatus** preference.

14. Click **Finish**.

    When you open the plant BOP and BOE, they reflect the structures you cloned but display the revision status and effectivity you accepted or selected. In this example, no effectivity was specified so Teamcenter uses the current date as the start date and defines no end date. Parts and tools are shared with the production structures rather than cloned, and do not display a revision status or effectivity.



> Note:
>
> If you chose to create a persistent in-process assembly in step 11, the line you selected for it displays a icon in the production BOP and a icon in the cloned BOP.

Create an alternative planning project using a local resource library

If you want to share standard libraries with your suppliers, you can scope a Local Resource Library (LRL) and send it to a line builder or supplier to share preferred resources such as weld guns, robots, and fixtures. The process is similar to creating a **standard alternative planning project** but requires an additional structure and rules.

1. Create master structures for your alternative project such as product, plant and plant bill of process (BOP).

2. Select **File→New→Item**.

3. In the **New Item** dialog box, select **Local Resource Library** and click **Next**.

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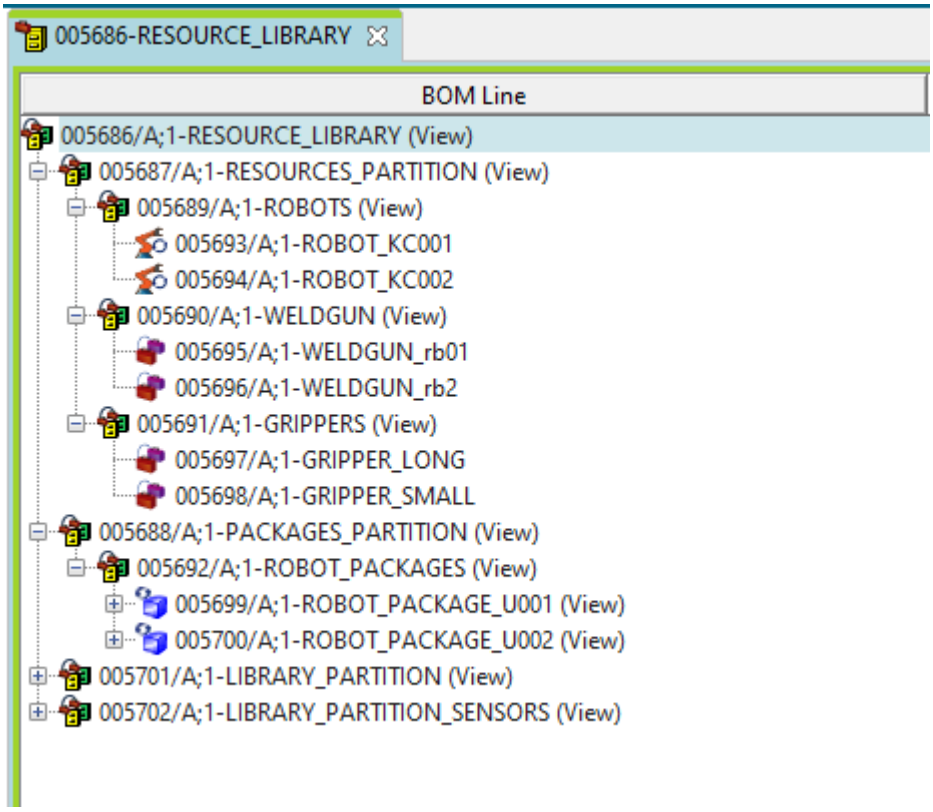
4. In the **Object Create** group, type an optional description and name for the library, and then click **Finish**.

5. In the new library resource structure, add items such as library resource partitions, robots, and other equipment to your LRL.



6. Create a new collaboration context (CC) that includes all four structures.

7. Choose **File→Save as New Structure Context**, and in the **Save as New Structure Context** dialog box, select **MEResourceContext**.

8. Select the top line of the production CC master, select **Move Structure into Collaboration Context Object**, and then click **OK**.

   The resource library is included in the production master CC.

9. Select a process line or station in the resource library and choose **New→Alternative**.

10. In the **New Alternative** dialog box, define alternate information as you would a standard alternative planning project.

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> Note:
>
> Cloning rules are essentially the same as those for a plant BOP. Part and library partitions are cloned but items and resources are referenced by default so that suppliers can add or remove resources as needed.

11. In the **Cloned/Referenced** column, select **Clone** or **Reference** for your resources.

12. In the **Full/Partial** column, select **Full** or **Partial** for any specific structure such as product, plant, plant BOP, or local resource library, and then click **Next**.

13. In **Alternative Scopes**, select a work area.

    If you selected **Partial** for any structure in step 12, the group **Selected Standard Resource Library Scopes** appears at the bottom of the dialog box.

    If you selected **Full** in step 10, you cannot define scope for that structure.

14. In your linked local resource library, select any partitions or resources you want to add to your new alternative, and in the **Selected Standard Resource Library Scopes** group in the **New Alternative** dialog box, click **Add** , and then click **Next**.

15. On the next page, in the **Create Standard Resource Library** group, accept the default resource library name or type a different name and click **Next**.

16. In the **Summary**, review the library scopes.

    The **Standard Resource Library Cloning Rule** list is the same as that of a plant structure. By default, all partitions are cloned and standard resources are referenced. You can use the default or select a custom template here.

17. Click **Finish**.

    The cloned and referenced resource structures are now visible.

> Note:
>
> The following restrictions apply regarding copying and pasting from a resource library top plant structure:
>
> - You can only consume resources from the linked standard library of resources into a plant BOP. If you try to copy an external resource or library into the plant BOP, you receive an error.

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- To copy a source object into an alternate process, first copy resources and partitions from the local library into the plant structure, and then copy them from the plant structure into the alternate BOP.

Create a lead plant BOP

If your company has many production plants that are similar in design and implementation, you can create a lead (master) plant bill of process (BOP) and other structures such as manufacturing bill of materials (MBOM) and bill of equipment (BOE) contained in a collaboration context (CC), and define a common structure from a central engineering location. This approach is like alternative planning in that the lead plant BOP serves as an offline framework to be reused, in part or in whole, in live target structures. To enable this functionality, an administrator must create a preference named **MEEnableLeadPlantBOP** with site-level scope set to **true**.

Note:

- The preference **MELeadPlantBOPDefaultPrefix** lets you specify a prefix for the cloned CC.
- The preference **MELeadPlantBOPDefaultReleaseStatus** specifies the default release status to be assigned to objects in the cloned structures in case these objects have no release status.
- The preference **LeadPlantBOPAllowedTemplates** lists the cloning rules available for cloning a lead plant BOP to another plant BOP.
- The preference **LeadWorkAreaAllowedTemplates** lists the cloning rules available for cloning a work area from another work area.

1. **Create** the plant BOP that will serve as the lead plant BOP.

   Note:

   The lead plant BOP can include the same elements as any regular plant BOP, including process areas, process lines, process stations, occurrence level information, variant rollups, and so on. Your plant BOP becomes a lead plant BOP only when you clone it using the **Plant BOP from Lead Plant BOP** command, as described in step 3 .

2. Create a related BOE, save the related structures to a CC, and assign process operations from the BOE to the lead plant BOP.

   Note:

   Your CC must contain, at the minimum, a BOE, MBOM, and BOP. It can also contain an engineering bill of materials (EBOM), studies, and a production program. Classic BOP is not supported.

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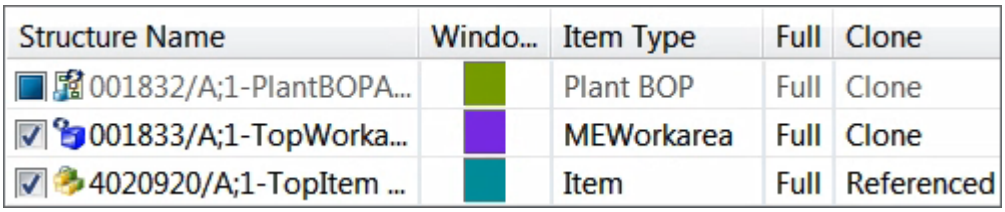
3. With the CC and all structures within it opened, in the lead plant BOP, select any object in the process plan, and choose **File→New→From Template→Plant BOP from Lead Plant BOP**.

   In the **New PlantBOP from LeadPlantBOP** dialog box, in the **Collaboration Context Details** group, the name of the currently open CC is displayed by default.

4. If necessary, change the CC **Name** and select the **Open On Create** ☑ check box.

   The **Collaboration Context Scope** list displays all structures from the CC, with details such as window colors, item types, and such information as which structures are fully cloned or referenced.



> Note:
>
> Both the plant BOP and BOE must be fully cloned.

5. If you prefer, select from the **Release Status** and **Effectivity** lists, and then click **Next**.

6. Modify the names of the process plan and BOE and click **Next**.

7. On the **Summary** page, review clone, reference, CC, revision rules, and other information.

8. From the **Configuration** group, optionally select process plan and BOE cloning rules, and then click **Finish**.

A new CC is created that contains the cloned and referenced structures. The cloned plant BOP does not differ in appearance from the lead plant BOP.

As changes occur in the lead plant BOP or the cloned plant BOP, you can propagate changes from the lead plant BOP to the cloned plant BOP and vice versa. To find gaps between the BOE and lead plant BOP, you can compare the structures to identify:

- Data that is not assigned to the lead plant BOP.
- Parameters that are different from the assigned data.

Scope flow support for alternative planning projects

Teamcenter alternative planning projects support scope flow connections between zones or lines in a plant bill of process (BOP) that are defined in a Program Evaluation Review Technique (PERT) chart.

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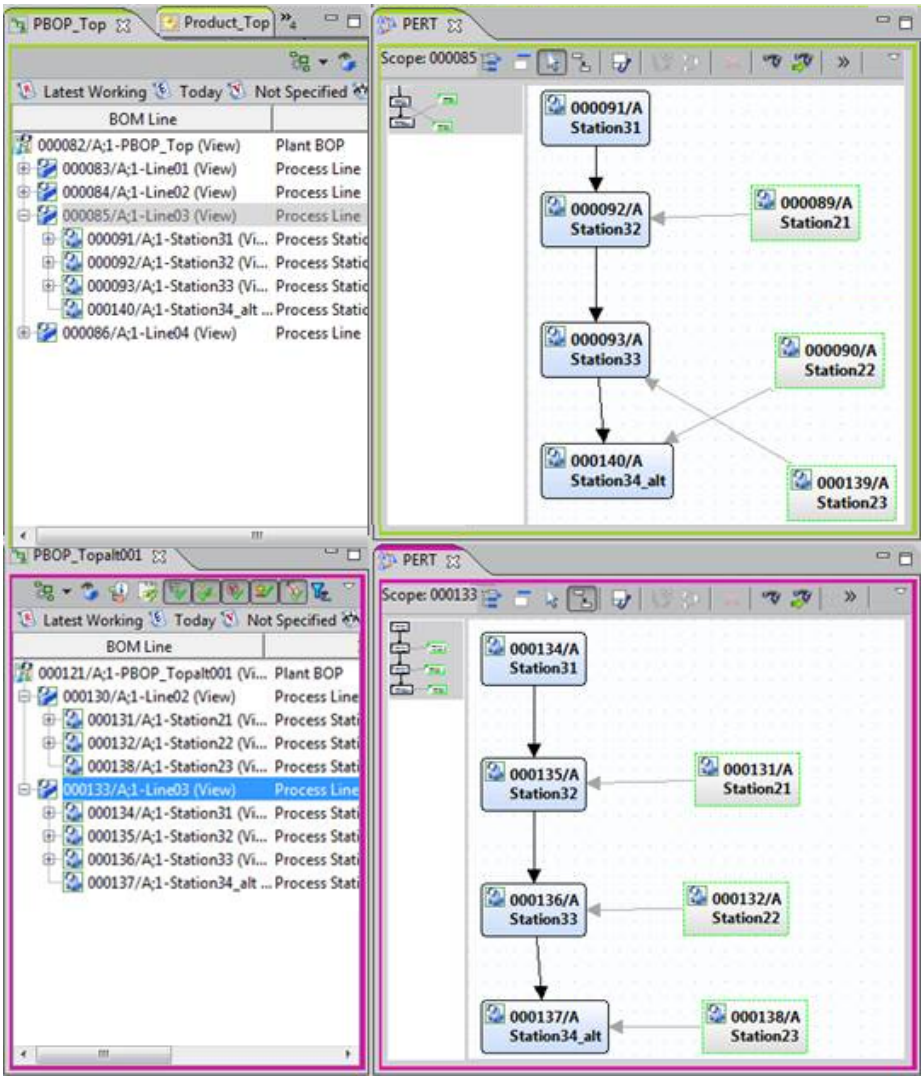
When scope flows are added, changed, or removed in a source (usually created by an original equipment manufacturer, or OEM), the changes can be applied to the target (usually alternative supplier) structure and vice versa.



To identify and update scope flow changes, you must select the line whose changes you want to apply (source), select the line to which you want to apply it (target), and run an advanced accountability check. On the **Partial Match** tab, on the **General** sub tab, select the **Predecessors mismatch (incoming flows)** check box before running the accountability check. The **Ignore the mismatches caused by creation of objects in the derived structure** check box is disabled for source/alternative planning comparisons. When you click **OK**, the accountability check identifies scope flow mismatches in the structures.

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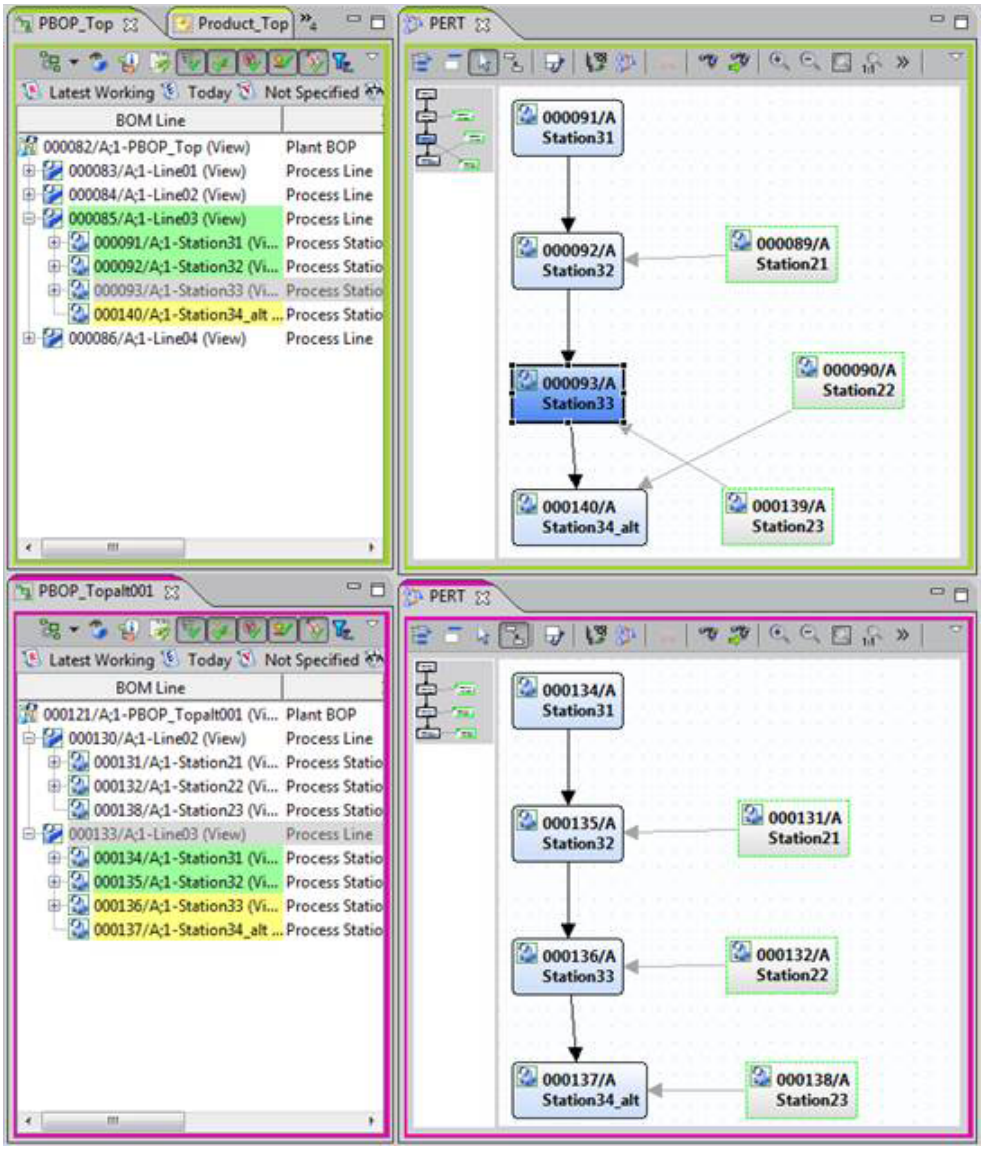

You can propagate scope flow changes in the following ways.

- Right-click the top line to be updated in the target structure and choose **Propagate**.
- Select the line to be updated in the target structure and choose **Tools→Accountability Check→Propagate**.
- In the accountability check results window, right-click the line to be updated in the target and choose **Propagate**.

Scope one or more subsets of a source plant BOP to an alternative study

Using the preference **ME_Enable_Alternative_Scope**, you can select multiple process areas, process lines, and process stations in a plant BOP and send or update those items to an alternative plant BOP,

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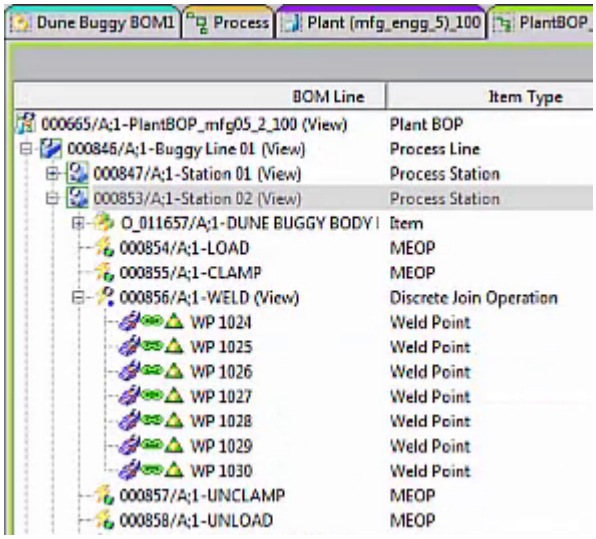
provided they are both launched from the same collaboration context (CC) tree. The selected scope of this action applies product part and manufacturing feature assignments, as well as in-process assemblies (IPAs), dynamic in-process assemblies (DIPAs), studies, and simulations to the alternative project.

1. From a CC, open the source plant BOP and alternative structure to be updated, as well as any product BOMs that contain items consumed in the plant BOP.

2. To enable subset scopes, set the value of the preference **ME_Enable_Alternative_Scope** to true; to define a suffix for the product scope name, define a single string value into the preference **ME_Alternative_Scope_Suffix**.

3. In the plant BOP, select the process areas, process lines, and process stations that you want to set as the scope of the alternative project. Press Ctrl to select different objects.

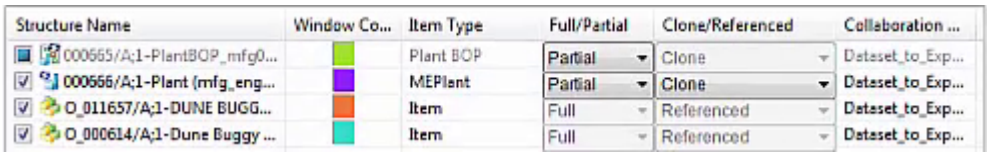
   In this example, a single process station is selected.



4. Choose **File→New→Alternative**.

   In the **New Alternative** dialog box, the **Full/Partial** column displays the source plant BOP as **Partial** because the selected scope includes only part of the structure.

   In this example, both **PlantBOP_mfg05_2_100** and a bill of equipment (BOE) called **Plant (mfg_engg_5)_100** are displayed as partial matches. These partial selections are the scope of what will be cloned in the alternative project. Two product BOMs that will be merely referenced are marked as **Full** in the **Full/Partial** column.



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5. Click **Next**.

   The process objects you selected as your scope from the source plant BOP are displayed in the **Process Plan** and **Bill of Equipment's Scopes** lists. By default, the **Create Persistent IPA** checkbox is selected.

6. Clear the check box or click to define an IPA from the plant BOP source.

   If you have more than one product BOE in your CC and they are open in the current session, a message reports that only one configuring structure is allowed.

7. To define the structure, click **Yes**.

   In the **Define Configuring Structures** dialog box, the source plant BOP is selected in the **Name** and the current CC is selected in the **Collaboration Context** read-only text boxes.

8. In the **Configuring Structures** group, select the preferred configuring structure and click **OK**.

9. In the **New Alternative** dialog box, click **Selected Scopes for Products**.

   The list displays product structures available in the CC and open in the current session.

10. Click a product view.

    The **Product Scope Name** text box lists the name of your new alternative project, along with a suffix if you set the **ME_Alternative_Scope_Suffix** preference. The **Scope for the selected Product** list displays objects (BOM lines) from the process items you initially selected as the scope.

    In this example, the selected product structure **DUNE BUGGY BODY BOM** is displayed as the **Product Scope Name** along with the **ME_Alternative_Scope_Suffix** preference value **_Alter**.

    All product parts in the scope of the selected station are displayed in the **Scope for the selected Product** list.

11. (Optional) Add a product part or manufacturing feature from an area of the source plant BOP that is outside the scope of the process areas that you originally selected.

    In this example, a weld is selected from **Station 03**, which is outside the originally selected **Station 02**.

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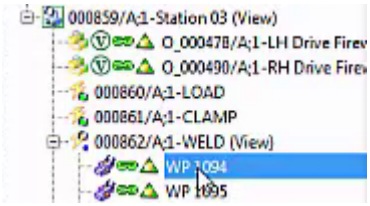
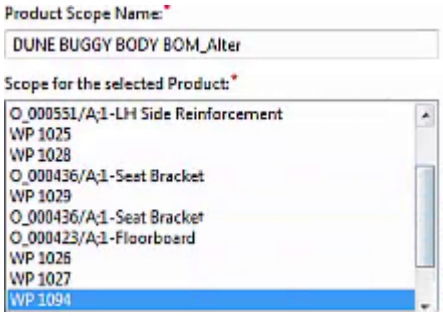


a. Right-click the selected product part or manufacturing feature, choose **Find→Find in All Visible Views**, and select the product view currently selected in the **Selected Scopes for Products** list.

   The product part or manufacturing feature is located in the product view and added to the **Scope for the selected Product** list. In this example, weld **WP 1094** from the product view **DUNE BUGGY BODY BOM** is added to the list.



b. Click **Next**.

   If you receive a **Missing Connected Parts** message, click **OK**. The message indicates that you added a part or manufacturing feature from outside the initially selected scope. This problem will soon be resolved.

c. For the process plan and BOP structures to be cloned, accept the default names, or in the **Name** boxes, type unique names and click **Next**.

d. Click **Next**, review the **Summary** page, and then click **Finish**.

12. Once the alternative structure views are created, open and review them in Manufacturing Process Planner.

In this example, **DUNE BUGGY BODY BOM_Alter02** shows a number of connectors. Parts and manufacturing features at the bottom of the view are in the direct scope of the station, while the collectors above represent parts and features that are not directly part of that scope. Parts to which the weld was connected are contained in the **Connected to Collector** node and manufacturing features in the **Manufacturing Features Collector** node. The **In-Process Assemblies Collector** node contains DIPA and IPA assemblies.

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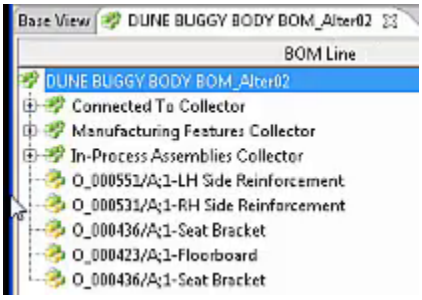


Quickly propagate operation changes to a production or alternative plant BOP

You can quickly propagate structure changes from a linked production plant BOP to an alternative plant BOP, or vice versa, if you have added or removed operations. This capability exists only for operations and their consumed parts or products. Changes do not propagate if resources are assigned to the operation.

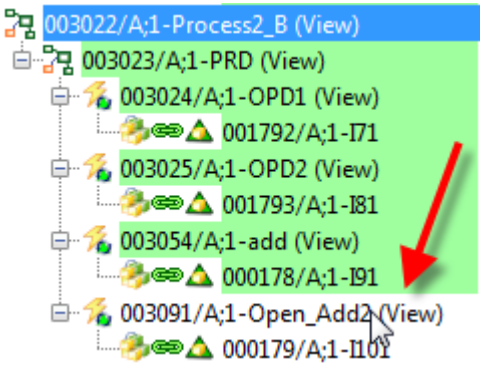
1. Open the production and alternative BOP structures to be updated.

2. The following examples illustrate the effect of this method.

   - Add an operation.

     a. Choose **File→New→Operation** and add an operation to the plant BOP.

     b. (Optional) Add a consumed part to the operation.



     c. Right-click the new operation and choose **Propagate to Master/Alternative**.

> Note:
>
> To enable this action your administrator must add the logical preference **ME_Alternative_Enable_Propagate** with site level scope.

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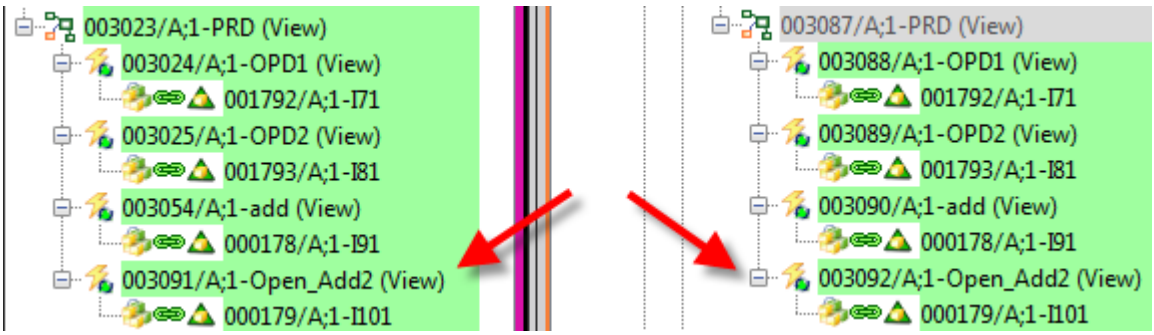
d. In the **Propagate to Master/Alternative** dialog box, select the check box next to the structure to which you want to propagate the change and click **Propagate to Selected Structures**.

The operation is propagated to the target.

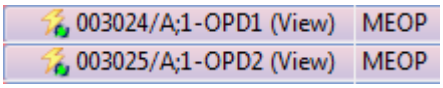


- Remove operations.

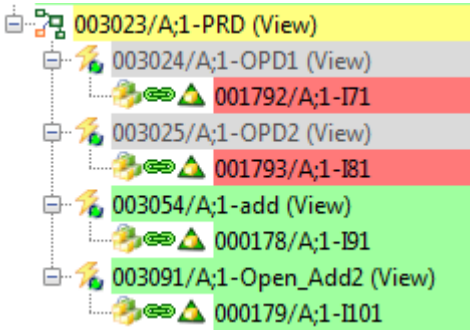
a. In the alternative BOP, press Ctrl and select one or more operations to remove.

b. Choose **Edit→Remove** and, at the warning prompt, click **OK**.

c. Run an advanced accountability check and in the accountability results for the BOP from which you did not remove operations, select missing in source (usually red) BOM lines.



The selected operations highlight in the affected BOP.



d. In the accountability results, right-click a selected line and choose **Propagate to Master/Alternative**.

e. In the **Propagate to Master/Alternative** dialog box, select the check box next to the structure to which you want to propagate the change and click **Propagate to Selected Structures**.

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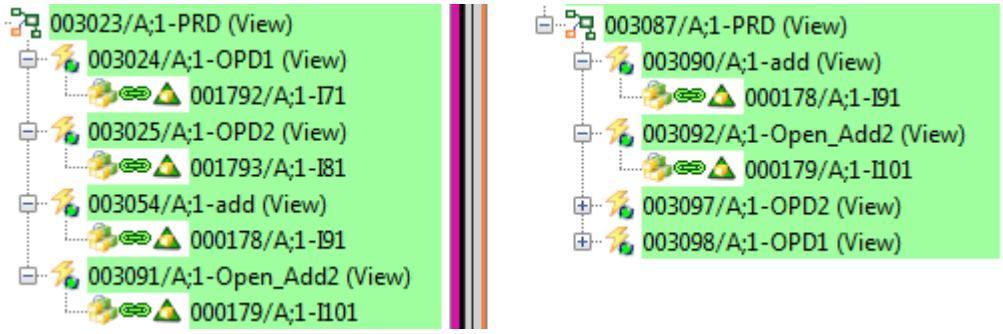
The operations are added back to the structure.



Propagate multiple alternative structures to a production BOP and BOE

To save time and reduce possible errors, you can propagate single or multiple alternative structures contained in a collaboration context (CC) to a bill of equipment (BOE) and bill of process (BOP) in a production environment. Operations, Process Simulate attachments, isolated studies, resources, and other objects added to alternative structures are asynchronously propagated to the production environment.

1. Confirm you have write privileges in the production environment and that no data in that environment is checked out.

2. Open the production and alternative structures and run an advanced accountability check on the alternative structure.

   The settings on the **Scope** tab determine how changes are propagated from the alternative structures to the production structures.

   > Example:
   >
   > You might set **Source objects** to one or more stations in the alternative BOP and **Target objects** to appropiate matching stations in the production BOP. You might set **Available Settings** to target a production BOE.

3. When the advanced accountability check settings are correct, click **OK**.

4. Open the alternative and production CCs containing the appropriately matched structures.

5. In the alternative CC, right-click the alternative structures to be propagated, and select **Alternative Auto Propagation**.

   > Note:
   >
   > You cannot propagate changes from a production CC to an alternative CC.

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Changes are propagated to the production CC in the following order:

- BOE
- BOP
- Isolated studies

When the changes are complete, start and complete notifications are sent to your home mailbox. A log file attached to the completion mail reports detailed changes to the production structures organized by lines, sublines, and stations to help you identify validation requirements.

Update production or cloned plant BOP or BOE structures

You can update structures from a linked production plant BOP to an alternative plant BOP, or vice versa, using an advanced accountability check. You can update structures from linked BOEs the same way. This functionality is available based on the default values of the **MEAutoReviseWhilePropagation** and **MEReleaseStatusListForAutoRevise** preferences.

> Note:
>
> You should propagate your BOE before running an accountability check on a plant BOP.

1. Open the BOP or BOE production and alternative structures to be updated.

   In this example, the production plant BOP at the top has changes in allocated time, changes to an operation's revision and item description, a new variant condition, and a new operation. Using the production plant BOP as the source of the changes, you can update the cloned plant BOP so that its recipient (a supplier using a single line and station) is kept up-to-date. The cloned plant BOP has already been released, with a status of **Planning Synchronization State**.

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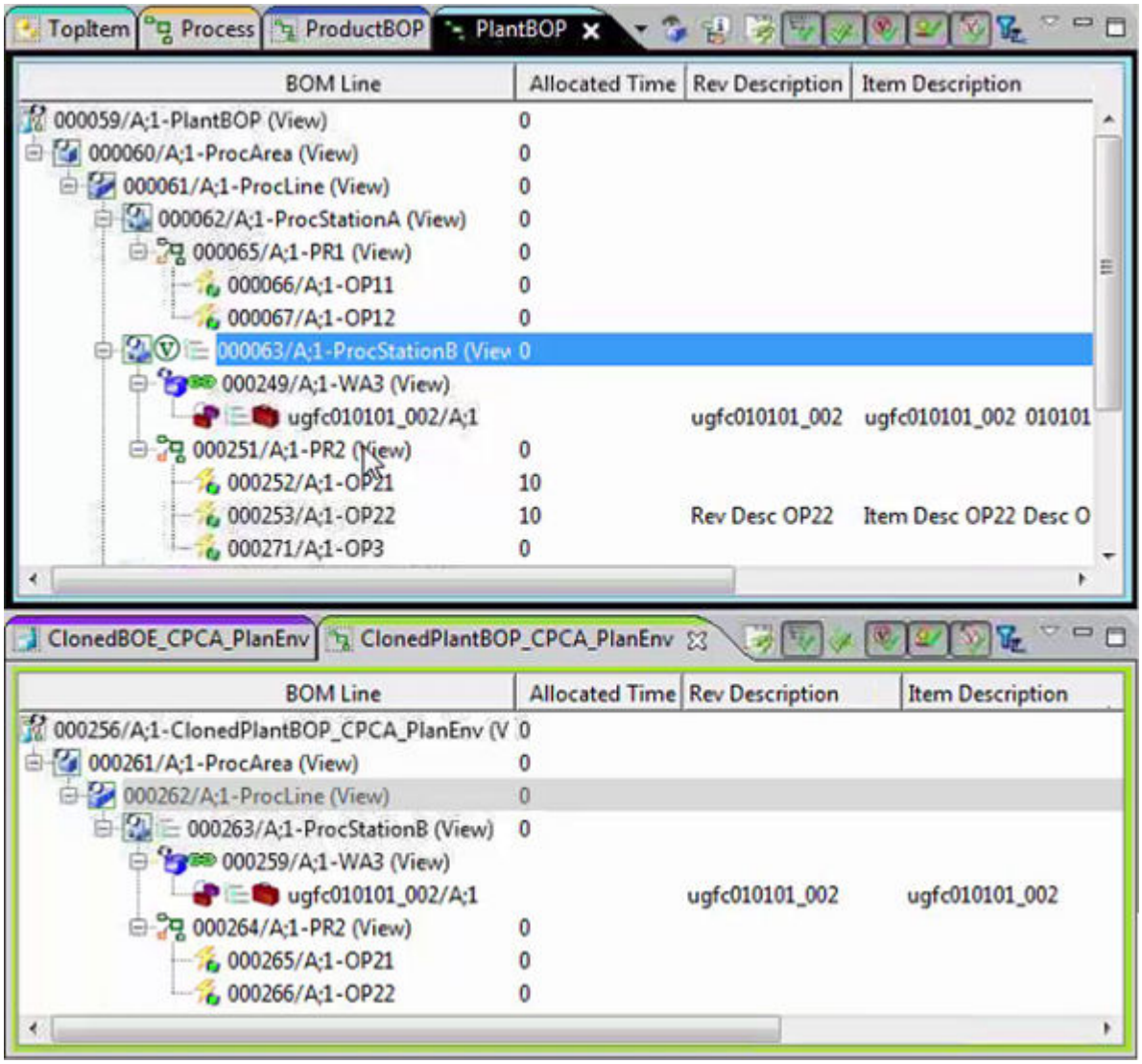

Note:

You can also propagate changes to shared or isolated studies, alternative planning projects, simulations, datasets, in-context edits, new and revised products, welds, arc welds, datums, and most content between production structures.

2. Run an advanced accountability check between the entire production and cloned structures.

   a. Select the source and target BOP or BOE structures that you want to update and choose **Tools→Accountability Check→Advanced Accountability Check**.

   b. If necessary, in the **Advanced Accountability Check** dialog box, on the **Inclusion Rules** tab, select **Search currently expanded source lines**.

   c. On the **Reporting** tab, select the **Partial match**, **Missing target**, and **Missing source** ☑ check boxes.

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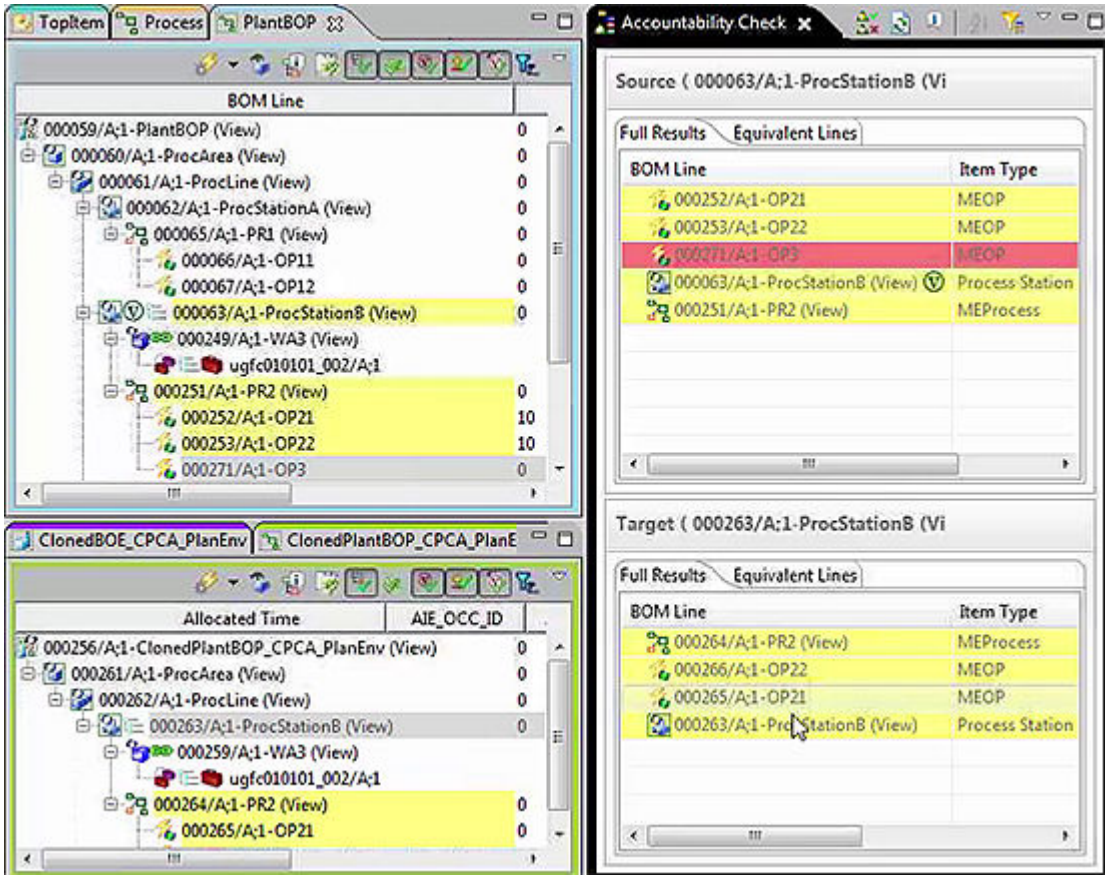
d. On the **Partial Match** tab, on the **BOM Properties** subtab, select and add the properties **AIE_OCC_ID**, **AIE_OCC_NAME**, **Allocated Time**, and **Variant Conditions** to the **Selected Properties** list.

> Note:
>
> **Allocated Time** and **Variant Conditions** are relevant to the production and cloned BOPs described in the step 1 example. You should select properties relevant to your structure change properties.

e. On the **General** subtab, in the **Process Structure** group, select the **Predecessors mismatch (incoming flows)**, **Descendants (sub-processes and operations) mismatch between processes**, and **Activities mismatch** ☑ check boxes.

f. Click **OK**.

In this example, the accountability check shows one operation missing in the target (red) and a variety of partial matches (yellow) related to property changes.



3. In the **Accountability Check** dialog box, in the **Target** list, press Ctrl and select each line you want to update or add, right-click the selection, and choose **Propagate**.

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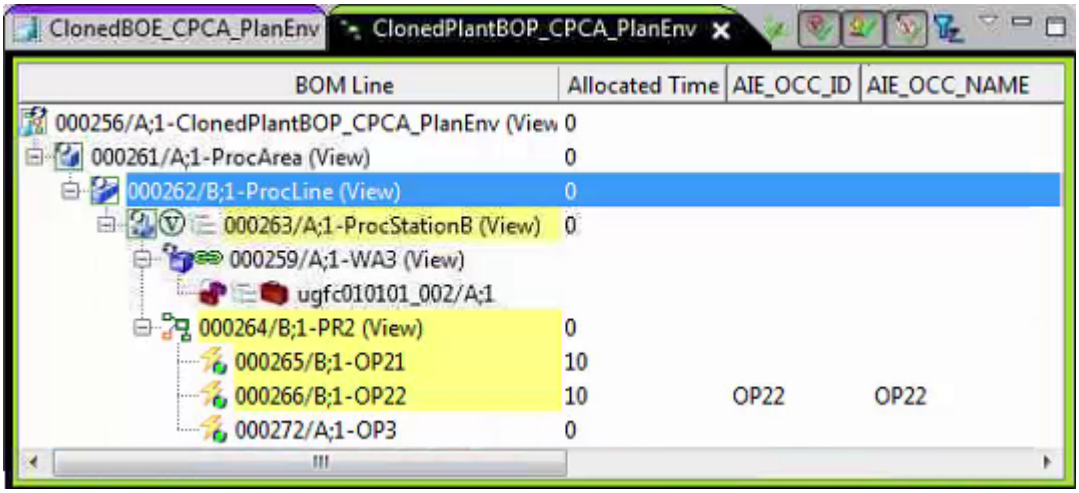
The target is updated to match the source. New items and items with changes now have cleared revision statuses.

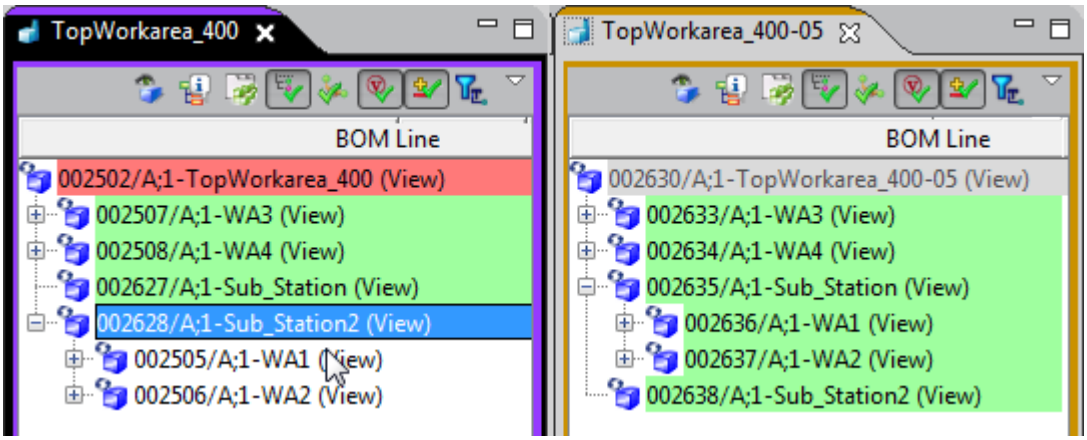


Quickly update moved elements in an alternative BOE

You can quickly update an alternative bill of equipment (BOE) when elements are moved in the production BOE. This example shows how to update an alternative BOE when work areas are moved between substations.

1. Open the production BOE in which the work areas were moved and the alternate BOE.

   In this example, two work areas have been moved from **Sub_Station** to **Sub_Station2**.



2. In the alternative BOE, right-click **Sub_Station** and choose **Propagate**.

   The work areas are moved in the alternate BOE from **Sub_Station** to **Sub_Station2** and match the production BOE.

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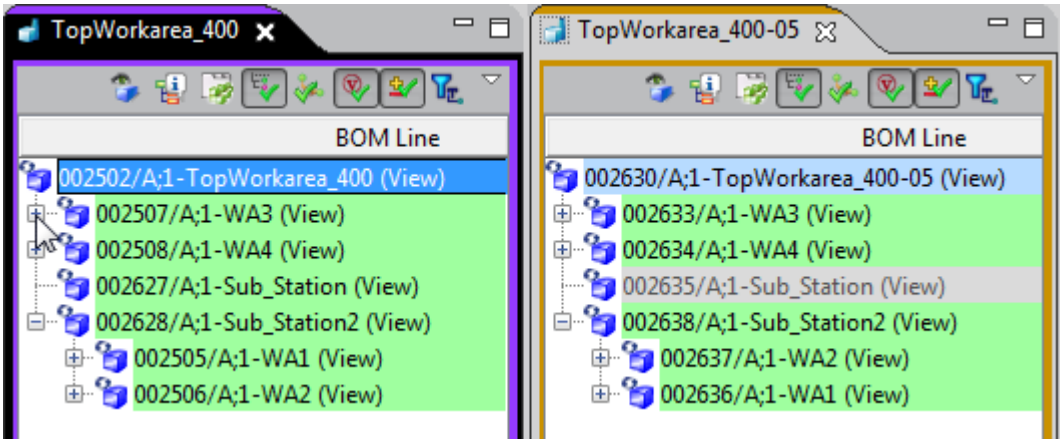
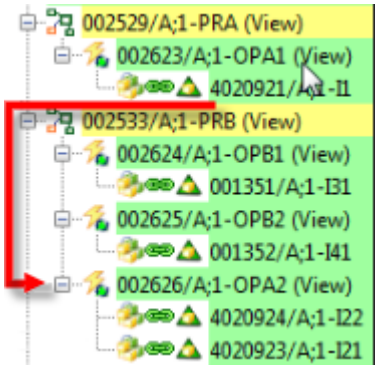


Quickly update moved elements in an alternative plant BOP

You can quickly update an alternative plant bill of process (BOP) when elements are moved in the production plant BOP. This example shows how to update an alternative BOP when operations are moved between processes.

1. Open the production plant BOP in which the operations were moved and the alternative plant BOP.

   In this example, operation **OPA2** has been moved from operation **PRA** to operation **PRB**.



2. In the alternate BOP, right-click **PRA** and choose **Propagate**.

   The operations are moved in the alternate BOP from **PRA** to **PRB** and match the production BOP.

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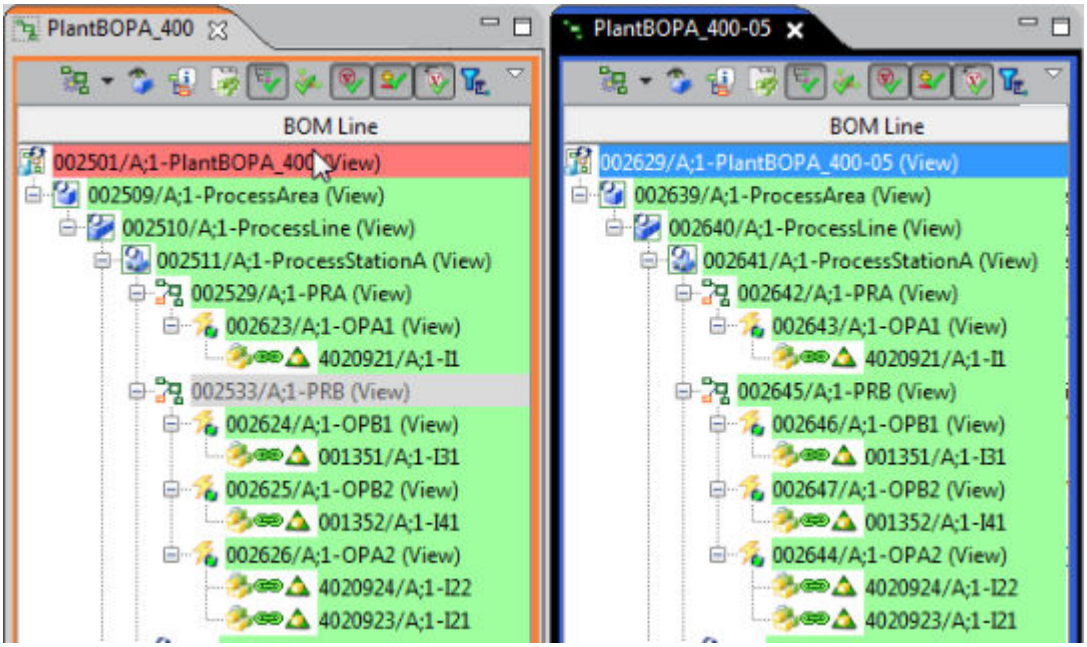

Find a plant BOP's alternative collaboration contexts

An alternative collaboration context is a collaboration context object, created from a plant BOP, that is used to create a production environment for supplier collaboration and other processes outside production. You can search for all collaboration contexts created from a plant BOP.

1. Right-click a line in the plant BOP and choose **Find Alternatives**.

2. (Optional) In the **Alternatives** dialog box, select any collaboration context you want to view and click **Load**.

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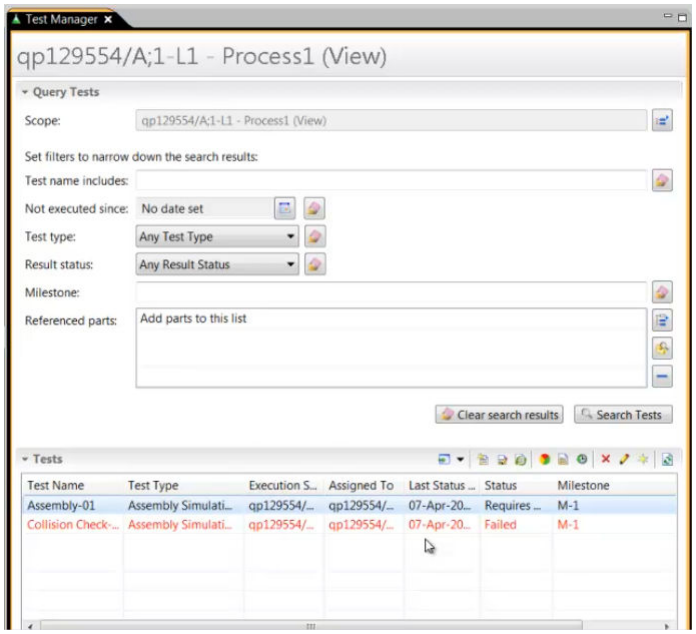
Managing virtual analyses

Performing virtual analyses

In manufacturing, it is cost-effective to reduce the number of physical prototypes required to begin manufacturing or after a change is introduced to the design or manufacturing process. Some iterations of prototyping can be replaced by a variety of virtual assessments that analyze the design and process plan in Process Simulate. You can manage these virtual assessments in Teamcenter by creating a library of available tests representing the analyses and then associating the tests with process data using the **Test Manager** view.



With the **Test Manager** view you can:

- Manage a master list of test cases in a library.
- Associate test cases with process data.
- Integrate with Process Simulate by performing the tests in Process Simulate and recording the results back to Teamcenter.
- Capture test result with comments and an image.
- View a dashboard of test results.
- Filter test searches by various criteria such as date, test type, name, or referenced part.

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- View and update the history of a test.

Create a test case

You can create a new test from the **Test Manager** view.

1. Choose **File→New→Test Case**.
2. In the **Name** box, type a name for the test case.
3. From the **Test Type** list, select the test type.

   Your administrator can extend this list in the **Tm0TestType** LOV in the Business Modeler IDE.
4. From the **Execution Application** list, select the application in which the test case runs.

   Your administrator can extend this list in the **Tm0ExecutionApplication** LOV in the Business Modeler IDE.
5. From the **Usage Address** list, select or type the usage address.
6. From the **Position Designation** list, select or type the position designation.
7. Click + to add the test steps.
8. In the **Add Step** dialog box, type the step instructions.
9. Select a word or words and click **Set Placeholder** to create a placeholder for future part assignment.
10. Click **OK** and continue to add steps until the test is defined.
11. Click **OK** to save the test.

> Note:
>
> The test case template is stored in the folder specified by the **tm0tsm_TestCases.ROOTFOLDER** preference. By default, this is the **DPA** folder. Teamcenter creates this folder when you save the first test case.
>
> You can organize test cases under requirements in the **Test Manager** view. To do so, you must ensure that the test case business object type (**Tm0TestCase**) is added to the **TCAllowedChildTypes_Requirement** preference.

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Test case library

The test case library contains template tests that you can choose from as the basis for test cases that are carried out with the data in a process structure.

The test case template is stored in the folder specified by the **tm0tsm_TestCases.ROOTFOLDER** preference. By default, this is the **DPA** folder. Teamcenter creates this folder when you save the first test case.

You can organize test cases under requirements. To do so, you must ensure that the test case business object type (**Tm0TestCase**) is added to the **TCAllowedChildTypes_Requirement** preference.

Associate tests with process data

The **Test Manager** view allows you to use test case templates from the test library to create test case instances in a process structure. You can replace the placeholders created in the test case template with consumed parts from the process structure.

1. In the BOP or BOM view, right-click the process to which you want to associate a test case instance and choose **Open With→Test Manager**.

   The **Test Manager** view opens with the selected process as the scope of the view.

   > Note:
   >
   > You can change this scope by selecting a new process and clicking .

2. Select a process that is a child of the process on which you opened the **Test Manager** view and click .

3. Click to select the **Test Case** template to associate.

4. In the **Name** box, type a name for the test.

   > Note:
   >
   > You can use the **Structure Search** view to search for a test case or search for it in your **Home** folder.

5. If there are parts required for this test:

   a. In the **Steps** list, select the placeholder text.

   b. In the process structure, select the required consumed part. This part must be a child of the process for which you are creating the new test.

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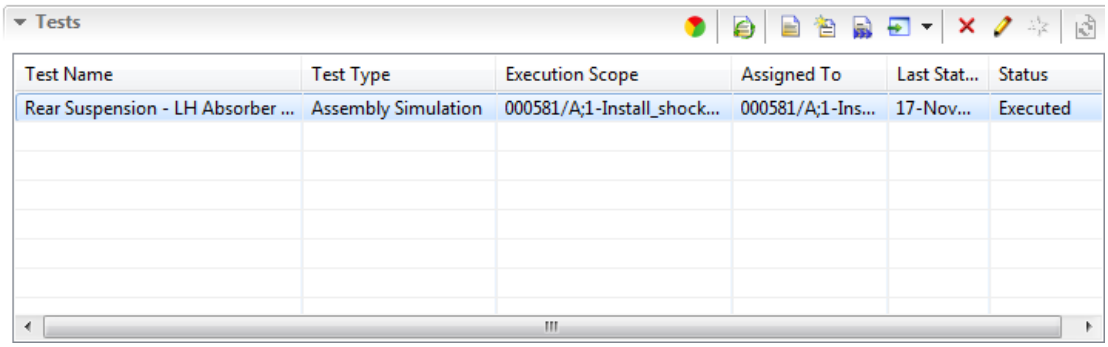
c. In the **New Test** dialog box, click to add the selected part to the **Placeholder Contents** box.

The placeholder text changes from blue to green once objects are added to it.

6. Click **OK**.

The test instance is associated to the scope process and is listed in the **Tests** group of the **Test Manager** view.



7. (Optional) Modify the placeholder contents by clicking .

> Caution:
>
> If you later edit a test instance and receive a warning regarding a missing object reference, one or more of its placeholders are missing a part reference. If you continue despite the warning, when you save the test instance, the missing part references are deleted.
>
> If you must edit a test that is missing an object reference, a best practice is to configure the product to 150% BOM.

Find test case instances associated with a process structure

1. Right-click a line in the process structure and choose **Open With→Test Manager**.

Teamcenter displays the **Test Manager** view with the selected process as the scope of the view. Teamcenter searches for test cases attached to processes or operations from the scope line downwards.

2. Enter search criteria.

- All or part of the test name
- A date representing a starting point from which to search for all tests that have not been executed between the given date and today

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- The test type
- A result status
- A part which is referenced in the test case

3. Click **Search Tests**.

Teamcenter displays all the tests that fulfil the search criteria in the **Tests** section of the **Test Manager** view.

Create and update test results

You can include test results with a test in several ways:

- Send the test to the Process Simulate for processing by clicking . When complete, Process Simulate sends the result back to Teamcenter and it is visible in the **Test Manager** view.
- Create new test results in Teamcenter.

  1. Click **Fill Test Result** .

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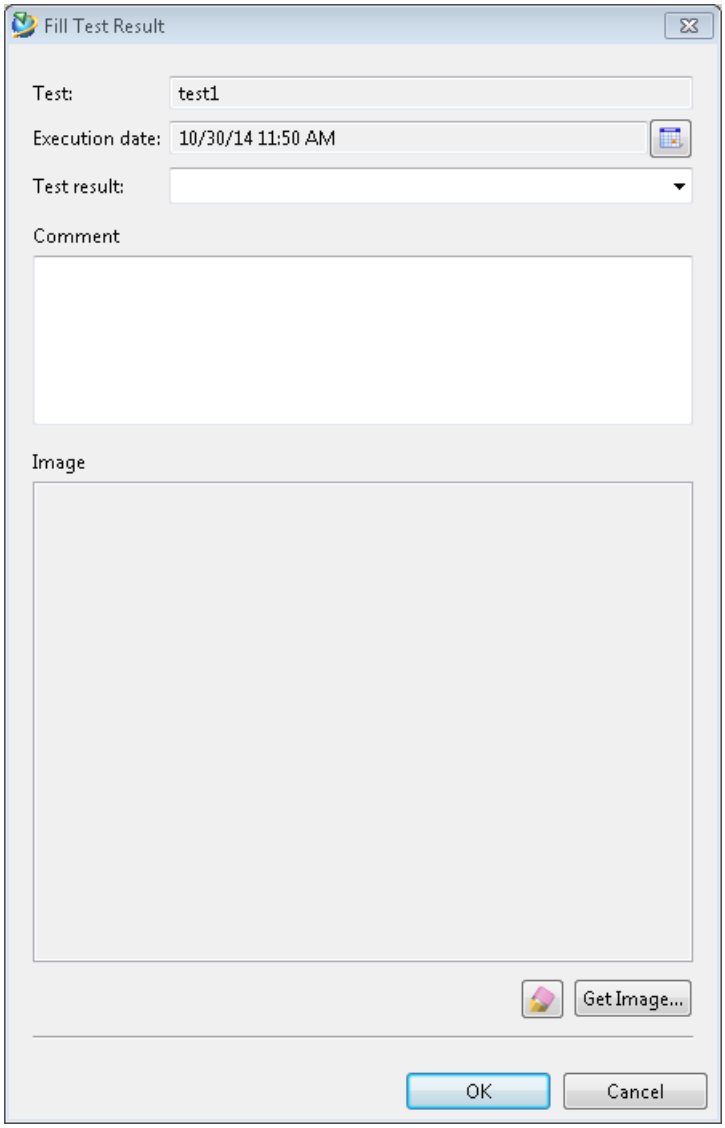

2. Enter an execution date.

3. Select a result from the **Test result** list.

   Teamcenter highlights the test line in a specific color, depending on the status you choose.

   You can modify the colors representing a passed or failed test in the **tm0tsm_TestResultStatus.COLORS** preference.

4. (Optional) Type comments into the **Comment** box.

5. (Optional) Add an image from your operating system.

6. Click **OK**.

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To update the test results:

1. Click **Update Test Result**.

2. Make the required changes.

   When you modify test results using this option, you overwrite the original test results. The original results are not displayed in the **History** section in Process Simulate.

View test result reports and history

- To create a dashboard of the test results, click in the **Tests** section of the **Test Manager** view.

  Teamcenter displays a dashboard representing a consolidated view of the test results. Each sector of the pie chart reflects the number of tests for a specific status.

- To generate a report of the test results, click **View Report** in the **Tests** section of the **Test Manager** view.

  Teamcenter displays an HTML report with the test results. You can customize the contents of this page using the **tm0tsm_ActivityReport.XSL** preference.

- To view the history of a test, select the test and click . All instances of the test execution are listed in the **Test History** dialog box; each can be selected to view the result.

Attachments to test results

You can attach datasets, such as images, documents, and spreadsheets, to test results. The details contained in dataset attachments can be important to understand all aspects of what a test is evaluating.

1. In the **Tests** box at the bottom of the **Test Manager** view, select the test you want to attach a dataset to.

2. On the **Tests** box toolbar, click .

3. In the **Edit Test Results** dialog box, click .

4. In the new dataset dialog box, click the **Test Result** button.

5. Click ....

6. Select the file to attach and click **Upload**.

7. In the **Name** box, type a name for the dataset.

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8. (Optional) Add a description.

9. Click **Apply** to add the dataset, and then click **OK** to add the dataset and close the new dataset dialog box.

10. In the **Edit Test Results** dialog box, click **OK**.

The new dataset is added to the test result.

Using Process Simulate

About Process Simulate

The Process Simulate application allows you to design, analyze, simulate, and optimize manufacturing processes from the factory level down to lines and workcells. It provides optional advanced capabilities that are not available in other Teamcenter manufacturing process management applications. Process Simulate is fully integrated into Teamcenter, and you can send data to it from Manufacturing Process Planner.

For more information about using the features of Process Simulate that are not specific to Teamcenter, see the *Process Simulate Reference Manual*.

Using studies in Process Simulate

You can store simulation data that you want to pass to Process Simulate in a study. If you need to switch between event-based and time based data, you can do so in an isolated study.

Load Process Simulate from Teamcenter

Do one of the following:

- Choose **Send To→Process Simulate**.

  Teamcenter opens a new application each time you choose this command.

- Choose **Tools→Open with Process Simulate**.

  This command enables several loads to be executed within the same application. If a Process Simulate session is already running, it displays a dialog box asking if you want to save unsaved data.

  - If you select **Yes** to save the data, Process Simulate opens the **Update Teamcenter** dialog window. Once the update completes successfully or the update dialog closes, data loading to Process Simulate continues. If the update fails, the data loading to Process Simulate still continues.

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- If you select **No** to discard changes, no Teamcenter update is performed and the loading process continues, discarding the previous data and its modifications.

- If you select **Cancel**, nothing changes in the Process Simulate session, and the loading of new data to Process Simulate is aborted.

> Note:
>
> The **Tools→Open with Process Simulate** command replaces the **Send To→Process Simulate** command beginning with Process Simulate 9.1. If an earlier version of Process Simulate is installed, Teamcenter still displays the **Send To→Process Simulate** command.

Merge scene details

You can take scene data that is assigned to processes in Process Simulate and copy it to another process or merge data from several scenes in Manufacturing Process Planner. A scene is the term used to describe the scope of the information that is passed back and forth between Teamcenter and Process Simulate. Scene details (or scene data) is additional data that is created directly in Process Simulate and cannot be stored in the Teamcenter model. Scene data is stored as XML in a dataset attached to a Teamcenter process, process area, or study.

1. Select the target process, process area, or study to which you want to copy or merge the scene details.

2. Choose **Tools→Merge Scenes**.

   The **Merge Scenes** dialog box is displayed.

3. In the structure views, select the processes or studies whose scene data you want to merge and click .

   > Note:
   >
   > The lines you select as source and target lines must always be the lines that you send to Process Simulate. Only these lines have scene data attached.

4. (Optional) Reorder the processes in the **Scenes to Merge** list by clicking a process and one of the direction arrows to move objects up and down in the list.

   Teamcenter uses the order of the scenes in this list to set the precedence of the scenes when merging. If scene data is contradictory, the scene data of the highest item in the **Scenes to Merge** list has priority over lower items in the list.

5. Click **Merge**.

   Teamcenter merges the scene data and saves the following with the target process.

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Scene objects	Scene information	Scene PLC information
Collision Pairs	Attributes of server objects (color, visibility, attachment)	Logic behavior flags (for example, Fast, Disabled, Error Active)
Dimensions	Device scene level information (instance poses, current configuration, mounted tool for robots)	Sensor flags (for example, Active)
Part Appearances (static)	References to engineering objects (for example, from display/blank events)	Conveyable part frames
Frames	Working frame	Signals (from Signal Viewer, not robot signals)
Notes		PLC Modules
Conveyors		
Logical groups		
Sections		
Section volumes		
Property projectors		
Robotic programs		
Point clouds		
View cameras		

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10. Creating work instructions

Creating, viewing, and editing manufacturing documentation

About manufacturing documentation

Teamcenter manufacturing documentation provides rich work instructions and collaboration between departments, integrated with the planning environment, leveraging Teamcenter data management capabilities.

- Teamcenter Publish

  Provides an environment for creating work instructions for manufacturing operations. Teamcenter Publish enables you to author, distribute, and visualize the most current product and process data. Its main features include:

  - Technical illustrations including text, 2D images, 3D graphics, table, text, and hyperlinks (for example, a link to a movie file) to improve clarity and enhanced quality on the shopfloor.
  - Easy update based on the most current planning data in Teamcenter, reducing rework and update times.
  - Batch processing and scheduling of reports.
  - Familiar Microsoft Visio authoring environment allowing WYSIWYG editing.

Teamcenter Publish

Using Teamcenter Publish

To create or view manufacturing documentation using Teamcenter Publish, install Microsoft Visio. Both Visio Standard and Visio Professional are certified. You can install Visio before or after the Teamcenter installation.

The **Save as PDF** feature is included with Visio and does not require installing the separate PDF add-in.

The administrator creates an alias file that determines the permissible contents of the documentation. For example, if the administrator uses the default alias file, you can create work instructions and product manuals, and a view for each of these is available.

When you first select a documentation view, Teamcenter loads the Visualization Illustration and Visio components. Depending on your workstation, this process may take several seconds to complete and Teamcenter displays a progress dialog box until it is complete.

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Working with publishing tools

You can create publishing pages in the embedded viewer and collect them into portfolios. A typical publishing page is a work instruction document, and a portfolio may contain all the work instructions needed at a particular assembly station. By default after installation, Teamcenter provides you with sample files. To use publishing tools in your environment, you must configure it to suit your needs.

Publishing pages are Visio files that are saved as datasets with the selected BOM line.

Visio documents are constructed using shapes that can appear as text and graphics. A rich library of shapes are provided in the Visio installation.

The Teamcenter publishing tools extend the shape library to include shapes called *assets* that you can link to data in Teamcenter. Assets can display text, tables, images, or a link to a Microsoft Word file or master form. For example, in Teamcenter you can configure a product assembly, view it, add markups, and capture the graphics in a product view (snapshot) that you can then display in a 3D asset. If the data in Teamcenter is subsequently updated, you can update the publishing page to show the changes.

You can organize collections of publishing pages into portfolios, which you can view, publish to HTML for a Web server or publish to PDF, or print in My Teamcenter using the options that appear in the **Graphics** view after you select the portfolio object. A portfolio can contain multiple work instructions, generic pages, header and footer information, a table of contents, and cover and trailer pages.

Publishing page roles

Publishing page documents can be used for any number of purposes. By default, two roles are provided, **Work Instructions** and, when a product structure is selected, **Product Manual**. Your database may be configured to support any number of roles. This documentation refers to the **Work Instructions** role, but the behavior of the pane is the same for each role.

Creating and editing publishing pages

Creating and editing publishing pages overview

When you first open the **Work Instructions** view, you see a blank page.

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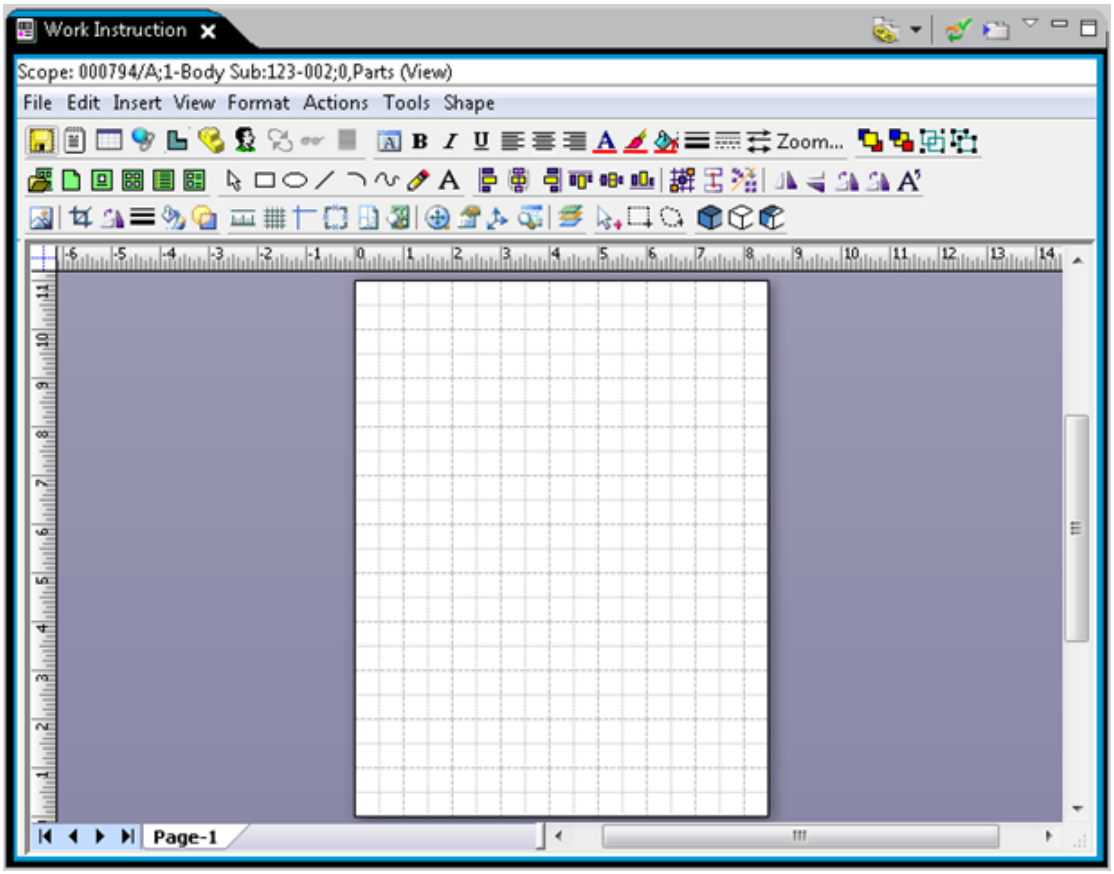

You can immediately begin to create a work instruction on this page or you can load a template and work from there.

The following is an overview of the process for creating a publishing page.

1. Add any static Visio shapes, text or graphics you need to the page.

2. Associate the page with an alias file.

   Alias files tell Teamcenter what data to display in different assets on the page and how to find that data. This step is optional; a default file is loaded.

3. Place the required assets on the page. These are placeholders. You can place the following objects in a work instruction page, each embedded in an asset of the same name:

   - Text that is bound to a property of an object in Teamcenter.
   - Tables whose cells map to object properties in Teamcenter.
   - 2D images (for example, BMP, GIF or JPEG files)
   - 3D geometry assets

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These are objects that you create or view in the embedded viewer, such as a factory view or the desired state of the product at a certain assembly station.

- 2D snapshots

  These are dynamic objects that represent a 2D scene (a view of the base image and markups) that are associated with a BOM line in your product structure.

- Links

  You can create a link to a Microsoft Word file or text file.

4. Associate the asset with a transfer mode and an alias name.

   The transfer mode and the alias tell Teamcenter how to find the data in the database that is displayed in the asset.

5. (Optional) Save this page as a template for reuse.

6. Select one or more assets and an object in Teamcenter to populate the assets.

   This step traverses the structure to find the desired data or files and places them in the selected assets.

The objects used to populate assets depend on which structure line is selected.

> Note:
>
> Be careful when selecting new structures for populating assets. You must first click the **Disable response to selections** button and then select a different structure. If you do not, the scope of the **Work Instruction** view changes and Teamcenter attaches the newly created work instruction dataset to the newly selected structure.

Create a publishing page

1. Right-click the BOM line with which you want to associate the work instructions, for example, the item revision of an assembly or operation, and choose **Open with → Work Instructions**.

   The selected line is the scope for the work instruction that you create. The new work instruction is attached to the line that you select here.

   > Note:
   >
   > Be careful when selecting new structures. You must first click the **Disable response to selections** button then select a different structure. If you do not, the scope of the

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Work Instruction view changes and Teamcenter attaches the newly created work instruction dataset to the newly selected structure.

2. From the menu commands in the **Work Instructions** view, choose **File → New TI Dataset**.

   Teamcenter displays the **New Dataset** dialog box.

3. Type a name and description in the boxes at the bottom of the dialog box and click **OK**.

   Teamcenter creates the new publishing page dataset.

4. To add data placeholders (assets) to the template:

Click	To add
	Data found in a **text file** attached to a structure line.
	A collection of **data** found in various properties in tabular form.
	A **link** to a Microsoft Word file or a text file.
	A **2D image** or a **2D snapshot** attached to a structure line.
	A **3D image** attached to a structure line.

5. Drag these placeholders to the desired spot on the page, resizing if necessary.

6. Right-click the asset and choose **Bind**.

   Teamcenter displays the **Bind Table Placeholder** dialog box.

7. Select the transfer mode and alias to use for the data to populate this asset and click **OK**.

   Note:

   The work instructions are attached to the BOM line with a **IMAN_MEWorkInstruction** relation.

Binding data

Binding assets overview

There are several different types of placeholders (assets) that you can place on a publishing page. Each of these must be bound with data from a structure. When you bind the asset, the **Bind** dialog box contains a list of transfer modes and a number of choices, called aliases, from which you can select.

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The choice you make for each asset defines how Teamcenter finds the data that is displayed in the asset when you populate it.

Bind textual information

You can bind information found in the text field of an object's properties. You can enter free-form text within the asset to complement the bound information. For example:

Operator must tighten **&&SUM(<alias_1>)&&** bolts with torque **&&MAX(<alias_2>)&&** and any other **&&alias_3&&**.

1. In the **Work Instructions** view, click .

   Teamcenter creates a placeholder for the text on the work instruction page.

2. Save the work instruction.

   You must always save a work instruction once to create the dataset before you can populate an asset.

3. Click the **Text Tool** button to add free-form text to the asset.

4. Right-click the placeholder and select **Bind**.

   Teamcenter displays the **Bind Text Placeholder** dialog box.

5. From the **Transfer Modes** list, select **tcm_export** transfer mode.

   You can select only one transfer mode per text alias.

6. In the **Aliases** list, open the **ObjectProperties** entry and select the piece of textual information that you want to embed. You can choose to manipulate the asset data using the list of simple formula.

   Each piece of bound data is added to the end of the text asset. You may have to rearrange the information after binding the data.

7. Click **Add**.

Tip:

- You can also type the binding directly into the text asset if you know the format.
- You can bind multiple times to create free-form text plus embedded text in one asset. Switch back and forth between binding and typing free-form text by doing the following:

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- Click the **Arrow Tool** button and right-click the text asset to access the bind dialog.
- Click the **Text Tool** button and select the text asset to type free-form text.

8. Select the object in the structure view containing the text that you want to embed in the Teamcenter window. For example, if you want to embed the description of a particular item revision, select that item revision in the structure view.

9. In the **Work Instruction** view, with the text placeholder still selected, click the **Populate Asset** button .

   Teamcenter displays the specified text on the work instructions page.

Bind data to display in a table format

Use the table asset to embed multiple pieces of information about a selected object.

1. In the **Work Instructions** view, click .

   Teamcenter creates a placeholder for the table on the work instruction page.

2. Save the work instruction.

   You must always save a work instruction once to create the dataset before you can populate an asset.

3. Right-click the placeholder and select **Bind**.

   Teamcenter displays the **Bind Table Placeholder** dialog box.

4. From the **Transfer Modes** list, select **tcm_export** transfer mode.

5. In the **Aliases** list, open the appropriate alias, and select the type of information you want in the list and click the plus sign.

   If you select multiple entries, the selected objects appear as columns of the table in the same order as in the **Aliases** pane.

6. Click **OK**.

7. Select the revision in the structure view containing the objects that you want to embed in the Teamcenter window. For example, if you want to embed the ID, name, and description of all members of an assembly, select the assembly root structure in the structure view.

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8. In the **Work Instruction** view, with the table placeholder still selected, click the **Populate Asset** button .

   Teamcenter displays the specified information on the work instructions page.

Bind linked data

To bind linked data, a dataset with a **.txt** file imported into it must exist. In addition, you must be able to open this **.txt** file in an associated text editor.

1. In the **Work Instructions** view, click .

   Teamcenter creates a placeholder for the link on the work instruction page.

2. Save the work instruction.

   You must always save a work instruction once to create the dataset before you can populate an asset.

3. Right-click the placeholder and choose **Bind**.

   Teamcenter displays the **Bind Link Placeholder** dialog box.

4. From the **Transfer Modes** list, select the **ExportGraphic** transfer mode.

5. From the **Aliases** list, select **LinkedDataset**.

6. In the **Attachment** view, select the text dataset and click **Populate** in the **Work Instructions** view.

   Teamcenter displays the link on the work instructions page.

Bind a 2D image

You can bind a 2D image that is attached to a revision.

1. In the **Work Instructions** view, click .

   Teamcenter creates a placeholder for the image on the work instruction page.

2. Save the work instruction.

   You must always save a work instruction once to create the dataset before you can populate an asset.

3. Right-click the placeholder and select **Bind**.

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Teamcenter displays the **Bind Image Placeholder** dialog box.

4. From the **Transfer Modes** list, select **ExportGraphic** transfer mode.
5. In the **Aliases** list, open the **2DGraphic** entry and select **file**.
6. Open the **Attachments** view.
7. Select the image that you want to embed.
8. In the **Work Instruction** view, with the image placeholder still selected, click the **Populate Asset** button .

   Teamcenter displays the selected image on the work instructions page.

Bind a 2D snapshot

If you embed a 2D snapshot, a **2D geometry asset**2D geometry asset must exist for it.

1. In the **Work Instructions** view, click .

   Teamcenter creates a placeholder for the image on the work instruction page.
2. Save the work instruction.

   You must always save a work instruction once to create the dataset before you can populate an asset.
3. Right-click the placeholder and select **Bind**.

   Teamcenter displays the **Bind Image Placeholder** dialog box.
4. From the **Transfer Modes** list, select **ExportGraphic** transfer mode.
5. In the **Aliases** list, open the **2DSnapshot** entry and select **file**.
6. Do one of the following to specify which 2D snapshot should be populated:

   - In the **Attachments** view, select the snapshot.
   - In the **2D Viewer** view, open the **2D Snapshots Gallery** dialog window and select an existing snapshot.
   - In the **2D Viewer** view, arrange the snapshot. When you populate the asset, Teamcenter automatically creates the snapshot for you.

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7. In the **Work Instruction** view, with the image placeholder still selected, click the **Populate Asset** button .

   Teamcenter displays the 2D snapshot on the work instructions page.

   > Note:
   >
   > If you receive an error saying **Failed to load Error document (2DSnapshot & file)** when populating a 2D asset, the 2D snapshot does not contain a 2D geometry asset.
   >
   > Recapture the 2D snapshot with the option to capture 2D geometry asset data turned on.

Bind a 3D asset

1. Open a structure to which you want to attach a work instruction.
2. In the **Work Instructions** view, click the **3D Graphic** button .

   Teamcenter creates a placeholder on the work instruction page.
3. In the **Work Instructions** view, select **File → Save TI Illustration**.

   You must save the work instruction once to create the dataset. If you do not save first, you receive an error when populating the asset. Once the dataset exists, this step is no longer required, unless you want to save changes to the work instruction page.
4. Right-click the placeholder and select **Bind**.

   Teamcenter displays the **Bind Geometry Asset Placeholder** dialog box.
5. From the **Transfer Modes** list, select **ExportGraphic** transfer mode.
6. In the **Aliases** list, open the **3DGeometryAsset** entry and select **file**.
7. Do one of the following to specify which 3D geometry should be populated:

   - In the **Graphics** view, open the **3D Product View Gallery** dialog box, create a snapshot, then select it.

     > Caution:
     >
     > You must ensure that the **Add or Update 3D Geometry Asset** option is selected before you create a snapshot.

   - In the **Attachments** view, select the 3D snapshot.

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- In the **Graphics** view, arrange the snapshot. When you populate the asset, Teamcenter automatically creates the snapshot for you.

8. In the **Work Instruction** view, with the placeholder still selected, click the **Populate Asset** button .

   Teamcenter displays the 3D geometry asset on the work instructions page.

Populate an empty asset

When you populate an asset, you associate Teamcenter data with it.

1. Select the asset.

2. Select the object in Teamcenter to which you want to link the asset.

3. Disable response to selections by clicking .

   When selecting structures to populate assets, it is important to understand the role of the **Disable response to selections** button. Clicking this button locks the view so that when you select a line in a different structure, the scope of the view does not change and the work instruction dataset, when created, is attached to the originally selected structure line. If the view is not locked (it responds to selection), when you select a line in a different structure to populate an asset, the work instruction dataset is attached to the newly selected structure line.

4. Click the **Populate Asset** button or menu command.

Working with templates

Creating a publishing page template

Your site may provide publishing page templates whose content can be used as the starting point for the creation of a new publishing page. A publishing page template is a publishing page dataset that is not populated with actual data.

A page template may contain standard data such as a company logo, pictures, and required text. It may also contain empty placeholders, whose content you must fill for each instance of a publishing page you create from the template.

You can classify templates in the Classification application for easy retrieval.

Classify a template

1. Add the **TCPublishingPage** business object type to the **ics_classifiable_types** preference.

2. Create a publishing page template.

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3. In the **Attachments** view, select the template and choose **Send to→Classification**.

4. In Classification, classify the template.

The template is now available when you create a new publishing page from a template.

Create a publishing page from a template

1. If you know the name of the required template, type it in the **Template name** box.

   If you do not know the name of the template, you can search the database for it. In the **Templates** pane at the top of the dialog box, click the **Find a Template by name** button next to the **Template name** box.

   Teamcenter displays the **Find by Name** dialog box, and you can search by part of the name and with wildcard (*) characters.

   If templates are classified, you can click Classification Search Dialog to find the template you require.

2. When you identify the publishing page you want to use as a template, double-click the name to select it and return to the **New Dataset** dialog box.

3. (Optional) Click the **Add To Favorites** button to add the selected template to the list in the **Templates** pane above it. Publishing pages for activities are tracked separately from other publish pages.

4. (Optional) Click the **Use as Default** button to use the specified dataset as the default template if no TI dataset is loaded.

5. In the **File** section, select **Use Template**.

6. Type a name and description in the relevant boxes.

7. Click **OK**.

   Teamcenter creates the new publishing page dataset.

Using default templates

All of the default templates contain 3D geometry assets. You can add the following details to specific page templates.

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Template	Purpose
TCPartList	Specifies the part list table. When populated, it lists all the parts under the selected BOM line. It includes the item identifier, item name, revision identifier, description, and find number of each part in the list.
TCAssemblyOperation	Use this template at the operation level in a manufacturing structure. It briefly describes the operation, its activities, the consumed parts, and tools required to perform the operation. The **Activities** table lists all the activities under the selected operation, their descriptions and durations. The consumed parts table lists the parts consumed by the selected operation, their identifiers, names, revision identifiers, descriptions, and logical identifiers. The **Tools** table lists the set of tools required by the operation, their identifiers, names, and descriptions.
TCOperationRouting	This template lists manufacturing process details, including the operations under it, the consumed parts of those operations and the list of tools used in those operations. Use this template at the process level. The **Operations List** table lists all the operations under the selected process. The consumed parts table lists all the consumed parts under all the operations below the process. The **Resource List** table lists all the resources under all the operations below the process.
TCActivityDetails	This template describes the activities under an operation. Use this template at the operation level of a structure. For each activity, the name, description, start time, duration, calculated start time, and calculated duration are listed.
TCActivityRouting	This template lists manufacturing activity details, including the operations under it. Use this template at the operation level.
TCActivityToolList	This template contains detailed description of the activities in the structure. It may also be used at the operation level. It lists the following activity details: • The **Activities Consumed Parts** table lists all the activities, their descriptions, and the parts consumed in each of these activities. • The **Activities Used Resources** table lists all the activities, their descriptions, and resources used in each of the activities.

Example — Populate assets using the TcPartList template

Teamcenter delivers several templates that are ready for you to use. The following is an example of how to use the **TcPartList** template.

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1. Load a product assembly. To use the 3D asset, you must load an assembly that displays parts in the assembly viewer.

2. Select a BOM line to which you want to add a publishing page. You can select the top line, if necessary.

3. Open the **Work Instruction** view or some other publishing page view.

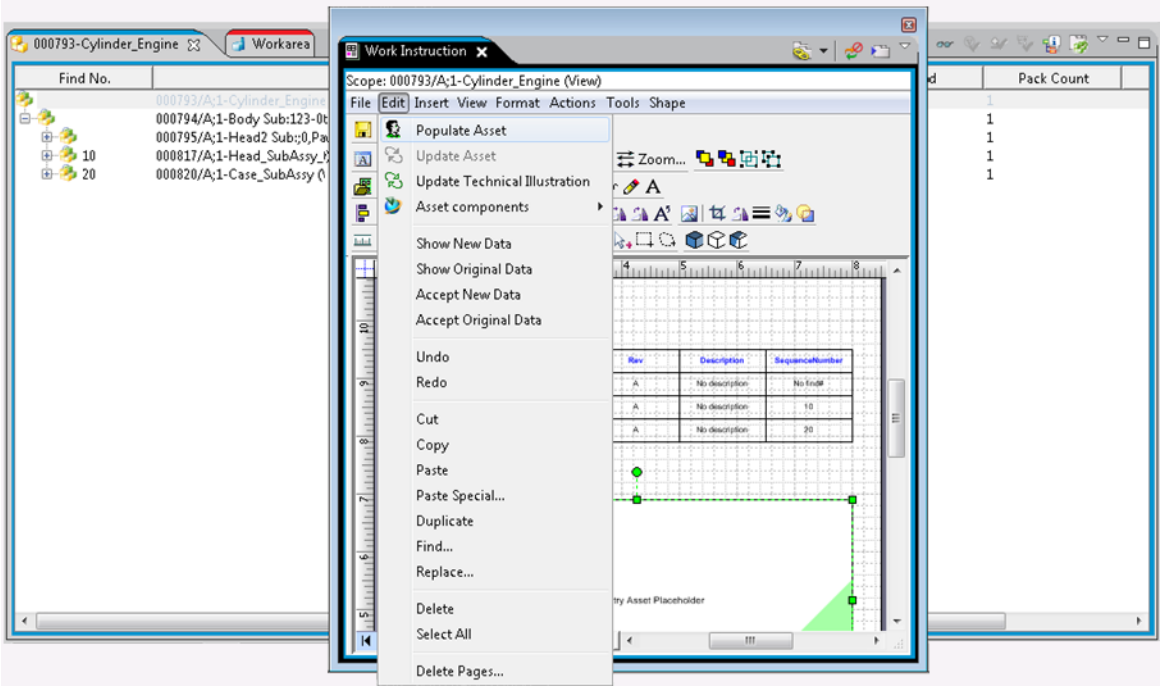
4. Hide the response to selections by clicking .

5. In the publishing page view, select **File→New TI Dataset**.

6. In the dialog box, find the **TcPartList** template by name and use it as the starting template.

7. Specify a dataset name and click **OK**. The template should appear in the publishing page viewer.

8. Populate the table assets by selecting the node (BOM line) whose data you want to populate in the table asset component in the relevant structure view. Then select the table asset component in the publishing page view and choose **Edit→Populate Asset**.



9. Populate the 3D geometry asset as follows:

   a. Click the **Graphics** view to make it the active view.

   b. Turn on parts and use the 3D viewer to manipulate the view until it shows what you want to see in the asset. Include markups if desired.

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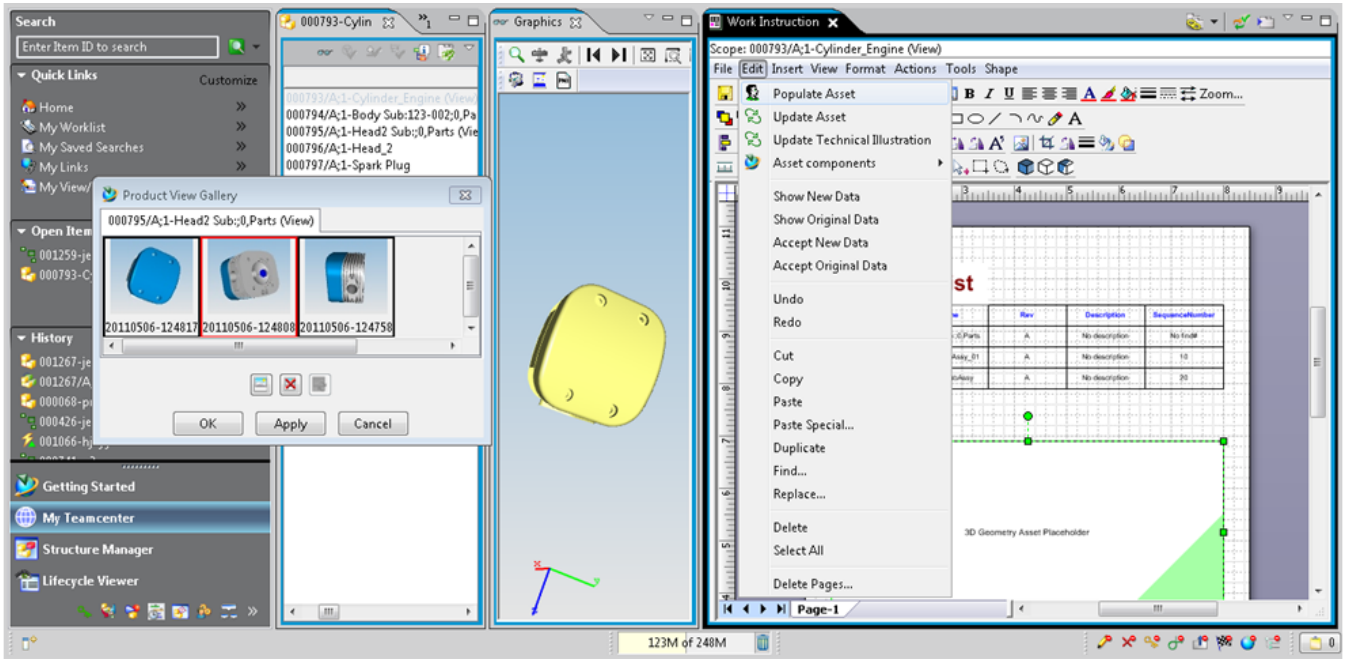
c. Ensure that a BOM line is still selected, then select the 3D asset in the publishing page viewer and select the **Populate** button. This creates a new snapshot (product view) dataset and populates the asset with it. You can also populate a 3D asset from an existing snapshot. However, the dataset must have an asset file attached to it. Asset file creation is an option; use the named reference dialog to determine whether or not the dataset has an asset file.

- Select a snapshot dataset in the **Attachments** view or in another application.
- Select a 3D snapshot (product view) in the **Product Views** dialog box of the assembly viewer. Asset file creation is controlled by a menu in this dialog box.



Updating publishing pages

When an asset is populated, a reference to the selected Teamcenter populating object is stored in the asset. If the data in Teamcenter changes, you can update the asset to show the changes. Updating is not automatic; you must explicitly perform an update.

Take, for example, the **TcPartList** template's table. Long after you create the publishing page and populate the table asset, the product structure can be modified. Item names can change or BOM lines can be added or removed from the line that was used to populate the table. After this happens, you can update the publishing page to show the changes.

Update an asset

1. Open the page dataset in a publishing page viewer anywhere in Teamcenter.

2. Select the asset and choose **Edit** → **Update Asset** from the page viewer menu.

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The new contents of the asset are displayed, along with a triangle indicating that the display shows new (and so far unaccepted) data.

3. Switch between displaying the old and the new data by choosing **Show Original Data** and **Show New Data** from the asset's shortcut menu. The asset is in an uncommitted state. You cannot update the asset again or repopulate it while it is in this state.

4. Accept or reject the change by choosing **Accept New Data** or **Accept Original Data** from the asset's shortcut menu. All of the assets on a page can be updated at once using the publishing page **Edit** → **Update Technical Illustration** menu. Other **Edit** menus let you toggle the display and accept or reject the changes for all of the assets on the page at once.

> Note:
>
> You cannot update data in the database (other than the publishing page itself) by updating an asset. Assets can only display what is already in the database. To update a 3D asset, you must first update the snapshot dataset in the assembly viewer.

Repopulate an asset

An asset that has been populated can be repopulated with a different Teamcenter component.

1. Select the asset in the publishing page view.

2. Select the component in another view, and choose **Edit** → **Populate Asset** in the publishing page view.

3. Switch between displaying the old and the new data by choosing **Show Original Data** and **Show New Data** from the asset's shortcut menu. The asset is in an uncommitted state. You cannot update the asset again or repopulate it while it is in this state.

4. Accept or reject the change by choosing **Accept New Data** or **Accept Original Data** from the asset's shortcut menu. All of the assets on a page can be updated at once using the publishing page **Edit** → **Update Technical Illustration** menu command. Other **Edit** menus let you toggle the display and accept or reject the changes for all of the assets on the page at once.

> Note:
>
> You cannot update data in the database (other than the publishing page itself) by updating an asset. Assets only can display what is already in the database. To update a 3D asset, you must first update the snapshot dataset in the **Graphics** view.

View populating and end objects

The populating object is the one that was selected when the asset was populated. The end object is the object that is actually displayed in the asset after it is populated. These can be the same object, or different ones, depending on your alias definition.

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You can view these objects.

1. Select the asset in the **Work Instructions** view.

2. Do one of the following:

   - To show the populating object in My Teamcenter, choose **Edit** → **Asset Components** → **Send to My Teamcenter** → **Populating Components**.
   - To show the end object in My Teamcenter, choose **Edit** → **Asset Components** → **Send to My Teamcenter** → **End Object**.
   - To view the populating object in the default viewer without switching applications, choose **Edit** → **Asset Components** → **View Populating Components**.
   - To view the end object in the default viewer without switching applications, choose **Edit** → **Asset Components** → **View End Object**.

> Note:
>
> These menu commands may not work depending on how the alias file is implemented. For more information, contact your administrator.

Create a new work instruction

1. Select the BOM line with which you want to associate the work instructions, for example, the item revision of an assembly or operation.

2. Open the **Work Instructions** view.

3. In the **Work Instructions** view, choose **File** → **New TI Dataset**.

   Teamcenter displays the **New Document** dialog box.

4. If your site uses templates, select the name of a template, enter a dataset name, and click **OK**.

   > Note:
   >
   > The work instructions are attached to the BOM line with a **IMAN_MEWorkInstruction** relation.

Add new pages to the work instructions or product manual

- Choose **Insert** → **New Page**.

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Teamcenter adds a new, blank page to the active work instructions or product manual. You can also search for an existing page by name or use a Classification search to find a classified page.

Delete pages from the work instructions or product manual

1. Choose **Edit** → **Delete Pages**.

   Teamcenter displays the **Delete Pages** dialog box containing a list of available pages.

2. Select the page to delete and click **OK**.

   Teamcenter deletes the page from the work instructions or product manual.

Save changes to the work instructions or product manual

- Choose **File** → **Save**.

Teamcenter saves any changes that you made.

Reserve space for headers and footers

You reserve space for headers and footers on a publishing page. When you print or export the work instructions or product manual, any shapes on the publishing page are clipped to the defined margins.

1. Open the work instructions.

2. Choose **View** → **Page Margins**.

   Teamcenter adds a gray-shaded background at the top, bottom, left, and right of the page.

Add export tags

You can add export tags to a page that are replaced with actual information when you print or export it. For example, if you select **page**, the actual page number appears. Additional export tags include date, long date, document file name, portfolio file name and total number of pages.

1. Open the work instructions or product manual.

2. Choose **Insert** → **Portfolio Export Tag** and select a tag from the displayed list. The tag you select appears on the work instructions or product manual.

3. (Optional) Move or resize the export tag on the work instructions or product manual.

Navigate to another publishing page

Use one of the following methods to navigate to another publishing page:

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1. Choose **View** → **Page** → **Go to**.

   Teamcenter displays the **Select Page** dialog box.

2. Select the page to you want to navigate.

- or -

Use the navigation arrow buttons to browse through the available pages.

Export publishing pages to HTML

1. Choose **File** → **Save as Web Page**.

   Teamcenter displays the **Save As** dialog box.

2. Type a name for the exported file and click **Save**.

   Teamcenter displays the **Save as Web Page** dialog box.

3. Change settings for the following options:

Tab	Options	Description
General tab	**Pages to Publish**	Choose **Select All** to print all pages or **Select Pages from** and then type the page span.
	Publishing options	Select any of the publishing options, which appear in the finished Web page to aid navigation and searching.
	Additional options	Choose any of the following: • **Automatically open Web page in browser** • **Organize supporting files in a folder** • Type text in the **Page title** box to name the exported HTML output.
Advanced tab	**Output formats**	Select a format for the HTML output.
	Provide alternate format for older browsers	Choose a format from the list.
	Target monitor	Choose the monitor size.

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Tab	Options	Description
	Host in Web page	Select a Web page from the list or browse to a file.
	Style sheet	Select a style sheet from the list or browse to a file.

4. Click **OK**.

   Teamcenter displays the publishing pages as a Web page in your default browser.

Export publishing pages to PDF

You can print a portfolio to PDF in My Teamcenter. Before you do this, you must install third party software capable of creating PDF output.

1. Create a portfolio.

2. Open My Teamcenter.

3. In the **File** menu on the viewer tab, choose **Publish PDF to Database**.

Creating a portfolio

About portfolios

Portfolios act as a container for work instructions or product manuals and supporting documents, such as a table of contents, cover or trailer pages, and header and footer information. Portfolios may contain a reference to a publishing page or generic page or to an embedded generic page. You can use portfolios to store document structure information, print multiple publishing pages, and export portfolio contents to HTML or PDF.

You generate portfolios in Manufacturing Process Planner, Part Planner, Multi-Structure Manager, Service Planner, or Plant Designer. You manage portfolios in My Teamcenter only.

When managing a portfolio:

- Use container nodes to add an organizational hierarchy to the portfolio. Think of container nodes as chapters in a book, in which you can separate and group documents. Container nodes are useful for multiple levels in the table of contents.

- During printing operations, Teamcenter creates the table of contents information in a dynamic page.

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- Create generic pages for any information page to add to the portfolio, such as cover or trailer pages. Generic pages are not considered publishing pages and Teamcenter does not apply headers and footers to them.

- Add header and footer information to portfolios by creating a special page. Teamcenter copies the shapes in this page to the published pages during printing and export operations. The same header and footer appears on every page.

- When adding supporting documents to portfolios, choose from the following options:

  - **Insert Reference**

    Select a supporting document for the portfolio to reference.

  - **Create**

    Add a new supporting document that Teamcenter embeds in the portfolio. You can only create and embed generic pages.

  - **Embed**

    Copy a supporting document into the portfolio.

Create a portfolio

1. Select the BOM line to which you want to associate the portfolio, which may be a configured item or process revision or occurrence in the structure. The portfolio contains the publishing pages that are attached to the BOM line's child lines.

2. In the Teamcenter window, choose **Advanced → Generate Portfolio**.

   Teamcenter displays the **Generate Technical Portfolio** dialog box.

3. In the dialog box, enter a name and select a role such as **Work Instructions** and click **OK**.

   Teamcenter creates a portfolio dataset that contains all of the appropriate pages. The portfolio is created under an intermediate data capture (IDC). If a structure context is opened, the IDC is attached to the structure context. Otherwise it is stored in the **New Stuff** folder.

4. (Optional) To view the portfolio, select it in My Teamcenter and click the viewer tab.

   > Tip:
   >
   > Note the menu and toolbars in the **Graphics** view. These commands help you manage portfolios.

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Create container nodes

You can create one or more container nodes in the portfolio in My Teamcenter in the viewer.

1. Select the portfolio in the **Newstuff** folder in My Teamcenter.

   Teamcenter opens the viewer.

2. Using the menu commands within the **Viewer** view, do one of the following:

   - Choose **Actions** → **Create** and select **Container Node**.
   - On the **Technical Portfolio** toolbar, click the **Create container** button .

Create the table of contents

You can create the table of contents for a portfolio in My Teamcenter in the viewer.

1. Select the portfolio in the **Newstuff** folder in My Teamcenter.

   Teamcenter opens the viewer.

2. Using the menu commands in the viewer, do one of the following:

   - Choose **Actions** → **Create** and select **Table of Contents Placeholder**.
   - On the **Technical Portfolio** toolbar, click the **Create table of contents** button .

Add a generic page

You can add a generic page to a portfolio in My Teamcenter in the **Portfolio** pane.

1. Select the portfolio in the **Newstuff** folder in My Teamcenter.

   Teamcenter opens the **Portfolio** pane.

2. Select an area to place the generic page.

3. Using the menu commands within the **Portfolio** pane, do one of the following:

   - Choose **Actions** → **Create**, **Actions** → **Insert Reference** or **Actions** → **Embed**, and select **Generic Page**.

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> Note:
>
> You cannot search using the classification search if working in My Teamcenter.

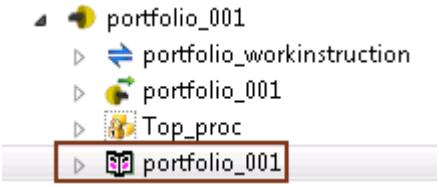
- On the **Technical Portfolio** toolbar, click the **Create generic page** button .

Add a new page in My Teamcenter

When you edit a portfolio in My Teamcenter, you can insert pages by choosing the **Insert Reference→Technical Illustration** or **Generic Technical Illustration** menu commands. In the resulting dialog box, the Classification search button is not available. To use the Classification search, you must send the portfolio to Manufacturing Process Planner.

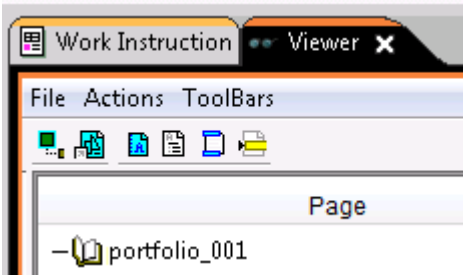
- If you created the portfolio using the **Generate Portfolio** menu command:

  1. Select the portfolio in My Teamcenter and send it to Manufacturing Process Planner.



  2. Open the **Collaboration Context** view and expand the portfolio intermediate data capture.

  3. Right-click the portfolio and choose **Open With→Viewer**.



  4. Choose **Actions→Insert Reference→Technical Illustration** or **Generic Technical Illustration**.

  The Classification search is available.

- If you do not generate the portfolio from the menu command, you can view the portfolio in Manufacturing Process Planner as follows:

  1. Create an item.

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2. Copy the portfolio dataset and paste it to the item revision.

3. Send the item revision to the Manufacturing Process Planner application.

4. Open the **Collaboration Context** view and proceed as above. You can copy the dataset from the Classification Search Dialog to the clipboard and paste it into the portfolio dataset in My Teamcenter.

Create a header and footer page

You can create a header and footer page in a portfolio in My Teamcenter in the viewer. Teamcenter copies the shapes in this page to the published pages during printing and export operations. The same header and footer appears on every page.

1. Select the portfolio in the **Newstuff** folder in My Teamcenter.

   Teamcenter opens the viewer.

2. Select an area in the portfolio to place the header and footer page.

3. Using the menu commands within the viewer, do one of the following:

   - Choose **Actions** → **Create**, **Actions** → **Insert Reference** or **Actions** → **Embed**, and select **Header/Footer Definition Page**.

   - On the **Technical Portfolio** toolbar, click the **Create header/footer data** button .

   Teamcenter opens a new viewer window with a blank page.

4. Using the commands in the new window, choose t **Insert** → **Portfolio Export Tag** and select one of the following:

   - **Date**

   - **Long Date**

   - **Document File Name**

   - **Portfolio File Name**

   - **Pages**

   - **Total Number of Pages**

   Teamcenter creates a placeholder for the object on the page.

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5. Move the placeholder to the desired position.

6. When you have placed all desired export tags, choose **File** → **Post to Technical Portfolio**.

7. Click **Close**.

8. In the viewer, click **File** → **Save**.

Modify header and footer information

1. Select the portfolio in the **Newstuff** folder in My Teamcenter.

   Teamcenter opens the viewer.

2. Right-click the header and footer page in the portfolio tree and choose **Open**.

3. Make any necessary changes.

4. Choose **File** → **Post to Technical Portfolio**.

5. Click **Close**.

6. In the viewer, click **File** → **Save**.

Add a work instruction

1. Select an area in the portfolio to place the work instructions.

2. Do one of the following:

   - Choose **Actions** → **Insert Reference** and select **Technical Illustration**.
   - On the **Technical Portfolio** toolbar, click the **Technical Illustration** button.

   The system displays the **Insert Page** dialog box.

3. Click the **Find a page by name** button and type the name of the work instruction that you want to add.

4. Click **Open**. The work instruction you chose appears in the tab.

Publish a portfolio to HTML

You can publish a portfolio on a Web server by exporting its contents in HTML format. This allows consumer users access to work instructions or product manuals from any Web browser.

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1. Choose **File → Publish Zip to Database**.

   The system displays the **Publish to HTML Options** dialog box.

2. Edit the export options in these ways:

Tab	Options	Description
General tab	**Destination Folder**	Specify the destination folder where the export data is written by clicking **Save**. Note: Specifying the destination folder is the only required selection in this dialog box. All other options in this dialog box are discretionary selections.
	Create zip file	Create a ZIP file of all export data. Click the **Browse** button to specify the location of the ZIP file. Use this option to allow users without access to Teamcenter to view the data.
	Use title page template	Use a template file for the main HTML title page. Click the **Browse** button to choose the HTML file.
	Replace or remove logo	By default, the HTML output includes the Siemens Digital Industries Software logo. To replace the default Siemens Digital Industries Software logo graphic, click the **Browse** button to locate a replacement graphic. To remove the default Siemens Digital Industries Software logo graphic, click the **Remove** button.
Export Options tab	**Stop if error occurs**	Stop the export operation if an error is encountered.
	Produce flat output	Remove the portfolio structure and document hierarchy.
	Publishing options	Indicate specific control panes to be included in the HTML output for each published page.

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Tab	Options	Description
		• Choose **Show Details** to display custom shape properties. • Choose **Go to Page** to include navigation for multi-page work instructions or product manual. • Choose **Search** to enable the ability to search shapes. • Choose **Pan and Zoom** to enable panning and zooming on a page. Note: The **Publishing Options** option is only applicable if you select **VML** for the **Output** format (**VML** is the default). VML output only displays **Publishing Options** if you use the Internet Explorer browser.
Advanced Options tab	**Output formats**	Choose the primary output format for the exported published pages.
	Provide alternate format for older browsers	Indicate a secondary output format for exported published pages, used for older browsers.
	Display options	Select a target monitor size.

3. Click **OK**.

   The Report Definition wizard displays the status of the export operation.

   Note:

   Name lists the supporting documents in the portfolio; **Status** indicates if the supporting documents were exported.

4. Click **Next**.

   The system displays the **Create Report Output** dialog box.

5. Create a standard or custom report output format.

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Publish a portfolio to PDF

You can create a PDF file from the portfolio that is attached as a dataset provided you have Microsoft Office installed.

1. Select the portfolio in the **Newstuff** folder in My Teamcenter.

   Teamcenter opens the viewer.

2. Using the menu commands in the viewer, choose **File** → **Publish PDF to Database**

   Teamcenter creates the PDF and attaches it to the portfolio dataset. You can view it in the viewer.

Creating manufacturing documentation in batch mode

Creating manufacturing documentation in batch mode overview

You can create and update Teamcenter work instructions and portfolios in batch mode, processing multiple documents using the **Teamcenter Publish Batch** dialog box. You do not need to process individual documents manually. You can schedule these tasks to take place immediately or at a later date.

Batch processing uses the Dispatcher infrastructure for scheduling create and update features. Additionally, Dispatcher has built-in status, logging, and error reporting features.

Create or update publishing pages in batch mode

1. Select one or multiple lines in a structure.

   These objects are typically processes, operations, items, or activities that can have publishing pages associated with them. You can select one or more Teamcenter objects for direct batch processing or specify that each object is to be treated as a root object and its children traversed.

2. In Manufacturing Process Planner, choose **Advanced** → **Publish Batch**.

   Teamcenter opens the **Publish Batch** dialog box.

3. Enter the parameters for the **Set Role and Scope** step.

   a. Select the paste relation used between the new page and its associated end object from the **Publishing Page Role** list.

      The roles available are set in the **TCPUBLISH_BATCH_ROLE** preference.

      This information is required.

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b. Select the type of action you want to perform from the **Batch Task** section.

- Select **Create and Update** to initiate a create task with an update option. The batch task creates pages where they do not exist and updates pages that do exist.
- Select **Update Only** to only update existing pages.

c. Specify the scope of the page creation in the **Batch Process Scope** section.

- Select **Process entire structure** to have the create task traverse the entire structure of each selected structure, even if a child line of a structure is selected.
- Select **Process selected lines** to create a page for the selected object(s) only. If you want to create a page for the selected object and all its child objects, additionally select **Process selected lines substructure**.

4. Enter the parameters for the **Set Update Parameters** step.

- Select **Update All** to:
  - Generate all missing pages.

    Teamcenter generates a new page for each new object it encounters.
  - Update populated assets.

    Teamcenter checks that all assets display the most current data.
  - Populate unpopulated assets.

    Teamcenter associates data with any empty assets.
  - Process all asset types.

    Teamcenter performs these activities on all asset types found in the work instruction.
- Select **Selective Update Options** to only perform specific update actions.

5. Associate classes with templates in the **Select Types and Templates** step.

The **Mark class types to process** list displays the types of objects that can have publishing pages associated with them.

The **Mark templates to be used with** list contains templates that you associate with a class or type by selecting both the class and the template.

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If you select **None** in the templates list, the class or type is not processed.

A type level association overrides the class level definition.

6. (Optional) Add more templates to the templates list.

   a. Click **Add Templates**.

   b. Type a template name in the **Template Name** box.

   c. Click **Search by Name** to search in the database for a template or **Search by Class** to search the classification hierarchy for a classified template.

   d. (Optional) If you are going to use this template repeatedly, add it to a favorites list by clicking **Add to Favorites**.

   e. Do one of the following:

      - Click **Add** to add the current selection to the **Mark templates to be used with class/type** list.
      - Click **OK** to close the dialog box and keep changes to the favorites list.
      - Click **Cancel** to close the dialog box without keeping changes to the favorites list.

7. (Optional) Enter the parameters for the **Define Portfolio Parameters** step.

   A *portfolio* is a container for work instructions. You can use portfolios to store document structure information, print multiple publishing pages, and export portfolio contents to HTML.

   a. Select **Generate a Portfolio**.

   b. Type a name for the portfolio in the **Portfolio Name** box.

   c. Type a description of the portfolio in the **Portfolio Description** box.

   d. (Optional) Select **Use a template** to select a template from the database.

      For more information about using templates, see step 6.

8. Enter the parameters for the **Schedule the Batch Process** step.

   You can schedule the batch process for a specific date and time.

   - Select **Immediate** to initiate the task at the current date and time. Clicking **Finish** on any page without previously selecting scheduling parameters also initiates the task immediately.

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- Select **Scheduled** to select a specific start date and time.
- Select **Periodical** to schedule a task that recurs at a specific date and time. You can specify a recurrence pattern on a daily, weekly, monthly, or yearly basis.

9. Click **Finish**.

Update a portfolio in batch mode from My Teamcenter

You can schedule a portfolio for updating in batch mode in My Teamcenter.

1. Open My Teamcenter.
2. Right-click a portfolio dataset and choose **Batch Update Pages**.

   Teamcenter opens the **Publish Batch** dialog box where you can schedule the batch process for a specific date and time.

3. Enter the parameters for the **Schedule the Batch Process** step.

   - Select **Immediate** to initiate the task at the current date and time. Clicking **Finish** on any page without previously selecting scheduling parameters also initiates the task immediately.
   - Select **Scheduled** to select a specific start date and time.
   - Select **Periodical** to schedule a task that recurs at a specific date and time. You can specify a recurrence pattern on a daily, weekly, monthly, or yearly basis.

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Creating textual work instructions using standard text

Authoring work instructions

Authoring work instructions overview

You can write new work instructions, or edit existing work instructions in the **Textual Work Instructions** view if the access control list permits. Work instructions are associated with operations or processes in a process structure.

The **Textual Work Instructions** view opens in view mode (read-only). When entering edit mode, Teamcenter checks out the operation or process and enables editing. When exiting edit mode, Teamcenter checks in the operation or process and filters out editing. If you want to edit the work instructions on multiple operations, you can check them out manually before you begin. This decreases the time it takes to edit each individual work instruction.

If this is the first editing session for the current work instructions document, Teamcenter loads the work instructions template, as defined in the **MEWiWorkInstructionTemplate** preference.

You can double-click the work instructions preview datasets in the Teamcenter **Attachments** view to open them in their associated applications. For example, if the preview file is stored in PDF format, it opens in a PDF reader.

The preview file is in one of the following formats: PDF, MHT, DOCX, or RTF, as configured in the **MEWiPreviewFormat** preference.

All editing changes take effect only after you perform a **Save** operation. For example, if you search for a text snippet in the **Structure Search** view, your search only returns results for already saved text snippets.

When adding standard text elements (from a standard text library) to work instructions documents (associated with operations or processes in a process structure), ensure that both the library structure and the process structure have the same configuration rule. If the configuration rule of the library structure and the process structure are different, you may be adding data with the incorrect revision. In this case, Teamcenter issues a message to inform you what has happened.

The following figure displays a process structure and a standard text library structure. The two views on the right are the **Textual Work Instructions** view displaying the work instructions document of an operation, and beneath it the **Standard Text** view displaying a preview of a standard text element.

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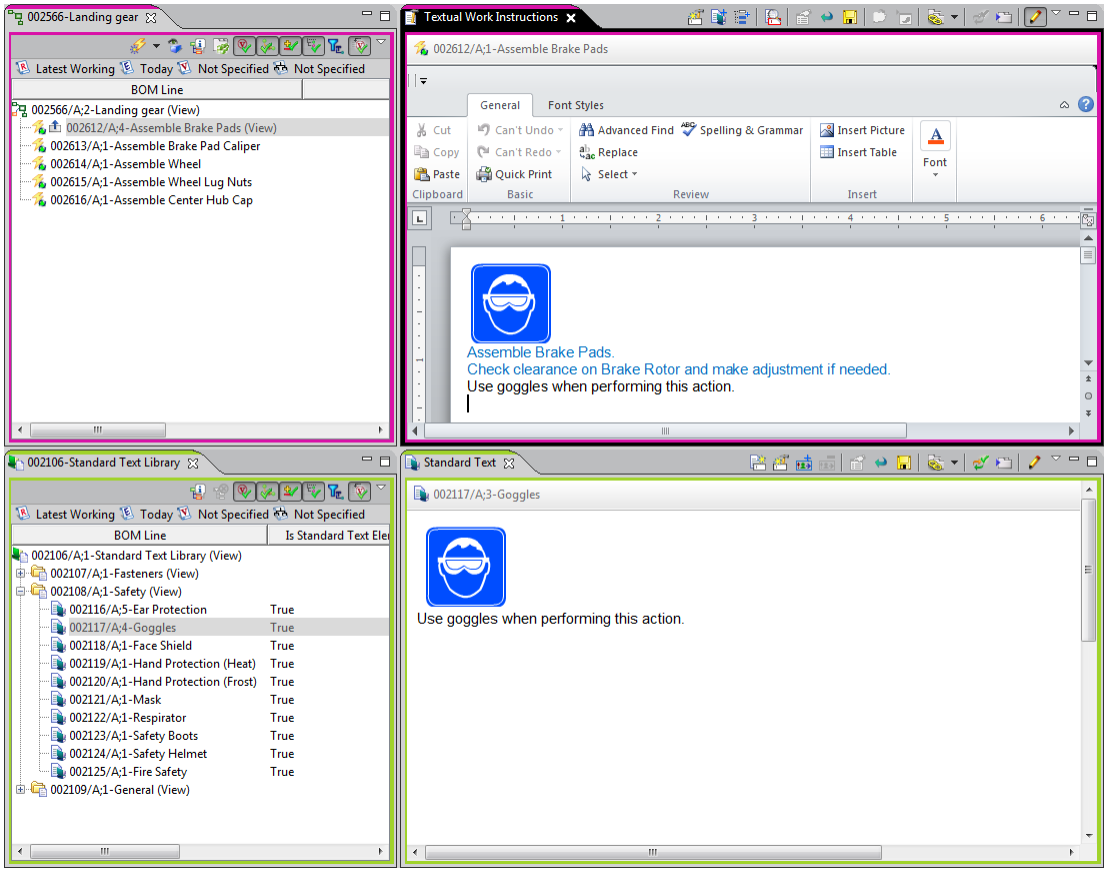

Activate the textual work instructions editor

Activate the textual work instructions editor in one of the following ways:

- Choose **Window→Show view→Textual Work Instructions**.
- Right-click an operation or process in the process structure and choose **Open with→Textual Work Instructions**.
- Right-click an operation or process in the **Result** pane of the **Structure Search** view and choose **Open with→Textual Work Instructions**.

Edit work instructions

When you select an operation or a process in the process structure, Teamcenter displays the preview file associated with the selected operation or process. If no preview file is defined, the **Textual Work Instructions** view displays the following message:

```
No preview file is available
```

- Click **Edit** .

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When entering edit mode, Teamcenter checks out the operation or process, updates property controls (see *Manufacturing Process Planning — Deployment and Administration*), and enables editing. You can now begin editing the work instructions document.

> Tip:
>
> If you edit multiple work instruction documents and want to decrease the time it takes to open each individually for edit, check out all the owning processes or operations manually before clicking **Edit** .

When editing work instructions, you can add and remove content of standard text, text, and data collection definitions. Teamcenter applies all the changes after you click **Save** .

> Note:
>
> - Typically, you can use standard text for many of the steps of your work instructions document. Supplement these with text and data collection definitions to create a complete work instructions document.
> - If the administrator adds operation or process properties to the template, these are visible in the document header. You cannot edit them.

Add text

Click anywhere in the document and write the new text. After performing a **Save** operation, Teamcenter captures the text in a text control and links it to the database. The text becomes searchable and localizable in Teamcenter. If you wish the text to remain in the body of the document and not in a text control, set the **METWICreateTextControlsOnSave** preference to **False**.

Add a symbol

You can add symbols to the work instructions document. The symbols appear in the document in the symbols section.

> Note:
>
> By default, adding and removing symbols is enabled in the **Standard Text** view. If you do not use a standard text library, your administrator can move these buttons to the **Textual Work Instructions** view.

1. Click anywhere in the **Textual Work Instruction** view.

   The Teamcenter focus returns to the view.

2. Click **Add symbol** .

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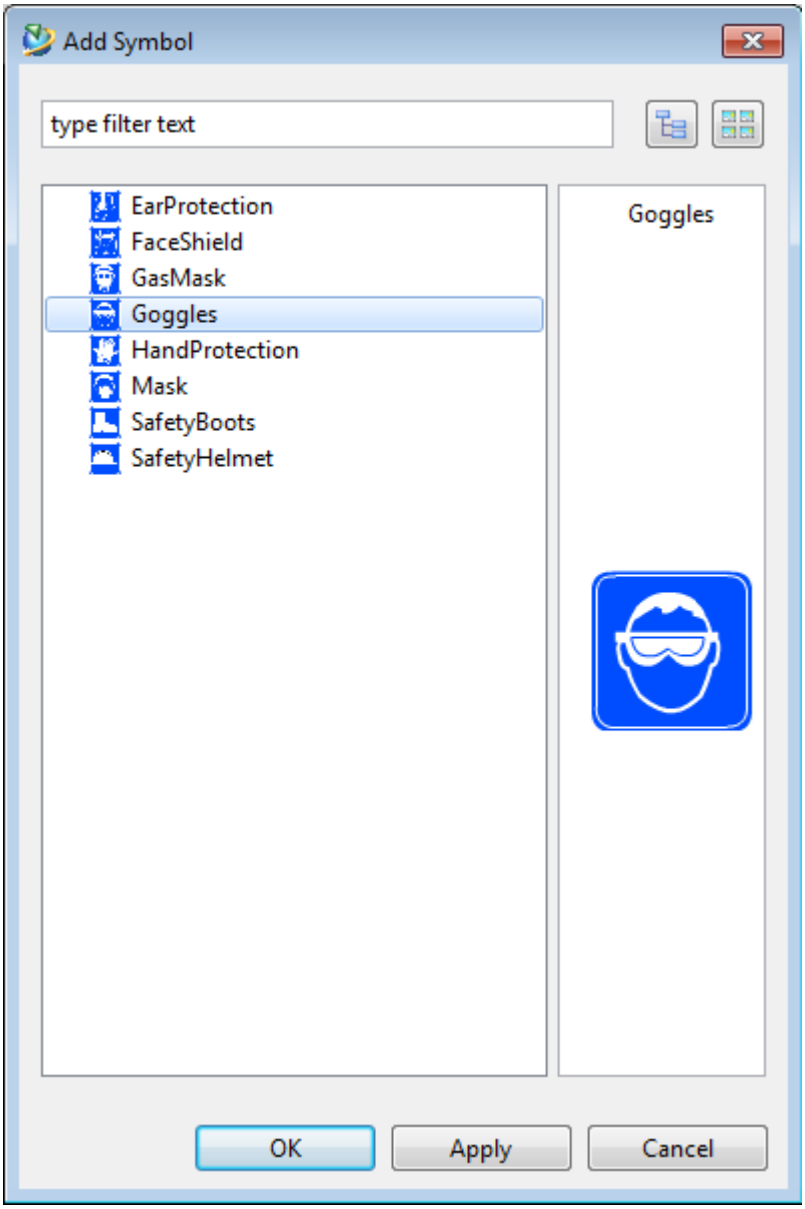
Teamcenter displays the **Add Symbol** dialog box listing all the symbols (contained in **Work Instructions Symbol** datasets) in the database. If you manage symbols in a folder structure, this structure is reflected in the **Add Symbol** dialog box.



3. Do any of the following:

   - Enter any part of the name of the symbol for which you are searching in the search box.

     Teamcenter automatically filters search results as you type.

   - Browse through the results by selecting each symbol in the list and viewing the thumbnail in the right pane.

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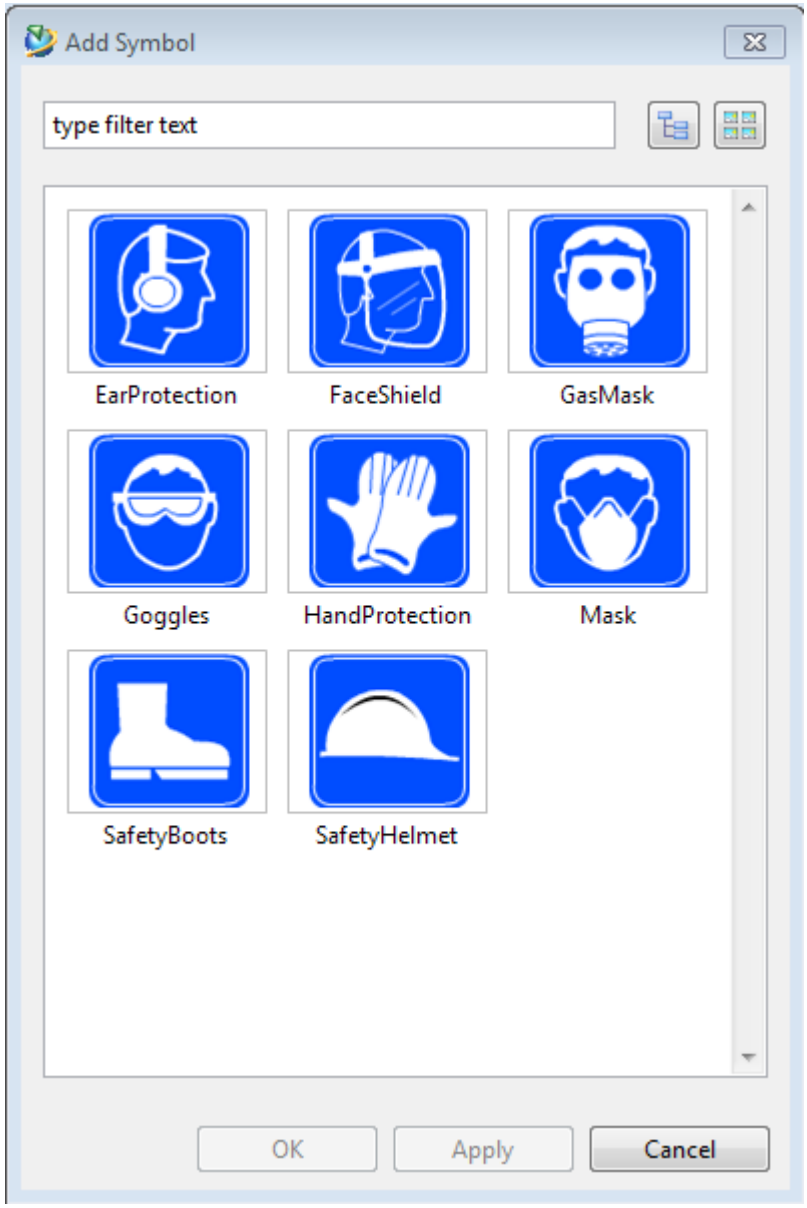
- Click to switch to the thumbnail view where you can view all symbols.



4. Select one or multiple symbols and click **OK** to close the dialog box or **Apply** to add the symbol but leave the dialog box open for further selection.

   Teamcenter adds the desired symbols to the symbol section in your document.

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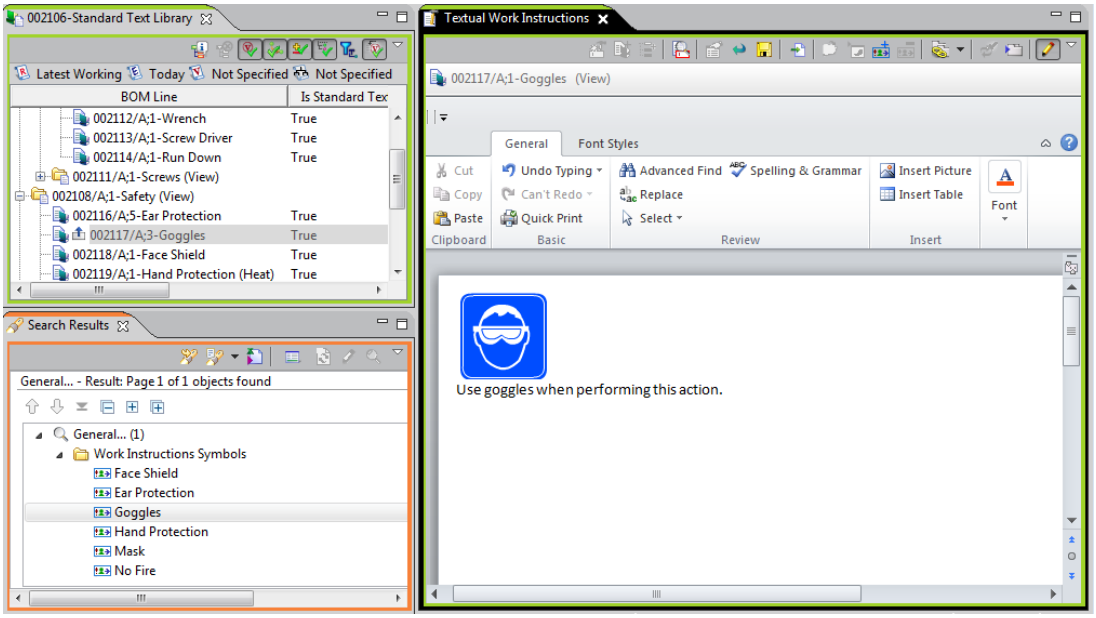

Note:

- Teamcenter always adds symbols to the symbol section. It does not matter where the cursor is when performing the **Add symbol** operation.
- You may select multiple symbols and add them with a single **Add symbol** operation.
- You cannot insert a particular symbol more than once.
- After performing this action, you cannot undo any previous actions (the **Undo** list is cleared).

Remove a symbol

- In the document, select the symbol you want to remove and click **Remove symbol** .

Note:

By default, the **Add Symbol** and **Remove Symbol** buttons are located in the **Standard Text** view. If you do not use a standard text library, your administrator can move these buttons to the **Textual Work Instructions** view.

Teamcenter removes the symbol.

Note:

After performing this action, you cannot undo any previous actions (the **Undo** list is cleared).

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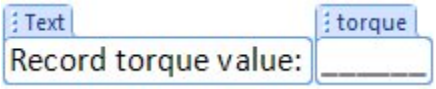
Add a data collection definition

You add a data collection definition to the document. This contains an instruction to perform data collection on the shop floor. You can also define the required properties for the new data.

For example, if you require production workers to note a torque value, you can use text followed by a data collection definition.



> Note:
>
> Data collection definitions are not visible in the Teamcenter structure.

1. Place your cursor at the location at which to add the data collection definition and click **New dcd** .

   The New Data Collection Definition wizard is displayed.

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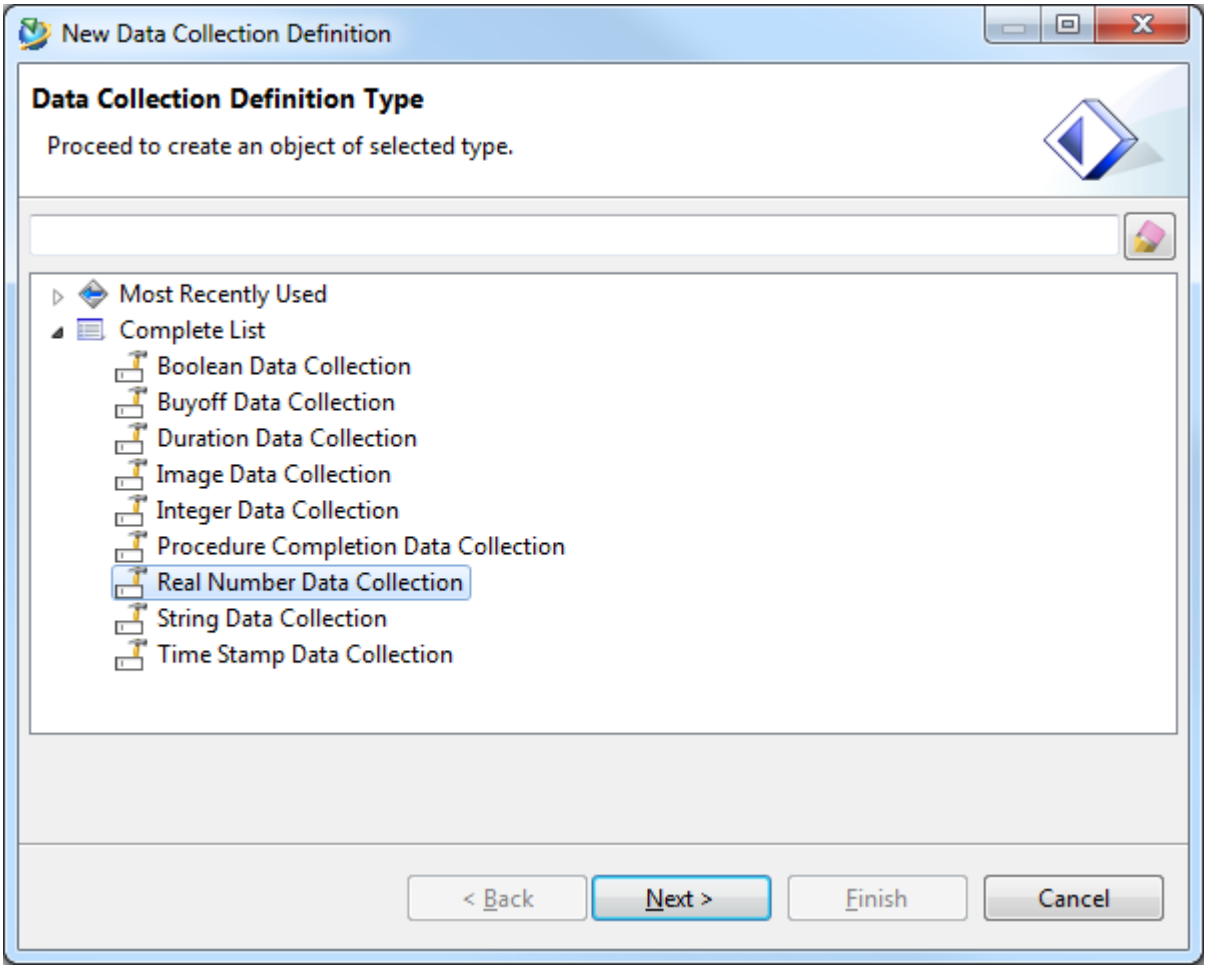

The following data collection definition types are available:

- **Boolean**
- **Buyoff**
- **Duration**
- **Image**
- **Integer**
- **Procedure Completion**
- **Real Number**
- **String Data**
- **Time Stamp**

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- **List of Values**

All the data collection definition types can be user-customized and are automatically supported by the editor.

2. Select the type of data control definition or type it and click **Next**.

The Data Collection Definition Create Information wizard is displayed.

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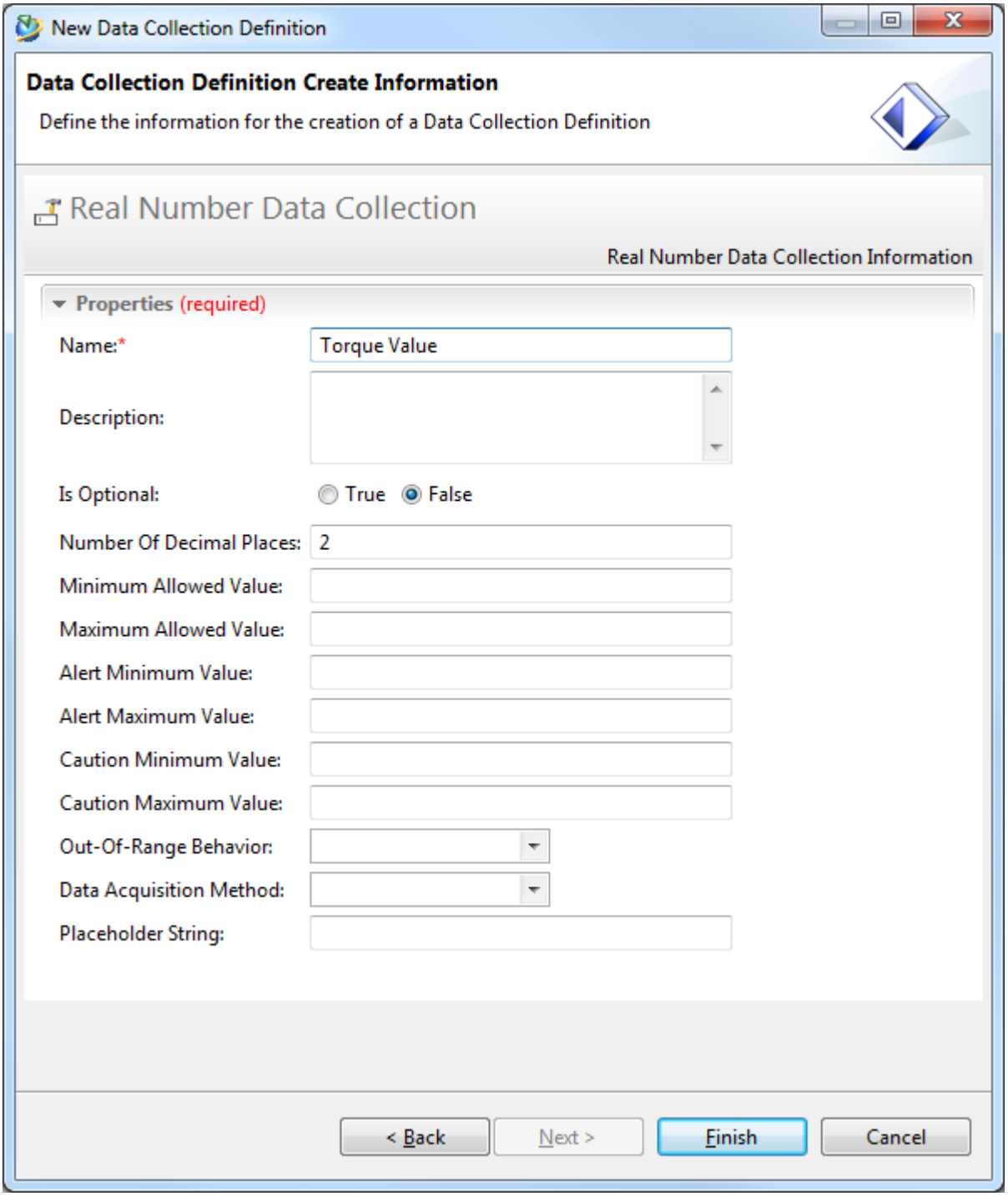

3. Enter the attributes for the new data collection definition and click **Finish**.

   - **Name** is required; all the other attributes are optional.
   - The **Placeholder String** property holds the characters to be displayed in the document. If this is left empty, ... (an ellipsis) is displayed in the standard text document.

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- The default value for **Is Optional** is **False**. This means that the data collection definition is not optional and a measurement must be recorded. You can set **Is Optional** to **True** to make the data collection definition optional.

The new data collection definition is displayed in your document.

Note:

You cannot copy data collection definitions.

Data collection properties

In addition to the **Name**, **Description**, **Is Optional**, and **Placeholder String** properties that each data collection type possesses, most data collection types have additional properties, except for **Boolean Data Collection** and **Duration Data Collection**.

The following table lists the additional properties and the data collection definition types that include them.

Property	Data collection definitions
Time format	**Time Stamp, Procedure Completion, Buyoff**
Allow characters	**String**
Maximum length	**String**
Minimum allowed value	**Integer, Real Number**
Maximum allowed value	**Integer, Real Number**
Caution minimum value	**Integer, Real Number**
Caution maximum value	**Integer, Real Number**
Alert minimum value	**Integer, Real Number**
Alert maximum value	**Integer, Real Number**
Number of decimal places	**Real Number**
Out-Of-Range Behavior	**Integer, Real Number, Image**
Data Acquisition Method	**Integer, Real Number, Image**

Note:

An administrator can add the **List of Values** type as a customized type when he or she sets up standard text.

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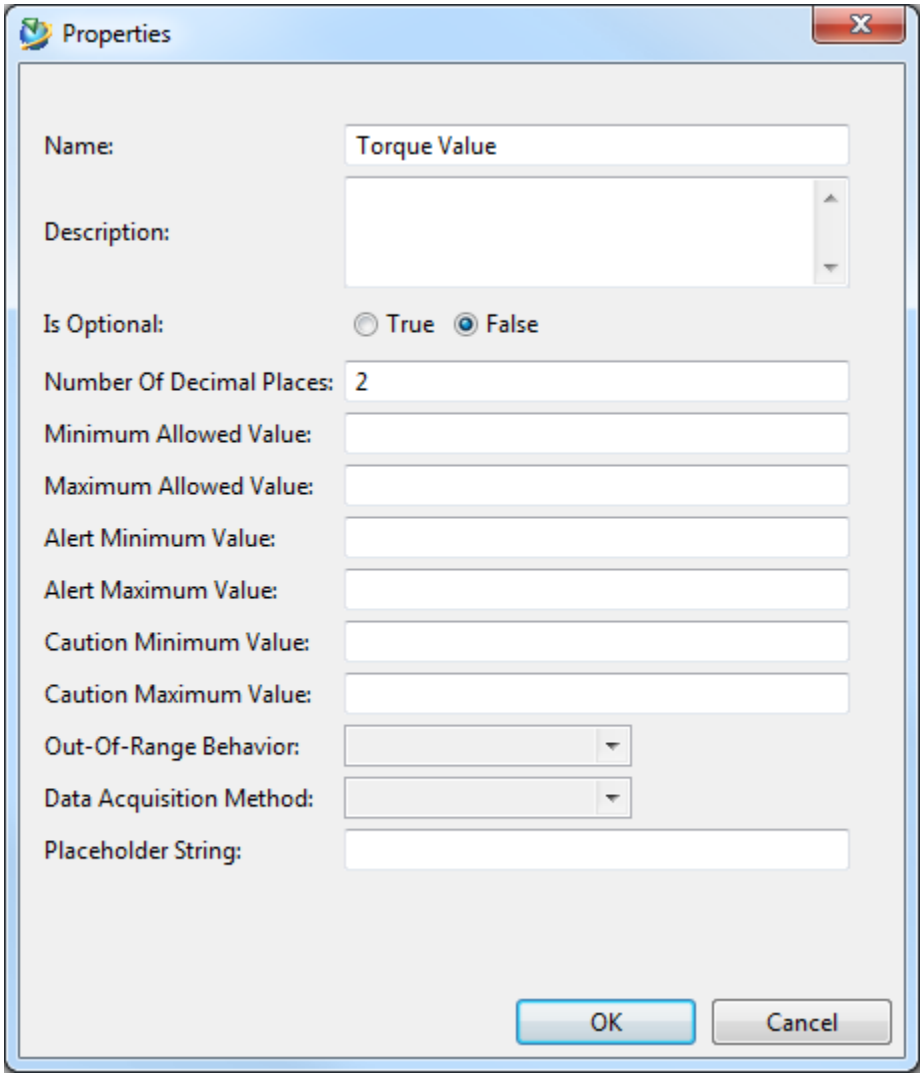
View and edit properties

You can view the properties of a data definition collection, planner input field, or standard text document.

- Select a data definition collection, planner input field, or standard text document and click **Properties** .

  The **Properties** dialog box appears.



A data definition collection can appear in the current textual work instructions document in one of two ways:

- Directly inserted into the current textual work instructions document—all the properties are editable.

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- As part of the content of standard text that you added to the textual work instructions document—some properties are not editable, as defined in the **MEWiDcdNotEditableProperties** preference.

Note:

- For data collection definitions added to your work instruction document as part of a standard text, the **MEWiDcdNotEditableProperties** preference lists the properties that are not editable for each data collection definition type.
  - The default value is **Placeholder**. The administrator can delete this value to enable editing the **Placeholder** value.
  - The administrator can delete the values for a specific data collection definition type.
  - If the **MEWiDcdNotEditableProperties** preference for a specific data collection definition type is empty, all its properties are editable. If, however, the preference for a derived data collection definition type is empty, the preference inherits properties from its basic data collection definition type ancestor.
  - You can add other properties to the **MEWiDcdNotEditableProperties** preference to protect them.
- You can edit the **Placeholder String** property by typing in the document without accessing the properties of the data collection definition. To complete the change, click anywhere in the document outside the data collection definition.

All the planner input field properties in the **Textual Work Instructions** view are read-only except for **Value** and **Skip Validity Check**.

Teamcenter enables you to omit the validity check for a planner input field. This is useful, for example, in an incremental drilling process. The process requires drilling a hole of a specific diameter and then drilling again to increase the diameter to a very accurate value. The result of the initial drilling operation does not meet the requirements noted in the planner input fields. The result of the subsequent drilling operation does, however, meet the requirements. In this case, it is desirable to skip the planner input field validity check for the initial drilling operation.

If you set **Skip Validity Check** to true, Teamcenter omits all the validity checks except for the following:

- String length - If the length of the **Value** you entered exceeds the **Maximum Length** for the planner input field, Teamcenter issues a warning that the string will be truncated when you save the planner input field. You can either proceed or edit the string.
- If **Is Optional** is set to **False**, Teamcenter performs all validity checks on the planner input field even if **Skip Validity Check** is set to true.

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Remove a data collection definition

- Select the data collection definition and press the Delete key.

> Note:
>
> If the data collection definition is embedded in the content of standard text that you added to the textual work instructions document, you cannot delete it.

Add reference

You can link text in your textual work instructions to datasets or product views. For example, you can instruct the operator to read a safety instructions document and provide a link to the dataset containing that document. You can instruct the operator to measure a particular dimension on a part and provide a link to the product view displaying the part with the dimension emphasized.

1. Select one of the following to be the target for the new reference:

   - Dataset in the **Attachments** or **Search Results** view.
   - Product view in the **Attachments** view or **Product View Gallery**.

   > Note:
   >
   > - If the **Product View Gallery** is visible, the system uses the product view from the gallery even if you have selected product views in the **Attachments** view or **Search Results** view.
   > - The product view must be attached to the current process (or a process nested under the current process).
   > - If you select an item that is neither a dataset nor a product view, the system returns an error.

2. Place your cursor at the location in which to create the new reference.
3. Click **Add Reference** .

   A content control is added to the document referencing the dataset or product view.

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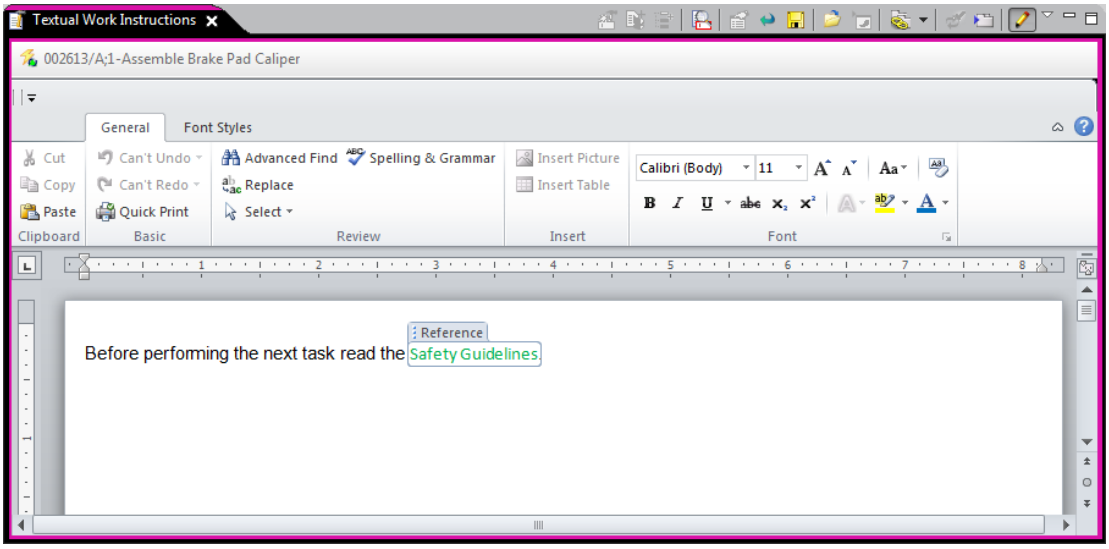

If you select text before invoking the command, the reference is created with the selected text. If no text is selected, the reference displays the name of the referenced dataset or product view.

4. If you wish to change the text of the reference, use the keyboard to place your cursor in the content control and edit the text. Even though you have changed the text of the reference, it still links to the same target.

> Note:
>
> You cannot change the referenced target. If you need to do this, delete the reference and create a new one.

Activate reference

Do one of the following:

- Click the reference and click one of the following:
  - For a referenced dataset, click **Open Referenced Object** .
  - For a referenced product view, click **Apply Referenced Product View** .
- Double-click the reference.

  The target document opens in its native application. If the target is a product view, the graphic view refreshes and displays the target image.

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Add standard text

You can insert the content of standard text to your textual work instructions document to compose a procedure.

1. Select a standard text element in the library structure or the **Search** view.

2. Place your cursor at the location in the textual work instructions document at which to add the standard text and click **Add standard text document** .

The standard text content is added to the textual work instructions document. The text is embedded in a text control, named after the source standard text element and is not editable. If the source standard text element contained symbols, these are added to the symbol section of the textual work instructions document. A specific symbol only appears once even if it is associated with more than a single source standard text element.

It is also possible to add data collection definitions and planner input fields to the textual work instructions document; for instructions about how to edit these, see **View and edit properties**.

Note:

- You cannot copy standard text. If you attempt to do this, Teamcenter returns an error message and clears the undo stack.
- Standard text elements are not visible in the process structure.
- Ensure that the configuration rule applied to the library structure is the same as that applied to the process structure. This ensures that you add the same content to the textual work instructions document as that which you viewed in library.
- If adding the standard text document causes the addition of a symbol to the textual work instructions document, Teamcenter clears the undo stack.

Remove standard text

- Click the standard text document and press the Delete key.

Note:

- Teamcenter also removes symbols associated with the standard text element from the textual work instructions document.
- If a symbol is associated with more than one standard text element, Teamcenter retains it in the textual work instructions document.

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- Teamcenter clears the undo stack.

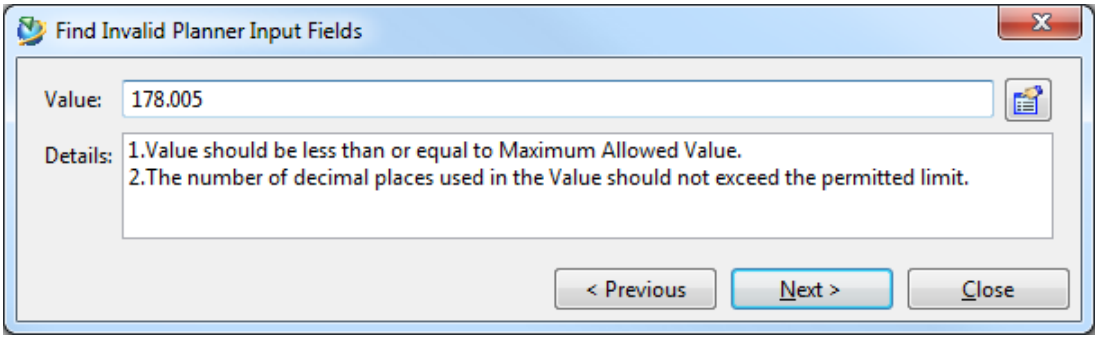
Finding invalid planner input fields

If there are invalid planner input fields in your standard text document, it can be a tedious task to locate them and correct the problem. This may occur if, for example, a new revision has come into use where a property has been updated. Even if there are invalid planner input fields in your standard text document, Teamcenter enables you to save your work. When you next open the document, Teamcenter issues a message that there are invalid planner input fields.

Find invalid planner input fields

1. Click the **Validate PIF** button .

   The **Find Invalid Planner Input Fields** dialog box appears.



   Note:

   If there are no invalid planner input fields, Teamcenter issues a message instead of opening the dialog box.

2. Click the **Properties** button and fix the invalid planner input field as required.

   The **Details** section displays **Valid** to indicate that you have fixed the current invalid planner input field.

3. Click **Find Next** and fix the next invalid planner input field as many times as necessary.

Note:

Teamcenter allows you to save and close the current document and continue fixing invalid planner input fields in your next work session.

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Save changes

- Click **Save** to save the current changes in your document.

  Teamcenter saves the document and updates the preview document.

Discard changes

- Click **Discard changes** to discard your current work and reload the last saved version of the document.

Set the scope

In edit mode, you can change the editing focus from the current document to another document (the new scope) without exiting edit mode.

1. Click the desired element in the structure.

2. Click **Set scope** .

   If there are unsaved changes in the current document, Teamcenter prompts you to save them before exiting the current document.

Teamcenter closes the current document, checks out the target operation or process, and loads the target document. You can now begin editing the target document.

> Note:
>
> The **Set scope** command does not work if any of the following conditions apply:
>
> - The target scope is not an operation or process.
> - You do not have permission to edit the target scope, as defined by the access control list in *Access Management Using Rules and ACLs*.

About creating textual work instructions using standard text

Teamcenter enables creating textual work instructions using standard text as building blocks. These textual work instructions are associated with operations or processes in the process structure.

The standard text library is a Teamcenter structure comprised of standard text folders and standard text elements nested under the folders. Standard text content is associated with standard text elements by a specific type of dataset and is accessible in the Teamcenter **Attachments** view.

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The benefits of standard text include:

- Standardization and consistency of textual work instructions throughout the entire organization.
- Managing standard text content. Standard text enables you to write once only and reuse the same text many times.
- Easy maintenance of up-to-date textual work instructions when products are upgraded. Make a single change in a procedure and propagate the change through all the relevant documents.
- Improved accuracy. Textual work instructions are intrinsically connected with the process structure; they are a textual expression of the manufacturing process.
- Textual work instructions are composed by the planners or engineers who designed the process, increasing accuracy.
- Standard text is stored in the database, enabling you to search for text by its ID, name, or the text itself.
- Easy localization.
- Easy transfer of documents between different virtual engineering systems.

Typically, there are three user roles involved in creating textual work instructions:

- Administrator

  Responsible for creating and maintaining standard text templates and textual work instructions templates. The **MEWiStandardTextTemplate** preference defines the template used for standard text documents, and the **MEWiWorkInstructionTemplate** preference defines the template used for textual work instructions. By default, both preferences are set to the same template. The administrator can change these templates or create new ones according to organizational requirements. The templates are in Microsoft Word DOCX format and are associated with a dedicated dataset object.

- Librarian

  Responsible for creating standard text libraries, managing standard text folders and elements, authoring standard text, and creating and managing standard text symbols. Standard text is written in a generic style so that it can be reused in varying contexts. An example of standard text is a procedure describing how to mount a wheel on a car and this can be reused in multiple projects. The librarian uses the standard text editor to write standard text elements and the standard text library interface to manage them. Additionally, the librarian may use the **Teamcenter Search** view and **Results** window as aids.

- Planner or engineer

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Uses standard text as building blocks to compose work instructions. Planners cannot edit standard text in the standard text library; however, they may add free text to the work instructions document associated with an operation or process and edit properties related to the standard text content. Additionally, the planner may use process structure, the textual work instructions editor, **Teamcenter Search** view, and the **Results** window as aids.

You can use Access Manager to configure various permissions for different roles using access control lists (ACLs). Siemens Digital Industries Software recommends using the scenario of administrator, librarian, and planner.

> Note:
>
> To use standard text features, Microsoft Word is required. For certified versions, see the Hardware and Software Certifications knowledge base article on Support Center.

Creating standard text symbols

By default, all standard text and work instructions have a symbol section at the top of the body text (just below the header). Teamcenter adds symbols to the symbol section (and nowhere else). However, Teamcenter only adds symbols of the **Work Instructions Symbol** type.

Librarians can create symbols for use in standard text and work instructions by adding a graphic file to a symbol dataset in My Teamcenter. You can manage the symbols by creating symbol libraries and folders and nesting the symbols.

Manage standard text symbols

If you have a large number of standard text symbols, you can create symbol libraries and folders in My Teamcenter. This enables you to organize your data and facilitates using symbols.

1. In My Teamcenter, select an object to be the parent of the new symbol library or folder and choose **File→New→Other**.

   The **New Business Object** dialog box appears.

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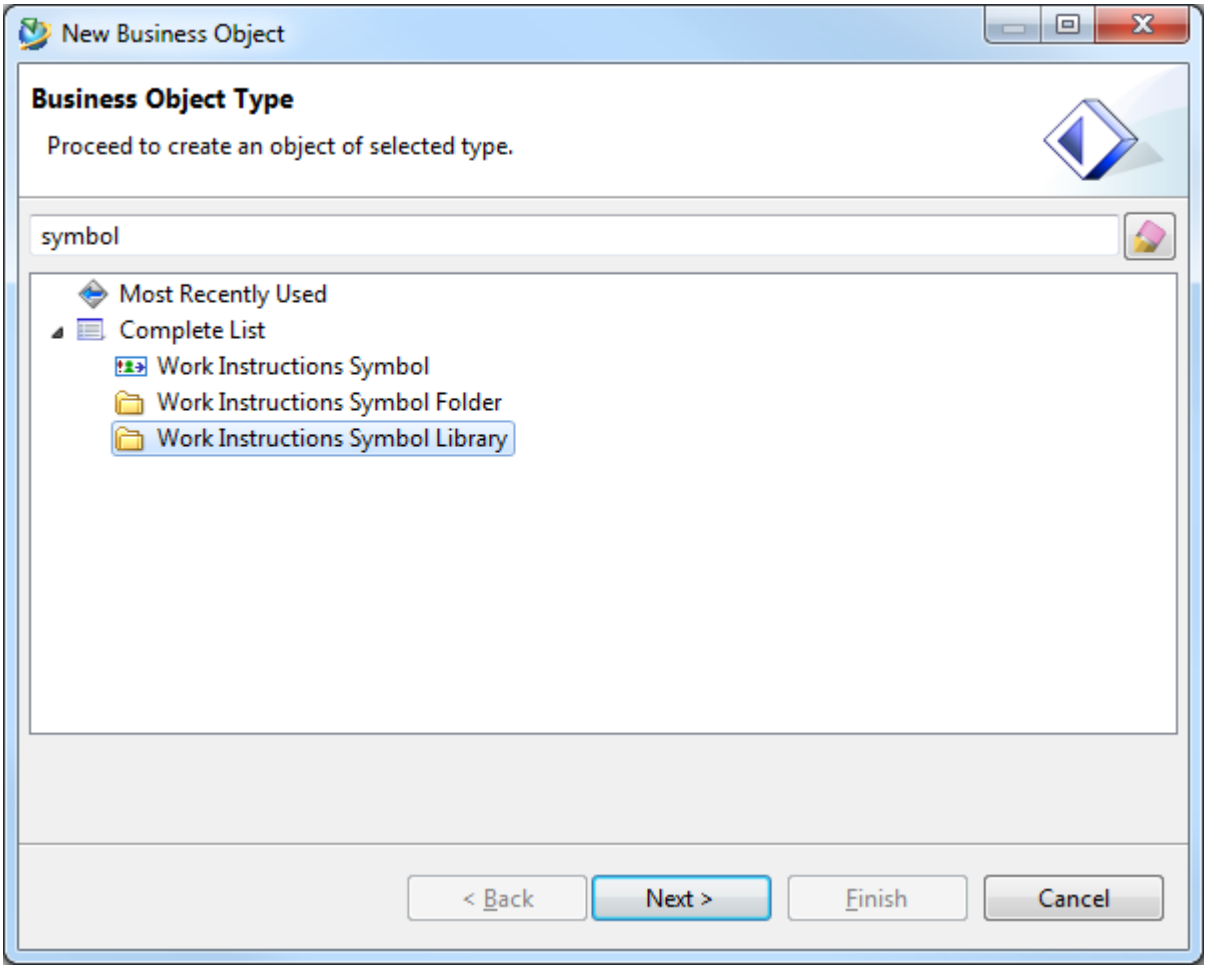

2. Select **Work Instructions Symbol Library** or **Work Instructions Symbol Folder** and click **Next**.

   Alternatively, type **symbol** in the search box. The **New Business Object** dialog box filters the objects and displays only symbol types.

   The **Object Create Information** dialog box appears.

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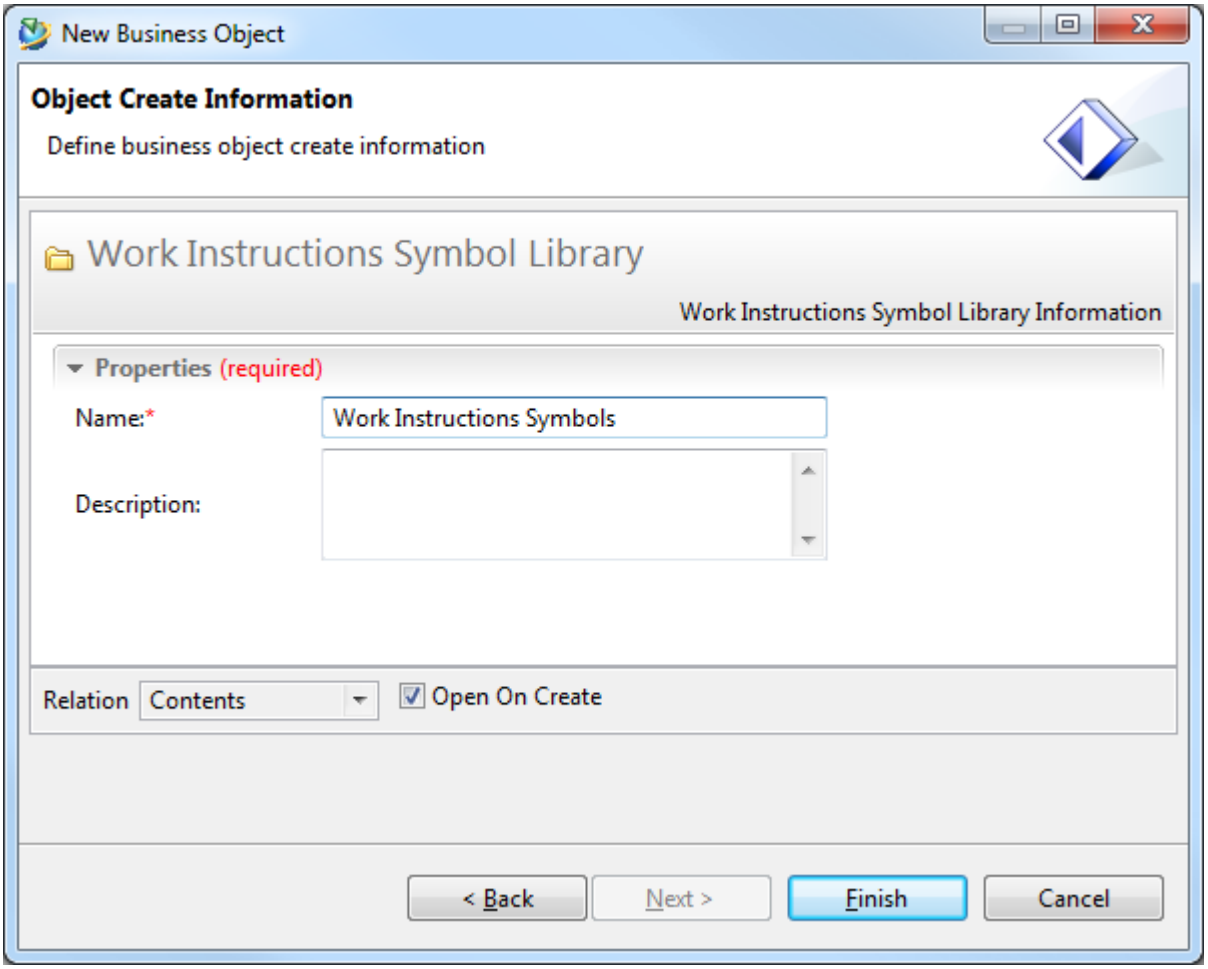

3. Type a name in the **Name** box, enter other optional attributes, and click **Finish**.

   Teamcenter displays the new symbol library or folder under the selected object in My Teamcenter.

Create a standard text symbol

1. In My Teamcenter, select an object to be the parent of the new symbol (for example, symbol folder) and choose **File→New→Dataset**.

   The **New Dataset** dialog box appears.

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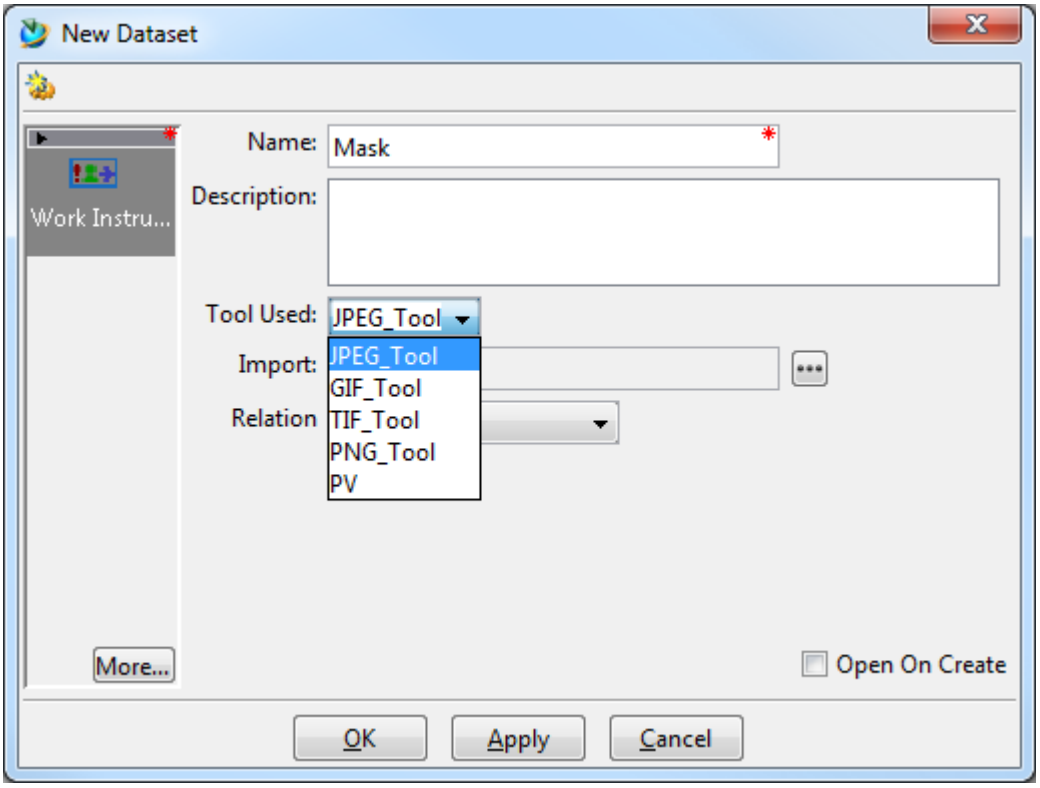

2. Select **Work Instructions Symbol** on the left side of the dialog box.

3. Type a name in the **Name** box, and enter other optional attributes.

4. Click the browse button next to the **Import** box.

   The **Upload File** dialog box appears.

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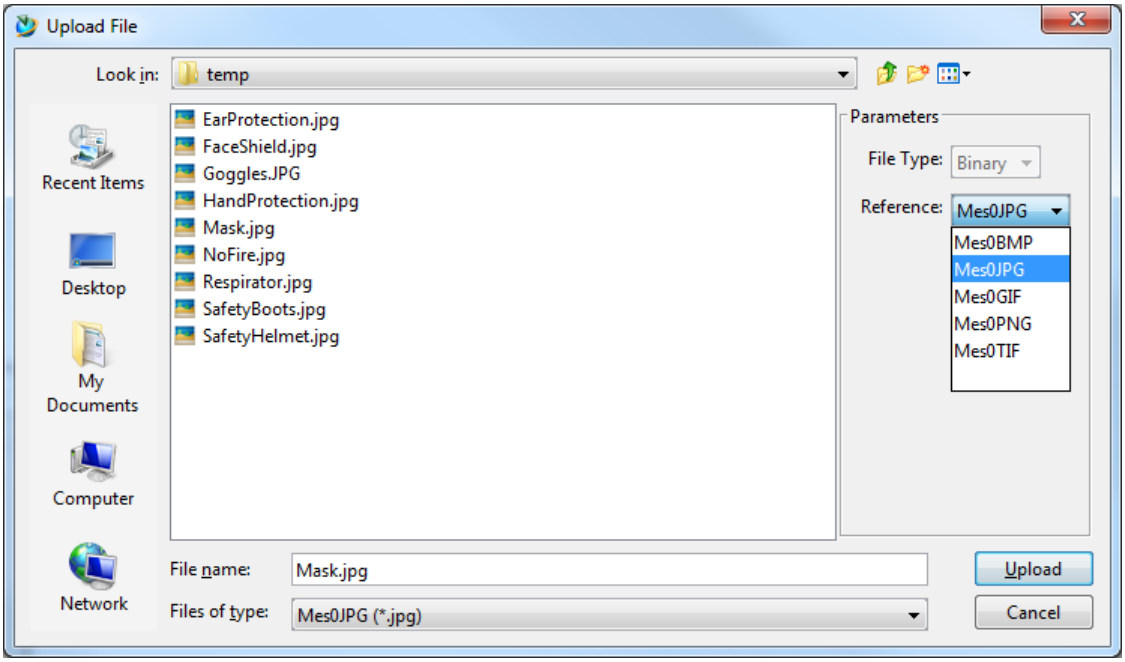

5. From the **Reference** list, select the desired file format.

   The **Work Instructions Symbol** dataset can contain graphic files of the following formats: BMP, JPG, GIF, PNG, and TIF.

   Teamcenter displays the selected format in the **Files of type** list and filters the display accordingly.

6. Navigate to the desired symbol file and click **Import**.

   > Note:
   >
   > Only a single file should be imported per dataset.

   The **Import** box contains the imported file name.

7. Select a tool from the **Tool Used** list according to the reference type of the imported file:

Reference type	Tool used
BMP	PV
JPG	JPEG_Tool
GIF	GIF_Tool
PNG	PNG_Tool
TIF	TIF_Tool

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8. Click **OK**.

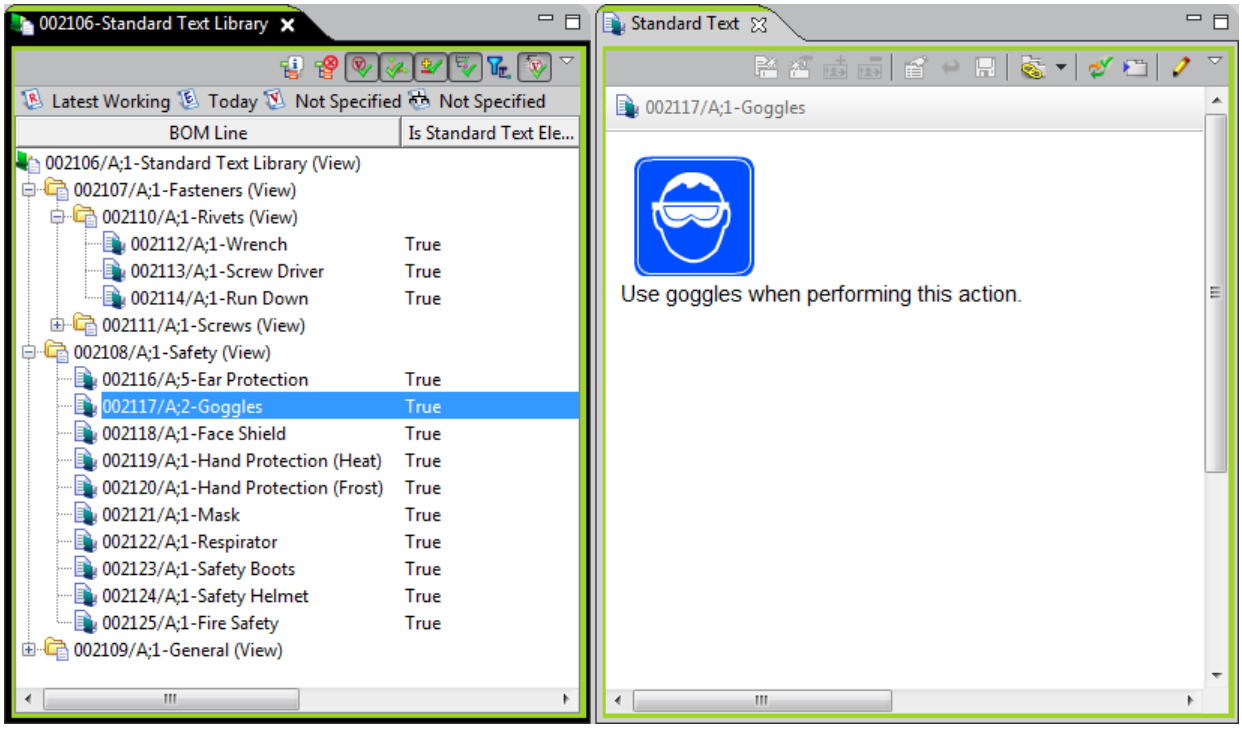
   Teamcenter creates the symbol dataset.

> Note:
>
> After creating the dataset, you can double-click it to launch the tool and display its image.

Creating standard text library structure

A standard text library object is a Teamcenter structure and is the root of a hierarchical structure comprised of standard text folders and standard text elements.

Each standard text element can be associated with specific content comprised of text, data collection information, and symbols. Following is an example of a standard text library structure and the standard text editor displaying a preview of specific standard text content.



Standard text elements are revisable.

> Note:
>
> You can add standard text library structures to collaboration context objects.

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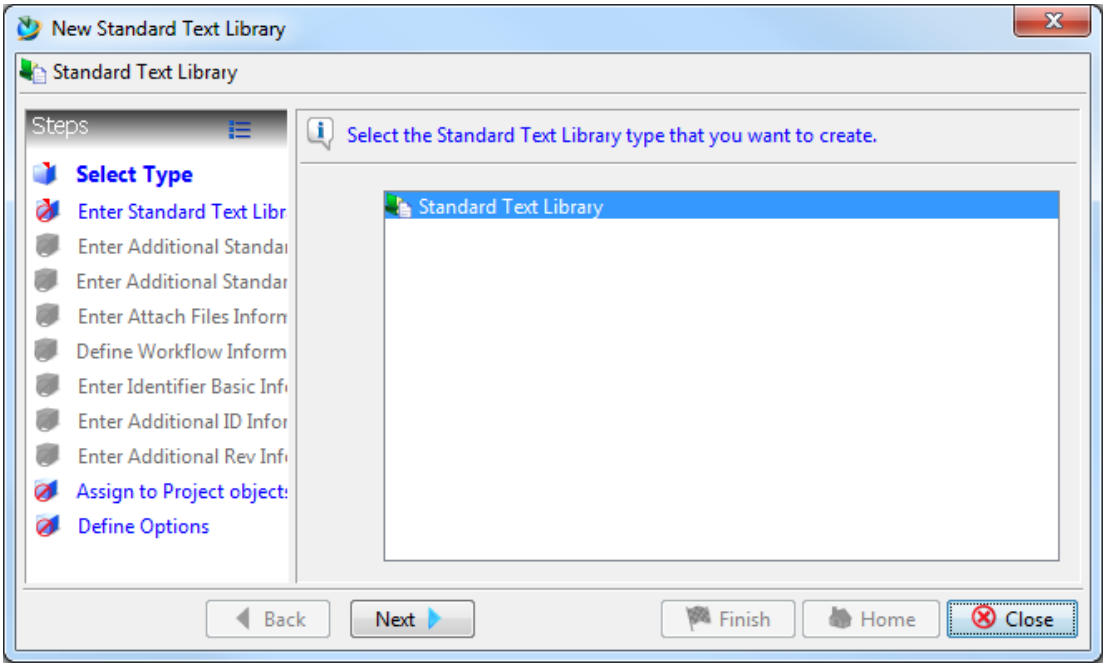
You can use Manufacturing Process Planner or Part Planner to create standard text libraries, folders, and elements. You can use the standard text editor to edit standard text and then use the textual work instructions editor to insert the content of the standard text to create work instructions.

Create a standard text library

1. Choose **File→New→Standard Text→Standard Text Library**.

   The New Standard Text Library wizard is displayed.



2. Select the library type and click **Next**.

   The New Standard Text Library basic information window is displayed.

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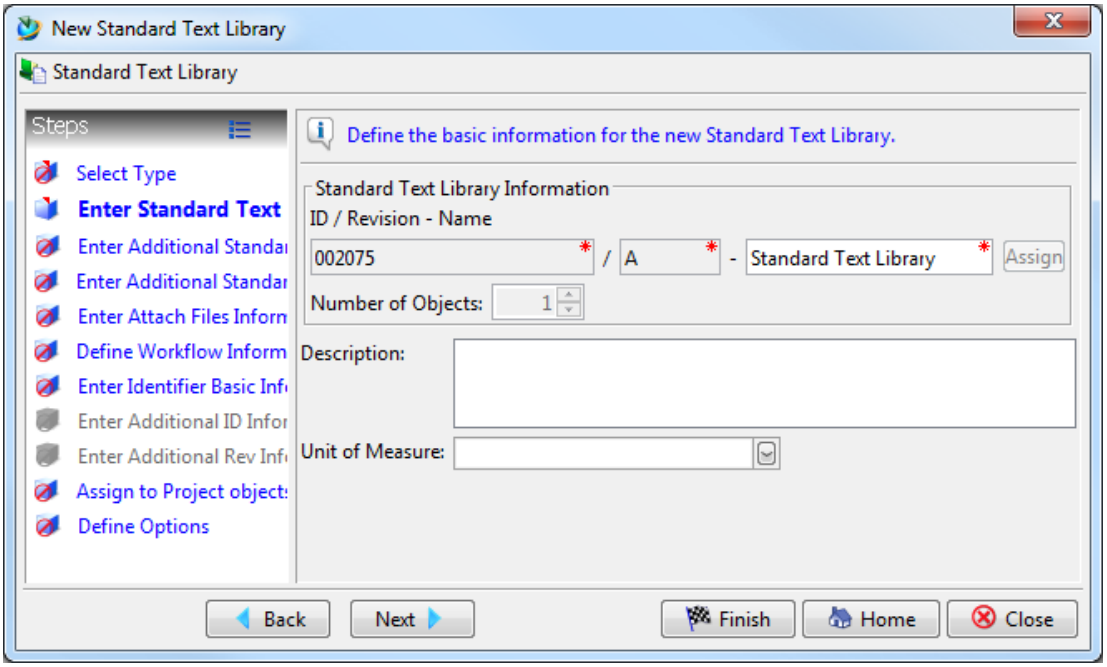

3. Type entries for the following mandatory boxes: **ID**, **Revision**, and **Name**.

4. Click **Next** to add optional parameters or **Finish** to create the new standard text library.

The application displays the new standard text library as a new root. This is a structure context with the standard text library at its root.

Create a standard text folder

1. Select a standard text library or folder and choose **File→New→Standard Text→Standard Text Folder**.

   The New Standard Text Folder wizard is displayed.

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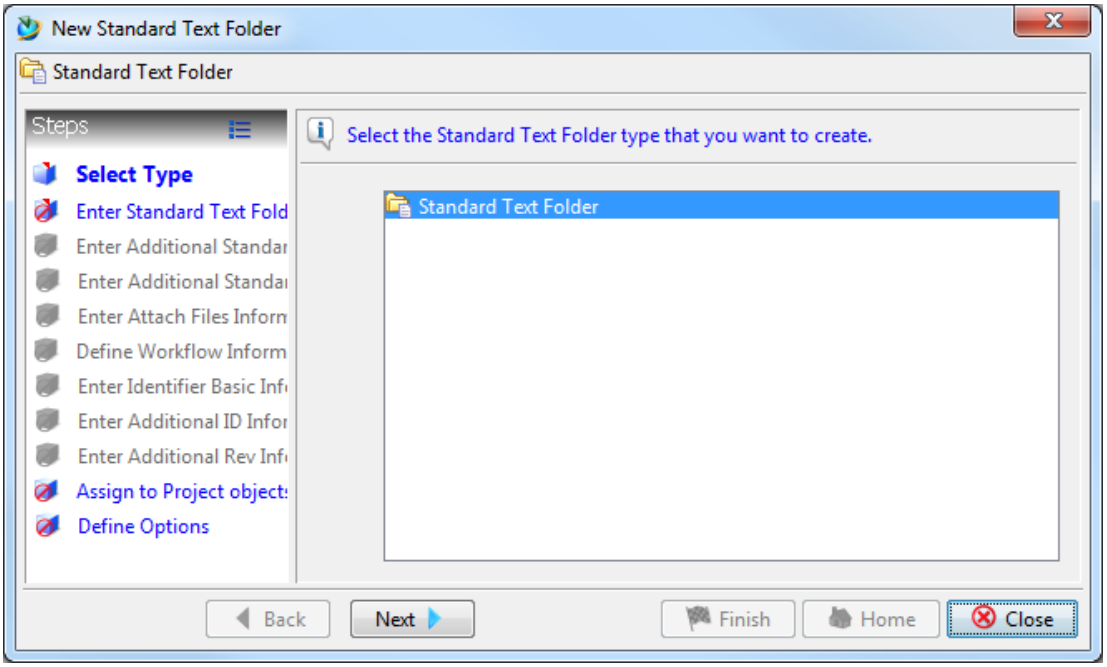
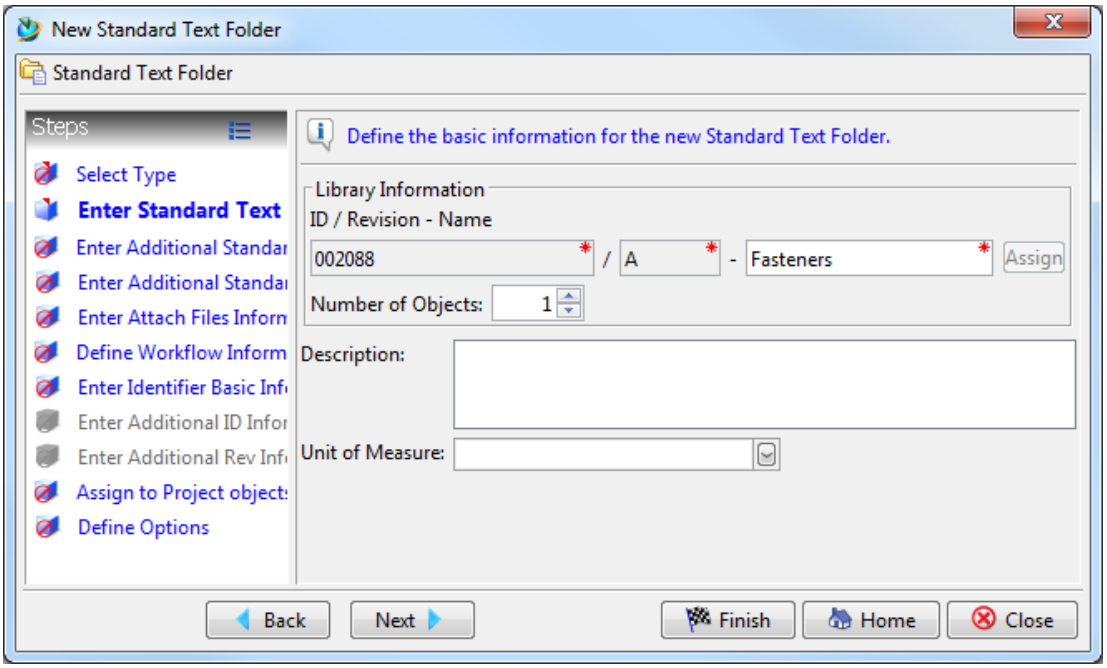


2. Select the folder type and click **Next**.

   The New Standard Text Folder basic information window is displayed.



3. Type entries for the following mandatory boxes: **ID**, **Revision**, and **Name**.

4. Click **Next** to add optional parameters or **Finish** to create the new standard text folder.

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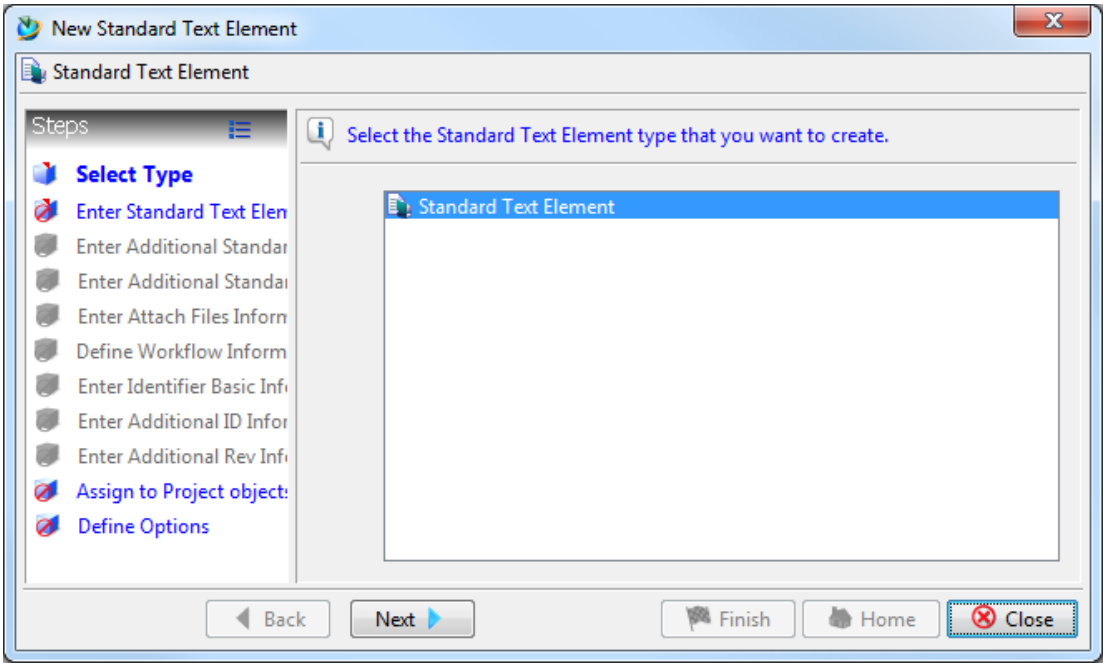
Teamcenter displays the new standard text folder nested under the selected standard text library or folder.

Create a standard text element

1. Select a standard text library or folder and choose **File→New→Standard Text→Standard Text Element**.

   The New Standard Text Element wizard is displayed.



2. Select the element type and click **Next**.

   The New Standard Text Element basic information window is displayed.

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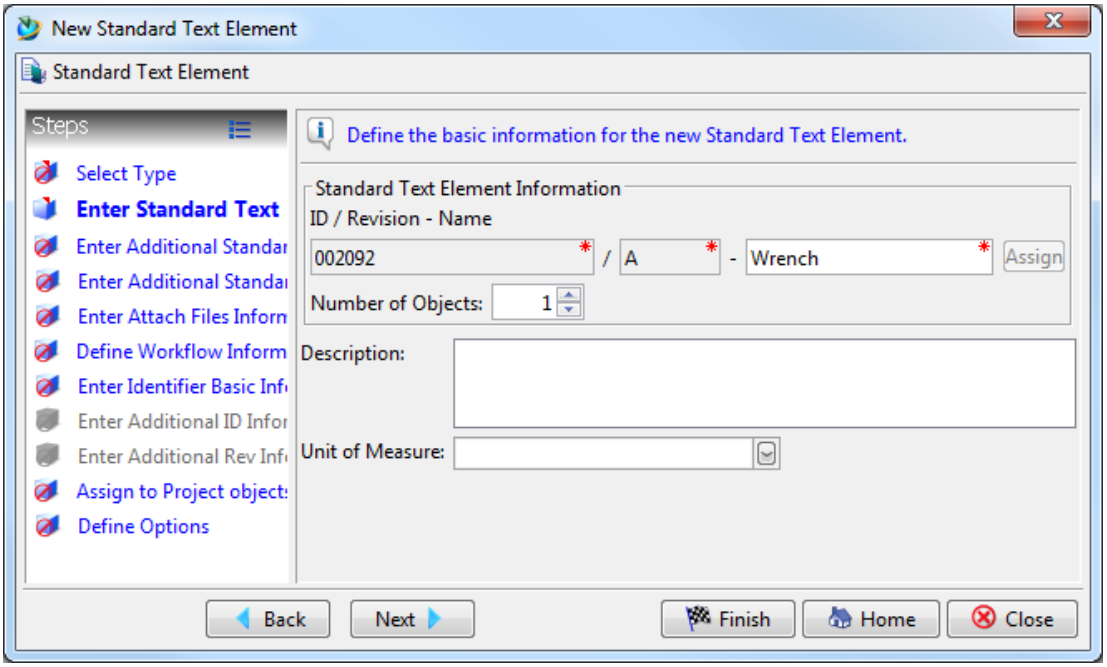

3. Type entries for the following mandatory boxes: **ID**, **Revision**, and **Name**.

4. Click **Next** to add optional parameters or **Finish** to create the new standard text element.

Teamcenter displays the new standard text element nested under the selected standard text library or folder.

The following figure displays a standard text structure.

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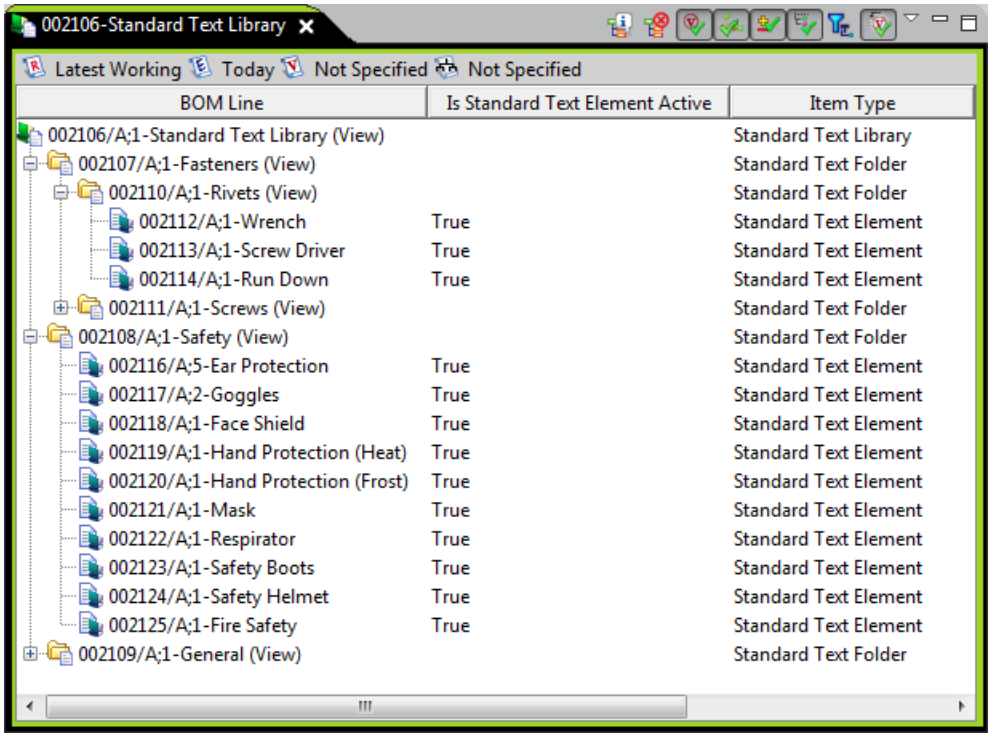

Getting started with standard text editor

You can locate standard text libraries using My Teamcenter or with the Teamcenter **Search** view and send them to Manufacturing Process Planner or Part Planner.

The following items are associated with each standard text element (after adding text to it and saving it):

- Preview file

  When you click the standard text element, the standard text view displays a preview. Preview files are in one of the following formats: PDF, MHT, DOCX, or RTF, as defined in the **MEWiPreviewFormat** preference. The preview file is updated with the latest information you entered in the standard text document.

  > Note:
  >
  > Preview files in MHT format do not display the headers and footers.

  The preview file is not visible in the library structure. However, you can double-click it in the Teamcenter **Attachments** view to open it in its associated application. For example, if the preview file is stored in PDF format, it opens in a PDF reader.

- Document

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When you enter edit mode, Teamcenter closes the preview file and loads the live standard text document. All the data you enter is stored in this file.

The standard text document is not visible in the library structure.

View standard text content

1. In My Teamcenter, right-click the standard text library and choose **Send to→Manufacturing Process Planner** or **Send to→Part Planner**.

2. In the library, right-click a standard text element and choose **Open with→Standard Text**.

   For a new standard text element that does not contain any text, no preview is available; in this case, the **Standard Text** pane displays the following message:

   ```
   No preview file is available
   ```

   After adding text and saving the standard text element, accessing the **Standard Text** view opens and displays the preview file associated with the selected standard text element.

Editing standard text documents

Editing standard text—overview

You can edit standard text when the elements are active and the access control list permits.

When editing standard text, you can add and remove text, data collection definitions, and symbols.

- Click **Edit** .

> Note:
> - Only the librarian is permitted to enter edit mode, as defined in the access control list.
> - All editing changes take effect only after you perform a **Save** operation. For example, if you employ a standard text query to search for a text snippet in the **Structure Search** view, your search only returns the result for an already saved text snippet.

Edit standard text

1. Right-click a standard text element in the standard text library and choose **Open with→Standard text**.

   The **Standard Text** view opens and displays the preview file associated with the selected standard text element. If there is no preview file, the **Standard Text** pane displays the following message:

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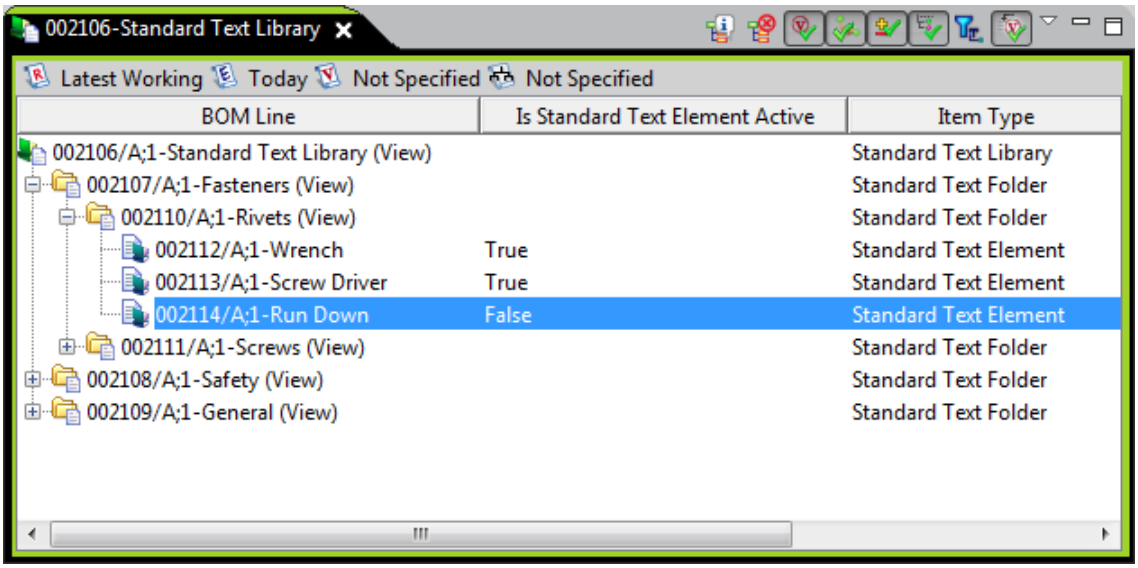
```
No preview file is available
```

Note:

- When the standard text editor is running in preview mode, you can select any standard text element in the standard text library and the preview is automatically refreshed to display the newly selected element. You can also preview deactivated standard text elements.

2. To edit the standard text element, click **Edit** .

   When entering edit mode, Teamcenter closes the preview, checks out the standard text element, and loads the standard text document. Teamcenter marks the checked-out element with the symbol.



   If this is the first editing session for the current standard text element, Teamcenter loads the standard text template, as defined in the **MEWiStandardTextTemplate** preference.

You can now begin editing the document.

Note:

- If you have deactivated a standard text document, for example, if it is out-of-date, you cannot access edit mode.
- When accessing edit mode, the cursor is placed after the last character in the standard text document.

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- When exiting edit mode, Teamcenter checks in the standard text element.

Add text

Click anywhere in the document and write the new text. After performing a **Save** operation, Teamcenter captures the text in a text control and links it to the database. The text becomes searchable and localizable in Teamcenter. If you wish the text to remain in the body of the document and not in a text control, set the **METWICreateTextControlsOnSave** preference to **False**.

Add a symbol

You can add symbols to the standard text element. The symbols appear in the document in the symbols section. When you add the content of a standard text document to a work instructions document, Teamcenter also adds the symbols of the standard text document to the work instructions document.

Note:

Your administrator may have moved the **Add Symbol** and **Remove Symbol** buttons to the **Textual Work Instructions** view. If this is the case, you can add symbols directly to a work instruction document without adding them to a standard text element first.

1. Click anywhere in the standard text view.

   The Teamcenter focus returns to the standard text view.

2. Click **Add symbol** .

   Teamcenter displays the **Add Symbol** dialog box listing all the symbols (contained in **Work Instructions Symbol** datasets) in the database. If you manage symbols in a folder structure, this structure is reflected in the **Add Symbol** dialog box.

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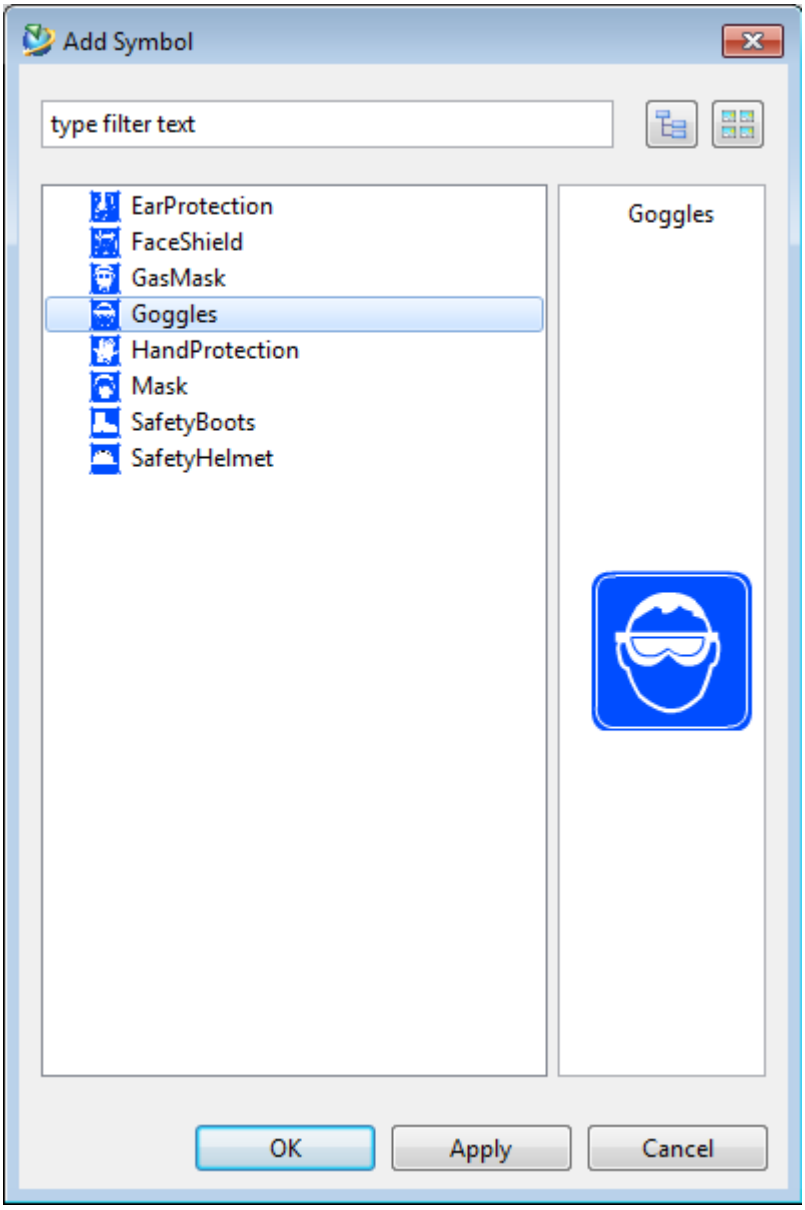

3. Do any of the following:

   - Enter any part of the name of the symbol for which you are searching in the search box.

     Teamcenter automatically filters search results as you type.

   - Browse through the results by selecting each symbol in the list and viewing the thumbnail in the right pane.

   - Click to switch to the thumbnail view where you can view all symbols.

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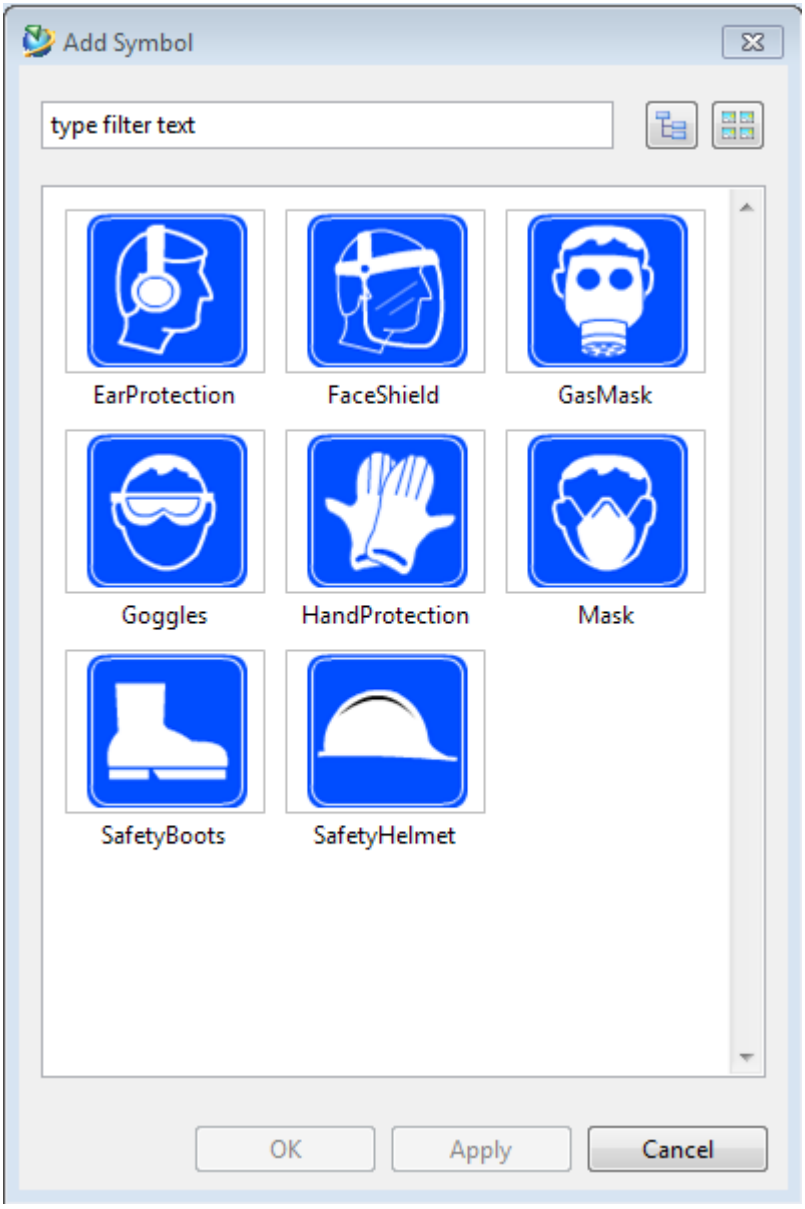

4. Select one or multiple symbols and click **OK** to close the dialog box or **Apply** to add the symbol but leave the dialog box open for further selection.

   Teamcenter adds the desired symbols to the symbol section in your document.

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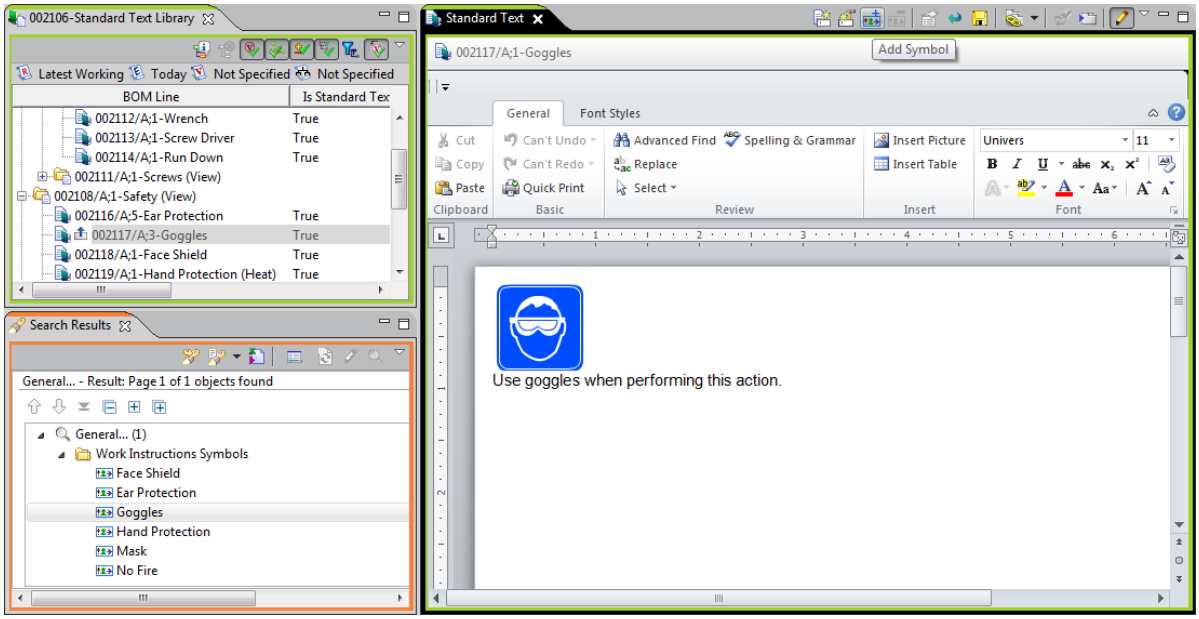

Note:

- Teamcenter always adds symbols to the symbol section. It does not matter where the cursor is when performing the **Add symbol** operation.
- You may select multiple symbols and add them with a single **Add symbol** operation.
- You cannot insert a particular symbol more than once.
- After performing this action, you cannot undo any previous actions (the **Undo** list is cleared).

Remove a symbol

- In the document, select the symbol you want to remove and click **Remove symbol** .

  Teamcenter removes the symbol.

Note:

After performing this action, you cannot undo any previous actions (the **Undo** list is cleared).

Add a data collection definition

You add a data collection definition to the document. This contains an instruction to perform data collection on the shop floor. You can also define the required properties for the new data.

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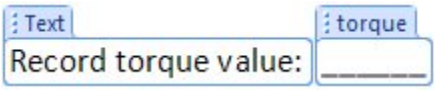
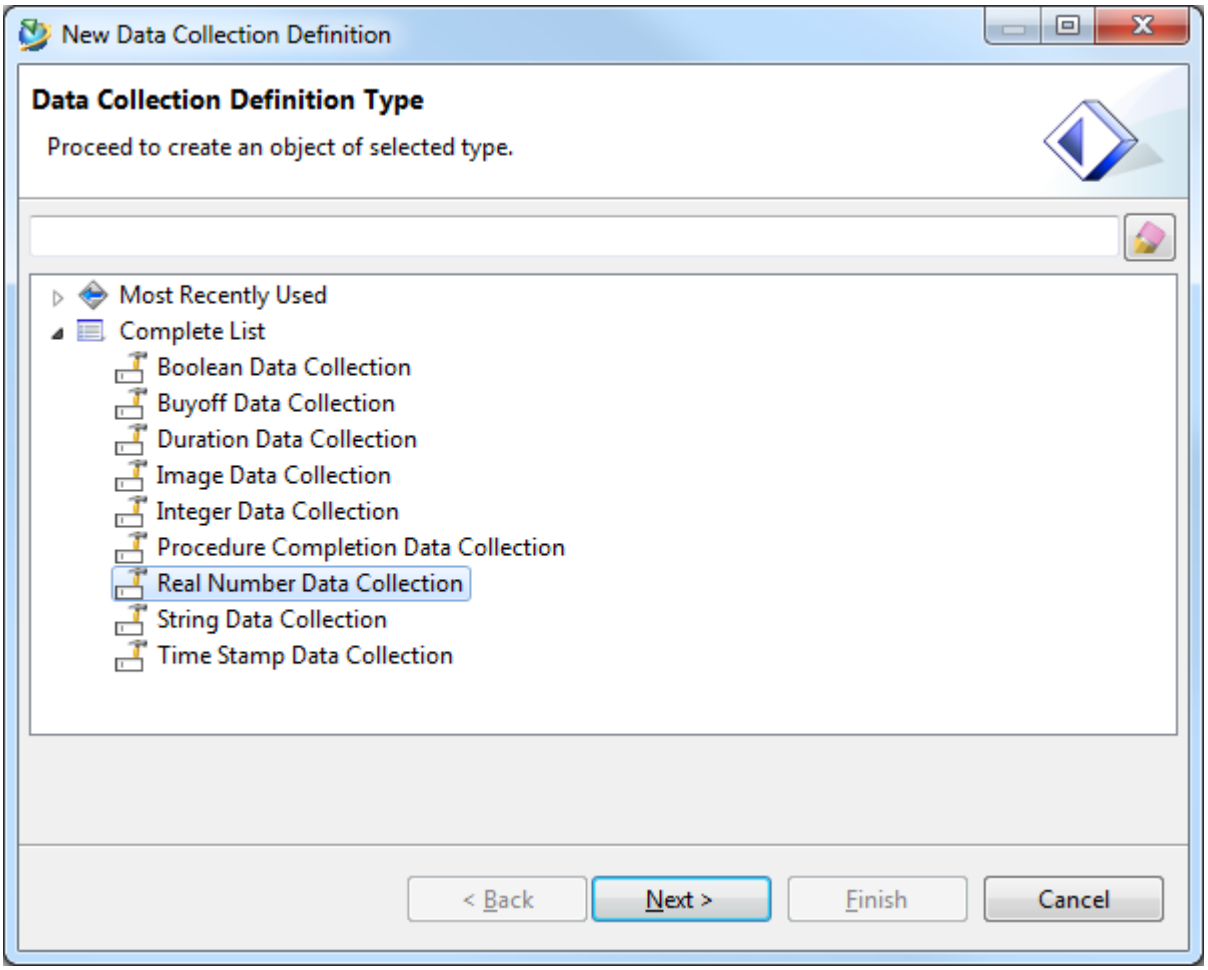
For example, if you require production workers to note a torque value, you can use text followed by a data collection definition.



> Note:
>
> Data collection definitions are not visible in the Teamcenter structure.

1. Place your cursor at the location at which to add the data collection definition and click **New dcd** .

   The New Data Collection Definition wizard is displayed.



   The following data collection definition types are available:

   - **Boolean**

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- **Buyoff**
- **Duration**
- **Image**
- **Integer**
- **Procedure Completion**
- **Real Number**
- **String Data**
- **Time Stamp**
- **List of Values**

All the data collection definition types can be user-customized and are automatically supported by the editor.

2. Select the type of data control definition or type it and click **Next**.

   The Data Collection Definition Create Information wizard is displayed.

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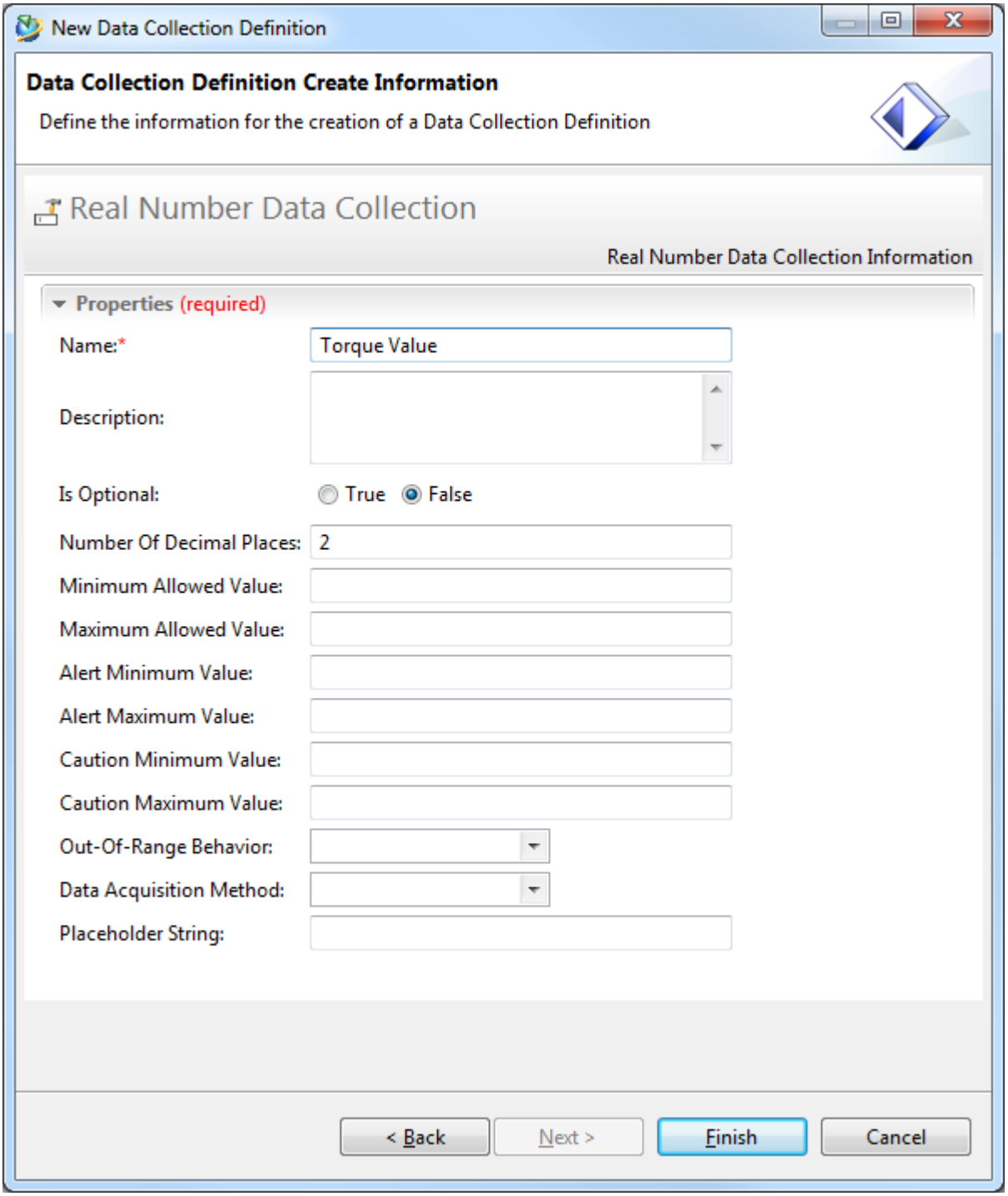

3. Enter the attributes for the new data collection definition and click **Finish**.

   - **Name** is required; all the other attributes are optional.
   - The **Placeholder String** property holds the characters to be displayed in the document. If this is left empty, ... (an ellipsis) is displayed in the standard text document.

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- The default value for **Is Optional** is **False**. This means that the data collection definition is not optional and a measurement must be recorded. You can set **Is Optional** to **True** to make the data collection definition optional.

The new data collection definition is displayed in your document.

Note:

You cannot copy data collection definitions.

Data collection properties

In addition to the **Name**, **Description**, **Is Optional**, and **Placeholder String** properties that each data collection type possesses, most data collection types have additional properties, except for **Boolean Data Collection** and **Duration Data Collection**.

The following table lists the additional properties and the data collection definition types that include them.

Property	Data collection definitions
Time format	**Time Stamp, Procedure Completion, Buyoff**
Allow characters	**String**
Maximum length	**String**
Minimum allowed value	**Integer, Real Number**
Maximum allowed value	**Integer, Real Number**
Caution minimum value	**Integer, Real Number**
Caution maximum value	**Integer, Real Number**
Alert minimum value	**Integer, Real Number**
Alert maximum value	**Integer, Real Number**
Number of decimal places	**Real Number**
Out-Of-Range Behavior	**Integer, Real Number, Image**
Data Acquisition Method	**Integer, Real Number, Image**

Note:

An administrator can add the **List of Values** type as a customized type when he or she sets up standard text.

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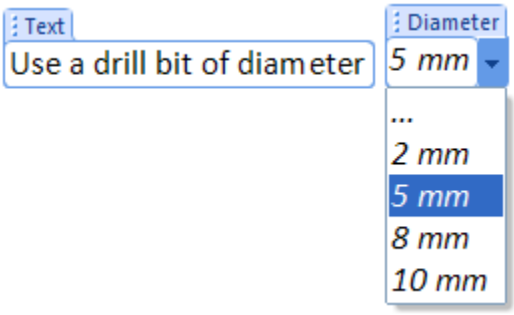
Add a planner input field

You can use a planner input field in a standard text document to create generic standard text elements for repeated use in varying scenarios. This is done by combining text and planner input fields. For example:



You can also define the required properties for the new data.

> Note:
>
> Planner input fields are not visible in the Teamcenter structure.

1. Place your cursor at the location at which to add the planner input field and click **New pif**.

   The **New Planner Input Field** dialog box is displayed.

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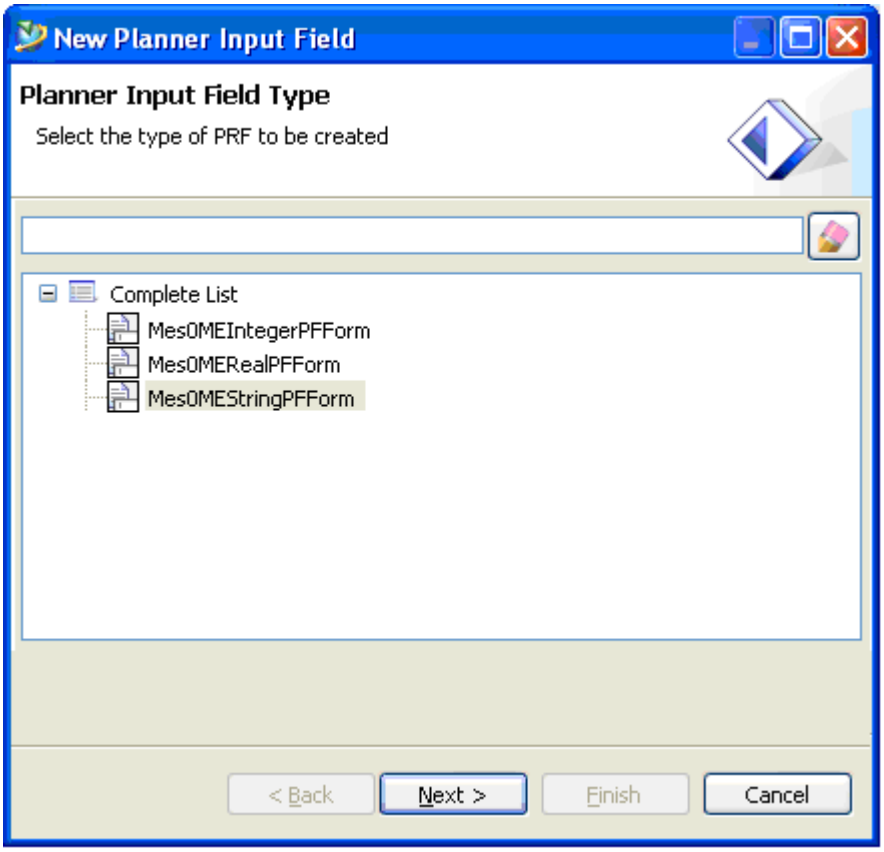

The following planner input field types are available:

- **Integer**
- **Real**
- **String**
- **Customized**

> Note:
>
> Customized planner input fields require a dedicated style sheet. If this is missing, the **New Planner Input Field** dialog box prevents you from proceeding to the next stage.

All the planner input field types can be user-customized and are automatically supported by the editor.

2. Select the type of planner input field or type it and click **Next**.

   The **Planner Input Field Create Information** dialog box is displayed.

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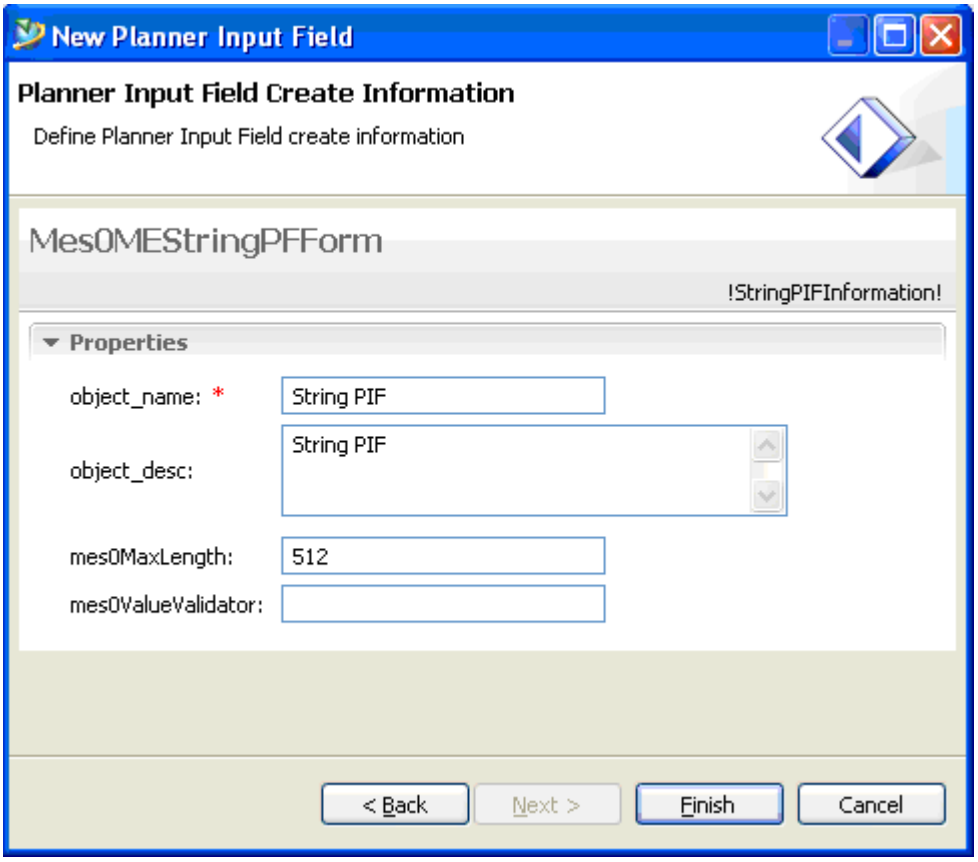

3. Enter the attributes for the planner input field definition and click **Finish**.

   Name attribute is required; all the other attributes are optional.

   The new planner input field is displayed in your document. It displays **Name** in its title bar.

4. Click **Finish**.

   Teamcenter performs a validity check on the new planner input field.

Planner input field type	Teamcenter checks that...
Integer	The value is not less than the minimum (if defined) and does not exceed the maximum (if defined).
Real	The value is not less than the minimum (if defined) and does not exceed the maximum (if defined). The number of fraction digits does not exceed the allowed number (if defined).
String	The number of characters in the string does not exceed the maximum length. If it does, Teamcenter truncates the excess characters when saving the planner input field. The default maximum length is 512 characters.

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Planner input field type	Teamcenter checks that...
	The string is in the legal format (if defined). Teamcenter checks whether the string conforms to regular expression patterns. The following are examples of commonly used regular expression patterns: • Date (dd/mm/yyyy): (0?[1-9]|[12][0-9]|3[01])/(0?[1-9]|1[012])/((19|20)\d\d) • Email: ^[_A-Za-z0-9-]+(\.[_A-Za-z0-9-]+)*@[A-Za-z0-9]+(\.[A-Za-z0-9]+)*(\.[A-Za-z]{2,})$ • IP address: ^([01]?\d\d?|2[0-4]\d|25[0-5])\.([01]?\d\d?|2[0-4]\d|25[0-5])\.([01]?\d\d?|2[0-4]\d|25[0-5])\.([01]?\d\d?|2[0-4]\d|25[0-5])$

Note:

- If the validity check fails, the system issues an error message detailing the problem. The **Planner Input Field Create Information** dialog box remains active until the problem is solved.
- You cannot copy planner input fields.

View and edit properties

You can view and edit the properties for data collection definitions and planner input fields.

- Click **Properties** to view or edit the properties of the selected item in the current document.

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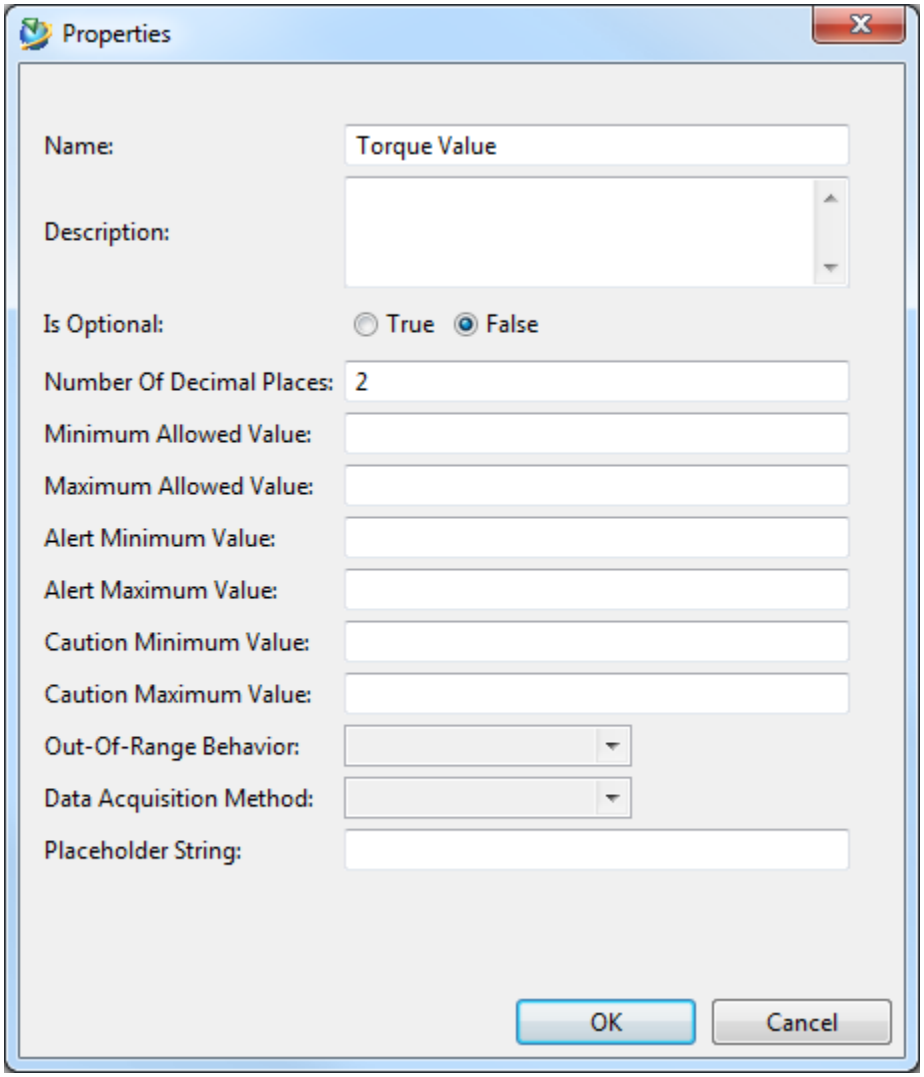

Note:

You can edit the **Placeholder String** property in-place without accessing the properties of the data collection definition. To complete the change, click anywhere in the document outside the data collection definition.

Remove a data collection definition

- Select the data collection definition and press the Delete key.

Remove a planner input field

- Select the planner input field and press the Delete key.

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Save changes

- Click **Save** to save the current changes in your document.

  Teamcenter saves the document and updates the preview document.

Discard changes

- Click **Discard changes** to discard your current work and reload the last saved version of the document.

Set the scope

In edit mode, you can change the editing focus from the current document to another document (the new scope) without exiting edit mode.

1. Click the desired element in the structure.

2. Click **Set scope**.

   If there are unsaved changes in the current document, Teamcenter prompts you to save them before exiting the current document.

Teamcenter closes the current document, checks out the target standard text element, and loads the target document. You can now begin editing the target document.

> Note:
>
> The **Set scope** command does not work if any of the following conditions apply:
>
> - The target scope is inactive.
> - The target scope is not a standard text element.
> - You do not have permission to edit the target scope, as defined by the access control list.

Activate/deactivate a standard text element

You can deactivate a standard text element if it is no longer valid. You cannot edit inactive standard text elements or add them to textual work instructions.

- To deactivate a standard text element, select it and change its **Is Standard Text Element Active** cell from **True** to **False**.

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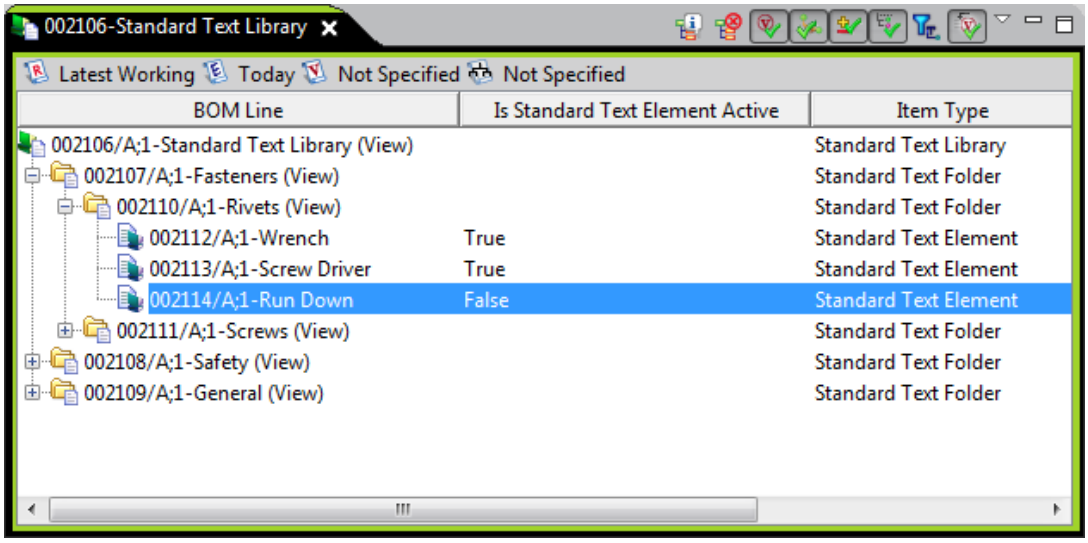

- To reactivate a standard text element, change its **Is Standard Text Element Active** cell back to **True**.
- If the **Is Standard Text Element Active** column is not visible, use the **Change Columns** dialog box to display the **Is Standard Text Element Active** column.
- You can still view deactivated elements.

Search a standard text element for a specific text string

You can search for standard text elements that contain specific text in their documents.

The **METWICreateTextControlsOnSave** preference must be set to **true** for this search to function properly.

- Type the string in the text field at the top of the **Standard Text Library** view and click .

  Teamcenter displays all the standard text elements in the **Search Results** section at the bottom of the view. You can work with these lines in the same fashion as you work with the lines at the top of the view.

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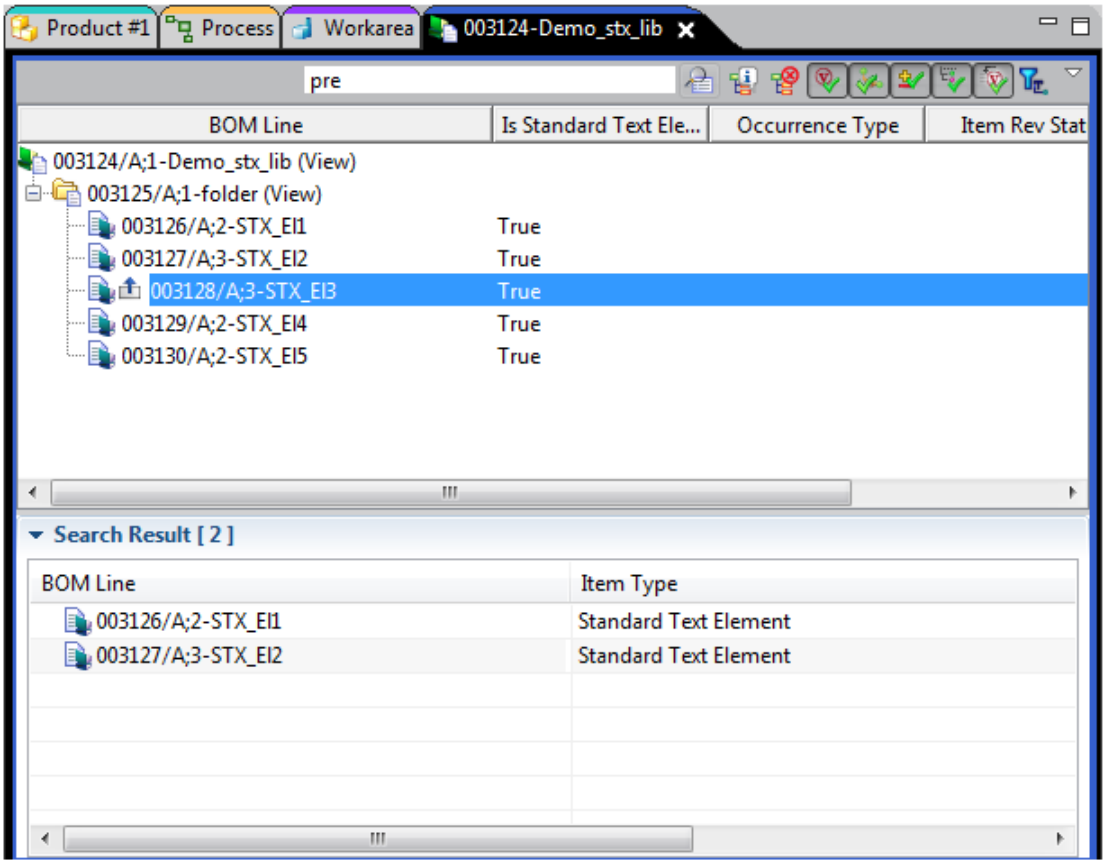

Generating reports

About reports

Use the *Report Management Using Report Generator* to generate reports for most aspects of a process plan including products, manufacturing processes, and plant structures.

> Note:
>
> Generation of 3D PDF reports in Manufacturing Process Planning — Usage is not supported.

You can view image datasets of the **Image** type that represent target parts and are attached to the operation. They are shown as hyperlinks in the report. You can also view images that were created by clicking the **Image Capture** button in the **Viewer** view in this way.

For more information about using the Report Generator application, see Report Generator in the Teamcenter help.

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Using the ProcessOperation report

The **ProcessOperation** report generates a sample work instruction document for the shop floor based on a process structure. It can contain 2D images of the manufactured assembly, as well as assembly simulation AVIs.

The HTML report for a process contains the following:

- Static title
- Title table containing the name of the process and the description
- 2D image (the first JPG attached to the process)
- List of files attached to the process (for example, JPG, DOC, PPT, XLS, VSD, TXT)
- Table list of the process operations
- Hyperlinked operation name that opens a separate operation HTML page
- Hyperlinked consumed part (if one exists) that loads the part in a JT applet

  > Caution:
  >
  > Assembly JT and multiple parts are not supported.

- Hyperlink to a simulation (if one exists) that plays the simulation AVI in an embedded media player

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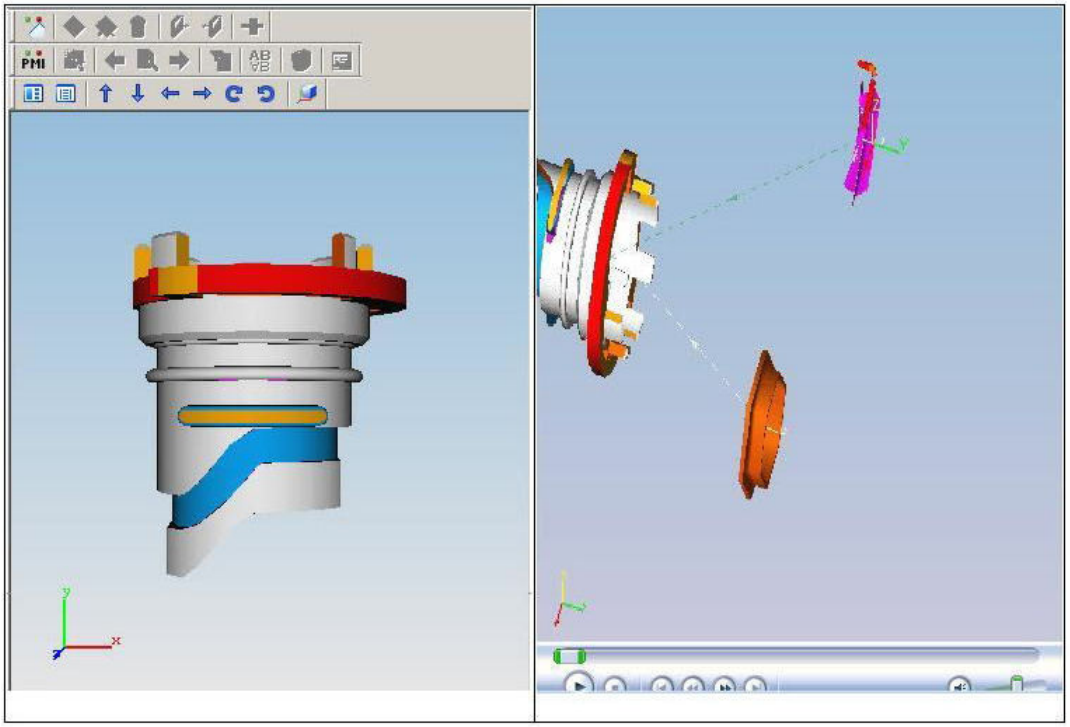
Assembly Work Instructions

ID	Name	Rev	Parent Name
000027	Assemble Knebel	A	Produce Knebel



Documents:	000086_A.jt Hexaring.jpg HexaringMfg.jpg InnerRing.jpg KnebelDisassembled.doc

Consumed Parts:

ID	Name	Rev

Assembly Steps:

ID	Name	Consumed parts	Simulations	Sequence No
000028	Assemble Inner Tube	't_3120146_01_000__kulisse_ausf'		10
000029	Assemble Spring	't_3120033_13_000_e01__drehfede' + g_3120241_01_000__exttess	springmovie10617.avi	20
000034	Navigation Sys Basic	't_3120009_01_000__dichtung_fro'		70
000036	Instrument Cluster DL	't_3120031_01_000__knebel_4_a_d'		90
000035	Assemble Base Knebel	't_3120032_02_000__frontring_5_'		100

Tools:

ID	Name	Rev
000069	saufh_1	A
000069	saufh_1	A

ProcessOperation report in Manufacturing Process Planner

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Select this report from the **Type** list in the **Report** view of Manufacturing Process Planner.

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11. Approving/releasing manufacturing process plans

About baselining or preliminary structures

You can release intermediate structure data for other users or suppliers to review or consume. An intermediate data release or baseline of in-progress data is sometimes called a preliminary data indicator (PDI).

You must create a baseline (PDI) of the related product structure and plant structure before you create a baseline of the process structure. This allows you to reproduce the process structure when necessary by applying the appropriate product and plant configuration rules that were applied when you created the PDI.

Creating PDIs

When you create a PDI of a process, Teamcenter creates a baseline of the associated operations and (optionally) resources as a set. It does not baseline the product structure or plant structure, and you must manually baseline these structures first.

> Note:
>
> By default, resources are not baselined. Your administrator must remove **MSResource** from the **Baseline_omitted_occurrence_types** preference to include them in the baseline.

Any resources consumed in these operations must be released, or you must have permission to baseline the resource items.

When you create a PDI, Teamcenter traverses each child of the structure, creates a new item revision under a specified baseline revision ID, and releases the new item revision. It does not include any occurrence groups in the structure in the PDI.

Creating a dry run

Before creating a new item revision for a PDI, you can optionally make a *dry run* to validate the baseline. Teamcenter provides detailed status information about the structure. If there are any errors in the structure, Teamcenter displays their details, halts the baseline process, and does not release the structure. Your administrator can set a preference that determines if validation is always required before you create the baseline, or if you can validate the structure only when you consider it necessary.

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Creating precise and imprecise baselines

Depending on the configuration of your structure, you can create the baseline as a precise structure or an imprecise structure. If you want a precise structure of a process, you must also baseline the product structure and plant structure first to be able to reproduce the revision status of the PDI in the future. In this case, all the relevant structures (product, plant and process) must be precise to allow their accurate reproduction in future sessions.

Viewing a PDI

You can view a PDI immediately when the baseline is created. However, the revision rule is not automatically applied when the baseline is loaded, and you must apply it manually.

You can also view the baseline in My Teamcenter and choose the appropriate item revision from the list of available item revisions. You can distinguish baseline revisions from other released revisions by the specific revision ID format as described in *Create a baseline of a structure*.

After applying the proper configuration rule, you can save the baseline structure and view it in Multi-Structure Manager.

Create a baseline of a structure

1. Open the structure revision.

2. Select the top line of the structure and choose **Tools→Baseline**.

   Teamcenter checks if you can create a baseline of the selected revision. If not, Teamcenter displays the reason (for example, you cannot create a baseline from an existing baseline). Otherwise, Teamcenter displays the **Baseline** dialog box, showing the item ID, baseline revision, and baseline name.

3. Enter the following information in the **Baseline** dialog box.

Box	Entry
Description	Type a description of the baseline.
Baseline Template	Choose a baseline release procedure template from the list of available procedures. Your administrator defines the available procedures with the **Baseline_release_procedures** preference.
Job Name	Note the job name. The job name is automatically generated and you cannot change it. Your administrator defines the naming scheme in the Business Modeler IDE application,

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Box	Entry
	as described in the *BMIDE for Data Model Design*.
Baseline Label	Type an alphanumeric string that represents the baseline label. Teamcenter uses the label you enter as the name of the baseline folder. This box is only displayed if your site uses baseline labels.
Job Description	Type a description of the PDI job.
Open On Create	Select this check box if you want Teamcenter to open the baseline for viewing when it is created. You must apply the revision rule manually when the baseline is open.
Dry Run Creation	Select this check box if you only want to validate the structure as suitable for creating a baseline. If you clear this check box, Teamcenter validates the structure and creates an item revision for the baseline. Note: Your administrator can set the **Baseline_dryrun_always** system preference to determine if a dry run is always required.
Precise Baseline	Select the type of baseline to create— precise or imprecise. Your site may be configured to allow only precise baselines, depending on the setting of the **Baseline_precise_bvr** preference.

4. Click **OK** or **Apply** to create the baseline. Alternatively, you can click **Cancel** to exit without creating a baseline.

   Teamcenter optionally creates a baseline folder to hold the baseline. Your administrator specifies if a folder is created by setting the **baseline_create_snapshot_folder** preference.

   If the value of this preference is **0**, the baseline folder name is in the format *Baseline_ItemId_BaselineRevId* and may be truncated to 32 characters, if necessary. The folder is attached to the top structure.

   If the value of this preference is **1**, the baseline folder name is the alphanumeric string you entered in the **Baseline Label** box in the **Baseline** dialog box.

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Note:

In addition to setting this preference, you must set the **Snapshot** relationship on the item revision to make the snapshot folder visible. Do this by choosing **Edit→Options→General→Item Revision** and adding **Snapshot** to the **Shown Relations** column of both the **General** and **Related Object** tabs.

Caution:

If you expand the baseline item revision below a certain level, the application displays duplicate objects.

5. Save the revision rule for the product structure, process structure, and plant structure by saving the structure as a collaboration context. After you do this:

   - The product root item is the baseline product.
   - The plant root item is the plant baseline.
   - The process root item is the process baseline.

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12. Managing the enterprise BOP

Planning manufacturing for reuse with the enterprise BOP

The enterprise bill of process (EBOP) capability allows you to capture standards and best practices across the business as generic processes and operations. You can reuse these generic definitions multiple times when planning the manufacture of any product or specific models at different manufacturing facilities.

When you implement EBOP, you work with the following data:

- A *generic BOP* or process plan that represents the processes for building a single generic product for a product family at all sites. For example, you can define a generic process plan for building any model of pickup truck. You build this process plan from standard tools, processes, and operations, excluding elements that are unique to a particular model.

- One or more *product BOPs*. This process plan represents the common processes for building a particular model at any site. It is derived from the generic BOP for the corresponding type of product, allowing for commonality and reuse between different products of the same type.

- One or more *plant BOPs*. This process plan represents all processes or operations that are performed at a specific plant or work station. Processes and operations are allocated from a product BOP to a plant BOP, which is then used for analysis and validation of the process plan. This can include consideration of nonvalue-added operations that are required in the specific plant, time analysis, line balancing of a given product mix, simulation, and derivation of precise requirements for tools and worker skills.

- *Partitions* to organize groups of processes within the generic BOP and product BOP into a hierarchical structure, for example, a partition may contain seat system processes or chassis processes.

- *Logical designators* to allow the same partition, process or operation to be mapped to different generic or product BOPs.

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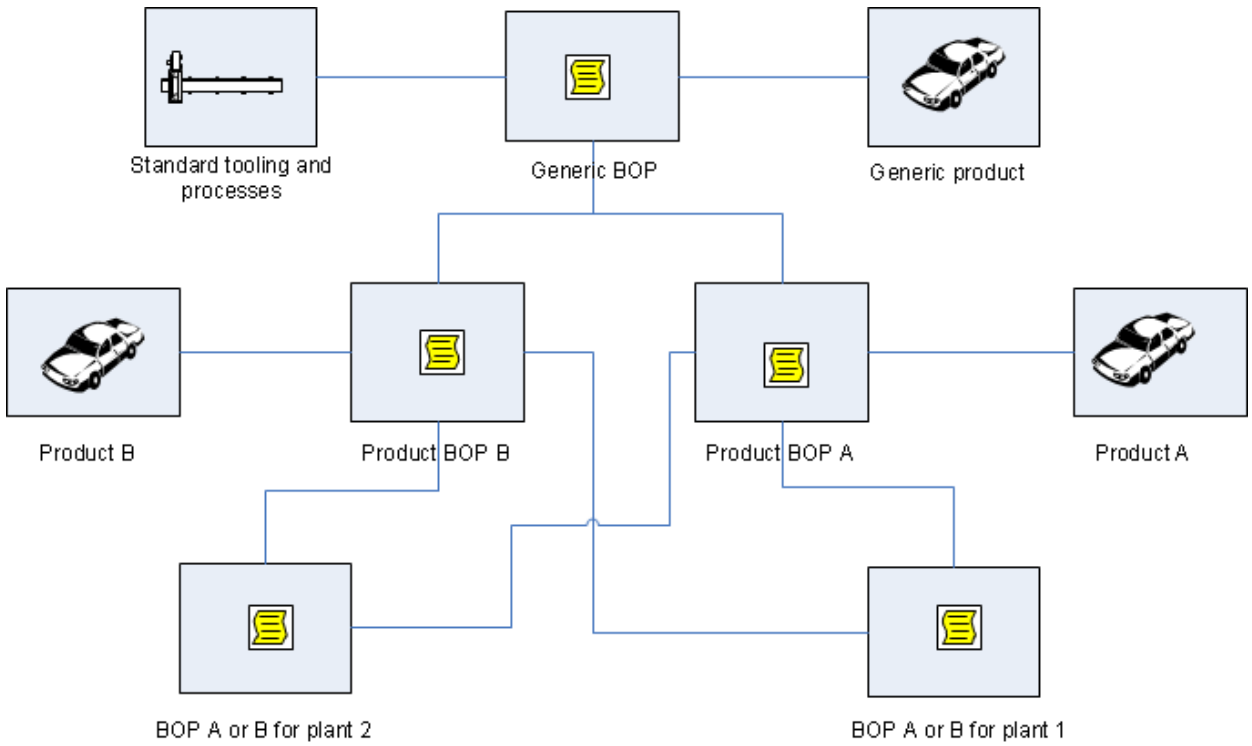

Creating enterprise BOP structures

Setting up the enterprise BOP structure

An enterprise BOP structure is built from processes, partitions, and operations. It can be created from these components, modified, and managed in Manufacturing Process Planner using similar techniques to other BOPs.

- A *partition* is a group of processes in a generic BOP or a product BOP, but is not a process itself. It provides a means to organize processes with a similar purpose for easy access, for example, all seat system processes may be placed in one partition and all chassis processes in another. A partition may have a logical designator to allow the mapping of partitions across different product BOPs. It breaks a BOP into a navigable structure.

  The content of a partition is not tracked over time, so there is no revisioning of partitions. Similarly, configuration information (variant expressions or effectivity) should not be applied to the partition itself.

  A partition may contain other partitions.

- A *process* is an ordered sequence of operations with a single purpose. It represents the complete content of the assembly or installation procedure for a subsystem, for example, **install the brake dust shield to knuckle**. Each process has an output, typically the built or installed subsystem. In final assembly, a process normally contains 5 to 10 operations.

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The order of operations under the process represents the logical order in which the shop floor operators execute them. Operations should also be arranged in a logical sequence in the generic BOP and product BOP.

- An *operation* is the smallest manageable unit of work that can be allocated to the plant, for example, **obtain a tail light** or **tighten a screw**. It can be broken down into *activities*. It can also consume or handle parts, and you can assign resources to it.

  The logical designator of an operation is typically derived from the logical designator of the owning process. You can drag operations within a process and between process; the logical designator automatically updates based on the operation placement.

- A partition, process, or operation has a *logical designator* that allows identification of partitions, processes, and operations with the same purpose in different BOPs. For example, the process to assemble a headlight may have the same logical designator in all BOPs. The process logical designator is derived from the part consumption and the purpose of the process. For example, the assembly process for a subsystem has a different logical designator to the installation process for the same subsystem. Conversely, two processes that achieve the same goal share the same logical designator, for example, manual and automated installation processes for the same subsystem.

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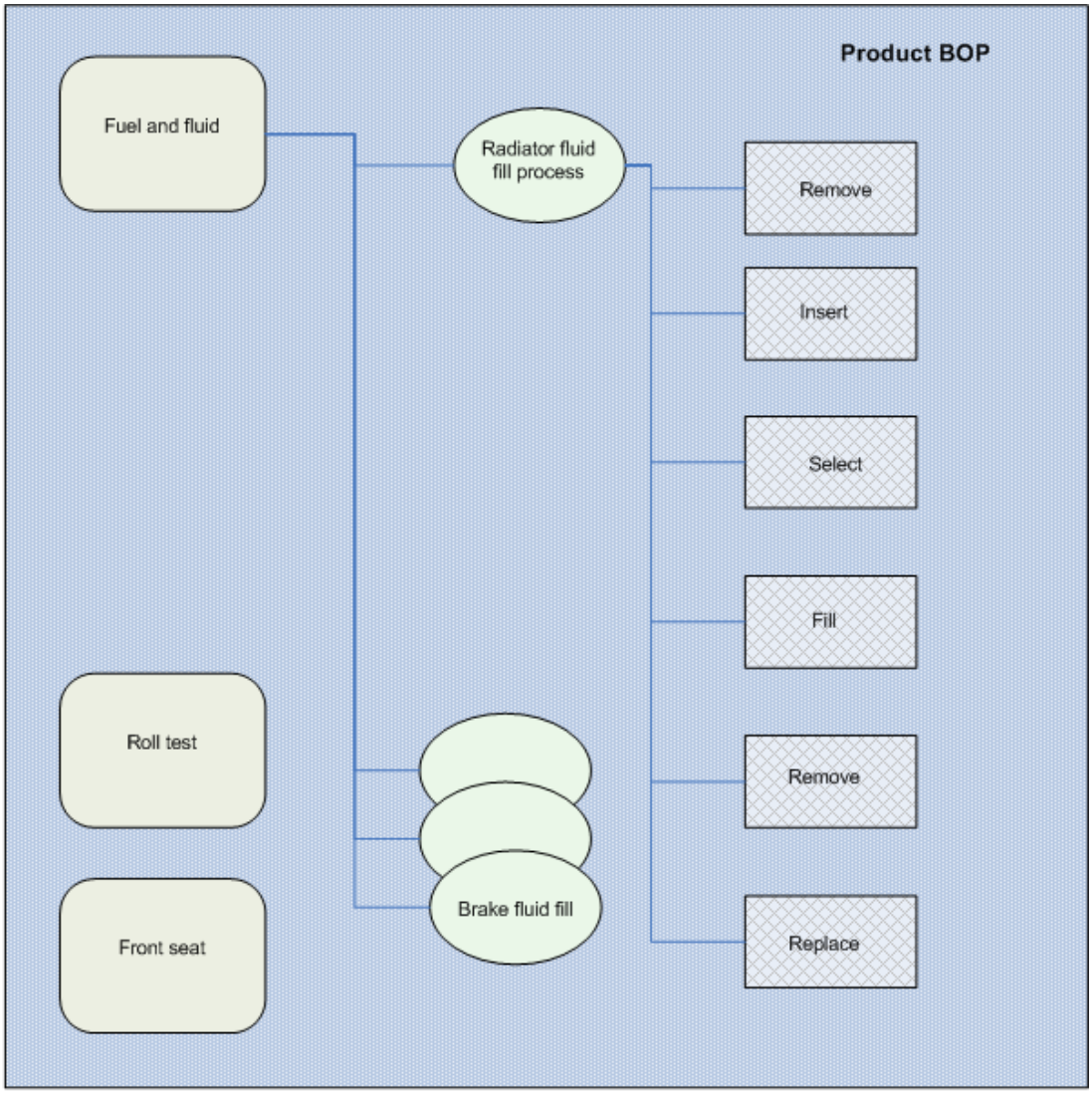
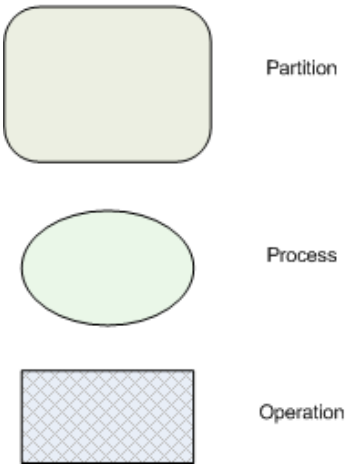


KEY:



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Create a generic BOP

1. Choose **File→New→Generic BOP**.

   Teamcenter displays the **New Generic BOP** dialog box.

2. Select one of the generic BOP types from the list and click **Next** .

   For more information about creating additional generic BOP types, see *BMIDE for Data Model Design*.

3. Select the root partition type you want to create and click **Next** . (The root partition name and description are identical to those of the generic BOP; it is not necessary to specify them again.)

4. Enter the ID number to be assigned to this new generic BOP. You can assign a unique revision number in the **Revision ID** box.

   > Note:
   >
   > To let the system automatically assign a unique ID, click **Assign**.

5. Type a name for the new generic BOP, following your company's naming standards.

6. (Optional) Type a description of the new generic BOP.

7. Click **Finish** to create the new generic BOP or click **Next** to add more information.

   > Note:
   >
   > If the master forms or partition logical designator forms contain mandatory fields, you must click **Next** at this step.

8. (Optional) Define any additional generic BOP master form information, and then click **Finish** to create the new generic BOP or click **Next** to add more optional information.

9. (Optional) Define any additional generic BOP revision master form information, and then click **Finish** to create the new generic BOP or click **Next** to add more optional information.

10. (Optional) Define the logical designator of the root partition, and then click **Finish** to create the new generic BOP or click **Next** to attach files.

11. (Optional) Attach any files you want to associate with the generic BOP, and then click **Finish** to create the new generic BOP or click **Next** to assign the generic BOP to a project.

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12. (Optional) Assign the generic BOP to one or more projects. The system displays the list of projects to which the generic BOP can be assigned.

    a. Select one or more projects from the **Projects for Selection** list.

    b. Click the right-arrow button to move the projects to the **Selected Projects** list.

    c. Click **Finish** to finish the project assignment and create the new generic BOP, or click **Next** to add more optional information.

> Note:
>
> The generic BOP is always owned by the project shown in the **Owning Project** box.

13. (Optional) Define the open, display, and checkout behavior.

    a. The **Show as new root** check box is always selected because a generic BOP must be a new root.

    b. If you created an alternate identifier for the generic BOP, you can use the alternate identifier as the default display object. Select **Use item identifier** as the default display and **Use revision identifier** as the default display to set the alternate identifier as the default display object.

    c. Select **Check Out Generic BOP Revision on Create** to lock the checkout of the associated generic BOP revision when the generic BOP is created.

14. Click **Finish** to create the new generic BOP.

Create a product BOP

1. Choose **File→New→Product BOP**.

   Teamcenter displays the **New Product BOP** dialog box.

2. Select one of the product BOP types from the list and click **Next** .

   For more information about creating additional product BOP types, see *BMIDE for Data Model Design*.

3. Select the root partition type you want to create and click **Next** .

4. If you want to create (clone) the product BOP from a template, enter the template information and click **Next** . If not, click **Next** immediately.

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5. Enter the ID number to be assigned to this new product BOP. You can assign a unique revision number in the **Revision ID** box.

   > Note:
   >
   > To let the system automatically assign a unique ID, click **Assign**.

6. Type a name for the new product BOP, following your company's naming standards.

7. Click **Finish** to create the new product BOP or click **Next** to add more information.

   > Note:
   >
   > If the master forms or partition logical designator contain mandatory fields, you must click **Next** at this step.

8. (Optional) Enter or browse to the ID of the template that the product BOP is based on, and then click **Finish** to create the new product BOP or click **Next** to add master form information.

9. (Optional) Define any additional product BOP information, and then click **Finish** to create the new product BOP or click **Next** to add more optional information.

10. (Optional) Define any additional product BOP revision information, and then click **Finish** to create the new product BOP or click **Next** to add more optional information.

    > Note:
    >
    > By default, this pane is empty as the default master form of the product BOP revision contains no fields.

11. (Optional) Define the logical designator of the root partition, and then click **Finish** to create the new product BOP or click **Next** to attach files.

12. (Optional) Attach any files you want to associate with the product BOP, and then click **Finish** to create the new product BOP or click **Next** to assign the product BOP to a project.

13. (Optional) Assign the product BOP to one or more projects. The system displays the list of projects to which the product BOP can be assigned.

    a. Select one or more projects from the **Projects for Selection** list.

    b. Click the right-arrow button to move the projects to the **Selected Projects** list.

    c. Click **Finish** to finish the project assignment and create the new product BOP, or click **Next** to add more optional information.

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> Note:
>
> The generic BOP is always owned by the project shown in the **Owning Project** field.

14. (Optional) Define the open, display, and checkout behavior.

    a. The **Show as new root** check box is always selected because a generic BOP must be a new root.

    b. If you created an alternate identifier for the product BOP, you can use the alternate identifier as the default display object. Select **Use item identifier** as the default display and **Use revision identifier** as the default display to set the alternate identifier as the default display object.

    c. Select **Check Out Product BOP Revision on Create** to lock the checkout of the associated product BOP revision when the product BOP is created.

15. Click **Finish** to create the new product BOP.

Create a plant BOP

1. Choose **File** → **New** → **Plant BOP**.

   Teamcenter displays the **New Plant BOP** dialog box.

2. Select one of the plant BOP types from the list and click **Next** .

   For more information about creating additional plant BOP types, see *BMIDE for Data Model Design*.

3. Enter the ID number to be assigned to this new plant BOP. You can assign a unique revision number in the **Revision ID** box.

   > Note:
   >
   > To let the system automatically assign a unique ID, click **Assign**.

4. Type a name for the new plant BOP, following your company's naming standards.

5. (Optional) Type a description of the new plant BOP.

6. Click **Finish** to create the new plant BOP, or click **Next** to add more information.

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> Note:
>
> If the master forms contain mandatory fields, you must click **Next** at this step.

7. (Optional) Define any additional plant BOP master form information, and then click **Finish** to create the new plant BOP, or click **Next** to add more optional information.

8. (Optional) Define any additional plant BOP revision master form information, and then click **Finish** to create the new plant BOP, or click **Next** to add more optional information.

9. (Optional) Select **Create BOP from Template** and choose a template by entering its ID, searching for it by name, or searching for it by classification class.

   If you create a plant BOP from an existing plant BOP, Teamcenter does not maintain origin links between the two plant BOPs. If, however, the template plant BOP contains operations or processes that were allocated from a product BOP, Teamcenter maintains origin links from the allocated processes or operations in the new plant BOP back to the original product BOP.

   > Note:
   >
   > You cannot create a plant in another plant (**Plant** under an **Plant**).

10. (Optional) Assign the plant BOP to one or more projects.

    Teamcenter displays the list of projects to which the plant BOP can be assigned.

    a. Select one or more projects from the **Projects for Selection** list.

    b. Click the right-arrow button to move the projects to the **Selected Projects** list.

    c. Click **Finish** to finish the project assignment and create the new plant BOP, or click **Next** to add more optional information.

    > Note:
    >
    > The plant BOP is always owned by the project shown in the **Owning Project** box.

11. (Optional) Define the open, display, and checkout behavior.

    a. The **Show as new root** check box is always selected because a plant BOP must be a new root.

    b. If you created an alternate identifier for the plant BOP, you can use the alternate identifier as the default display object. Select **Use item identifier** as the default display and **Use revision identifier** as the default display to set the alternate identifier as the default display object.

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c. Select **Check Out Plant BOP Revision on Create** to lock the checkout of the associated plant BOP revision when the plant BOP is created.

12. Click **Finish** to create the new plant BOP.

Create a process area

A process area is a specific work area in a process plan. You can only create process areas under a plant BOP.

1. Select a plant BOP root structure.

   > Note:
   >
   > You cannot create a process area as a root object, nor can you open it as a root object.

2. Choose **File→New→Process Area**.

   Teamcenter displays the **New Process Area** dialog box.

3. Select one of the process area types from the list and click **Next** .

   You can select from **Process Area**, **Mfg0MEProcStatn** (**Process Station**) **Mfg0MEProcLine**, (**Process Line**) or **Mfg0ProcResource** (**Process Resource**). **Process Resource** is also available when you use the **File→New→Process Resource** command. The **Process Station** and **Process Line** objects derive from the **Process Area** object and have the following limitations:

   - You cannot create a process line under a process station.
   - You cannot create a process area under a regular process.

   You can use the **MEAllocationLevel** preference to limit the type of process area to which you can allocate operations.

   For more information about creating additional plant BOP types, see *BMIDE for Data Model Design*.

4. Enter the ID number to be assigned to this new plant BOP. You can assign a unique revision number in the **Revision ID** box. To let the system automatically assign a unique ID, click **Assign**.

5. Type a name for the new process area, following your company's naming standards.

6. (Optional) Type a description of the new process area.

7. Click **Finish** to create the new plant BOP, or click **Next** to add more information.

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If the master forms contain mandatory fields, you must click **Next** at this step.

8. (Optional) Define any additional process area master form information, and then click **Finish** to create the new process area, or click **Next** to add more optional information.

9. (Optional) Define any additional process area revision master form information, and then click **Finish** to create the new process area, or click **Next** to add more optional information.

10. (Optional) Assign the process area to one or more projects. The system displays the list of projects to which the process area can be assigned.

    a. Select one or more projects from the **Projects for Selection** list.

    b. Click the right-arrow button to move the projects to the **Selected Projects** list.

    c. Click **Finish** to finish the project assignment and create the new process area, or click **Next** to add more optional information.

    The process area is always owned by the project shown in the **Owning Project** box.

11. (Optional) Define the display and checkout behavior.

    a. If you created an alternate identifier for the process area, you can use the alternate identifier as the default display object. Select **Use item identifier** as the default display and **Use revision identifier** as the default display to set the alternate identifier as the default display object.

    b. Select **Check Out Process Area Revision on Create** to lock the checkout of the associated process area revision when the process area is created.

12. Click **Finish** to create the new process area.

Opening an existing enterprise BOP structure by name

You can open an existing generic BOP, product BOP, or Plant BOP in Manufacturing Process Planner to view or edit.

> Caution:
>
> Always load a generic BOP, product BOP, or plant BOP as a top-level item. Although Teamcenter does not prevent you from loading its substructure, you may encounter data integrity issues if you edit substructure.

When you load a generic BOP or product BOP, two tabbed panes are opened:

- A base view containing a standard process structure.

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You do not need to perform any tasks in this tab. All user interaction takes place in the partition tab.

- A partition tab to view the partition.

  You can open a partition (including a nonroot partition) separately by sending it to Manufacturing Process Planner from My Teamcenter.

Create a partition

1. Select the generic BOP, product BOP, or a partition within the generic BOP or product BOP to create a partition. Choose **File→New→Partition** or click the **Create a New Partition** button on the toolbar.

   > Note:
   >
   > This command is enabled only when you select a partition.

   Teamcenter displays the **New Partition** dialog box. The available partition types are listed at the left side of the dialog box, including all subtypes of the **MEProcessPartition** class.

2. Select a partition type, enter its name and (optionally) a description, and then click **OK** or **Apply**.

   Teamcenter creates the partition. If the logical designator of this class is defined, it also creates a new logical designator of this class, attaches it to the partition and opens the form for editing.

3. If a logical designator form is displayed, edit the content of the form and check it in. You *must* fill this form to successfully create the partition.

   If the form contains mandatory fields, enter the necessary data and click **OK** to continue. If the form does not contain mandatory fields, click **OK** immediately to continue.

   > Note:
   >
   > The form name is derived from the partition name and the suffix defined in the **MELogicalDesignatorFormNameSuffix** preference in the *partition_name-preference_value* format.

4. Add processes to the partition choosing **File→New→Process**.

View a process partition

Partitions are used to organize the processes and operations in a generic or product BOP into a hierarchy structure.

1. Load the top-level item of the generic BOP or product BOP.

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2. Open a partition to display all process partitions and the operations under them.

> Note:
>
> You cannot expand the top-level item in the base view, nor can you edit the structure or create new objects. Also, you cannot create occurrence groups in the base view.
>
> The administrator sets the property columns displayed for partitions by editing the shown columns preferences described in the *Enterprise BOP preferences*. You can change these settings for your workstation by right-clicking the column header and choosing **Insert Columns** or **Remove Columns**.

Edit a process partition

1. Load the top-level item of the generic BOP or product BOP structure.

2. If appropriate, modify the contents of the partitions by doing one or more of the following:

   - Add a new process by selecting the partition and choosing **File→New→New Process** or clicking the **Create a New Process** button on the toolbar.
   - Clone processes and operations by right-clicking the object and choosing **Paste Duplicate** in another generic BOP or product BOP, and then pasting the copy into a partition.
   - Add new partitions by selecting the existing partition and choosing **File→New→New Partition** or click the **Create a New Partition** button on the toolbar.
   - Use **Paste duplicate** to clone processes and partitions from one partition to another.
   - Remove an object from a partition by selecting the object and choosing **Edit→Remove**.

> Note:
>
> You cannot copy or move a process or operation from a process structure that is *not* a generic BOP or a product BOP.
>
> The **Paste** commands are unavailable when you try to copy a partition. You cannot paste a copy of a partition because this action creates a new occurrence of an existing revision. This results in sharing of the revision, which is inappropriate for partitions. You *can* cut and paste partitions.
>
> You can only add partitions or processes to a partition, not other objects.
>
> You cannot create a process or an operation from a template if you are working in a product BOP or a generic BOP.

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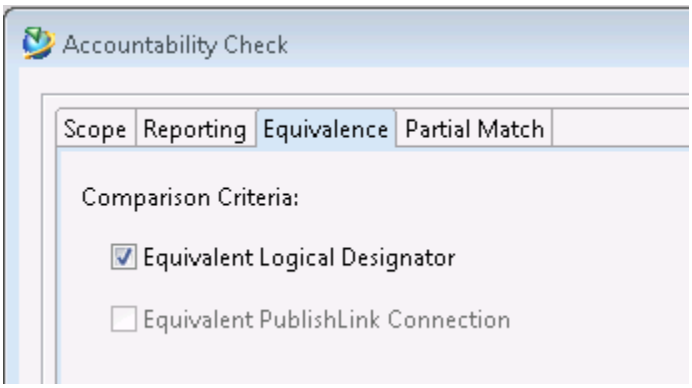
Creating a logical designator on a process, operation, or partition

Logical designator overview

You can attach a logical designator to a process, operation, or partition in the context of a generic bill of process (BOP) or product BOP. A logical designator is represented by two existing fields that are available on the absolute occurrences of the product structure, namely the usage address and the logical position. They have run-time property names of **bl_usage_address** and **bl_position_designator**, respectively. Your administrator can use Business Modeler IDE to assign lists of values (LOVs) to the fields to limit the possible selections.

Logical designators on partitions, processes, or operations are used by the accountability check when comparing two generic BOPs or two product BOPs.



Note:

Propagating changes from a product BOP with logical designators used in multiple operations and a generic BOP using cloning can result in accountability errors. After running an advanced accountability check, operations that should display partial matches are sometimes reported as missing in target and missing in source. Use the **Copy** and **Paste** commands between generic and product BOPs rather than cloning.

Automatically create part usage data from existing properties

To create part usage information (logical designators) for every part can be time-consuming. Teamcenter provides a mechanism to create this information based on a concatenation of other BOM line properties. Consider the following situation. Company A creates its **Usage Address** property value from two other properties called **UPC** and **FNA**. The usage address uniquely identifies each part. Company A uses the following business process.

1. The BOM for Model A is about to be released to manufacturing. During the release process, the designer runs the **me_stamp_ids** utility to populate the **Usage Address** property. Alternatively, the designer can run a workflow based on the **ME-stamp-ids-AH** action handler that performs the same task.

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2. The manufacturing planner ensures that the processes and operations contain the correct logical assignment designator and consumes the parts in the product BOP by resolving them in the **Assignments** view.

3. Further along the manufacturing cycle, parts and subassemblies in Model A are added and removed.

4. The designer again runs the utility to repopulate the usage address.

5. The planner again resolves the parts and the added or removed parts are assigned to the process.

Manually create a logical designator during process or operation creation

You can define a logical designator for any process or operation that you create in a generic BOP or product BOP, if a logical designator class is defined for the process or operation.

1. Create a **process** or an **operation**.

2. Enter the revision form information and click **Next**.

3. Enter the required logical designator information. The logical designator form contains fields relevant to your site.

   If the form contains mandatory fields, you must enter the necessary data and click **OK** to continue. If the form does not contain mandatory fields, click **OK** immediately to continue.

   Click **Finish** to create the new process or operation or click **Next** to continue and add additional information.

   > Note:
   >
   > If you do not complete the required fields at this step, a blank form is created and remains attached to the process revision or operation revision.

4. On completion, Teamcenter creates the logical designator. Its name is derived from the item ID and the value of the **MELogicalDesignatorFormNameSuffix** preference in the *item id-preference value* format.

If you create multiple objects in a single procedure, the same logical designator is created for each object and any values you enter on the form are copied to each logical designator.

Viewing and editing a logical designator

You can view the logical designator information associated with a process, operation, or partition by selecting the **Logical Designator Representation** property cell associated with the process, operation,

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or partition in the BOP window. If you double-click this cell, you can check out the logical designator form for editing.

> Note:
>
> The logical designator comprises several fields that are concatenated into a single string in the property cell. The fields appear in the property in the same order as on the form, separated by a user-defined delimiter character.

Removing a logical designator

You cannot remove a logical designator form from a process, operation, or partition, as it remains permanently attached to the associated object. If appropriate, you can edit the logical designator form to set all values to null.

Assign parts using logical assignments

Assignments overview

The **Assignments** view allows you to create and edit the logical assignments of a process or operation. When working with the enterprise BOP, you can view product assignments by processes or operations in the context of a generic BOP or product BOP. It shows logical assignment definitions and the actual part to which it resolved; manual part assignment; and tool requirement and the actual tool resolved for this tool requirement.

> Note:
>
> For completeness, the **Assignments** view shows any part consumptions of the processes and operations, even if they are not related to logical assignments.
>
> If the assignments are filtered in the BOP tree by (for example) occurrence type, revision rules, variant rules, or incremental change, the same filters are applied to the assignments in the view.

Logical assignment definition names comprise the usage address and position designator of the logical assignment, separated by a user-defined delimiter.

By default, the **Assignments** view shows only the occurrences that relate to product assignments, as determined by the occurrence type.

Once created, you cannot edit a logical assignment. Instead, remove the line and create a new logical designator in its place.

You cannot force an actual part assignment on a logical assignment. Consequently, dropping a part on a specific logical assignment or on another inappropriate location has no effect. Also, you cannot copy, cut, paste, or drag a logical assignment between processes and operations.

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Create logical assignments

1. Right-click a process or operation, and then choose **Open with→Assignments**.

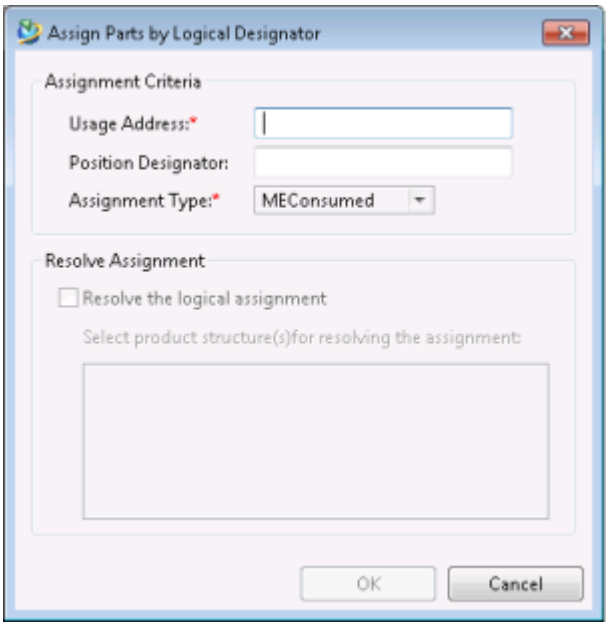
   Teamcenter displays the **Assignments** view containing any assignments that already exist on the currently selected line.

2. Do one of the following:

   - Use the menu commands.

     a. On the view toolbar or the main **Tools→Logical Assignment** menu, choose **Assign Parts by Logical Designator**, or click the **Assign Parts by Logical designator** button .

     Teamcenter displays the **Assign Parts by Logical Designator** dialog box.



     b. Enter values in the **Usage Address** and (optionally) **Position Designator** boxes.

     If you leave the **Position Designator** field blank, the system treats this as a wildcard (*) entry.

     c. Select the required assignment type from the list, for example, **MEConsumed**.

     The default entry provided in this box is specified by the **MERelationTypePartsDefault** preference.

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d. (Optional) Select the **Resolve the logical assignment** check box to immediately resolve the assigned logical designator, and then select one of the loaded product structures in the **Select product structure(s) for resolve** section.

   You can also resolve the assignments at a later time.

e. Click **OK** to complete the part assignments.

- Drag a part into the view if the part has a logical designator.

  If the dragged part does not have a logical designator, the system only creates an actual assignment and an error message appears. This result is similar to pasting the part on an operation or process in the BOP tree.

  Note:

  Dragging a part in this way only creates a logical assignment. The logical assignment is not resolved and the part is not consumed.

Note:

If an incremental change is currently active, all assignments are created in the context of that incremental change. Your administrator can modify the **MEResolveBypassICForReleaseStatus** preference so that new lines are not added to the incremental change context.

Teamcenter considers all occurrences, even if some assignments are filtered out by occurrence type.

Manually set the assignment state for review and approval

When you resolve part assignments, you can set a state for the assignment allowing it to go through a manual review and approval process.

Note:

This feature is only supported for enterprise BOP (EBOP) structures.

1. Ensure that the **MEAssignmentStateEnable** preference is set to **true**.

2. Add the **Assignment State** column to the **Assignments** view.

3. Resolve a part assignment as you normally would.

   Teamcenter resolves the assignment with the applicable part and displays the word **Pending** in the **Assignment State** column. The state assigned after resolving is specified in the **MEAssignmentStateInitial** preference.

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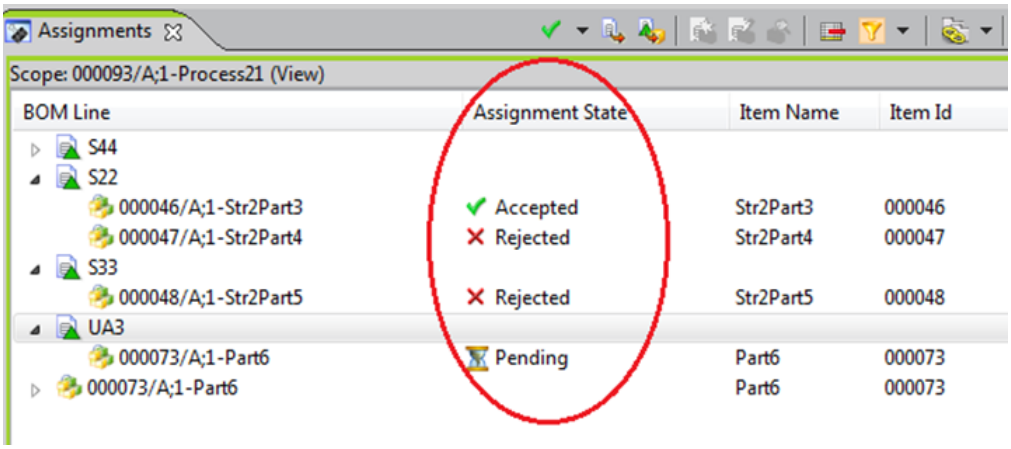
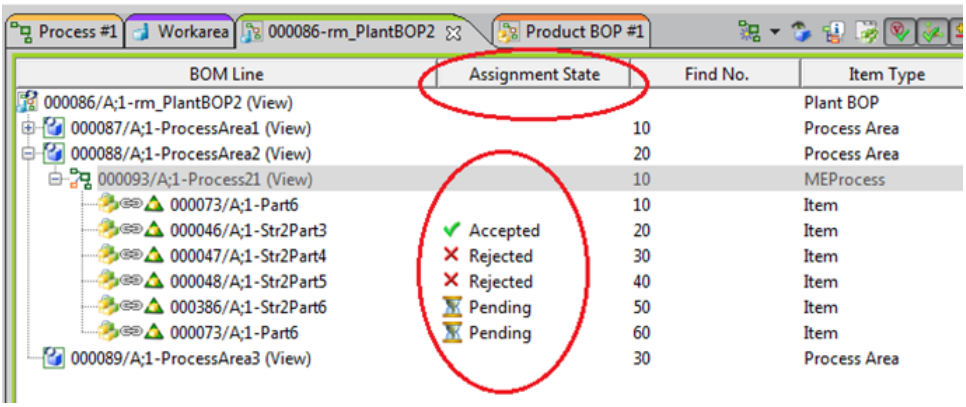


Note that the state is also displayed in the structure view.



If the line being resolved is a packed line, all the lines in the packed line receive the same state. If you change the state in one of the unpacked lines, you cannot repack the lines unless you change the state in all the other lines of the pack to the same assignment state.

When Teamcenter resolves assignments, by default, if a part is configured out and you re-resolve the same structure, the part is removed. Additionally, if the process contains consumed parts from one structure and you resolve using another structure, the consumed parts from the first structure are removed. Your administrator can change this default behavior using the **MERetainResolvedParts** preference. If the value of this preference is set to **true**, the resolution of a logical assignment definition always adds new parts. It does not remove any existing consumed parts regardless of the configuration of the loaded structure. This means that a process structure can contained consumed parts from multiple products.

Manually dragging the part to resolve it does not assign a state. Additionally, if you directly consume a part in a process or operation within an EBOP structure, Teamcenter does not assign it a state.

4. After a manual review of the assignment, change the state by right-clicking the assigned part in the **Assignments** view or in the structure view and choosing **Change Assignment State** and the appropriate state. You can choose from:

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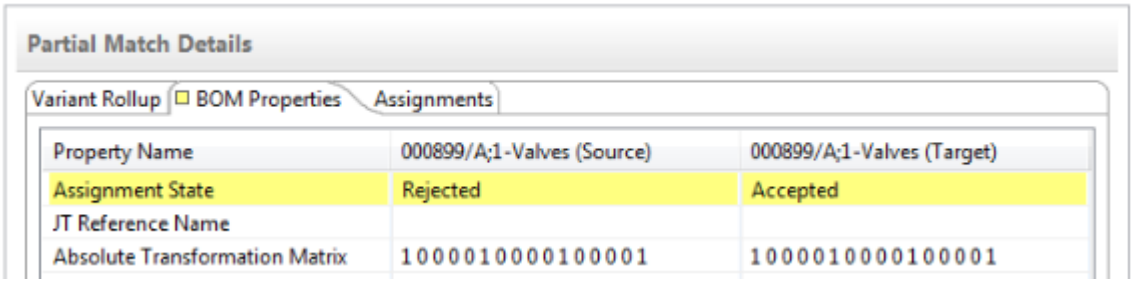
- **[No State]** (displayed as an empty cell in the **Assignment State** column)
- **Pending**
- **Accepted**
- **Rejected**
- **To be Removed**

Note that the manually changed state is not reflected in the structure view.

5. Allocate the process or operation from the product BOP to the plant BOP.

   Teamcenter carries over the assignment state from the source structure to the target structure. You can change the state on either of these structures independently. By default, Teamcenter carries over all the parts that are consumed in the process or operation and that have a **Pending** state. Your administrator can modify this behavior in the **MEAssignmentStatesForTarget** preference. For example, if the preference is set to **Pending** and **Accepted**, a consumed part in the product BOP that has been rejected (**Assigned State**=**Rejected**) is not carried over to the plant BOP.

6. (Optional) Run an accountability check between the product BOP and the plant BOP to ascertain differences in the assignment state. Since the assignment state is saved as a BOM line property, you can view any differences in the states in the **Partial Match Details** pane.



   You can then propagate the status from the source structure to the target structure.

   If, after initial resolution, the usage address is changed on an assigned part, when you resolve the consuming logical assignments again, Teamcenter displays an error message in a log file and, if the **MEAssignmentStateEnable** preference is set to **true**, sets the assignment state to **To be Removed**. You must then remove this part manually.

Search a product or plant BOP by assignment states

You can search for one or more specific assignment states (for example, **Accepted**, **Rejected**, or **Pending**) in a product bill of process (BOP) or plant BOP. Classic BOPs and assignment states are not supported.

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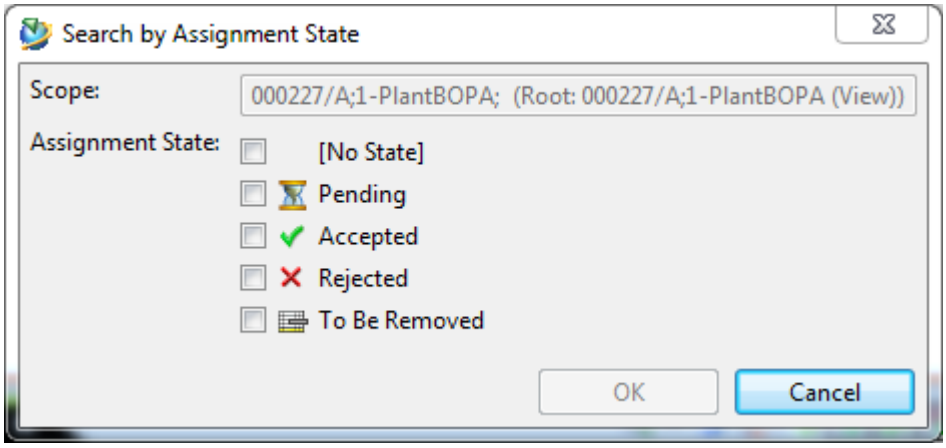
Note:

To enable the **Search by Assignment State** command, the **MEAssignmentStateEnable** preference must be set to **true**.

1. Select the top line of the product BOP or plant BOP structure that you want to search.

2. Select **Tools→Search by Assignment State**.

3. Select one or more types of assignment states that you want to search for in the product BOP or plant BOP structure.



4. Click **OK**.

A results view shows objects that reflect the selected assignment states.

Resolve part assignments

You can resolve part assignments as you create logical assignments. Alternatively, you can perform this task after creating the logical assignment.

1. Ensure the product structure to resolve against is loaded.

2. Right-click a process or operation, and then choose **Open with→Assignments**.

   Teamcenter displays the **Assignments** view displaying existing logical assignments.

3. (Optional) Select one or more logical assignments to resolve. Alternatively, if you do not select a logical assignment, all logical assignments are resolved.

4. On the view toolbar or the main **Tools→Logical Assignment** menu, choose **Resolve Part Assignments**, or click the **Resolve Logical Part Assignments** button.

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Teamcenter displays the **Resolve Logical Part Assignments** dialog box.

5. If more than one product structure is loaded, select the loaded structures to resolve against in the **Select product structure(s) for resolve** box.

6. (Optional) Select **Resolve Process Descendants** to pick a recursive resolution, and then click **OK**. Recursive resolution is available only when you select a process or partition.

   Choose a recursive resolution when you select the assignments of a process, rather than a logical assignment. The system resolves all logical assignments of the process and all logical assignments of all operations under it.

   Teamcenter resolves the selected assignments. By default, if a part is configured out and you re-resolve the same structure, the part is removed. Additionally, if the process contains consumed parts from one structure and you resolve using another structure, the consumed parts from the first structure are removed. Your administrator can change this default behavior using the **MERetainResolvedParts** preference. If the value of this preference is set to **true**, the resolution of a logical assignment definition always adds new parts. It does not remove any existing consumed parts regardless of the configuration of the loaded structure. This means that a process structure can contained consumed parts from multiple products.

> Note:
>
> Logical designators may not be unique in the product structure. If multiple product lines have the same logical designator or the logical assignment specifies only a partial logical designator, Teamcenter resolves to multiple assignments.

Resolve part assignments at a scheduled time

If you have many logical assignments to resolve, you can schedule these to take place at a later time, for example, in the evening or on a weekend. You can schedule the task to take place once or multiple times, for the entire structure or only for specific levels of the structure.

1. Choose **Tools→Logical Assignment→Schedule Part Assignments**.

2. In the **Schedule Parts Assignments** dialog box, select the top level or one or more lower level lines in the product BOP for which you want to resolve the assignments, and click to add the lines to the **Scope Objects** box.

3. Select **Resolve descendants** if you want Teamcenter to resolve lines lower down in the structure. If you do not select this, only the assignments on the lines added to the **Scope Objects** box are resolved.

4. Select the product structure whose parts will be used for the assignments.

   All structures that are linked to the product BOP are listed here.

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5. Schedule the time you want the structure to be resolved.

   You can schedule a recurrence pattern to have the structure resolved regularly.

Remove part assignment

1. Right-click a process or operation, and then choose **Open with→Assignments**.

   Teamcenter displays the **Assignments** view containing the logical assignments of the currently selected process or operation.

2. Right-click and choose **Remove** or click the **Remove** button .

   - If you select one or more logical assignments, the system removes the logical designators and all parts that are currently resolved to them.
   - If you select a part that is resolved to the logical designator, the system removes those parts only from the process or operation. This does not prevent the system displaying the same parts when you next resolve assignments.
   - If you select parts that are directly assigned to a process or operation, the system removes those parts from the process or operation.
   - If you select parts that have mixed assignments (that is, some have logical designators while others have direct assignments), the system removes all parts.

   > Note:
   >
   > Removing a resolved assignment does not prevent the system reassigning it next time you resolve the same logical assignment.

Searching an enterprise BOP structure

You can use the advanced manufacturing search to locate objects in an enterprise BOP structure in a similar way as with any other process structure.

If you select a view in the **Search** pane that represents a generic BOP, product BOP, or plant BOP, you can search for operation or process objects. You can search by any combination of item ID, Classification data, occurrence notes, spatial filter values, and form attributes.

In addition, you can also search by logical designator. If you do not have this license or have not selected an enterprise BOP structure, the **Logical Designator** box is unavailable.

If you click the **...** button to the right of the **Logical Designator** box, Teamcenter displays the **Logical Designator** dialog box. You can use this dialog box to define logical designator searches by any

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combination of manufacturing domain, subsystem, and unique identifier. You can include the following special character in search strings:

- *****

  This wildcard character indicates any string. For example, ***abc** retrieves all strings that end with **abc**.

- **?**

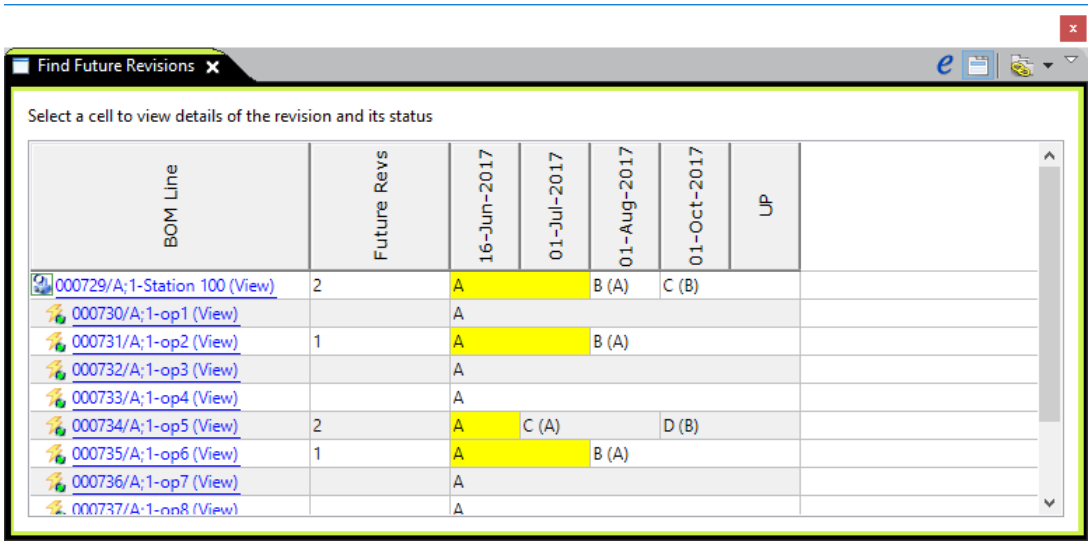
  This special character indicates a single character. For example, **a?c** retrieves all three character strings that begin with **a** and end with **c**.

Finding future effective revisions in a Bill of Process (BOP)

Revision effectivity can be used to model changes in a bill of process (BOP). When looking at a BOP that is configured by effectivity, the only revisions you can see are the ones that are in effect for the configured date or unit and end item. Changes to the BOP that will be configured on future dates and units are not visible. However, if you are planning to make changes to the BOP, it is important to understand whether there are future changes already planned as this can affect your work.

The **Find Future Revisions** command in the **Tools** menu searches for these future revisions and displays them.

To find and examine future revisions, select the Process, Process Area, or Operation and click **Find Future Revisions** command. A view shows you the results of the search.



Use the view's toolbar button to display dates vertically or units horizontally in the table header .

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Interpreting the search results

The search operates on Processes, Operations, or Process Areas. It searches the selected line and any immediate process or operation child lines.

Each line appears as a row in the table which shows the following:

- The BOM line (selected line or child). If you select this in the table, the BOM line is highlighted in the **Structure** view.
- The number of future revisions that are effective after the configured revision.
- Each future revision is displayed at the start of the effectivity at which that revision becomes effective. These effectivity transition points are displayed as columns in the table.

The cells display the future revision ID and, in parentheses, the ID of the revision from which the future revision was derived.

> Note:
>
> The **Find Future Revisions** command works for revisions with status and effectivity. The search focuses only on revisions whose statuses are specified in your revision rule in Has Status () by effectivity clauses.
>
> The search can be used when the revision rule contains a Working() clause. However, the use of Precise, Override, Revision Rule Groups, Latest, and other non-effectivity controlled clauses in the Revision Rule can obscure the search results and lead to inaccurate results.

Viewing more detail

You can select any of the future revision cells and view the difference between the future revision's BOM line and the configured revision's BOM line. These are displayed in a panel in the view.

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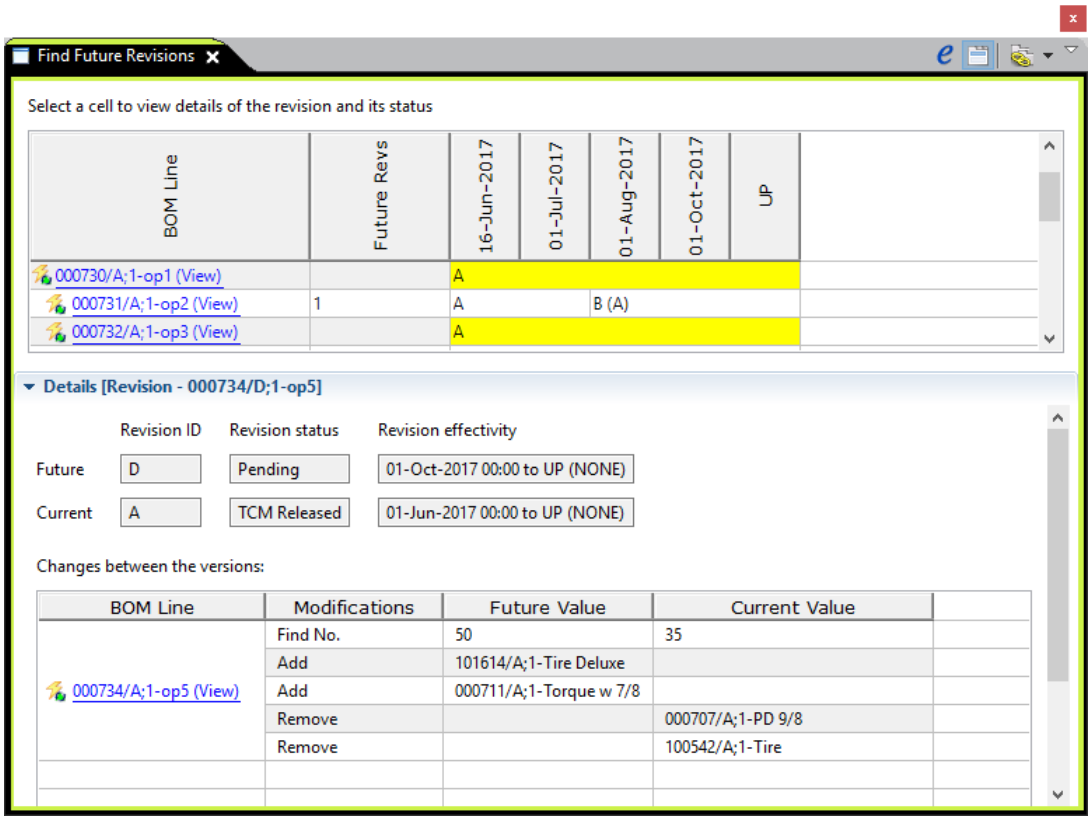

The panel shows:

- The name and effectivity of the status that causes each revision to be configured in the BOP.
- Any child lines that are added or removed.
- Changed property values for child line rows.

> Note:
>
> The changes shown are the delta between the configured and the selected future revision. These changes may have been authored over a series of interim revisions.
>
> Your administrator can configure which properties to compare and display in the **Details** panel using the **MECTRevEffectivityChildLineCompareProperties** and **MECTRevEffectivityDetailsProperties** preferences.

You can see more details about the status that configures the future revision by selecting the **Find Future Revision** view's toolbar button .

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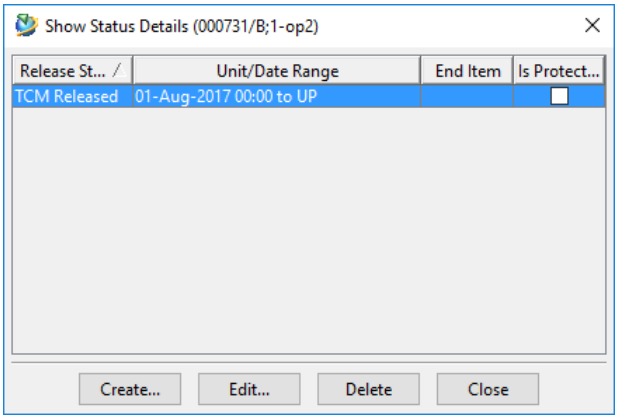

Cloning enterprise BOP structures

Cloning enterprise BOP structures overview

You can create a structure from another structure or template. This procedure is called *cloning* and typically creates an identical copy of the original structure or template. In the enterprise BOP, you can use cloning to create the following structures:

- When creating a new product BOP, use a generic BOP as a template.

  Teamcenter creates origin links for the new product BOP and all partitions, processes and operations in it.

- When creating a product BOP, use another product BOP as a template.

  Teamcenter creates origin links for the new product BOP and for all cloned partitions, processes, and operations inside it. These links refer to the original generic BOP, not the source product BOP.

- Use the **Paste Duplicate** command from a generic BOP to a product BOP. Teamcenter does not create origin links for all cloned partitions, processes, and operations in the structure.

- Use the **Paste Duplicate** command from a product BOP into another product BOP, if both product BOPs have the same origin generic BOP. Teamcenter creates origin links for all cloned partitions, processes, and operations in the structure to the original generic BOP.

- When creating a new plant BOP, use another plant BOP as a template. Teamcenter creates origin links for all the cloned processes and operations to the original product BOP from which the processes and operations were allocated.

- Allocate processes or operations from a product BOP to a plant BOP. Teamcenter creates origin links to ascertain whether changes are made to the original processes or operations.

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You can clone other objects in generic BOPs and product BOPs, but no origin links are created. For example, you can use the **Paste Duplicate** command to create clones of structures in the clipboard, but these clones will not contain origin links back to the original structure.

Any logical designator or logical assignment in the process or operation template is included in the clone.

If you create a product BOP by cloning another product BOP, all partitions in the template and their contents are cloned. You *cannot* clone a single partition or the substructure of a partition.

Origin relations indicate the generic BOP process or operation that is the basis of each corresponding process or operation in the product BOP. If you clone a product BOP, the origin links always point to the original generic BOP, not the product BOP you copied. Origin links are not generated for assigned product.

Product BOP master forms are created independently of the template master and master revision. The types of the master form are determined by the product BOP type.

> Note:
>
> If you use the **Paste Duplicate** command to copy processes or operations, you cannot use the **Find** command to find the cloned process or operation in another view because the **Paste Duplicate** command creates a new process or operation without any connection to the original structure from which it was cloned. **Origins** are important to understanding linkages between cloning and copying.

Create a new product BOP from template

1. Follow the procedure in *Create a product BOP* until step 4, where you are prompted to enter template information.

   Teamcenter displays the **Enter Template Information** pane.

2. Select the **Choose Template** tab.

   a. Choose the required generic bill of process (BOP) or product BOP template by typing the template ID, searching for it, or picking it from the list of favorite templates.

   b. (Optional) From the **Select Type** list, select a product BOP custom type to which you want to clone your existing product BOP.

3. Click the **Configuration** tab and enter the following information:

   a. **Revision Rule**

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Select a revision rule from the list to configure the structure to clone, and then select an effectivity by clicking **Set Date/Unit/End Item**.

For more information about configuring with revisions and creating effectivities, see *Getting Started With Product Structure*.

b. **Variant Rule**

Select **Process all variants** to traverse the structure considering all unconfigured variants or select **Process configured** to only process the configured structure.

If you select the **Process configured** option, you must specify a variant rule by clicking **Configure Variants**. The structure is configured using the variant rule and unconfigured variants are not considered during cloning.

c. **Naming and Numbering Pattern**

If you have multiple naming or numbering patterns defined, select the one you want to use.

d. **Cloning Rule**

Select one of the available copy action rules from the list. The administrator configures the copy action rules at your site. Cloning rules are driven by the preferences **GenericBOPAllowedTemplates** and **ProductBOPAllowedTemplates**.

A product that is assigned to a process or operation after resolving a logical assignment is not evaluated for cloning or referencing in the cloned structure.

If more than one line in the target structure has the same logical designator, only the first line encountered is mapped. If more than one logical assignment line in the template references the same logical designator, all are mapped to the same object in the target, if they are processed with the same copy action.

e. **Carry over future incremental changes**

If you select this check box, you must set the effective date. If you do not select this check box, cloning copies the configured structure only.

4. Click **OK**, and then return to step 5 in *Create a product BOP*.

Understanding origins

When you use a generic BOP as a template for the creation of a product BOP or allocate processes or operations from a product BOP to a plant BOP, Teamcenter creates an **Origin** relation between the structures. It also creates **Origin** relations between each individual process, operation, and partition in the product BOP and the corresponding origin in the generic BOP. Teamcenter uses the **Origin** relations

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to trace objects in the product BOP to their counterparts in the generic BOP when you compare the structures using accountability checking.

> Note:
>
> When pasting a partition, process, or operation from a generic BOP to a product BOP (or product BOP to a plant BOP), Teamcenter creates an origin link.
>
> When you use the **Paste Duplicate** command on a partition, process, or operation from a generic BOP to a product BOP (or product BOP to a plant BOP),Teamcenter *does not* create an origin link.

You cannot delete a partition if it is the origin of another partition. Consequently, you cannot delete a generic BOP if it is the origin of any product BOP. You can, however, delete processes or operations that are origins of other processes or operations, but the cloned processes or operations are still marked as having an origin (for example, they still have an allocation indication symbol).

Paste a duplicate object in generic BOP or product BOP

You can clone a process, operation, or partition in an enterprise BOP structure.

1. Copy the object in the source BOP.

2. Choose **Edit→Paste Duplicate** to create a clone using the cloning rule specified by the **PasteDuplicateTemplates** preference or the **PasteDuplicateAllowedPlantBOPTemplate** preference when pasting between plant BOPs.

   The **Paste Duplicate** command is available only when the content of the clipboard matches the target selection. You can clone:

   - A process if you are pasting to a partition.
   - An operation if you are pasting to a process.
   - A partition if you are pasting to a partition.

   If you copy the cloned process or operation from a different generic BOP or product BOP than the target selected for pasting, Teamcenter displays a dialog box that allows you to define the reference product structure of the target so product mapping can be completed.

   > Note:
   >
   > You can paste a duplicate of a partition and its contents from a product BOP into a generic BOP. However, you must subsequently manually remove product-specific content (for example, resolved product assignments) from the generic BOP to ensure the generic BOP remains product-independent.

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Performing accountability checks

Accountability checks allow you to compare process structures to ensure completeness and integrity of data. You can identify if lines in one structure are represented in another structure, or you can compare properties of equivalent lines in the two structures to identify differences.

You can use this mechanism to compare the following enterprise BOP objects:

- Generic BOP with generic BOP, including two configurations of the same structure
- Product BOP with product BOP, including two configurations of the same structure
- Generic BOP with product BOP
- Product BOP with plant BOP
- Plant BOP with plant BOP

You can also perform accountability checks between the following objects to ensure all lines in the source structure are consumed in the target structure:

- Generic BOP and product structure (BOM)
- Product BOP and product structure (BOM)
- Plant BOP and product structure (BOM)

Propagating changes in enterprise BOP structures

If you make changes in processes and operations in enterprise BOP structures, Teamcenter provides a controlled way to propagate these changes from the generic BOP to the product BOP or from the product BOP to the plant BOP. After finding differences using an accountability check, you can determine which of the differences to carry forward to the target structure.

Linking enterprise BOP structures

Link a product BOP to a plant BOP

Before you can allocate processes from a product BOP to a plant BOP, you must link these structures.

1. Right-click the plant BOP root line and choose **Link/Associate→Link Plant BOP**.
2. Select the product BOP root line and click **Set/Add Current Selection** .

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Teamcenter displays the name of the product BOP in the **Product BOPs** list.

3. Click **OK**.

Remove link between generic BOP and product BOP or product BOP and plant BOP

1. Right-click the root node of the product BOP or plant BOP whose link you want to remove and choose **Link/Associate** and then **Link Generic BOP** or **Link Product BOP**.

2. Select the structure from the list and click .

Teamcenter traverses the target structure and removes all the links to the source structure. The data in the structures remains the same.

View linked plant BOPs

- Right-click the root of a product BOP structure and choose **Linked Plant BOPs** from the shortcut menu.

  Teamcenter displays a dialog box containing a list of all linked plant BOPs that are created at the current site. This dialog box is read-only.

Open a product or EBOM/MBOM linked to another EBOM/MBOM

You can quickly open a product or EBOM (engineering bill of materials)/MBOM (manufacturing bill of materials) that is linked to another EBOM/MBOM. This capability also supports linkages between **CAD BOMs and part BOMs**.

1. Open one or more product structures, EBOM or MBOM, in Manufacturing Process Planner.

2. Select the top or sublevel line in the EBOM or MBOM for which you want to find a linked product.

3. Click **Open by Name** and then click **Open Product** .

4. In the **Open Product** dialog box, select **Linked to Product**, and if it is not already selected, select the product structure you began with in step 2.

   > Tip:
   >
   > You can also select a sub-level structure in the product structure you initially selected and click **Set to selected product** .

5. Click **Search**.

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6. In the search results, double-click the linked structure that you want to view.

Synchronizing plant BOP and BOE structures

Synchronizing plant bill of process (BOP) and bill of equipment (BOE)

A manufacturing process is described by a bill of equipment (BOE) and a plant bill of process (plant BOP). It is common for both structures to share the same hierarchical structuring in zones and stations. BOE stations contain location information and define the equipment required for manufacturing. Plant BOP stations define the sequence of the process and store information about the parts to be assembled in the station. The BOE is linked to the plant BOP.

Before validation, all levels of a manufacturing line need to be defined twice: once for the BOE and once for the plant BOP. The common organization of the two structures is to reduce the effort required for manual definition of the line structures. In this process, you create the initial BOE from the plant BOP or synchronize the plant BOP and an existing BOE. You can also create a plant BOP from an existing BOE and synchronize it.

The synchronization action will create corresponding hierarchical levels as that of the source in the target. The number of levels is not limited. The mapping from plant BOP elements to BOE elements will be configured. You can link an existing plant BOP structure and an existing BOE. Also, you can synchronize the plant BOP structure and linked BOE. The synchronization will happen in the direction from the plant BOP to BOE and from the BOE to the plant BOP. You decide the direction of synchronization for the source and the target.

In preparation for synchronization, perform the following functions.

1. Create a plant BOP from a BOE or a BOE from a plant BOP.

2. Synchronize a plant BOP and an existing BOE.

3. Link an element of the BOE to the plan BOP or the plant BOP to the BOE.

4. Open the connected process structure or open the connected plant structure.

> Note:
>
> Only unconfigured structures are considered for the create, link, and synchronization process - namely Latest working. Except when using the **ME-revise-AH** action handler, effectivity, variant rules, closure rules, occurrence filters or any other configuration criteria are not allowed.

Create BOE from plant BOP

You can create the BOE from the top node of the plant BOP as the **Create Plant** option is only available for the root plant BOP line.

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During BOE creation, a copy of the hierarchical structure of the plant BOP will be created to serve as the BOE, which results in the following:

- Creation of a link between the plant BOP root and the BOE root.
- Creation of a link between the elements of the plant BOP and the BOE.
- Copying of the attributes from the plant BOP elements to the BOE.
  - Item: Name, Description
  - Item Revision: Name, Description
  - Occurrence: Name, Alias, Variant Condition, Find No

    The attributes for Item, Item Revision and Occurrence are configurable through a preference. The new objects in plant BOP or BOE will have same name as their respective mapped objects in the plant BOP or BOE.

    > Note:
    >
    > You can only use BOM line attributes.

- Consuming stations created in BOE to plant BOP's station process.

To create a BOE from the plant BOP, do the following:

1. Load and select the plant BOP root node.
2. Right-click the plant BOP root node and choose **Synchronize Process and Plant→Create Plant**

   The **Create Plant** command is launched.

Create plant BOP from BOE

You can create the plant BOP from the top node of the BOE as the **Create Process** option is only available for the root plant BOE line.

During BOP creation, a copy of the hierarchical structure of the BOE will be created to serve as the BOP, which will results in the following:

- Creation of a link between the BOE root and the plant BOP root.
- Creation of a link between the elements of the BOE and the plant BOP.
- Copying of the attributes from the BOE elements to the plant BOP.

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- Item: Name, Description
- Item Revision: Name, Description
- Occurrence: Name, Alias, Variant Condition, Find No

  The attributes for Item, Item Revision and Occurrence are configurable through a preference. The new objects in plant BOP or BOE will have same name as the name of their respective mapped objects in plant BOP or BOE.

  > Note:
  >
  > You can only use BOM line attributes.

- Consuming stations created in the BOE to the plant BOP's station process.

To create a plant BOP from the BOE, do the following:

1. Load and select the BOE root node.
2. Right-click the BOE root node and choose **Synchronize Process and Plant→Create Plant**

   The **Create Process** command is launched.

Open the connected process structure / Open connected plant structure

These options will open corresponding connected plant BOP and BOE structures.

- **Open connected Process Structure, Open connected Plant Structure**

  These options are only available or connected root of a BOE and a BOP.

- **Open connected Process Structure**

  This option is only available for a root plant BOE.

- **Open connected Plant Structure**

  This option is only available for a root plant BOP.

Synchronizing structures

The synchronization command is responsible for synchronizing objects and attributes. The **Synchronize** option will only be available for previously linked elements. You can perform a synchronization on any

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connected element. The target structure (plant BOP or BOE) gets synchronized based on the source structure (BOE or plant BOP) respectively.

The synchronization will lead to the following:

- Creating missing elements in the target.
- Copying of attributes from source line to target line.
- Copying of attributes from source line to target line.
  - Item: Name, Description
  - Item Revision: Name, Description
  - Occurrence: Name, Alias, Variant Condition, Find No
- For every object in the source that is not present in the target, a new object is created in target and the object in source is linked to the newly created target object. If the hierarchy below the source synchronization object is not present in the target, then the synchronization process will also create those levels in target.

  > Note:
  >
  > In the case of a station, it will also be consumed to station process.

- If you chose the option to delete obsolete twins, then elements with no links in the target will be deleted.

To synchronize a newly created plant BOP and BOE, do the following:

1. Load the structure, select the plant root, right-click and chose **Synchronize Process Plant→Synchronize Structure** and then click **OK**.

   The Synchronize Structures dialog box appears.

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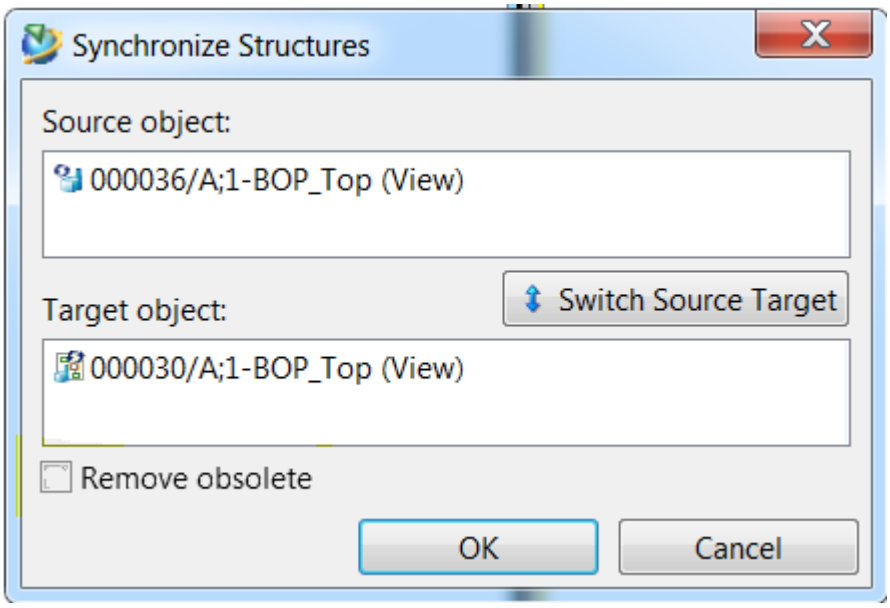

2. From here, you can switch between the source and target objects and according to source object, it will synchronize the structure.

Connect elements

To connect an element in the plant BOP to the BOE or in the BOE to the plant BOP, do the following:

1. Select the line you want to connect manually.

2. Right-click the line and choose **Synchronize Process and Plant→Connect**

   If the parent for the selected line is not linked, you will be prompted to connect the parent first.

   The connect action is *irreversible*. Once linked, connected elements cannot be unlinked.

Miscellaneous connect information

- You can only connect mapped object types in *BOEPlantBOPTypeAndPropertyMap.xml*.
- If you add a new element in the structure and try to connect it with an existing element, you will be prompted to replace the existing connection. If you try to replace the connection to a new element by replacing its old connection, the old connection will lost.
- If two elements are already connected and you want to connect one element to another element, it will first ask if you want to replace the existing connection. If you reply Yes, it will replace the connection and connect to new element. If you reply No, nothing will happen.
- After manually connecting the element, if you want to synchronize the sub-structure, you can select the manually connected line and perform a synchronize.

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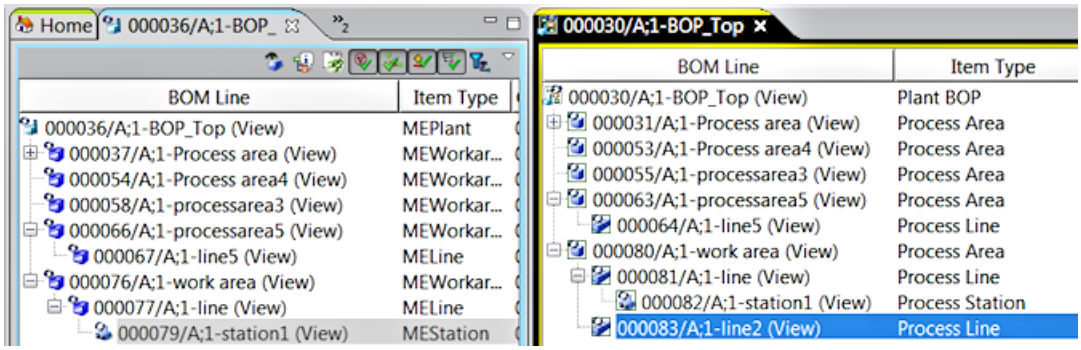
Remove obsolete elements

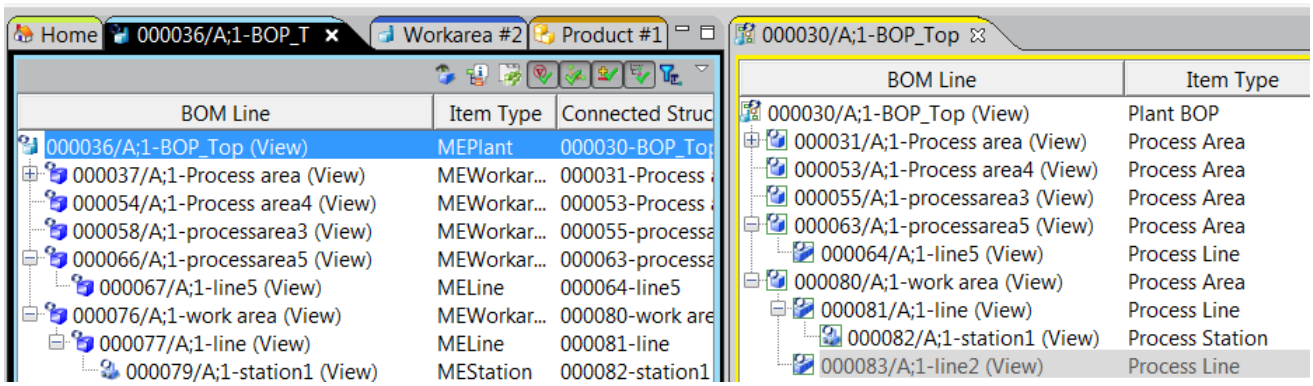
If elements have been deleted from the plant BOP and you want to reflect the changes in the BOE, you do that by selecting the **Remove Obsolete** option at the time of synchronization. Selecting **Remove Obsolete** will remove an unlinked element from both structures.

In the following example, first consider the BOE and plant BOP structures below.



In the plant BOP structure, **000083/A;1-line2** is unlinked or it was manually deleted from the BOE.

If you select the root of the BOE structure and perform a synchronize using the **Remove Obsolete** option, it will remove **000083/A;1-line2**.



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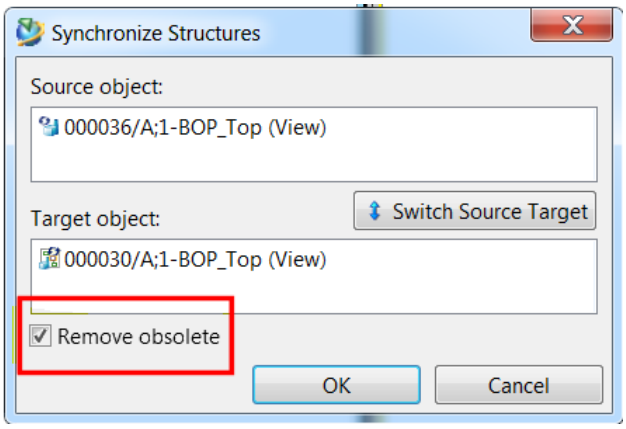
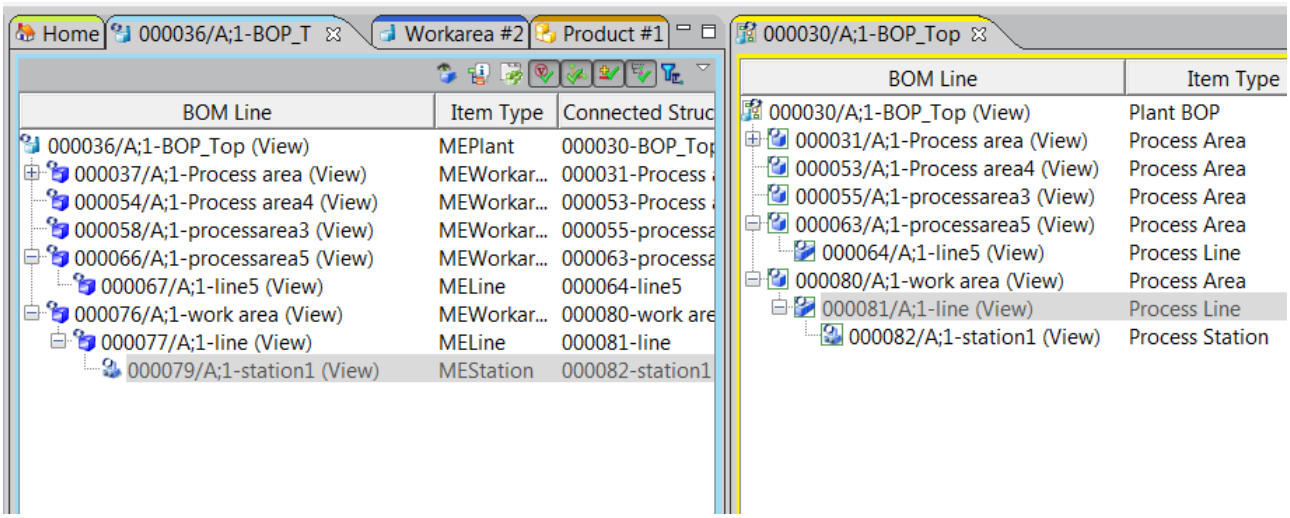


Results after the synchronization operation.



To remove obsoleted elements, do the following:

1. Load the structure and select the element to remove.

2. Right-click the element and choose **Synchronize Process and Plant→Remove Obsolete**

   The element is removed from the structure.

Synchronization XML template

You can use a template object to create a BOE from the plant BOP, or visa versa. You use a preference and a dataset to setup the mapping between the structures.

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Preference

The **MEBOPToBOEObjectTypeMap** preference is added to support the XML dataset (BOEPlantBOPTypeAndPropertyMap) which has object type and attribute mappings. These are used while creating a BOE structure from a plant BOP structure or vice versa.

Dataset

Using the **BOEPlantBOPTypeAndPropertyMap** dataset in the template, you can define the mapping between classes in the process area and corresponding classes in the work areas. The OOTB mapping for types are as follows:

Process Area → Workarea

Process Station → Station

Process Line → Line

Plant BOP → Plant

An administrator can add their own twin classes and map its own mapped attribute.

OOTB mapping for attributes

No mapping for persistent attributes is allowed. Only the mapping of BOM line properties to BOM line properties is allowed, meaning that only properties you can see in the trees in Manufacturing Process Planner are allowed. The following are the properties that are mapped OOTB:

bl_item_object_desc

bl_item_object_name

bl_sequence_no

bl_variant_condition

The mapping will be done in an XML file where your administrator should modify it to add any relevant properties. A preference is defined to hold the XML data set name, which Teamcenter will read and process accordingly.

Refer to the XML file format in **BOEPlantBOPTypeAndPropertyMap.xml** (example below).

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```
<?xml version="1.0" encoding="UTF-8"?>
<!--This is the sample XML specifically for Create and Sync BOP to BOE feature-->
- <BOE_PlantBOP_Mapping>
        <!--One objectMap Element will specify one object type, new objectMap element needs to be added separately for any inherited
        types-->
        <!--even all the properties also need to be specify separately-->
    - <objectMap BOEObjectTypeTemplateId="" BOEObjectType="MEPlant" PlantBOPObjectType="Mfg0MEPlantBOP">
        - <attribute_mapping>
            <attribute BOELineAttribute="bl_item_object_name" PlantBOPLineAttribute="bl_item_object_name"/>
            <attribute BOELineAttribute="bl_item_object_desc" PlantBOPLineAttribute="bl_item_object_desc"/>
            <attribute BOELineAttribute="bl_rev_object_name" PlantBOPLineAttribute="bl_rev_object_name"/>
            <attribute BOELineAttribute="bl_rev_object_desc" PlantBOPLineAttribute="bl_rev_object_desc"/>
        </attribute_mapping>
    </objectMap>
    - <objectMap BOEObjectTypeTemplateId="" BOEObjectType="MEWorkarea" PlantBOPObjectType="Mfg0MEProcArea">
        - <attribute_mapping>
            <attribute BOELineAttribute="bl_item_object_name" PlantBOPLineAttribute="bl_item_object_name"/>
            <attribute BOELineAttribute="bl_item_object_desc" PlantBOPLineAttribute="bl_item_object_desc"/>
            <attribute BOELineAttribute="bl_rev_object_name" PlantBOPLineAttribute="bl_rev_object_name"/>
            <attribute BOELineAttribute="bl_rev_object_desc" PlantBOPLineAttribute="bl_rev_object_desc"/>
            <attribute BOELineAttribute="bl_sequence_no" PlantBOPLineAttribute="bl_sequence_no"/>
        </attribute_mapping>
    </objectMap>
    - <objectMap BOEObjectTypeTemplateId="000069" BOEObjectType="MELine" PlantBOPObjectType="Mfg0MEProcLine">
        - <attribute_mapping>
            <attribute BOELineAttribute="bl_item_object_name" PlantBOPLineAttribute="bl_item_object_name"/>
            <attribute BOELineAttribute="bl_item_object_desc" PlantBOPLineAttribute="bl_item_object_desc"/>
            <attribute BOELineAttribute="bl_rev_object_name" PlantBOPLineAttribute="bl_rev_object_name"/>
            <attribute BOELineAttribute="bl_rev_object_desc" PlantBOPLineAttribute="bl_rev_object_desc"/>
            <attribute BOELineAttribute="bl_sequence_no" PlantBOPLineAttribute="bl_sequence_no"/>
        </attribute_mapping>
    </objectMap>
    - <objectMap BOEObjectTypeTemplateId="" BOEObjectType="MEStation" PlantBOPObjectType="Mfg0MEProcStatn">
        - <attribute_mapping>
            <attribute BOELineAttribute="bl_item_object_name" PlantBOPLineAttribute="bl_item_object_name"/>
            <attribute BOELineAttribute="bl_item_object_desc" PlantBOPLineAttribute="bl_item_object_desc"/>
            <attribute BOELineAttribute="bl_rev_object_name" PlantBOPLineAttribute="bl_rev_object_name"/>
            <attribute BOELineAttribute="bl_rev_object_desc" PlantBOPLineAttribute="bl_rev_object_desc"/>
            <attribute BOELineAttribute="bl_sequence_no" PlantBOPLineAttribute="bl_sequence_no"/>
        </attribute_mapping>
    </objectMap>
</BOE_PlantBOP_Mapping>
```

Easy propagation in plant bop structures

Easy propagation in plant bop structures

Easy propagation simplifies the steps to run the **Accountability Check** on operations and processes that are shown in the Custom Process View. Two commands are provided in the view, either to check all lines or only the selected lines. The commands utilize the saved favorite of the **Accountability Check**. Which favorite you want to use is defined in a preference. After the preference is set, there is no need to choose settings for each check. The supported scenario is to take the product BOP as the source and the plant BOP as the target of the accountability check. When the command starts, a dialog box shows a list of available sources or targets depending on the structure that the Custom Process View is currently showing. After the check is finished, the user can propagate changes in the **Accountability Check Result** view.

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Using easy propagation

Before running the Accountability Check, the favorite settings must be defined in the Accountability preference (**MEAccountabilityCheckQuickFavorite.PBOP.PlantBOP**) and the plant BOPs are linked to the corresponding product BOPs.

1. **Choose Tools→Accountability Check→Advanced Accountability Check** and define and save the settings as favorite.

2. Open the search tab of the Options dialog and find the newly defined favorite entry in **MEAccountabilityCheckSettings.PBOP.PlantBOP**.

3. Copy the value to the preference **MEAccountabilityCheckQuickFavorite.PBOP.PlantBOP**.

4. Make sure the plant BOPs are linked to the corresponding product BOPs.

Run Accountability Check.

1. Open a process from the product BOP in the Custom Process view.

2. Ensure the **Content** section is active.

3. Ensure the **Compare Selected** and **Compare All** buttons are visible.

4. If the commands are missing, check the preference **MECustomViewChildLinesCommandNames.PBOP**.

5. Click the desired command (**Compare Selected** or **Compare All**).

   A dialog will open allowing you to select the target plant BOP.

6. Select a plant BOP and click **OK** to run the **Accountability Check**.

   If a process from the plant BOP is currently opened in the Custom Process View, clicking **Compare Selected** or **Compare All** will open a dialog to allow selecting a product BOP as source.

Propagation can be performed from the Accountability Check Result view by selecting the partial match lines in the target section and choosing **Tools→Accountability Check→Propagate**. The **Propagate** command is also available in the context menu.

Run an accountability check

1. Open a process from the product BOP in the **Custom Process View**.

2. Ensure the **Content** section is available.

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3. Verify that the **Compare Selected** and **Compare All** buttons are visible.

> Note:
>
> If the commands are missing, check the preference **MECustomViewChildLinesCommandNames.PBOP**.

4. Click the **Compare Selected** or **Compare All** button.

   A dialog box opens allowing you to select the target plant BOP.

5. Select a plant BOP and click **OK** to run the accountability check.

   If a process from the plant BOP is currently open in the **Custom Process View**, clicking **Compare Selected** or **Compare All** will open a dialog box. Then, you can select a product BOP as source.

Propagation is performed from the **Accountability Check Result** view by selecting the partial match lines in the target section and choosing **Tools→Accountability Check→Propagate**. The **Propagate** command is also available in the context menu.

Allocating processes or operations to a plant BOP

Allocating processes or operations to a plant BOP overview

Before you can allocate from a product BOP to a plant BOP, you must link a product BOP to a plant BOP.

When you allocate processes and operations, Teamcenter creates clones of the objects and adds them to the plant BOP. You can allocate both processes and operations. If you allocate processes, you allocate:

- All the child operations belonging to the process.
- All parts consumed in the product BOP. These are also consumed in the plant BOP.
- The flows between operations.
- The deeper hierarchy levels (processes below allocated processes).
- In-context data (in the context of the allocated process or operation or lower contexts) that is configured in the product BOP.

If incremental change is active, all changes to the plant BOP are included in the incremental change.

Teamcenter maintains an origin link between allocated processes or operations. If there is a change to the process or operation in the product BOP, you can find these by performing an accountability check and propagating the change to the plant BOP.

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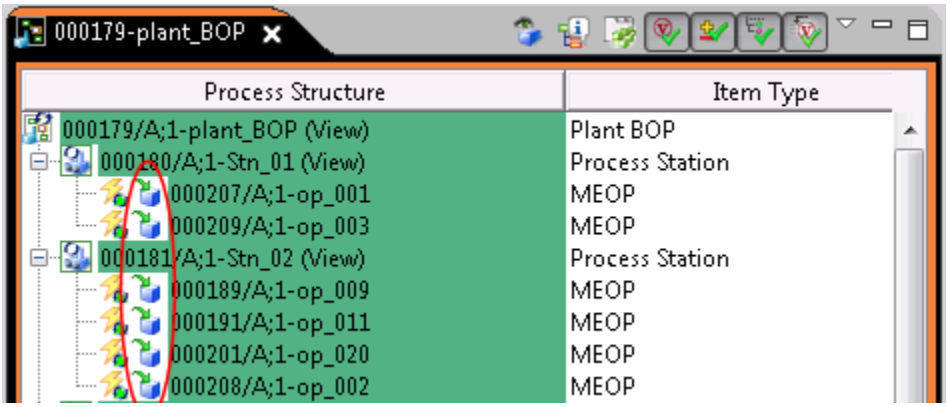
You can specify which types of process areas can contain allocated operations in the **MEAllocationLevel** preference.

You can enable the display of an allocation symbol in the product BOP and plant BOP structures using the **MEProcessIconPropertyNames** and **MEOperationIconPropertyNames** preferences.



This display is turned off by default as enabling the preferences causes structures to load more slowly.

Allocate processes or operations to a plant BOP

Do one of the following:

- Drag the process or operation from the product BOP to the appropriate process area or process in the plant BOP.
- Use the **Copy** and **Paste** commands.

  1. In the product BOP, do one of the following:

     - Right-click the process or operation that you want to allocate and choose **Copy**.
     - Select the process or operation that you want to allocate and click **Copy** .

  2. In the plant BOP, do one of the following:

     - Right-click the process area under which you want to allocate the copied process or operation and choose **Paste**.
     - Select the process area under which you want to allocate the copied process or operation and choose **Edit→Paste**.
     - Select the process area under which you want to allocate the copied process or operation and click the **Paste** button .

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Teamcenter allocates the processes or operations to the process areas and maintains a link between them. If there is a change to the process or operation in the product BOP, you can discover these by performing an accountability check and propagate the change to the plant BOP.

Allocating and propagating split processes

Sometimes a process is not intended to be fully implemented in a single station. Part of the process is intended to be carried out in one station while the other part should be performed in another station. In such a case, instead of allocating the process, allocate its child operations such that the operations that are relevant to the first station are directly allocated to that station (perhaps under a plant-specific process) and the remainder of the operations are allocated to that station. Do not allocate the process itself as problems arise when you later propagate from product BOP to plant BOP. If you allocate the process and remove the irrelevant operations, these removed operations reappear in the structure each time you propagate.

Adding a new product BOP to an existing plant BOP

Teamcenter provides the ability to automatically allocate processes and operations based on the allocations that were made in the original product. If a new product is being produced that is similar to an existing one, the new and existing product can share many similar processes and operations. Take, for example, a new model of car that is very similar to an existing model. The processes and operations required to install the mirror are the same in both models; therefore, their logical designators are given the same value, and it is expected that the mirrors of the new model should be installed at the same process station as the existing one. If the mirror installation processes are allocated to process station 1 for the existing model, the new model's mirror installation processes should also be allocated to process station 1.

The automatic allocation is based on the logical designator and is assumed to be a one-time action. A preview is provided (in the form of a CSV file) displaying which process/operation will be allocated and to where. The original product BOP containing the allocated process and operations is considered the *reference* product BOP, and the product BOP with the unallocated processes is considered the *source* product BOP.

The automatic allocation functions as follows:

- Teamcenter traverses the plant BOP structure and finds the first level of objects that has an origin. It then picks the object having the same origin from the reference product BOP. Teamcenter searches for the logical designator of this object in the source product BOP and if it finds it, this object and its children are considered for automatic allocation and allocated at same level. Once the allocation level is found, Teamcenter does not continue to check the children.

- The parents of the candidate lines are also considered part of the allocation level.

- An object can only be allocated once to an allocation level, even though the allocation level can have more than one allocated instance pointing to the same origin or having the same logical designator.

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- The same process can be allocated to different allocation levels multiple times but only once to the same allocation level.

- If you try to automatically allocate again, only the processes that are not already allocated to the allocation level are considered candidates for allocation. This check is based on origin and not on logical designator.

- If multiple processes with the same logical designator are found in the plant BOP, only the first is considered for allocation.

- Changing the source or restructuring the source product BOP affects which candidate is found for allocation and can result in multiple allocation.

In the following examples, processes and operations are manually allocated from a reference product BOP, **PBOPSID1** to a plant BOP, **PLANTSID1**. Then a new source product BOP, **PBOPSID2**, is created that shares many processes and operations with the same logical designator as **PBOPSID1**. The examples show what happens when the processes and operations from the new product BOP, **PBOPSID2**, are automatically allocated to the existing plant BOP.

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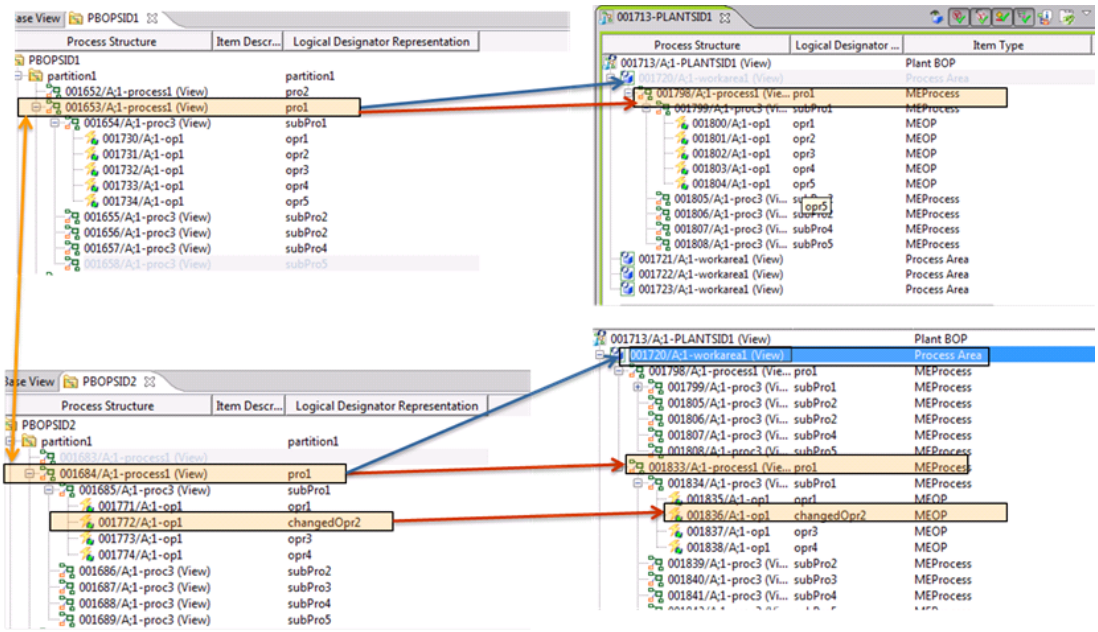
Example 1

PBOPSID1, the reference product BOP, contains a process with a logical designator, **pro1**, that is manually allocated to a process area in **PLANTSID1**. In the source product BOP, **PBOPSID2**, there is a process with a matching logical designator (**pro1**) and an operation with a logical designator that does not match the reference product BOP.

The allocation level in this example is the process with the **pro1** logical designator in the **PLANTSID1** structure.



Teamcenter allocates the process with the **pro1** logical designator from the source **PBOPSID2** to the plant BOP. Also, all its operations are allocated, including the one whose logical designator does not match, and the order of the processes and operations is maintained.

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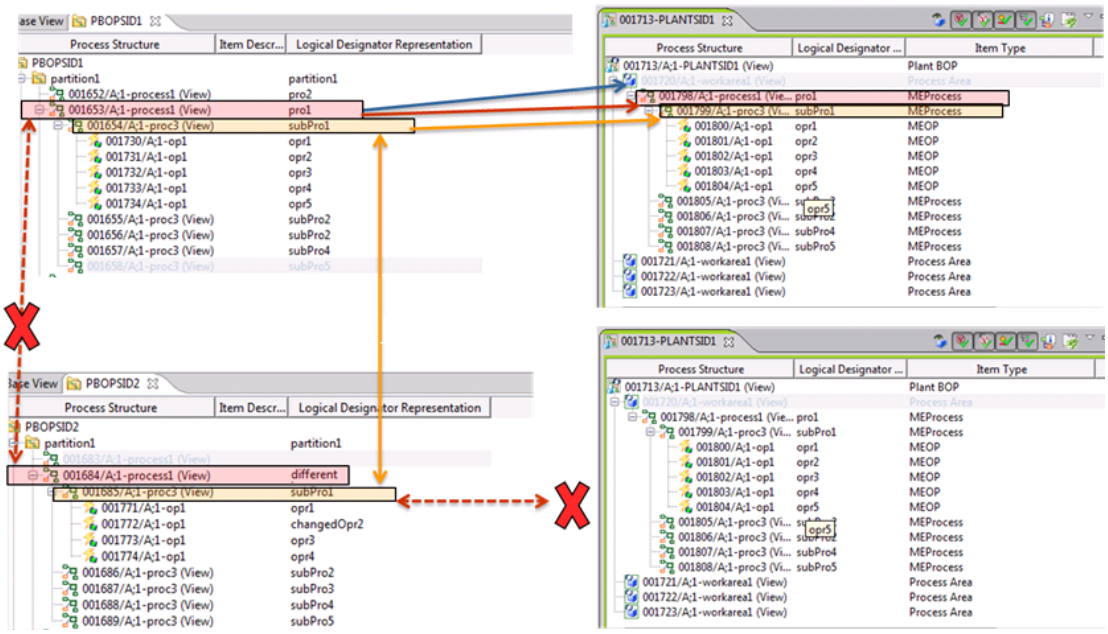
Example 2

PBOPSID1 has a process with logical designator, **pro1**, that is allocated to a process area in the plant BOP. In the source product BOP, **PBOPSID2**, there is no process with matching logical designator, but there is a subprocess with a **subPro1** logical designator that matches allocated lines in the substructure of the reference product BOP, **PBOPSID1**.



In example 2, Teamcenter searches downward in the plant BOP structure until it finds a process with the same logical designator as a process in the reference structure, **PBOPSID1**. In this case, it finds the **pro1** logical designator, but because there is no counterpart of this process in **PBOPSID2**, it searches no further and does not allocate anything.

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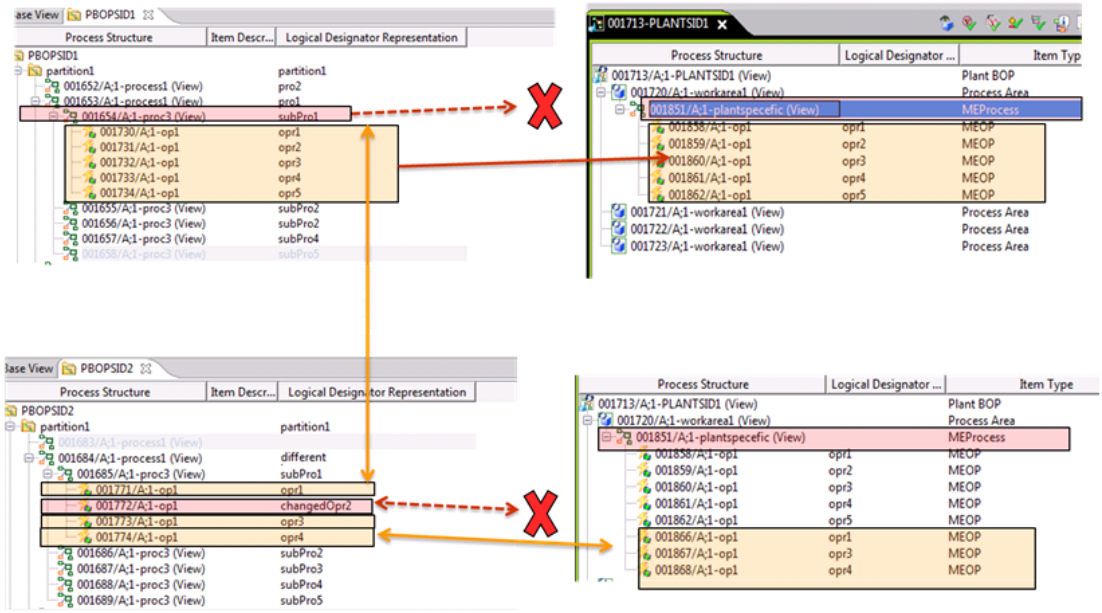
Example 3

The operations **opr1**-**opr5** are manually allocated in the reference BOP, **PBOPSID1**, to the plant BOP. The source product BOP, **PBOPSID2**, does not contain a process with the **pro1** logical designator but does contain a subprocess with matching logical designator (**subPro1**). This subprocess, however, is not allocated from the reference to the plant BOP.



In this example, the allocation level is the level containing the operations with the **opr1**-**opr5** logical designators. When Teamcenter searches for these operations in **PBOPSID2**, it finds three of them, **opr1**, **opr3** and **opr4**, and allocates them. The order of the processes is maintained.

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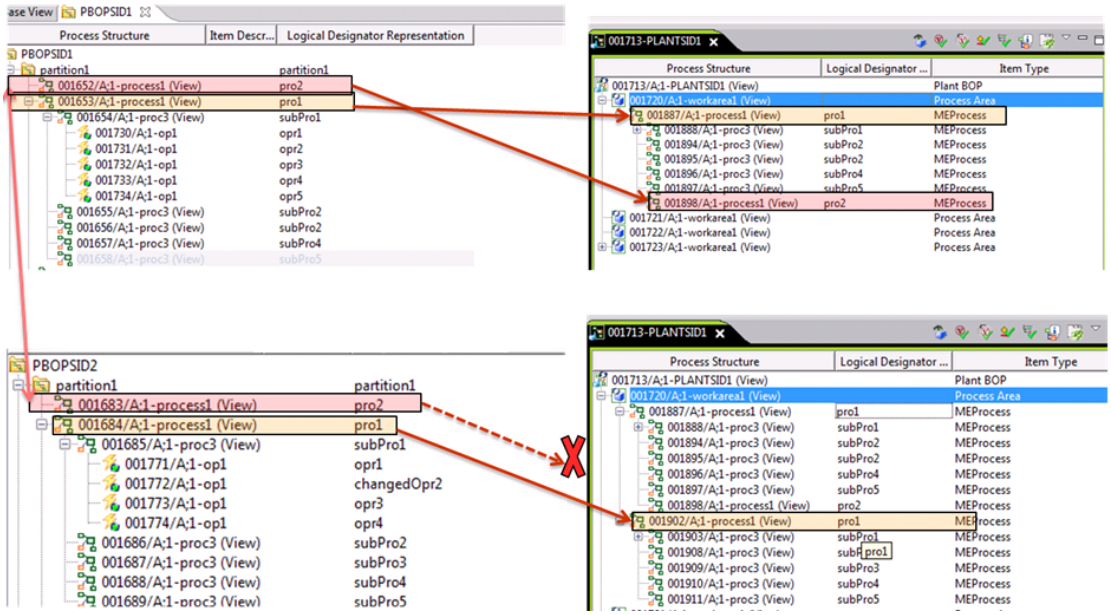
Example 4

PBOPSID1 has a process with logical designator, **pro1**, that is allocated to a process area in the plant BOP. There is another process with logical designator **pro2** that is allocated to the plant BOP as a child of the process with the **pro1** logical designator.



The allocation level is the process with the **pro1** logical designator. Teamcenter does not allocate the process with **pro2** as it is below the defined allocation level. The children of the process with **pro1** are allocated.

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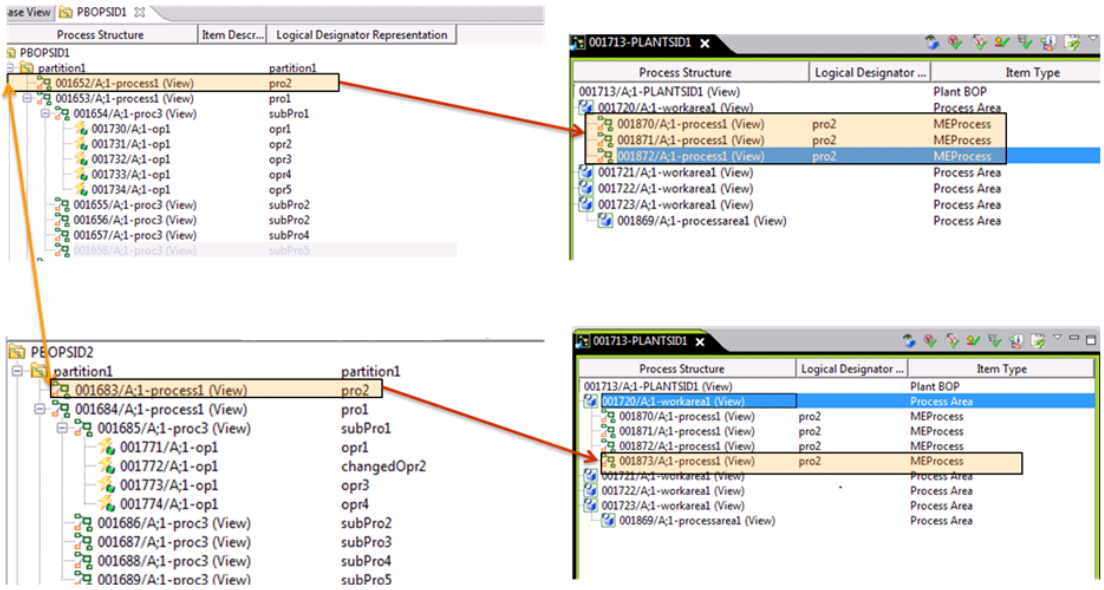
Example 5

A process with **pro2** logical designator is allocated multiple times from the reference product BOP to a process area in the plant BOP. There is a process in the source product BOP, **PBOPSID2**, that has a matching **pro2** logical designator.



Teamcenter allocates the process with the **pro2** logical designator only once from **PBOPSID2** to the plant BOP.

Automatically allocate from a new product BOP to a plant BOP

The prerequisites for this procedure are as follows:

- There is a product BOP (the *reference* product BOP) from which processes and operations are manually assigned to a plant BOP.
- There is a second product BOP that has processes and operations that have the same logical designators as the first product BOP and from which you want to automatically allocate processes and operations to the same plant BOP as the reference product BOP.
- Both product and plant BOPs are configured.

1. Right-click a plant BOP root, a process area, or multiple process areas and choose **Automatic Allocation**.

   The **Automatic Allocation** dialog box opens with the selected line or lines listed in the **Target allocation area** list. The **Reference product BOP for allocation** list holds all the product BOPs that are linked to the selected plant BOP.

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2. In the **Reference product BOP for allocation** box, select the product BOP whose processes or operations you want to use as the basis for the automatic allocation to the plant BOP.

   Teamcenter chooses the latest revision of the structure that you choose.

3. Add the product BOP from which you want to allocate processes and operations by selecting it in the structure view and clicking .

4. (Optional) Click **Preview** to display a CSV file in Excel showing which processes and operations will be allocated to which targets in the plant BOP.

5. Click **Allocate**.

For every process or operation under the selected product BOP scope that is configured in, Teamcenter searches for a corresponding process or operation (according to the logical designator) in the configured plant BOP. If a process or operation is already allocated for the same scope, Teamcenter does not allocate it again.

Migrating a classic BOP to a plant BOP

Overview of migrating a classic BOP to a plant BOP

What is a classic BOP?

With the introduction of the **plant BOP** data model, to distinguish it from what was in Manufacturing Process Management in the beginning, the term **classic BOP** will be used.

The classic BOP model will continue to be supported, so you can continue to use it if its capabilities satisfy your needs.

What is a plant BOP?

A plant BOP is a data model with logic that corresponds to the organization of the plant structure (BOE - Bill of Equipment).

- A Process area is an area in the plant used as a process to group smaller processes like lines, zones, or stations.
- A Process area and all of its descendants (for example, area, line, and zone) in an OOTB model are the same in terms of attributes and behavior.
- A Process station has a unique logic in that it is the only level that:
  - Should contain operations and/or process resources and other objects like a BOE station.

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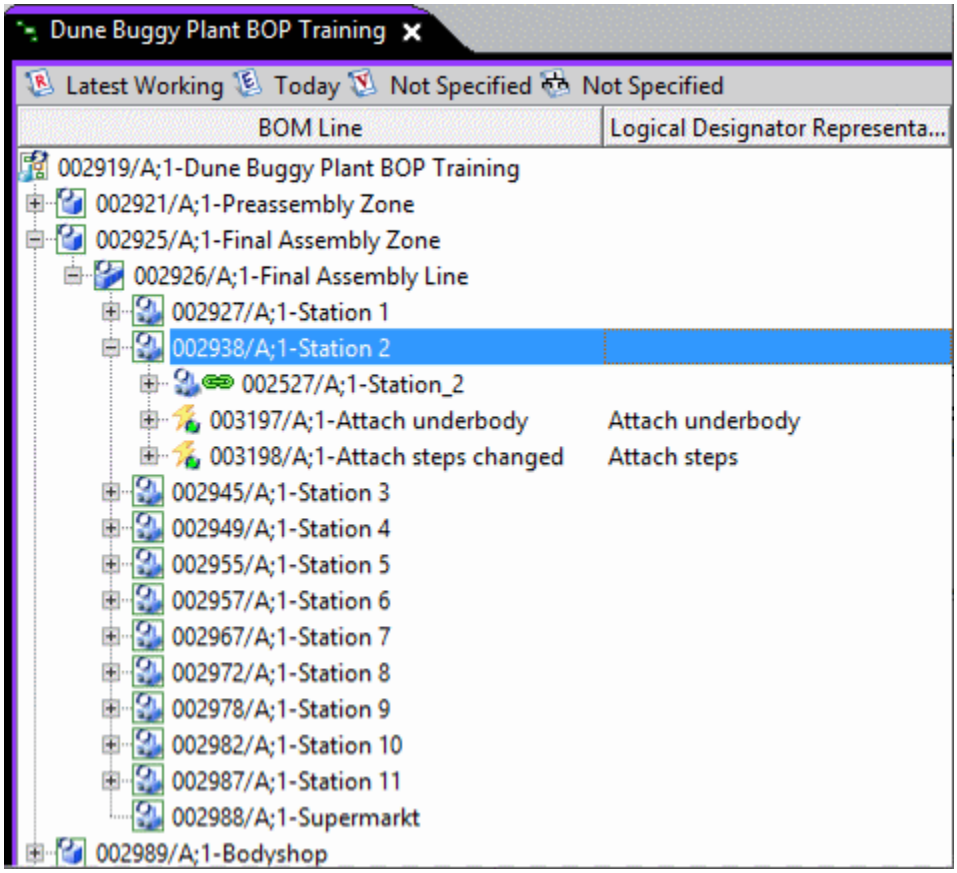
- Should be used for balancing.
- You accumulate the IPA on.
- You connect to the plant structure (BOE).
- Cannot contain another type of process below.



Key benefits of a plant BOP compared to a classic BOP

- Line balancing - supporting station level and process resource level balancing
- Integration to TiCon
- Supplier collaboration using briefcase
- Alternative management
- Easy adoption of EBOP
- Sync plant BOP with plant BOE

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- Part positioning based on plant BOE
- Logistics Planning
- IPO-Log integration

> Note:
>
> The **PS_assume_legacy_transform_units** preference determines how Teamcenter interprets the units of measure for legacy transform data. Teamcenter and NX currently use meters for transform units of measure; legacy measurements were in inches or millimeters. This preference affects all data using legacy transforms that have no database-resident indication of the unit measurement stored with them. The default setting is **Unknown**. If the preference is left in the default setting, you may see discrepancies between the model and display units when you view collaboration context structures in Manufacturing Process Planner.

Using the me_populate_plantbop_from_bop migration utility

The command line utility **me_populate_plantbop_from_bop** is the primary tool for migrating a classic BOP structure to a plant BOP with a predefined plant BOP skeleton. The utility copies operations from the classic BOP and pastes them into an equivalent station in the plant BOP. The copied operations are controlled by a closure rule and are shared with the classic BOP.

The **me_populate_plantbop_from_bop** utility is a migration tool, not an update tool, meaning it should only be executed once on a classic BOP. After that, the **Paste by Rule** command in Manufacturing Process Planner should be used for any cleanup or adjustments.

Data input

- A classic BOP, its configuration, scoping, and closure rule to control what is copied.
- Optional mapping of the stations in the classic BOP to the equivalent ones in the plant BOP.
- Plant BOP skeleton - could be automatically created from the BOE twin structure.
- A classic BOP and a plant BOP are inputs to the utility as collaboration context objects.
- Station mapping options.

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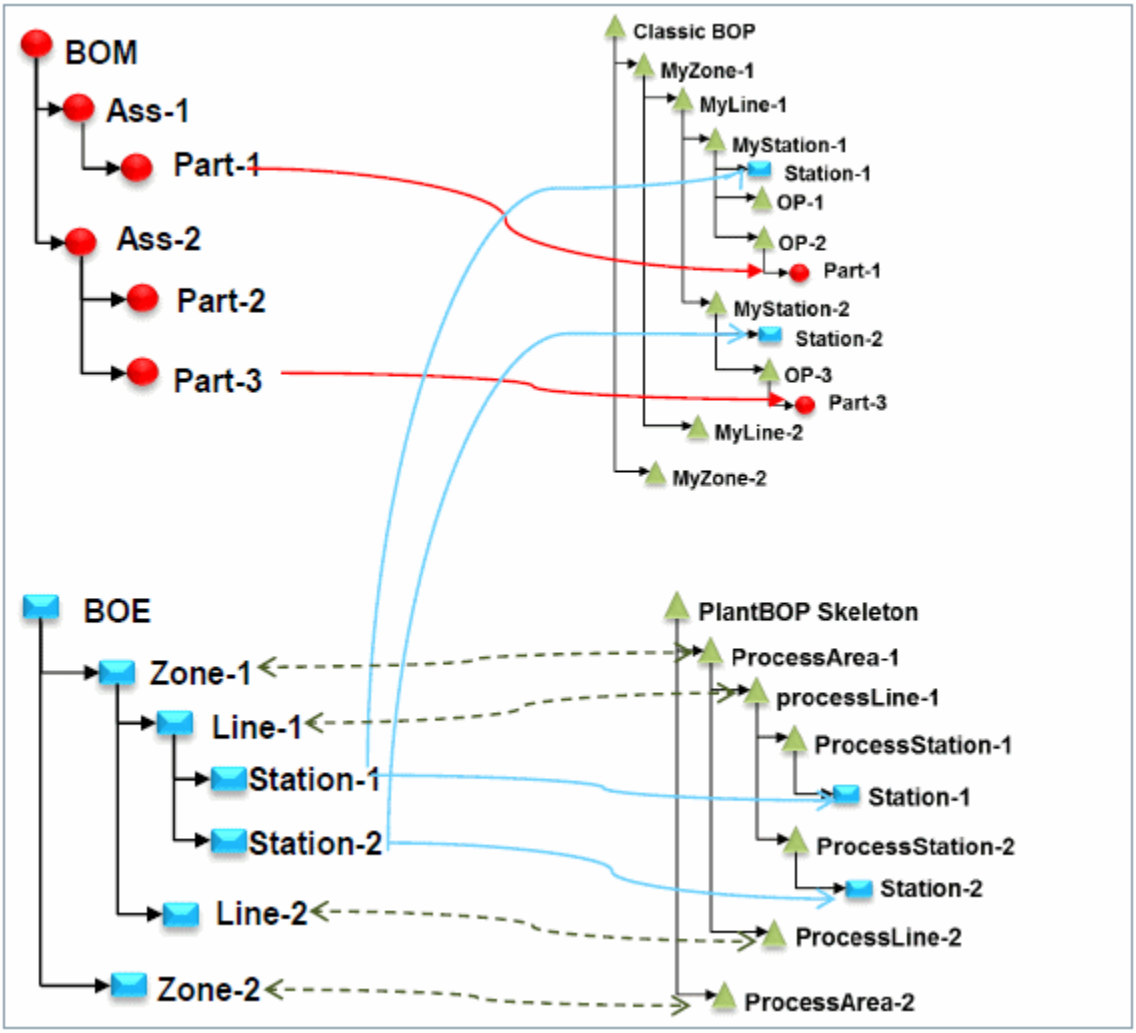

Main functional behavior

- Properties and attachments are copied from a classic BOP station to the equivalent station in plant BOP (controlled by a cloning rule).
- Operations from the classic BOP are copied and shared with the plant BOP (controlled by a closure rule).
- Properties of operation occurrences are copied (controlled by a preference).
- Simulation datasets on the operation and station are kept consistent (simulation IDs are maintained).
- Operation flows and scope flows are carried over.
- Operation copy is controlled by the cloning rule.
- Depending on use case, process could also be shared between classic BOP and plant BOP.

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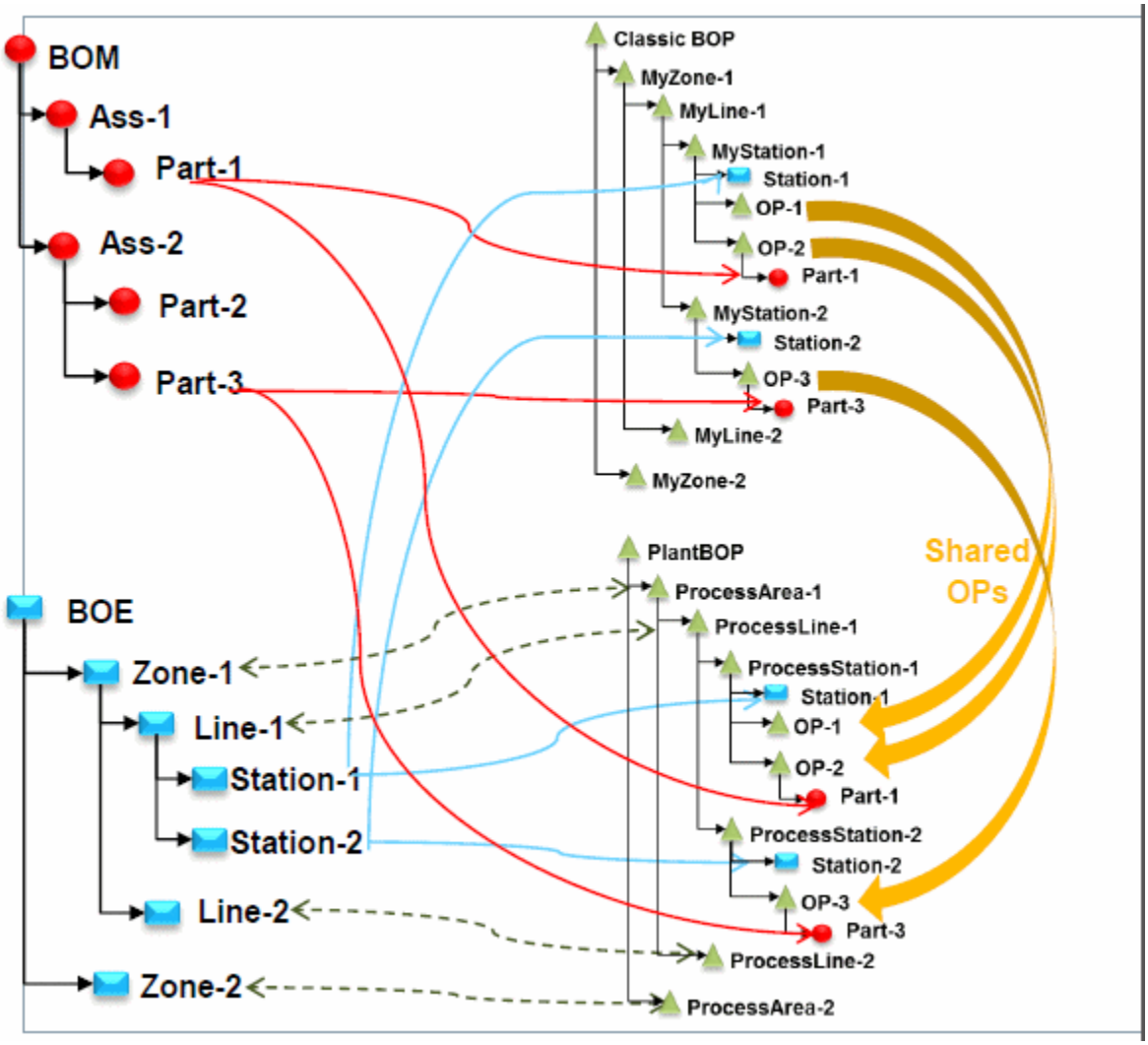
- Operations can be copied into one plant BOP only and only once per plant BOP.



Excluded

- Product views are not migrated.
- Twin relation between BOE and skeleton plant BOP is not required. The utility only uses the station relation.
- No support to Process Simulate studies.

Station mapping in the me_populate_plantbop_from_bop utility

The command line migration utility must resolve the mapping of what represents the *station* in the classic BOP to the *process station* in the plant BOP. This is done using one of four methods:

1. **Map by itemID**

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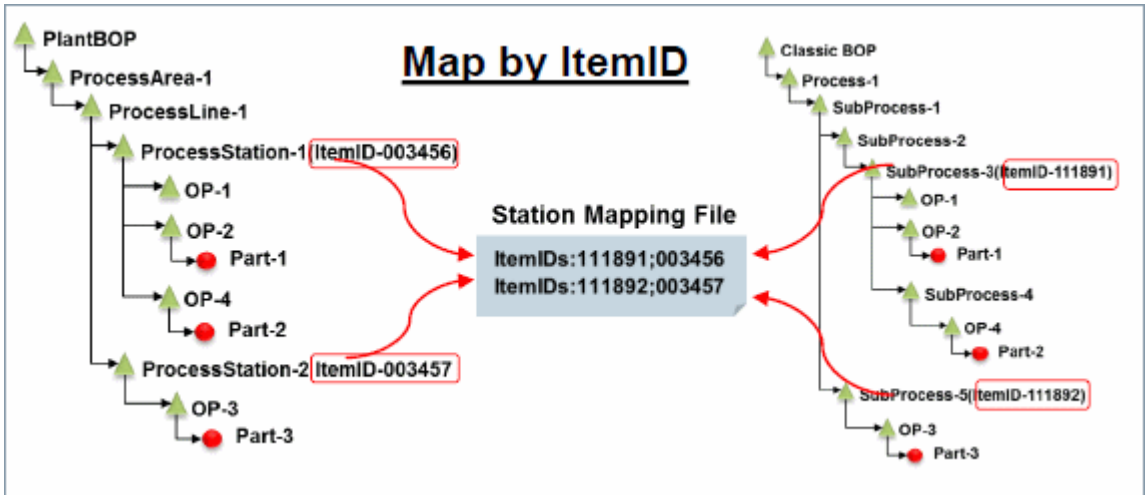
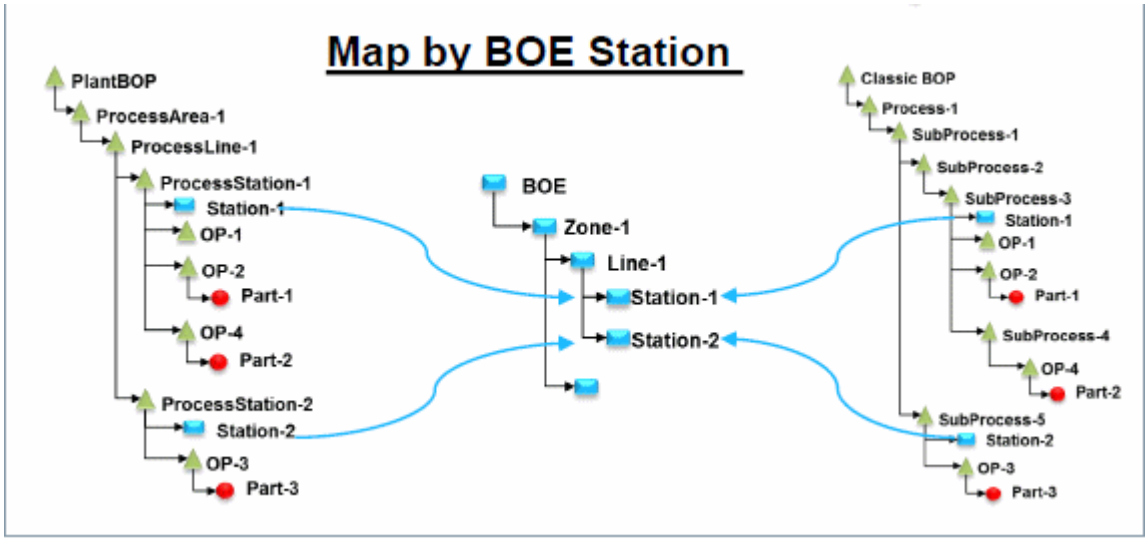
In the utility, a file can be provided with a list of pairs of itemIDs or itemUIDs values that identify what represents a station in the classic BOP and its equivalent station in the plant BOP.



2. **Map by BOE Station (Default)**

The equivalence stations are those that are sharing the same BOE station. This is the default behavior.



3. **Map by BOE Station assigned to Operation (Default)**

If there is no clear definition of a station in the classic BOP and the BOE station is assigned to the operation, the operation is copied to the process station in the plant BOP with the same BOE station.

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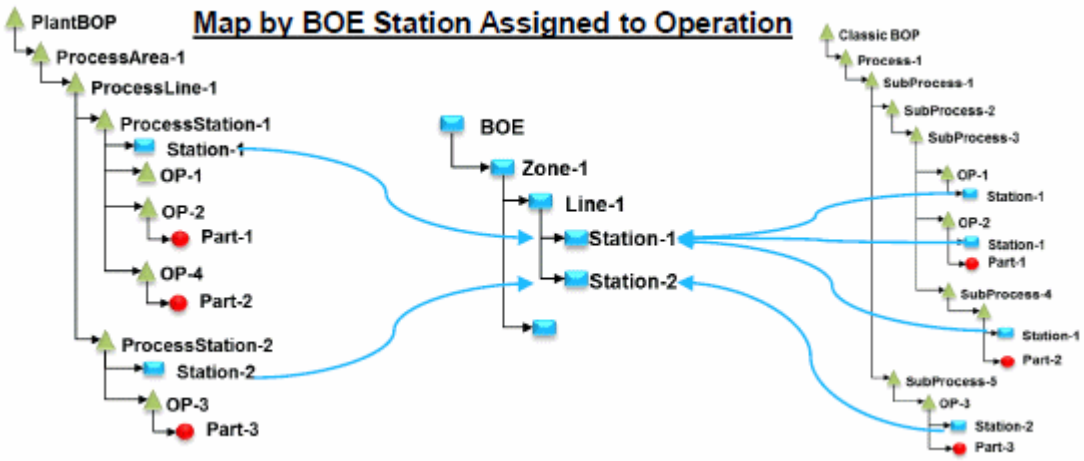
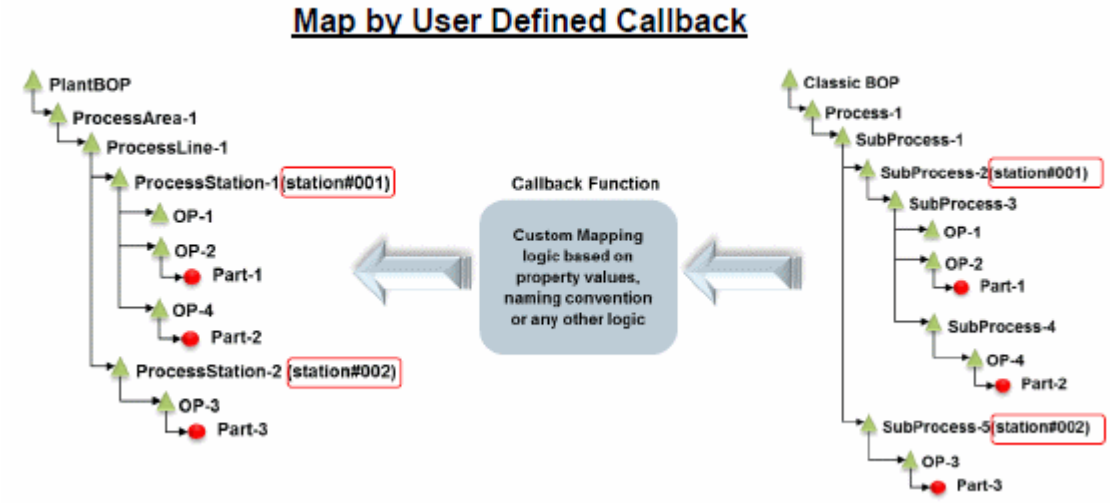


Note:

In the plant BOP structure, a BOE station should not continue to be referenced directly by the operation; it creates redundancy and overhead when moving an operation from one station to another. When the migration utility has completed, you can revise the operations and remove the references to the station BOE, as shown in the image above.

4. **Map by user defined callback**

A custom callback function can be written to define how to map the classic BOP station to the plant BOP process station. The callback could also explicitly determine which operation in the classic BOP needs to be copied to which process station in the plant BOP.



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Key steps in migrating a classic BOP to a plant BOP

1. You must have a classic BOP in a collaboration context as the source.
2. You must have a skeleton plant BOP for the target, which can be created using one of two methods.
    a. Manually create the skeleton plant BOP.
    b. From an existing BOE, use the **Synchronize Process and Plant** command to create the skeleton plant BOP.
3. Put the skeleton plant BOP in a collaboration context.
4. Run the **me_populate_plantbop_from_bop** utility first, using the **-dryrunfile** argument to check if the migration will be as expected.
5. If satisfied, run the **me_populate_plantbop_from_bop** utility again without the **-dryrunfile** argument.
6. Run an **Accountability Check** to make sure all operations are accounted for.
    a. Use the **Dynamic Equivalence** option using the ItemID.
7. If there are missing operations, use the **Paste by Rule** command in Manufacturing Process Planner to copy and paste the operations from the classic BOP to the correct locations in the plant BOP.

> Note:
>
> Typically, you migrate a previously released (and frozen) classic BOP. However, if the classic BOP was not released, you should release (freeze) it after the migration to prevent any modifications.

Using the Paste by Rule command

The **Paste by Rule** command is used after executing the **me_populate_plantbop_from_bop** command line utility to complete the migration with any needed minor cleanup. It allows you to paste one or more operations to a PlantBOP Station.

Main functional behavior

- One or more operations are copied and shared from a classic BOP to a ProcessStation in PlantBOP.
- Operations are selected recursively according to the closure rule.
- Operations can be pasted to only one PlantBOP and one time per PlantBOP.
- Operation occurrence properties are aligned according to the preference.

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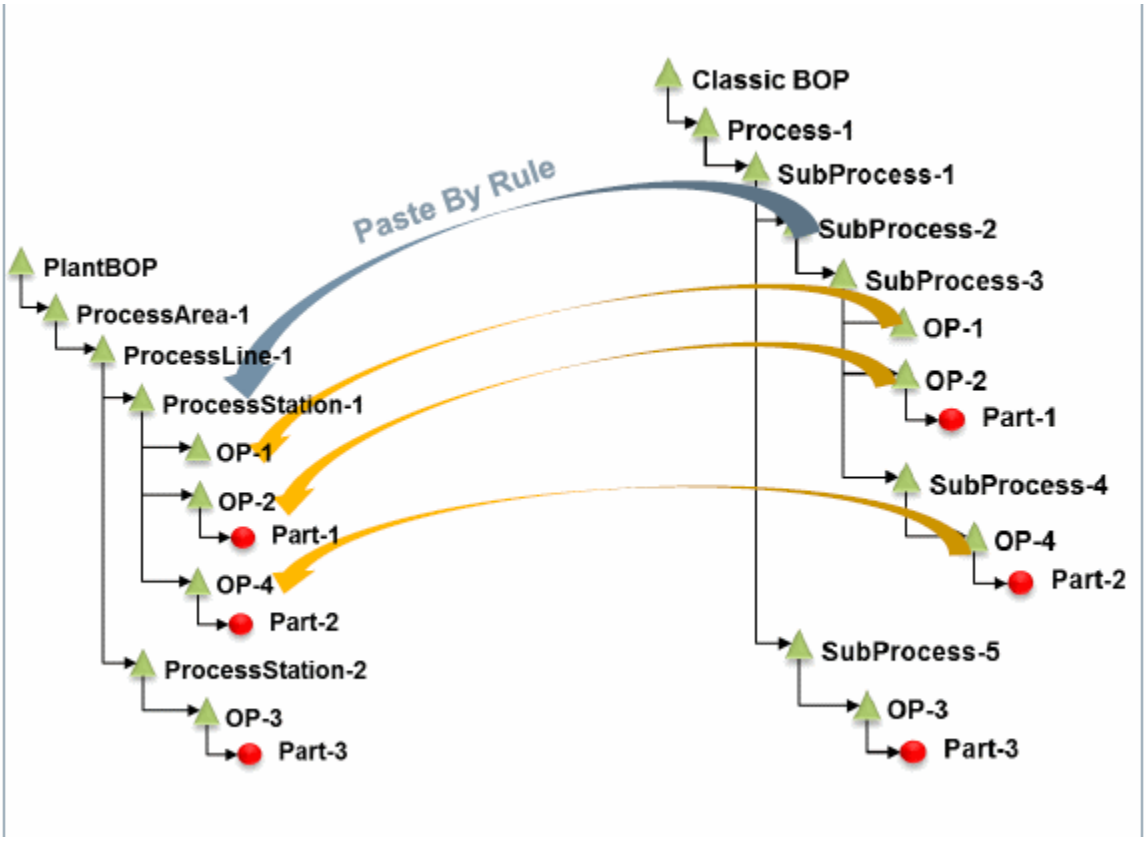
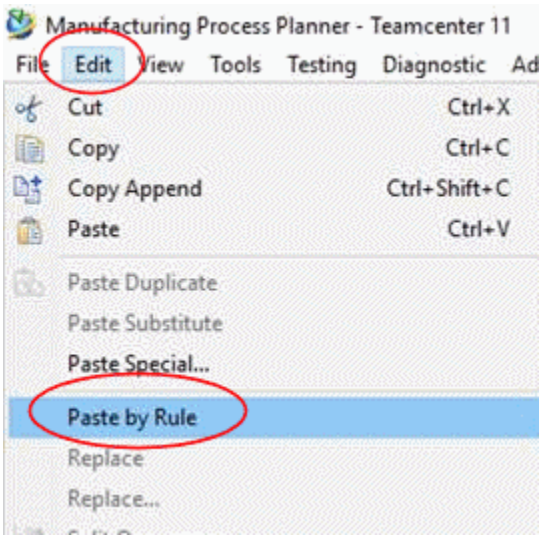
- Paste by Rule logic follows the command line migration utility logic: however, the UI does not have station equivalence logic that the utility does.



The **Paste by Rule** command is located in Manufacturing Process Planner on the **Edit** menu and is only active after selecting valid objects; *processes* or *operations* in the source and *process stations* in the target.



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Preferences for migrating a classic BOP to a plant BOP

Several preferences control the migration of a classic BOP to a plant BOP.

These preferences are used by both the **me_populate_plantbop_from_bop** command line utility and the **Paste by Rule** rich client command.

- **MEPasteByRuleClosureRule**

  Specifies the name of the closure rule to be used for collecting the objects to be copied from a classic BOP to a plant BOP.

  A valid value is the name of a closure rule. The default is **MEOperationsOnly**.

- **MEPasteByRuleCloningRule**

  Specifies the cloning rule name to be used during migration of classic BOP to plant BOP.

- **MEPasteByRuleOccProperties**

  Specifies the BOM Line properties to be included during **PasteByRule** operation between a classic BOP and plant a BOP.

  Valid values are BOM Line property internal names.

These preferences are only used by the **me_populate_plantbop_from_bop** command line utility.

- **MEPasteByRuleAttachmentsCloning**

  Specifies the Attachments to be processed on equivalent stations during PasteByRule operation between a classic BOP and a plant BOP.

- **MEBOEStationTypes**

  Defines the types to be designated as Bill of Equipment (BOE) station types.

  Valid values are type internal names and only need to change if new subclasses have been derived from **WorkArea** to represent BOE station types.

  > Note:
  >
  > Teamcenter needs to be restarted for any change to take effect.

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Restructuring an enterprise BOP structure

You can copy or move operations or processes within the same enterprise BOP structures. If origin links exist, these links are maintained.

The following commands are disabled in a plant BOP structure:

- **Replace**
- **Replace...**
- **Split occurrence**
- **Paste Substitute**

Remove origin links between BOP structures

At some point in the planning process, a processor operation (for example, in the plant BOP) is optimized to a level where further updates to it (in this case, from the product BOP) is counter-effective. It is assumed that your business process defines when such an action needs to be performed. You can use the **Disconnect** menu command to remove the origin link on a selected process or operation.

After disconnecting a process or operation, the object has the same behavior as a structure-specific node (for example, a plant-specific process or operation).

> Caution:
>
> Because there is no longer an origin link between the source and target after disconnecting, the following applies:
>
> - The accountability check now considers the source and target nodes as different.
> - The **Find in ...** menu commands no longer find the equivalent node in the other structure.

To perform this procedure, you must have write access to the product or plant BOP.

1. Right-click one of the following:
   - An allocated process, operation, or process area in a plant BOP.
   - A partition, process, or operation in a product BOP that is cloned from a generic BOP.
2. Choose **Disconnect from Origin** from the shortcut menu.

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3. In the **Disconnect from Origin** dialog box, select **Disconnect Children** to break the origin link of all the children of the selected line.

4. Click **OK**.

Teamcenter traverses the structure from the selected point down and removes all the origin links with the product BOP or generic BOP. The selected line (and its children, if that option is selected) is now product or plant-specific. You can no longer propagate from generic to product BOP or from product to plant BOP. This procedure does not remove any lines from the structures.

If you do not have write access to certain processes or operations, these are not disconnected.

Re-establish origin links

During the course of your work, there can be situations where the origin link between processes or operations in the product and plant BOPs or between the generic and product BOPs is broken or needs to be re-established.

- If, after allocation, you accidentally remove the process or operation from the product BOP.
- If you initially created a structure-specific process or operation and now want to connect it to a process or operation in the generic BOP. This can happen as your deployment matures, for example, you start with a product BOP and then in time realize that a generic BOP is a necessity.

1. Right-click a process or operation in the generic BOP or product BOP and choose **Link/ Associate→Establish Origin Link**.

   The **Establish Origin Link** dialog box opens with the selected process or operation listed as the source structure.

2. Select the process or operation in the target structure (product BOP or plant BOP) that you want to link and click beside the **Target** box.

   You can select multiple targets.

3. Click **OK**.

   Teamcenter creates the origin link between the source and target processes or operations. You can now use the **Find In** commands and the accountability check also shows these two structures as a match.

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Working with tool requirements

Tool requirements overview

A process planner uses tool requirements to describe the tools required for a process or operation. This can be in the form of a search criteria or a description of the tool in free text. A tool requirement is defined at the process or operation level in a generic BOP or product BOP. After definition, the requirement is resolved to an actual tool in the plant BOP.

You can assign multiple tool requirements to a process or operation line. You can copy a tool requirement from one operation to another. After copying, each tool requirement is considered as separate. There is no link maintained between them. The resolved tools (if any) from the source are carried over to the target. If you copy an operation with a tool requirement, a link between the original and copied tool requirements is maintained.

A tool requirement is resolved in the plant BOP after allocation. The default occurrence type used when resolving the tool requirement is specified in the **MERelationTypeUsedEquipment** preference. You can change this default in the **Create Tool Requirement** dialog box.

There are two types of tool requirements:

- Search criteria

  This is a valid search criterion that Teamcenter executes to find matching tools that automatically resolve the requirement.

- Free text description of the tool

  This is a description of the tool in free text format that you resolve manually.

Tool requirements are displayed in the **Assignments** view. You can create and edit them in the generic or product BOP and resolve them in the plant BOP. Additionally, you select which types of objects are displayed in the **Assignments** view by clicking the **Filter** button and selecting the desired objects from the list.

You may have business reasons for wanting to override existing tool requirement criteria and resolve the requirement manually with a tool that you select from the **Classification** view or copy from elsewhere. You can do so in the **Edit Tool Requirement** dialog box.

Create a tool requirement

1. In a generic or product BOP, select a process or an operation and choose **Open With→Assignments**.

2. Click the **Create tool requirement** button or choose **Tools→Logical Assignment→Create Tool Requirement**.

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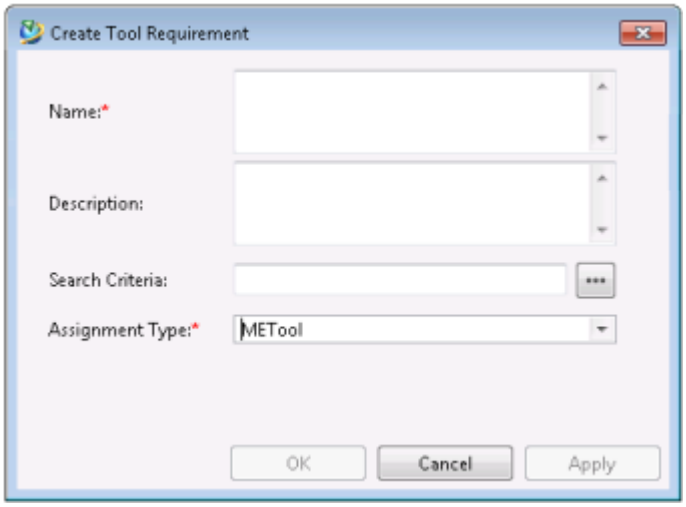
Teamcenter displays the **Create Tool Requirement** dialog box.



3. Enter a name for the new tool requirement.

4. Do at least one of the following:

   - Enter classification search criteria that describe the desired tool by clicking •••.

     Teamcenter displays the **Classification** dialog box where you can perform an ad hoc search.

     a. Click the **Search Classification Class** button to access the **Class/Attribute Selection Popup** tree.

        If applicable, you can specify the system of measurement as metric, nonmetric, or both.

     b. Double-click a class name to select it from the popup tree. If you want to search by attribute value, you must select a class that contains attributes.

        A row for the class is added to the classification search criteria definition table. You can add or remove a search criteria clause by clicking + or — on the right side of the table.

     c. Click the name of the class in the **Property Name** column to list and select the desired search attribute. You can use relational operators to search for a combination of attribute values, for example, for a value range.

     d. Click **OK**.

        Teamcenter closes the **Classification** dialog box and enters the search criteria into the **Search Criteria** box.

   - Enter a description for the new tool requirement.

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If you enter classification search criteria, Teamcenter searches for matches to resolve the requirement. If you enter a description, you must resolve the tool requirement manually, copying and pasting a tool to the tool requirement.

5. Select the type of the assignment that the resolved tool will have to the parent process or operation. The types available in the list and the default selected are specified by the **MERelationTypeUsedEquipment** preference.

6. Click **OK** to close the dialog box and create the new tool requirement, or click **Apply** to create the new tool requirement but leave the dialog box open to create further tool requirements.

> Note:
>
> You must enter either a description or search criteria. You cannot leave both empty.

Edit a tool requirement

1. In a generic or product BOP, select a process or an operation containing the tool requirement that you want to edit and choose **Open With→Assignments**.

2. In the **Assignments** view, select the tool requirement.

3. Click the **Edit tool requirement** button or choose **Tools→Logical Assignment→Edit Tool Requirement**.

   Teamcenter displays the **Edit Tool Requirement** dialog box.

4. Modify any of the entries.

5. Click **OK** to close the dialog box.

   Teamcenter modifies the existing tool requirement.

About resolving a tool requirement

Tool requirements are *resolved* in the plant BOP. Teamcenter searches for all the tools that match the search criteria contained in the tool requirement in both the work area (and child work areas) associated to the immediate process area and the classification hierarchy and presents these matching tools in the **Tool Requirement Resolver** view. You then choose one tool to fulfill the requirement from the list of possibilities, and Teamcenter exchanges the requirement with the actual tool in the plant BOP.

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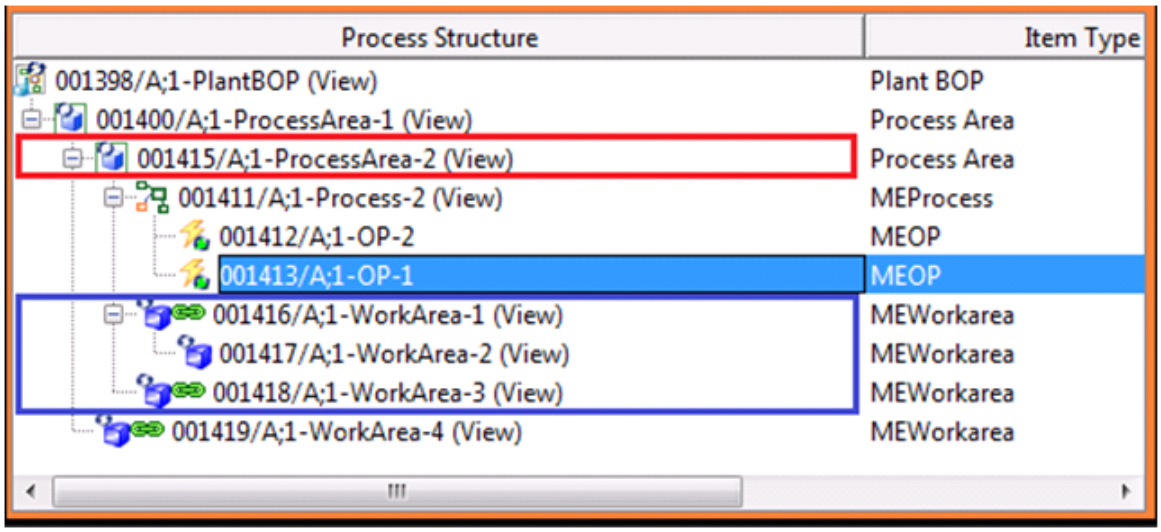

For example, for **OP-1** shown in the figure, the immediate process area is **ProcessArea-2**. The child work areas of **ProcessArea-2** are displayed in blue—**WorkArea-1**, **WorkArea-2**, and **WorkArea-3**. If **WorkArea-1** and **WorkArea-3** are unavailable, no other work area is considered. If a tool is used in multiple work areas, Teamcenter reports it from the work area that precedes the other. If the same tool is found in a work area and in the classification hierarchy, it is reported multiple times.

If the resolved tool is configured out, the tool becomes invisible and is not displayed in the tool requirement. As a result, the tool requirement allows resolving against other candidate tools without removing the invisible tool. This implies that the tool requirement is resolved against two tools—one invisible and another visible—with different effectivity. An attempt to re-resolve at this stage replaces the visible tool with the new matching tool without affecting the invisible tool. Based on the configuration rule, the tool can be made visible. You can, therefore, set configuration rules such that both the tools are visible at one time. This is the only exception where multiple tools are shown as a resolved tool in a tool requirement. If you re-resolve at this stage, Teamcenter replaces both tools with the new one.

Caution:

If the same tool requirement is open in two different configurations, the **Tool Requirement Resolver** view does not update the results of resolving a requirement immediately. You must do one of the following:

- Choose **Refresh** from the **Tool Requirement Resolver** view menu.
- Close and re-open the **Assignment** view.

If you delete a resolved tool from a process or operation using the **Remove a Line** button , the resolved tool requirement in the **Assignments** view reverts to being an unresolved tool requirement. You must refresh the **Tool Requirement Resolver** view to see the results.

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Resolve a tool requirement

Do one of the following:

- Manually resolve a tool requirement.

  If a tool requirement contains a description only (no search criteria defined), you must resolve this tool requirement manually. Copy and paste or drag and drop a tool into the tool requirement.

- Automatically resolve a tool requirement.

  1. In the plant BOP, select the process or operation that contains the unresolved tool requirement and choose **Open With→Assignments**.

     Teamcenter displays the tool requirements in the **Assignments** view.

  2. In the **Assignments** view, select the tool requirement you want to resolve.

  3. Click the **Find Candidates** button or choose **Find Candidates** from the shortcut menu.

     Teamcenter searches for all tools that fit the criteria specified in the tool requirement and opens them in the **Tool Requirements Resolver** view. This view displays the candidate tools found during the search listed by the tools found in the classification hierarchy and the tools found in the work area.

  4. (Optional) Use the **Filter** button to filter tools according to the source of the tool (by work area or classification root).

     The filter settings remain applied in the view for subsequent searches until you change the value manually.

  5. Choose the correct tool and click the **Accept Tool** button or choose **Accept Tool** from the shortcut menu.

  Teamcenter resolves the tool requirement in the plant BOP by adding the selected tool to the structure using the assignment type specified in the tool requirement. Additionally, the tool is shown beneath the requirement in the **Assignments** view and under the process or operation in the structure view. The resolved symbol is displayed beside the selected tool in the **Tool Requirements Resolver** view.

  If you want to change tools, select another tool in the **Tool Requirements Resolver** view and click again.

  If the resolved tool is removed from the classification root or work area, if you search again for candidate tools, the tool is still displayed in the **Tool Requirements Resolver** view.

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Override a tool requirement

While planning your tooling in a plant BOP structure, you may have a situation where you want to manually resolve a tool requirement while retaining the requirement definition. When you do this, Teamcenter adds a symbol to the tool requirement to indicate that it is manually overridden.

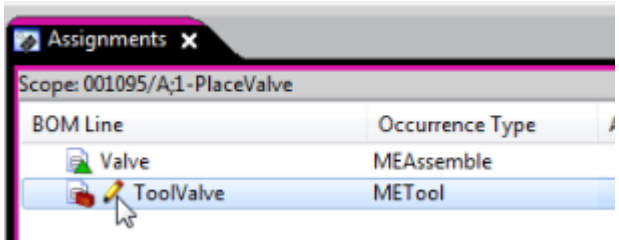
1. Select the tool requirement in a plant BOP structure that you want to override.

2. Click the **Edit tool requirement** button or choose **Tools→Logical Assignment→Edit Tool Requirement**.

   Teamcenter displays the **Edit Tool Requirement** dialog box.

3. Select the **Override Criteria** check box and click **OK**.

   Teamcenter displays the override symbol on the tool requirement.

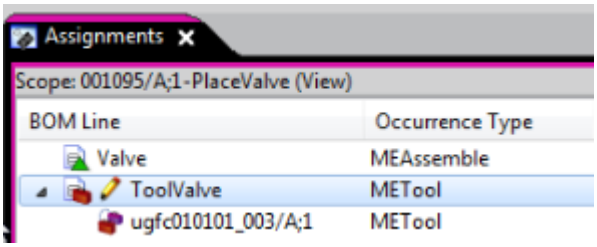


4. Click the **Find Candidates** button or choose **Find Candidates** from the shortcut menu.

   Teamcenter opens the **Classification** view displaying the classification hierarchy.

5. Find the desired tool and drag it or copy and paste it to the tool requirement to resolve it.

   Teamcenter resolves the tool requirement but retains the symbol indicating that the criteria are overridden.



   Teamcenter also adds the tool to the process structure.

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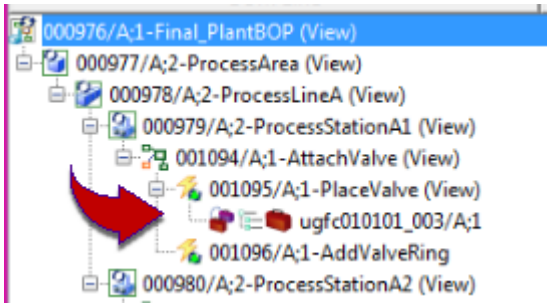
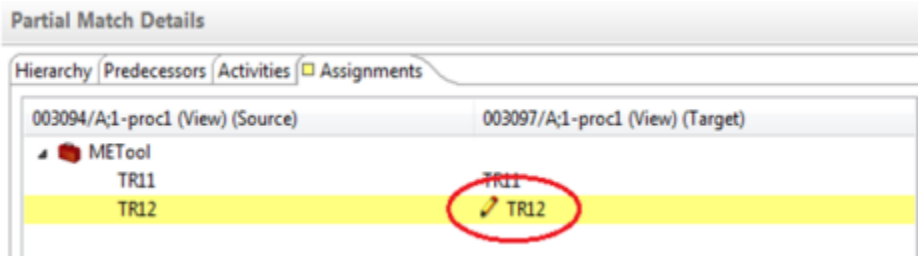


If you compare a product BOP and plant BOP, the accountability check results indicate the presence of an overridden tool requirement.



View a resolved tool

1. Select a tool.

2. Choose **Open With→Classification Properties**.

Teamcenter displays the tool with its classification attributes in the **Classification Properties** view.

Search for a process or operation for tool requirements

The following search is available only from a plant BOP:

1. Select the process in which you want to search for unresolved tool requirements and choose **Structure Search** from the shortcut menu.

2. In the **Query type** box, select **tool requirement**.

3. Select whether you want to see the unresolved tool requirements contained in processes, operations, or processes and operations in the **Result type** list.

4. To search for resolved and unresolved tool requirements, clear the **Consider only unresolved tool requirements** option.

5. Add other criteria for which you want to search.

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6. Click **Search**.

   Teamcenter displays all the processes or operations in the scope structure that contain tool requirements or unresolved tool requirements, if you selected that check box.

Delete a tool requirement

1. Select a process or an operation in a generic, product, or plant BOP and choose **Open With→Assignments**.

2. Select the tool requirement that you want to delete.

3. Click .

   Teamcenter detaches the tool requirement and removes any resolved tool from the process or operation.

> Note:
>
> All tools are deleted, even those that are configured out.

Rolling up variant conditions

You can optionally propagate **rolled-up variant conditions** when you assign parts from the EBOM to the MBOM or from a product BOP to a plant BOP. As a result, the BOM lines in the MBOM or plant BOP hold the same variant conditions as the corresponding BOM lines in the EBOM or product BOP. Teamcenter copies the variant condition on the source line, rolls up the variant conditions of all parents of the source line, and then propagates the rolled-up variant condition to the target MBOM line, as shown.

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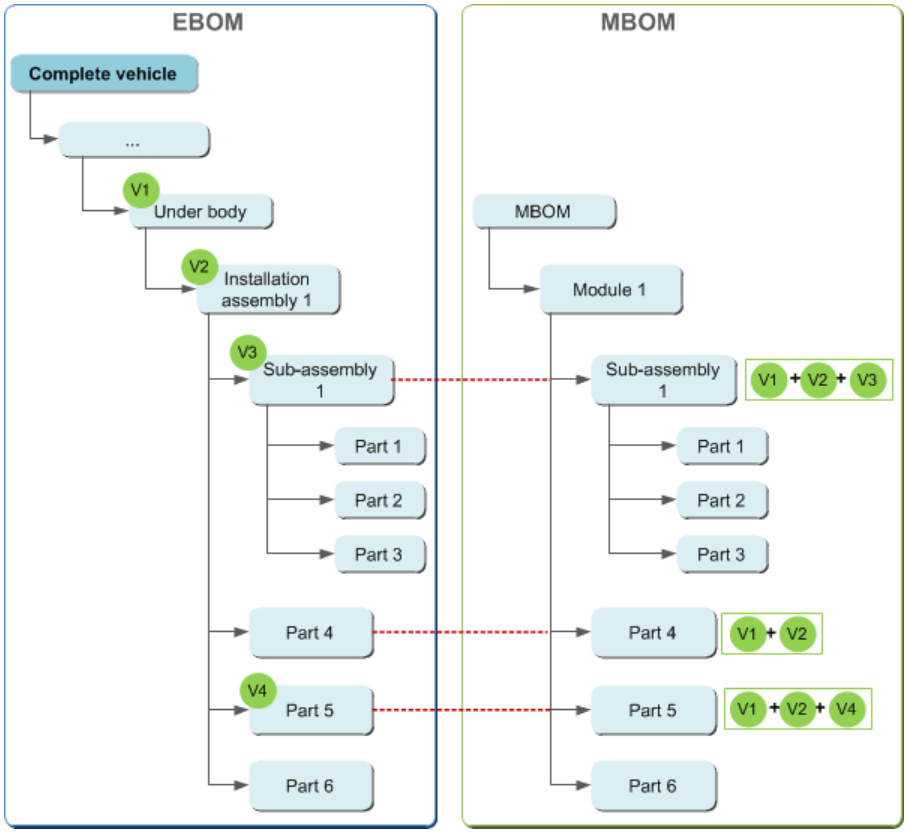

The top levels of the EBOM and MBOM must be linked for correct propagation of rolled-up variant conditions. Teamcenter calculates the rolled-up variant condition by traversing from the source line to the linked top or up to the installation assembly level, and then adding together all the variant conditions found during the traversal.

If the source line does not have variant conditions, Teamcenter calculates the rolled-up variant condition by considering the variant conditions of the parent and all levels above.

The accountability check is modified to recalculate the rolled-up variant condition on the source line and compare it with the variant condition already stored on the associated MBOM line. It then reports any partial match discrepancies between the variant conditions.

By default, rolling up of variant conditions is disabled and must be enabled by setting the **Rollup_Variant_Feature** site preference to **true**. You should also set the **RollUp_Variant_Traverse_Level_Is_InstallationAssembly** preference to determine the level to which rolled-up variant conditions are calculated. If this preference is set to **TRUE**, Teamcenter calculates the rolled-up variant condition by traversing up to the installation assembly level in the structure. If the preference does not exist or is set to **FALSE**, it calculates the rolled-up variant condition by traversing up to the linked top.

If the rolled up variant expression is too long, your administrator can create the **Rollup_Variant_Optimized_Format** preference and set it to **TRUE**. Teamcenter then optimizes the rolled up variant expression for storage and display.

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The following installation assembly preferences must also be set:

- **PortalDesignContextIsInstallationAssemblyMethod**
- **PortalDesignContextIsInstallationAssemblyMethod.hasIRType.Type**
- **PortalDesignContextIsInstallationAssemblyMethod.has_bomline_prop.name**
- **PortalDesignContextIsInstallationAssemblyMethod.has_bomline_prop.value**

> Note:
>
> For the EBOM/MBOM scenario, Teamcenter calculates a rolled-up variant condition only if an assignment is made from the EBOM to the MBOM and both structures are linked.
>
> Rolled-up variant condition supports the Teamcenter Product Configurator and classic model, not with modular variants.
>
> The rolled-up variant condition is saved in optimized form in the database but, when you view it, you see a summation (**AND** calculation) of all variant conditions from the source line to the linked top. Consequently, the rolled-up variant condition displayed on the target line may contain some redundant clauses. This helps you decompose the variant condition to its constituent building block expressions.

Additional preference settings:

- Set **PSM_enable_product_configurator** to **true**.
- Set **Rollup_Variant_Feature** to **true**.
- Add **bl_formula** to the **MEAlignedPropertiesList** preference.
- Make sure **bl_formula** is not in any preferences beginning with **MEAlignedPropertiesToExclude...**

When Teamcenter calculates the variant condition when allocating from a product BOP to a generic BOP, it only calculates for the line being allocated. Therefore, if you allocate a process with child processes or operations, it does not calculate the rolled up variant condition for any children of the process being allocated. This results in a mismatch if you run an accountability check between the product BOP and the plant BOP. You have two choices in this case:

- Do not run the accountability check for a level lower than the one you allocate.
- Propagate the mismatch between the children of the process from the product BOP to the plant BOP.

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Importing and exporting enterprise BOP data

You can import or export a generic BOP, product BOP, or partitions and their contents in PLM XML format. You can import a complete new structure or only changes since the previous import. You can perform incremental exports to only transfer changes to the structure since the previous export.

While Teamcenter does not block the import of enterprise BOP data or the viewing of such data with Microsoft Excel Live, there are limitations in both cases. Specifically, the Excel import feature does not support occurrence groups, so it is not possible to import partitions. As all processes must reside under partitions, it is not possible to import valid enterprise BOP data using Excel. Similarly, Excel Live does not support logical assignments or origin relations.

Relate and filter a mixed products production plant BOP to show only operations related to specific product BOMs

For companies involved with mixed product production, a station-based plant BOP often contains operations that refer to multiple product BOMs. Some products may be consumed in the BOP under operations but many operations do not contain consumption from any products. Using this feature, operations can be related to one product, to some products, or to all products.

In order to show information related to a specific product or products, you can use the **Related Products** view to identify operations with consumed elements as well as operations allocated to a plant BOP from multiple product BOMs. You can also define relations between operations and products yourself. Using the **Define Configuring Structures** command, and the **MEFilterBopByProductRelation** preference, you can filter the plant BOP to show only operations related to a specific product or products.

1. In Manufacturing Process Planner, open a station-based plant BOP linked to multiple product BOMs and load the BOM(s) for which you want to identify product information.

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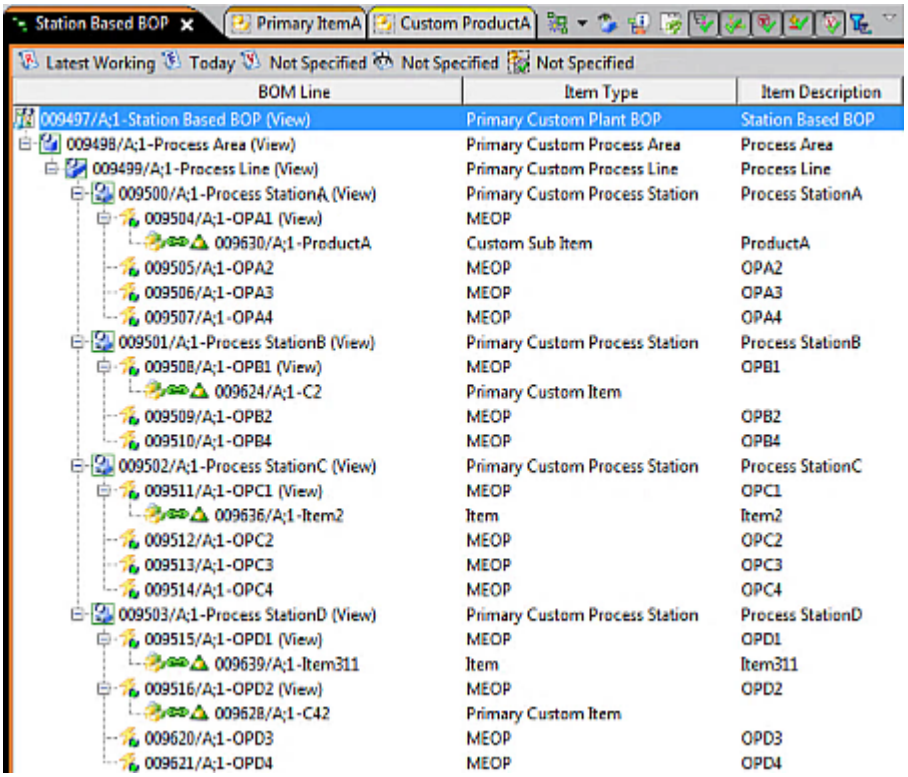

As long as an operation has write access, links to BOMs can be changed or updated over time. Product information can be identified for all BOMs open in the current session.

2. Right-click a process station and choose **Open with→Related Products**.

   A **Related Products** view shows all operations within the process station, including those with no relation to the product. The icon indicates products that are consumed under the operation. You cannot modify relations with the icon, but you can remove the relations by going to the plant BOP and manually removing the consumption. A green check box indicates that the operation is related to the item structure.

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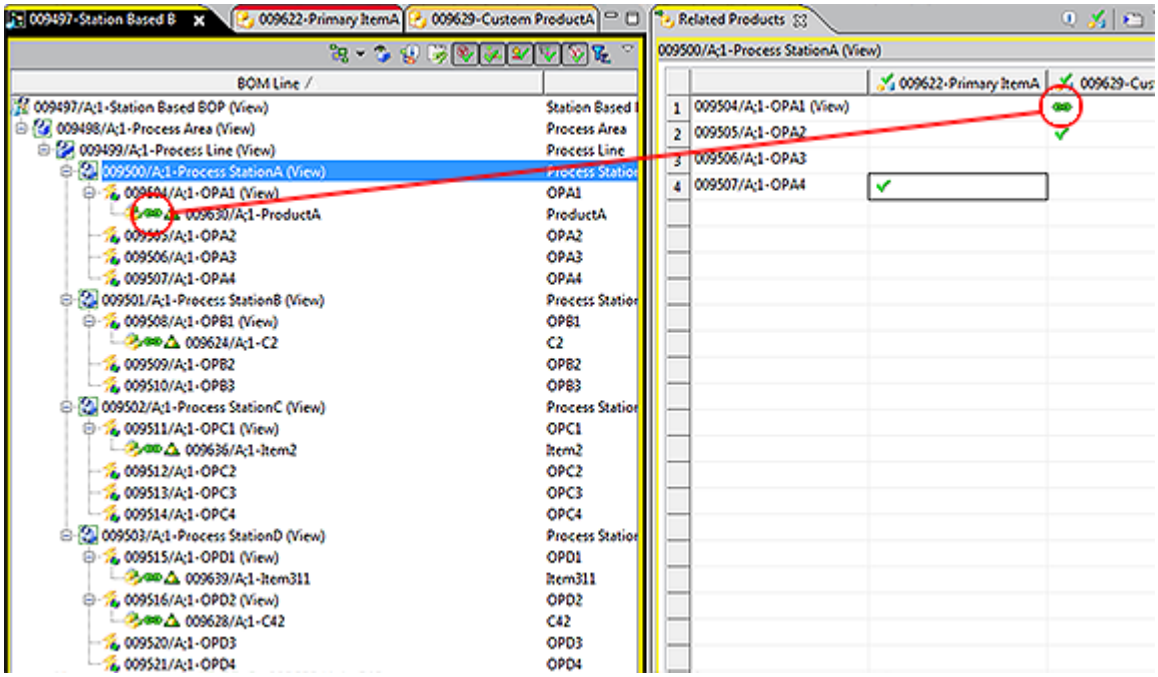
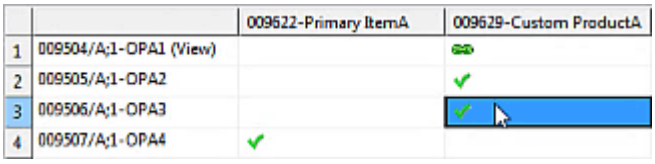


3. To associate an operation with an item structure, in the **Related Products** view, double-click the operation's cell in the structure's column.

   A green check box is displayed to indicate the association.



   Use check boxes to configure the plant BOP structure even if there is no consumption in the product structure. For example, if a weld operation does not have specific items consumed because they are already consumed in an assembly operation higher up in the plant BOP hierarchy, you can relate the weld operation to the product structure and configure it out depending on **Define Configuring Structure** dialog box settings.

> Note:
>
> You can also double-click a cell with a check box to clear an association.

4. To filter the plant BOP based on consumed items or related products, do the following.

   a. Select **Tools→Define Configuring Structures**.

      The **Define Configuring Structures** dialog box is displayed, showing all the currently loaded configured structures.

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b. Clear the check boxes next to any configured structures for which you do not want to view consumption and click **OK**.

c. In the plant BOP, select **Show Unconfigured Assigned Occurrences** .

The plant BOP structure and **Related Products** view are updated to display operations related to the checked structures.

Balancing a production line

Balancing a line with variants

Applying a production program with variants

When using the line balancing feature, you can define product variants (also known as *control models*) to balance an assembly line in a mixed production scenario. You can define *production programs* based on these product variants that determine the probability of operations according to given production rates.

A production program is represented by a three-level item structure. The production program contains one or more production program definitions that hold the data of the program for a specific effectivity date. Each production program definition holds a list of items representing the product variants. It also defines the targeted cycle time for the production line as a property. The production rate for each variant in a specific definition is a property of the occurrence that links the variant to its parent definition. You must configure the BOM structure to assure that the definition of the production program is unambiguous; only one definition is visible for the production program. The production programs are held in a production program collection that is then added as a structure context to the enclosing collaboration context. In this way, you can inspect and edit the state of all production programs for a consistent effectivity date and revision rule by opening the production program collection.

When you send a plant BOP to the **Line Balancing Chart** view, you can apply the production program to it and see the work content of the stations according to the operation probability defined by the production program that you are working on.

Siemens Digital Industries Software strongly recommends that you use only classic variants when working with line balancing. If you configure a modular variant condition on a structure, this filtering is maintained, but only the classic variant filtering is reset by the production program filtering done on the structure.

Set up the data

You can define a *production program* that contains a set of variants of a particular product (a 120% BOM). For example, if you create refrigerators, you may produce multiple similar variants that you want to manage as one production program. The production program contains all the variants belonging to that product group. If you apply the production program on the **Line Balancing Chart** view, all the saved variant rules assigned to the product variants are applied on the structure within the collaboration

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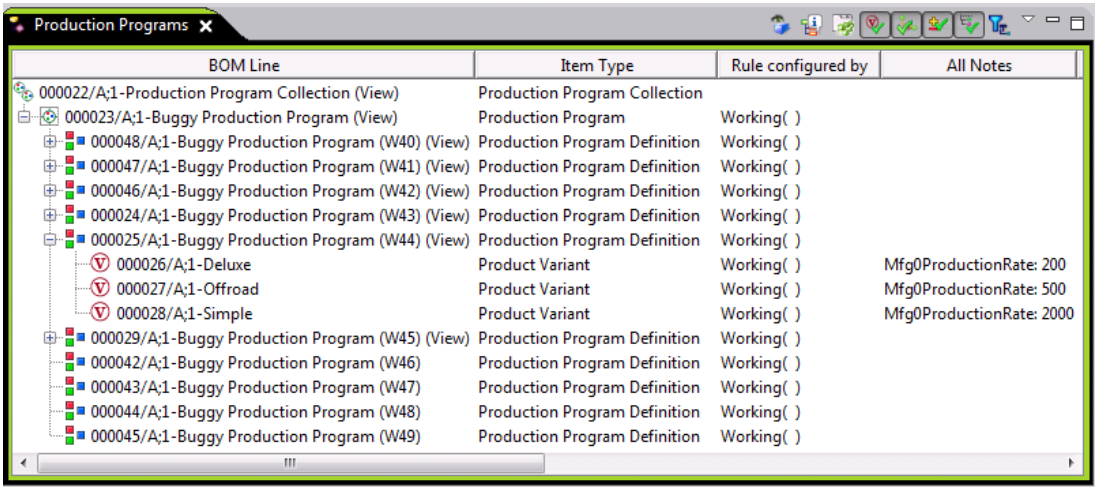
context. Depending on the state of the **Show Unconfigured Variant** and **Show Unconfigured Assigned Occurrences** buttons, related BOM lines are configured out.

1. Create a production program structure.

   As a root, create a **Production Program Collection** item. Under the collection, create a **Production Program** item, and under that, create a **Production Program Definition** item using **File→New→Item** and selecting the appropriate types.



   Although you can create more than one production program within a production program collection, you can only have one production program configured into the production program collection (*active*) at the point when you apply the production program in the line balancing chart.

2. Under the newly created production program definition, add the product variants.

   The product variants are items of **Product Variant** type. A product variant item contains no structure itself, but by linking saved variant rules to the product variant, you specify the configuration of one machinable product. The saved variant rule specifies the item and its configuration for the product variant.

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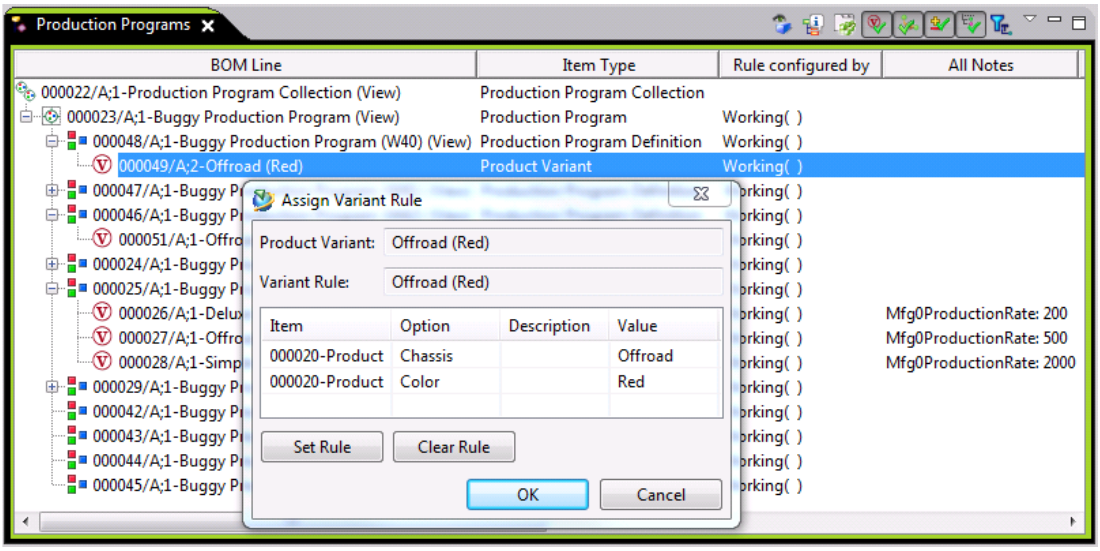
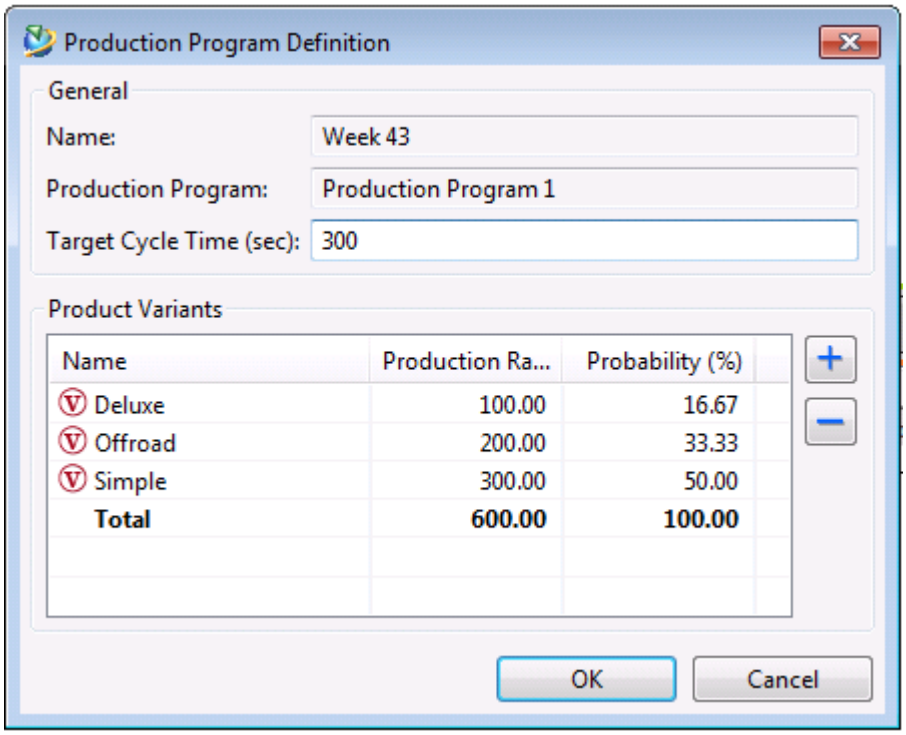


3. In the production program definition, specify the production rate with which each of the variants are produced.

   Teamcenter calculates the probability of each variant based on these production rates.



4. Save all the structures into a collaboration context that also contains the plant BOP and any supporting structures, such as product BOP, process, and product.

   When applying a production program to a plant BOP, Teamcenter searches for the production program in the owning collaboration context.

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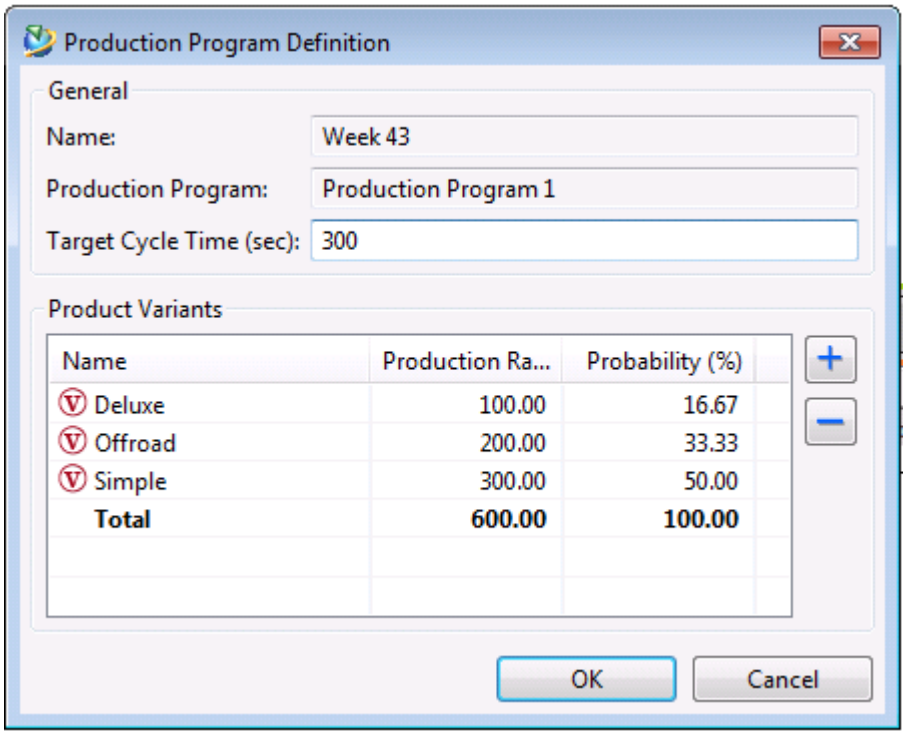
Add product variants and set their production rates

For each product variant that you add to a production program, you must set a production rate that allows Teamcenter to calculate the probability of each variant's production within the production program definition.

1. Right-click the production program definition and choose **Edit Production Program Definition**.

   Teamcenter displays the **Production Program Definition** dialog box with the name and production program listed. In addition, each of the variants contained in the production program is listed.



2. (Optional) Enter a target cycle time.

   The value of the target cycle time is specified in the current time units set in the **Manufacturing** options.

   This value is optional. If it is not 0, this entry has higher priority than the cycle time defined in the plant BOP. If it is 0, Teamcenter uses the cycle time defined in the plant BOP.

3. Add or remove variants from the product program definition using the plus and minus buttons.

   You can only add existing product variants.

4. For each variant, type a production rate in **Production Rate** box.

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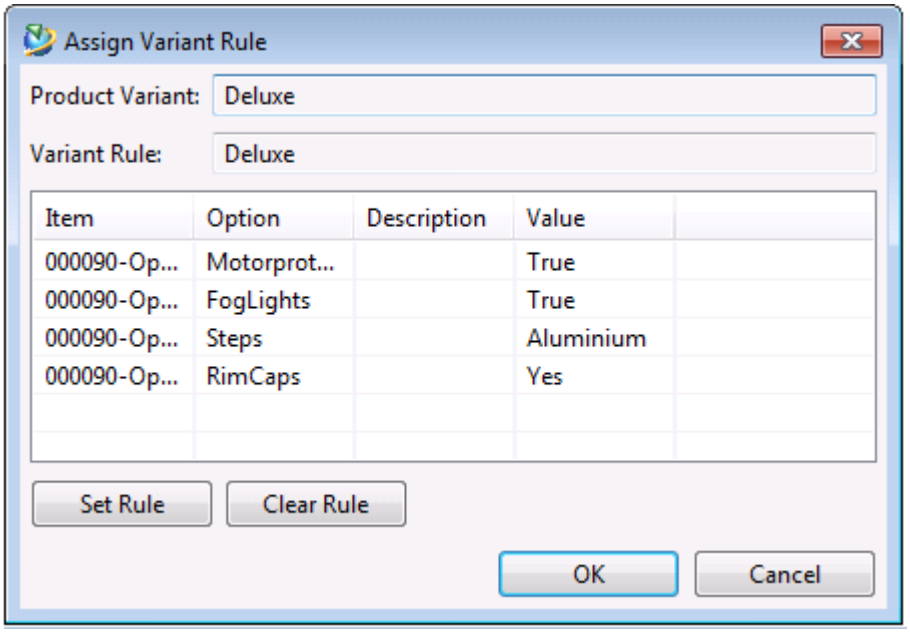
Teamcenter calculates the overall probability of production for each of the variants.

Assign a variant rule to a product variant

1. Right-click the product variant and choose **Assign Variant Rule**.



2. Click **Set Rule**.

3. Type a search string in the **Name** box and click **Find**.

4. Select a saved variant rule from the list and click **OK**.

You can assign only one saved variant rule to each product variant.

Balance the line with variants

1. Right-click a plant BOP and choose **Open With→Line Balancing Chart**.

   The first time you open the view, Teamcenter checks the current collaboration context for a production program and asks you whether to apply it to the view.

   Teamcenter opens the **Line Balancing Chart** view in **Average** mode.

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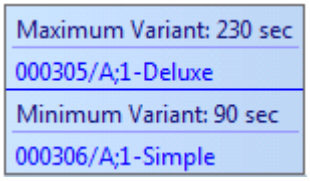
1	Header	Displays the active production program. In the figure, the line balancing chart is in **Average** mode with no variant filter applied.
2	Overlay	Shows the maximum and minimum work content of all the product variants in the production program. The station bar shows the weighted average times of all the operations, but the overlay indicates the range of work content for these operations. Using this, you can quickly determine if there are larger time deviations from the average. Hide the overlay by clicking **Show Overlay**.
3	Operations	Displays operations found in all the product variants. The darker green operations have a probability of 1 (they are found in every product variant). The lighter green operations have a probability of less than 1 (they are not contained in every product variant). Their probability is the sum of their individual probabilities of being included in each of the product variants.

Any problem stations that exceed capacity are displayed in red.

2. With the overlay turned on, place the mouse over the blue bar to view the maximum and minimum product variant times.



3. Place the mouse over an operation to view the tooltip.

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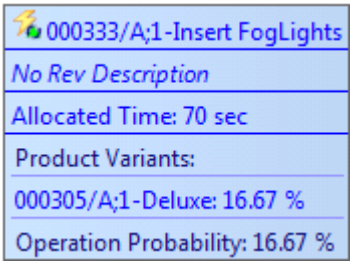
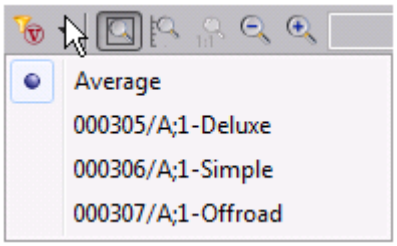


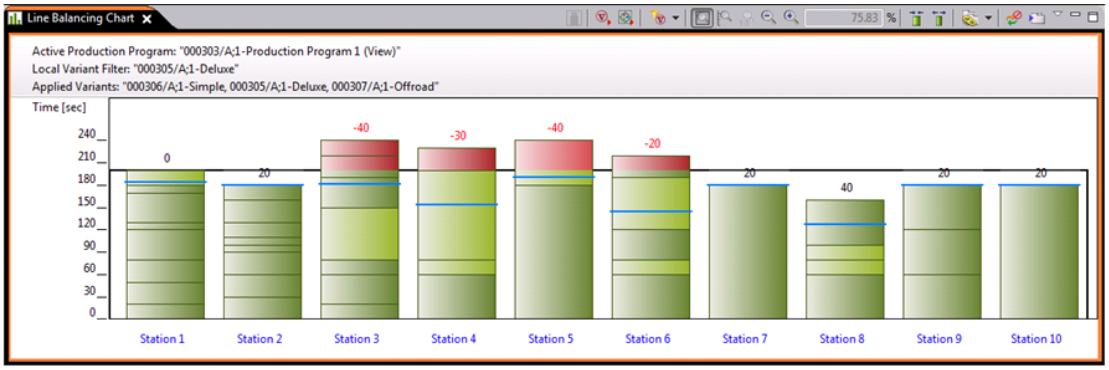
This displays:

- The relevant product variants from the active production program.
- The probability of each relevant product variant.
- The sum of the probability of all relevant product variants that amounts to the probability of the operation.

4. Click **Change Variant Filter** and select a different variant to change the product variant displayed in the chart.



Changing between variant filters in the line balancing chart does not apply the variants to the plant BOP structure. This allows you to analyze different variant configurations with no affect on structures.



The blue horizontal lines represent the averages.

5. Drag the problematic operations to a station with available capacity.

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If you move an operation from one station to another with a variant filter applied, the operation is also moved in the structure and, therefore, in all other variants of the structure.

6. Switch between variant filters and average mode to determine whether the line is properly balanced.

> Caution:
>
> While modifying the variant configuration in the **Line Balancing Chart** view, do not change the configuration in the structure views. If you do this, the information in the **Line Balancing Chart** view is no longer accurate and you must reapply the production program to the line balancing chart so the structure and chart are synchronized.

7. To view an applied variant in the plant BOP structure, apply the variant to the structure by clicking **Apply Variant Filter** .

   This updates the structures views with the variant configuration set in the **Line Balancing Chart** view.

   Clicking **Apply Variant Filter** applies a variant to the structure from which the variant rule originated. For example, if you create the variant rule within the process structure, when you apply the variant filter, it is applied to the process structure.

> Note:
>
> When you apply a variant from the line balancing chart, whether the variants that are configured out are displayed in the structure depends on the state of the **Show Unconfigured** buttons.

> Tip:
>
> If you receive a warning that some of the variants may not be visible because of currently applied product variants, click to reapply the production program.

Display time values on the line balancing chart

- In the **Line Balancing Chart** view, select **Times per Bar** and one of the following options:

This option	Displays
Overall	The working time of the station.
Available	The difference between the capacity of the station and the overall working time for the given bar. The **Line Balancing Chart** view always opens in this mode.

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This option	Displays
Utilization	The overall working time/capacity of the station.
None	No time values.

Add operations to the Line Balancing Constraints view

Do one of the following:

To	Do the following
Load a single operation or multiple operations simultaneously	1. Select one or multiple operations in the product BOP. 2. Click **Add Selection**.
Load all child operations of a selected process or processes	1. Select a process in the product BOP. 2. Click **Load Operations**. Note: This procedure loads all child operations, including child operations of nested processes.
Load additional operations	Do one of the following: • Load predecessors or successors of the selected operation or process. 1. Select a node. 2. Click or and choose the number of levels to be loaded. –or– 1. Right-click a node. 2. Choose **Add Previous Levels** or **Add Next Levels** and the number of levels to be loaded. • Drag a process or operation into the view. The selected process or operation must exist in the same product BOP as the scope of the view.

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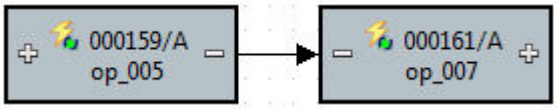
To	Do the following
	• Reveal processes or operations that already participate in constraints but are currently not displayed in the view by double-clicking ✚ in the previous or subsequent node. 
Hide operations in the view	Double-click ▭ on the top left of a node to collapse a predecessor. Double-click ▭ at the top right of a node to collapse its successor. If a node participates in an additional constraint, it is not hidden in the view, but is placed below the current flow with no attaching arrow between them.

Add or edit information on a constraint

1. Select the arrow representing the precedence constraint.
2. Click .
3. Type a description in the **Edit Constraints** dialog box or modify the existing description.
4. Click **OK**.

Generate line balancing reports

You can create reports for the line balancing data in Excel format. These reports are attached to the scope of the view from which the report is launched. You can see these datasets in the **Attachments** view.

> Note:
>
> Teamcenter manufacturing process management does not roll-up the number of workers for a station/line/... in the OOTB reports. If needed, you can create a custom report to show the total number of workers.

1. From the view menu, choose **Reports** and the type of report you want to open.

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Report	Description
Opens from the **Line Balancing Chart** view:	
Constraints Violation Check Report	This report has three sections. • The **Check Details** section listing all constraint violations in a plant BOP. • The **Constraints Definition** section listing all defined constraints. • The **Process Area Information** section listing all stations.
Balancing Overview Report	This report shows data for all stations of the current scope of the current **Line Balancing Chart** view such as: • Capacity • Work content • Allocated time • Time remaining • Number of workers • Category
Balancing Line Detail Report	This report shows data for all stations of the current scope of the current **Line Balancing Chart** view, but also includes details about allocated operations. Process area and operation names are indented in the **Name** column to reflect the hierarchy under the station.
Opens from the **Line Balancing Constraints** view:	
Constraints Consistency Check Report	This report contains two sections: • The **Check Details** section lists inconsistencies of the constraints defined in the product BOP. • The **Constraints Definition** section lists all constraints defined in the product BOP.

2. Accept the default name for the report or type a new name and click **OK**.

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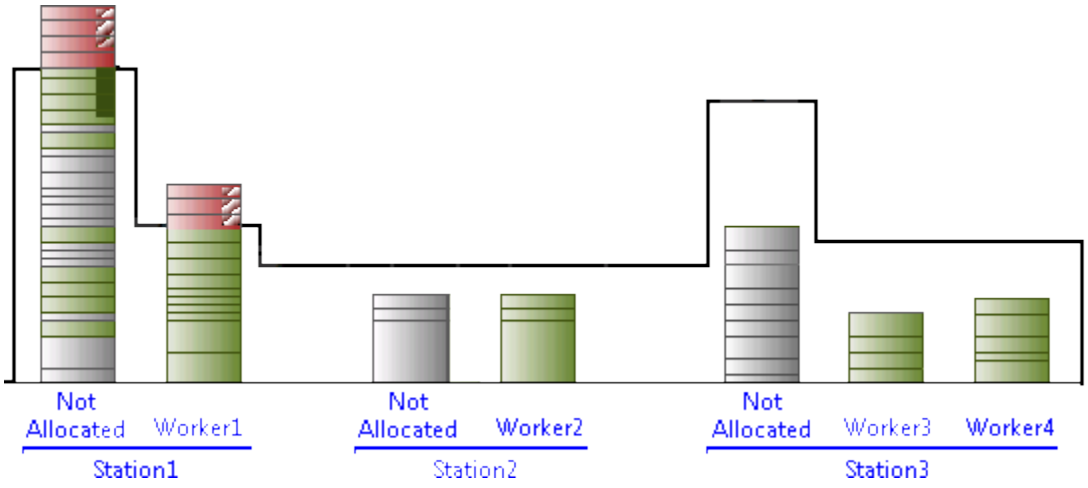
What is line balancing?

Production line balancing is the process of dividing assembly line tasks equally across workstations and resources to reduce idle or overburdened worker time and to thereby improve productivity.

Use line balancing to:

- Improve the quota of assembly lines by reducing bottle necks between tasks.
- Continuously eliminate waste from operations and processes.
- Reduce production time by assigning workstation operations, processes, and workers for maximum efficiency, based upon quotas as well as fluctuations in customer demand.

Line balancing solutions often rely upon minimizing the cycle time between workstations, minimizing the number of required stations, optimizing the allocation of workers at each station, and improving tools. In the following example, too much production moving to the first workstation creates a bottle neck that countermands the cycle time flow represented by the black line in the background. The impact of a backup at the first workstation is passed to the second and then to the third workstation, resulting in unbalanced lines and steadily decreasing productivity. Workers at the second and third stations are able to quickly complete their operations and processes, but do not receive production fast enough from the first station. The third station is more efficient than the second, probably due to the presence of an additional worker.



By shifting a worker from the third to the first workstation and moving work operations and processes to less-strained worker resources, you can improve lag time where the problem started, remove the bottle neck, and balance throughput.

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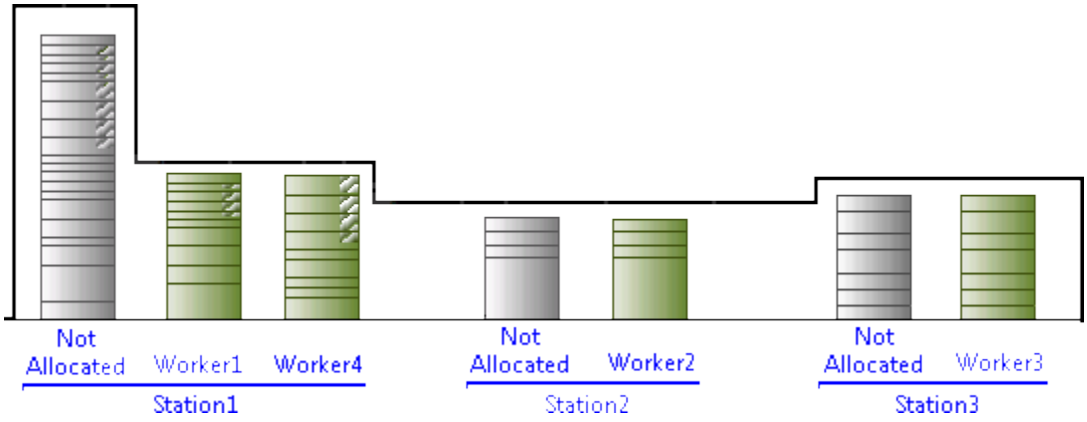

Other line balancing solutions may include:

- Moving operations and processes that contain sequential operations, indicated respectively as blocks and blocks with a dark bar or diagonal white bar in the chart, between stations and workers.
- Optimizing the efficiency and use of labor by constraining the process and order of operations and processes.
- Reducing nonvalue-added activities and operational expenses.

Line balancing workflow

Line balancing involves assigning operations (tasks) and processes (sequential tasks) to workers and workstations based on constraints or rules. Rules may mandate that:

- Operations must occur in a parallel sequence. For example, two assemblies must be completed simultaneously before they can be combined.
- Operations must occur in a mandatory sequence. For example, a bolt must be added to an assembly before it can be secured and tightened. Sequential operations are best defined as manufacturing processes to ensure that their order remains unchanged.
- Not all operations and processes can be performed at all workstations, and some operations and processes are more effectively performed at a specific station. For example, special tools required for specific operations may be available at only one workstation.
- Operations combined at a single station sometimes prove too costly. For example, if a worker has to walk long distances between operations and processes, idle time and worker stress negate productivity.

The following is a typical Teamcenter line balancing workflow:

1. Create a product BOP and a linked plant BOP.

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> Tip:
>
> For convenience, store these in a collaboration context that includes any other structures you need for reference.

2. If not yet defined, specify the plant BOP's station sequence in the **PERT** view.
3. Define the precedence constraints in the product BOP.
4. Define the workers or machine process resources and cycle time at each station.
5. Allocate operations from the product BOP to the plant BOP.
6. Detail plant-specific times (for example, nonvalue-added times).
7. Balance processes and resources.

To carry out this workflow, the following views are available in the Manufacturing Process Planner perspective:

- The **Line Balancing Chart** station view presents a bar chart where by default, the horizontal axis shows the process stations, and the vertical bars display the time required to perform the allocated operations and processes at those stations.
- The **Line Balancing Chart** details view presents a bar chart where the horizontal axis shows the time required to perform operations and processes allocated to the process stations, as well as the time required to complete the operations and processes allocated to each process resource (worker or machine) at those stations.

  > Note:
  >
  > Change your **MELBChartProcessOperationTypes** preference to **Process** to hide operations and see only processes in the **Line Balancing Chart** station and details views. Change it to **OP** to return to a view of both operations and processes. By default, you can quickly switch between these modes in the **Line Balancing Chart** view by choosing **View Menu → View Options → OP** or **Process**. If an assembly line uses multiple types of operations, an administrator can define custom values for each and give them custom names in the **MELBChartProcessOperationTypeDefaultValues** preference.

- The **Process Resources** view shows all processes and operations assigned to each process resource.
- The **Line Balancing Constraints** view helps you define the mandatory sequence of processes and operations in the product BOP.

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- The constraints check result views, which include the **Constraints Consistency** and **Constraints Violations** views, display operations or processes that participate in constraint inconsistencies and violations for the current product or plant BOP.

- The **Graph Overview** view gives you an overview of the **Line Balancing Constraints** and **Line Balancing Charts** views. This view helps you to navigate and provides orientation.

> Note:
>
> If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the PlantBOP structure, the **PlantBOP → Open With → Line Balancing Chart** option is not available in the rich client.

> Note:
>
> If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the ProductBOP structure, the **ProductBOP → Open With → Line Balancing Constraints** option is not available in the rich client.

Represent workers or machines in a station

Workers or machines at a station are represented in line balancing by **Process Resource** objects. Each process resource represents a worker or a machine to which you can assign operations and balance the operations in a station using the **Line Balancing Chart** view.

1. Select a station and choose **File→New→Process Resource** to create a process resource (**Mfg0ProcResource**) for each worker or machine that you need at that station.

   The **Number of Workers** property on the station increases or decreases when you create or delete a process resource.

   > Note:
   >
   > To add a process resource to a station, the **MELBChartStationTypes** preference must be set to **Mfg0MEProcStatn**.

2. Associate operations with the process resources by dragging them from a process or station to the process resource.

   > Tip:
   >
   > Add the following columns to the structure view to see which operations and process resources are associated.

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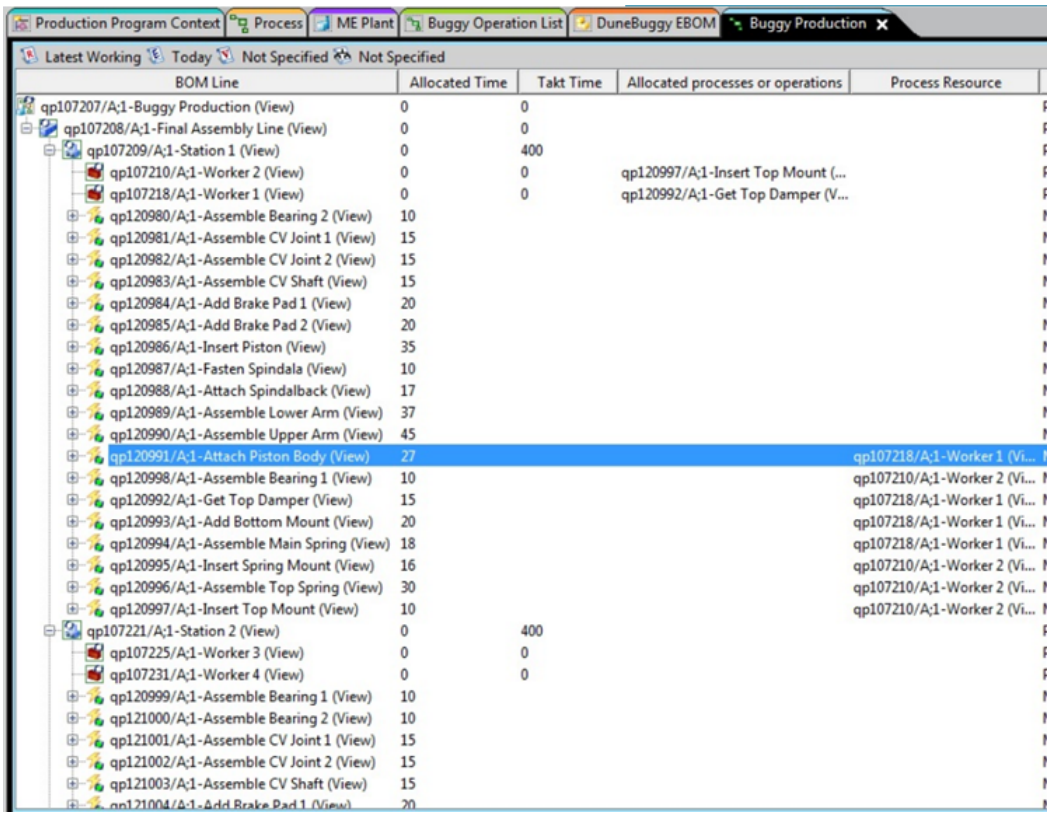
Column name	Description
Allocated Lines	Lists operations that are associated with the selected process resource.
Associated Process Resource	Lists the process resource to which the selected operation is associated.

You can associate operations to one process resource only. If you drag an operation to a second process resource, the association to the first is broken and replaced with the new association.



3. Open the **Process Resources** view to display a list of unallocated operations (highlighted in blue) as well as operations allocated to stations. Drag operations from the unallocated group to the desired station.

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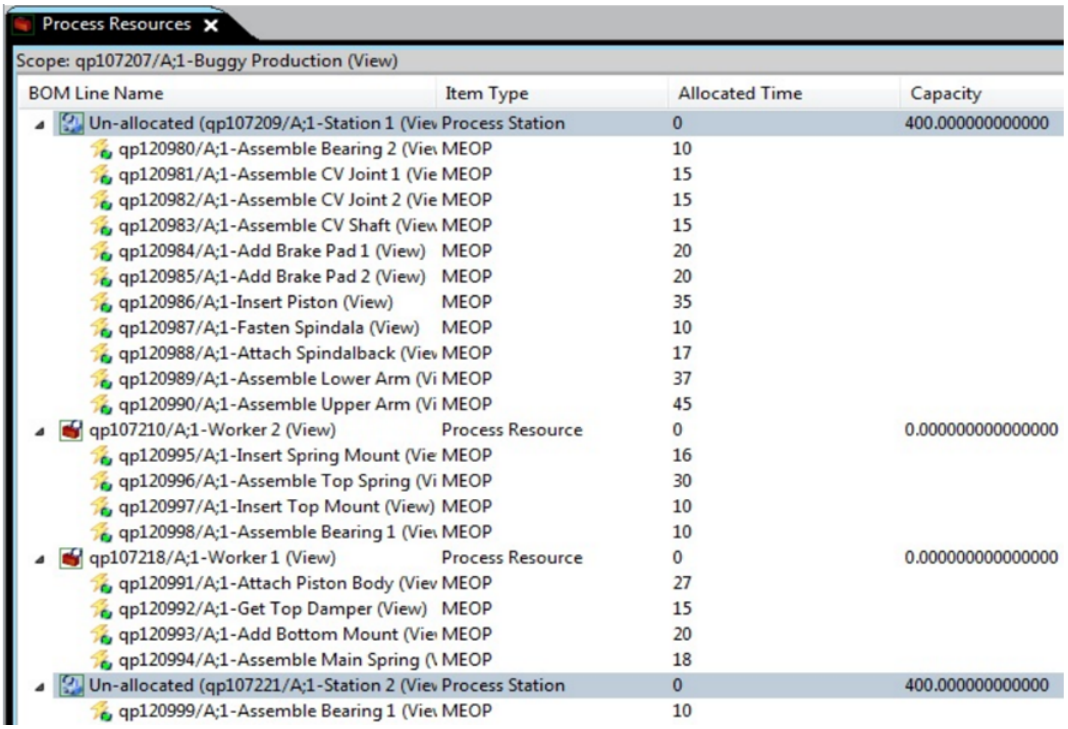

4. In the **Line Balancing Chart** view, open the view menu and choose **Switch View→Details View** to drag the operation to the appropriate process resource.

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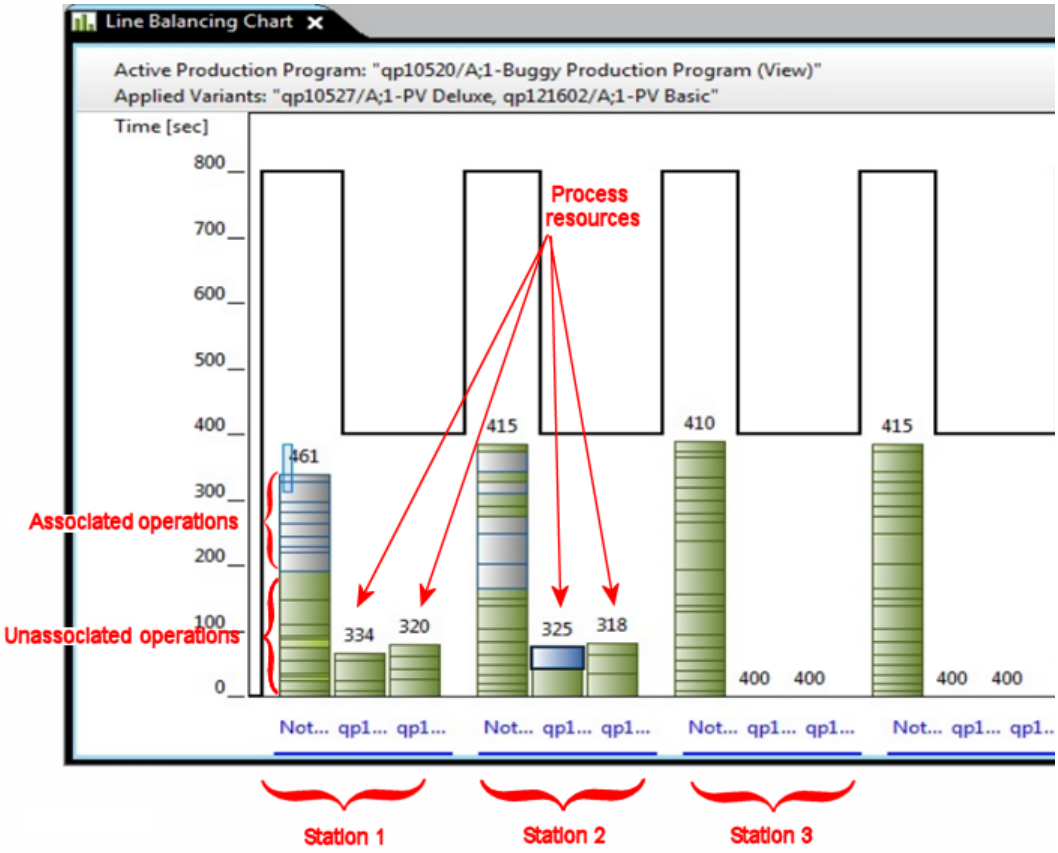

All the operations in the station are displayed in the left bar. Operations that are already allocated to a process resource are displayed in gray.

The capacity of the station is calculated as follows:

- When you do not use process resources:

  Capacity = takt time * number of workers

- When you do use process resources:

  Capacity = Sum of (takt time * capacity percentage of the process resource)

  You can specify a capacity percentage between 0 and 100 in the **Capacity Percentage** property on the process resource.

Note:

If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the PlantBOP structure, the **PlantBOP→Open With→Line Balancing Chart** option is not available in the rich client.

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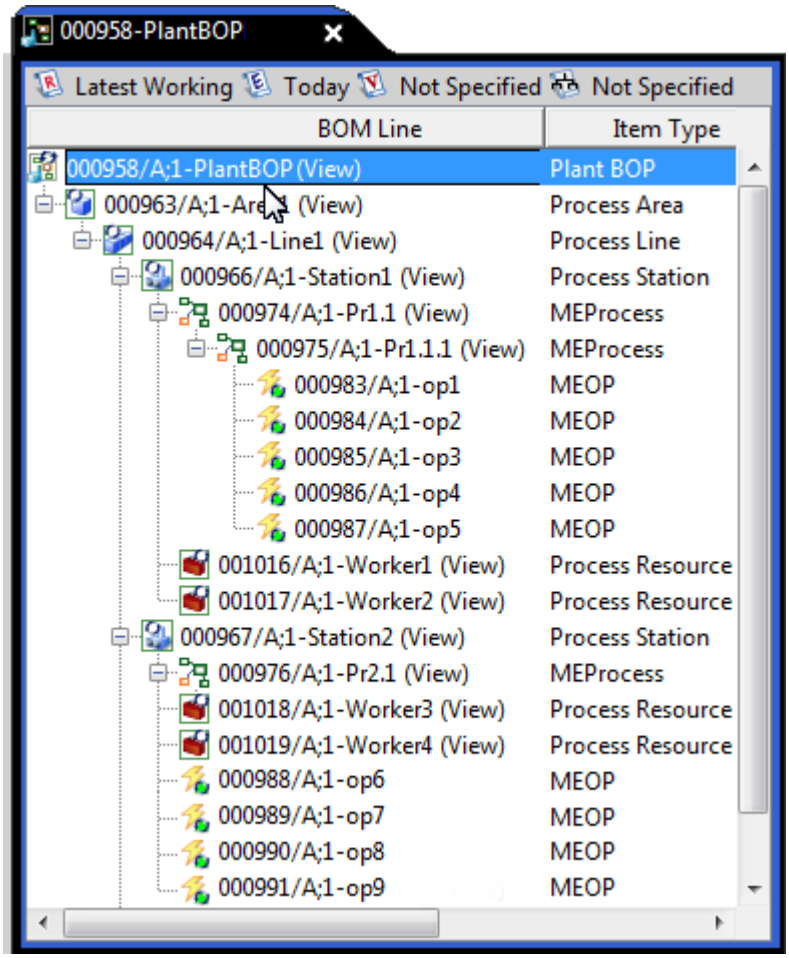
Assign time to your operations, processes, and resources

Before you can use the **Line Balancing Chart** view, you must assign time to plant BOP objects in the chart.

1. In Teamcenter, open a collaboration context and associated views, or at the very minimum, open a plant BOP with an appropriate line structure.

   In this example, process **000975** ensures that the process operations within it occur sequentially. Operations **000988** through **000991** are not contained in a process and can be completed nonsequentially.



> Note:
>
> You must define a production program (linked product BOP) to define constraints, apply variants to a product, and check constraints.

2. In the plant BOP, right-click the **BOM Line** header and choose **Insert column(s)**.

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3. In the **Change Columns** dialog box, from the **Available Items** list, select **Allocated Time**, **Takt Time**, **Capacity**, and **Capacity Percentage**.

4. Click +, and in the **Displayed Columns** list, select the added columns.

5. Click ▲ until the columns are after the **BOM Line** column, click **Apply**, and click **Close**.

6. In the plant BOP, right-click the process area, line, or station for which you want to balance processes and choose **Open with→Line Balancing Chart**.

   Use the **Line Balancing Chart** view to measure the results of your time entries.

7. For each operation, in the plant BOP, click the **Allocated Time** column and type the calculated time that the operation should take the process resource to complete.

8. For each station, click the **Allocated Time** column and type the allocated time that all operations in the station should take to complete.

9. For each station, click the **Takt Time** column and type the production cycle time to be applied to that station.

10. For each process resource, click the **Capacity Percentage** column and type the productive capacity of the worker or machine resource.

The capacity (cycle time * number of workers) is shown as a red line in the graph. If there are different cycle times for each station, the gray lines show multiples of the cycle time of the first station—from the top of the plant BOP structure moving downward in the structure—whose cycle time is not equal to zero.

> Note:
>
> When calculating the capacity for stations in a structure, Teamcenter uses the cycle time of the topmost station in the structure. In the preceding figure, the cycle time is 20 and the capacity is 40 because the first station, **Stn1**, has a cycle time of 20 with 2 workers assigned to it. If you change the cycle time of the top-level plant BOP from 0 to 30, the cycle time shown in the chart is 30, and the capacity is then 30 for the stations that have 1 worker and 60 for the station that has 2.

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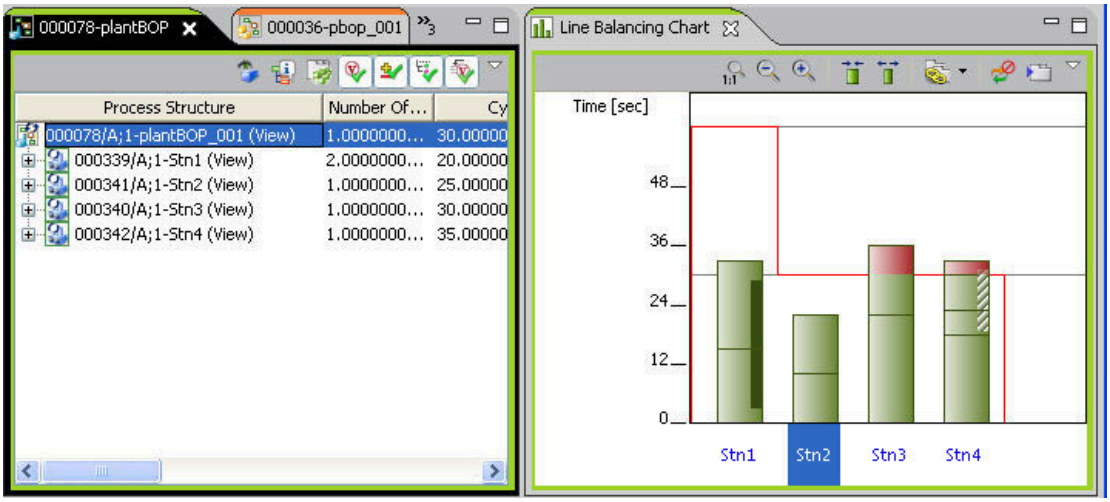

Note:

If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the PlantBOP structure, the **PlantBOP→Open With→Line Balancing Chart** option is not available in the rich client.

Balance a line in operation mode

The default **Line Balancing Chart** view shows operations and processes that consist of multiple sequential operations. Use operation mode to balance both object types at the same time.

1. In Teamcenter, open the plant BOP with an appropriate line structure.

   Note:

   To drag operations and manufacturing processes to a station, the **MEAllocationLevel** and **MELBChartStationTypes** preferences must be set to **Mfg0MEProcStatn**.

2. If you have not already done so, assign time to your operations, processes, and resources.

3. If you previously changed your default **Line Balancing Chart** view to display only processes, choose **Edit → Options**, search on the keyword **LB**, and ensure that the following preferences are set to **OP**.

MELBChartProcessOperationTypes	Shows both operations and processes in the **Line Balancing Chart** view.
MELBChartDnDSourceTypes	Enables you to drag operations in the **Line Balancing Chart** view.

4. Ensure that the following preference is set to **Process**.

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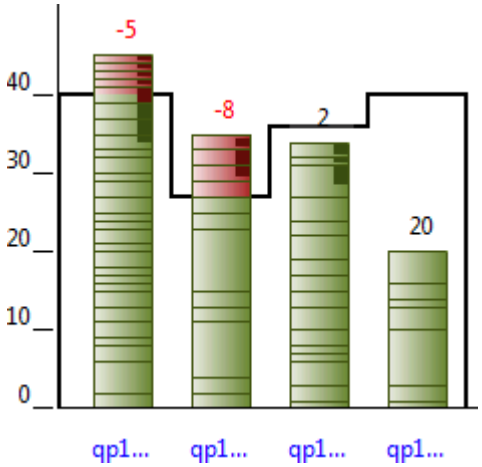
MELBChartDnDTargetParentTypes Lets you drag operations to stations and resources in the **Line Balancing Chart** view.

5. In the plant BOP, right-click the process area, line, or station for which you want to balance operations and processes and choose **Open with→Line Balancing Chart**.

   By default, the **Line Balancing Chart** view opens in station view to show individual stations, labeled **qp1...** in this example, as well as operations and processes assigned to those stations. In this example, the first three stations on the line contain processes, indicated by the dark bars at the top. Each block in a process represents a sequentially defined operation. Blocks without dark bars represent individual operations.



   Tip:

   To view the complete station names, hover the mouse over the labels or click **Increase Bar Width** .

6. If you are using process resources to represent multiple workers or machines, choose **View Menu→Switch Views→Details**.

   The details view shows operations and processes that are or are not assigned to resources, clustered for each station. Operations that are allocated to resources are gray in the left bars, labeled **Not...** in this example, or green if they are not yet allocated to a resource. Allocated operations also appear green in the resources, labeled **qp1....**

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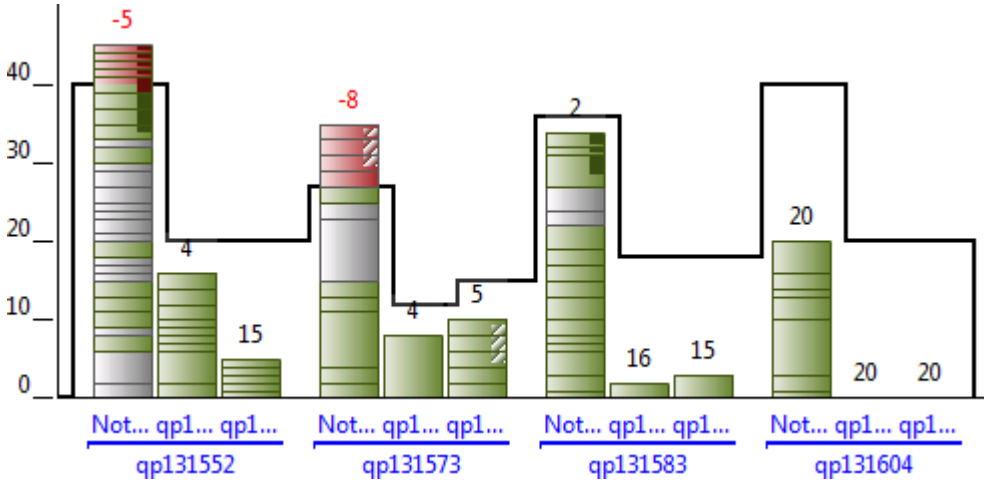

Processes that are allocated to resources appear white with diagonal lines in the left bars as well as in the resource to which they are allocated. Processes not allocated to resources show dark bars.

In this example:

- No processes, but some operations, are allocated to resources in station **qp131552**. The time to complete all operations and processes exceeds the available station time.
- One process and three operations are allocated to resources in station **qp131573**. The time to complete all operations and processes again exceeds the available station time.
- No processes and two operations are allocated to resources in station **qp131583**. The station's available time is adequate to complete all the assigned operations and processes.
- No processes or operations are allocated to resources in station **qp131604**. This station has room for additional processes and operations to reduce the workload on the first two stations.

7. (Optional) Customize and navigate the **Line Balancing Chart** view.

> Note:
>
> You can customize the colors of operations, processes, text, and tooltips using the **MELBChartColors** preference.

8. To be able to drag processes as well as operations, click **Collection Mode** .

9. Select operations or processes to be allocated elsewhere.

   You can:

   - Hover the mouse over sections of an operation or operation within a process to view its name, ID, description, and allocated time.

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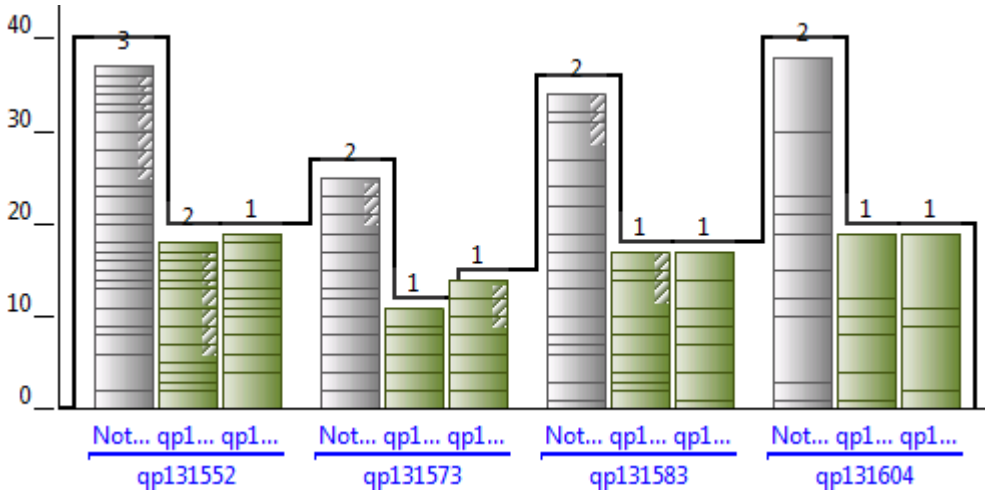
- Navigate through the stations, resources, operations, and processes in the bar chart using the arrow keys on the keyboard.
- Select individual operations in a station or resource bar. They are displayed in blue in the bar chart and highlighted in the plant BOP structure.
- Select an entire station by clicking its name below the bar chart. Selecting a station in the bar chart also selects it in the plant BOP structure, and vice versa.
- Press and hold Ctrl or Shift and then select multiple operations or processes.

10. Drag the operation or process to an appropriate station or resource.



Note:

- To remove a resource or operation from a resource bar, drag it back to the station bar, or select it in the resource bar and click **Unallocate**.
- You cannot drag operations assigned to a process outside that process, change the order of a process, or drag operations that are outside a process into a process in the **Line Balancing Chart** view.

11. Repeat steps 9-10 until all operations and processes are evenly balanced across the line.

Note:

If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the PlantBOP structure, the **PlantBOP → Open With → Line Balancing Chart** option is not available in the rich client.

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Balance a line in process mode

Manufacturing processes contain multiple operations that must be completed sequentially. To reduce clutter in the **Line Balancing Chart** view, and to ensure that all operations contained in your processes retain their sequential order, use process mode to hide all operations.

1. Allocate all the required operations to the stations in a plant BOP. If you have multiple process resources, allocate the operations to these.

2. If you have not already done so, assign time to your operations, processes, and resources.

3. If you have not already changed the **Line Balancing Chart** view to process mode, choose **Edit** → **Options**, search on the keyword **LB**, and ensure that the following preferences are set to **Process**.

MELBChartDnDSourceTypes	Enables you to drag processes in the **Line Balancing Chart** view.
MELBChartDnDTargetParentTypes	Lets you drag processes to stations and resources in the **Line Balancing Chart** view.

4. In the plant BOP, right-click the process area, line, or station for which you want to balance processes and choose **Open with** → **Line Balancing Chart**.

5. Choose **View Menu** → **View Options** → **Process**.

   > Note:
   >
   > If the majority of your work is performed in process mode, you can also set your **MELBChartProcessOperationTypes** preference to **Process**.

   The **Line Balancing Chart** view opens in process mode to show individual stations, labeled **qp1...** in this example, and any processes assigned to those stations. The first two stations in the image below contain two processes, the third only one, and the fourth none. Capacity is shown as black lines in the view. If the total allocated time of all the processes at a station exceeds the capacity of the station, processes above the capacity line are displayed in red.

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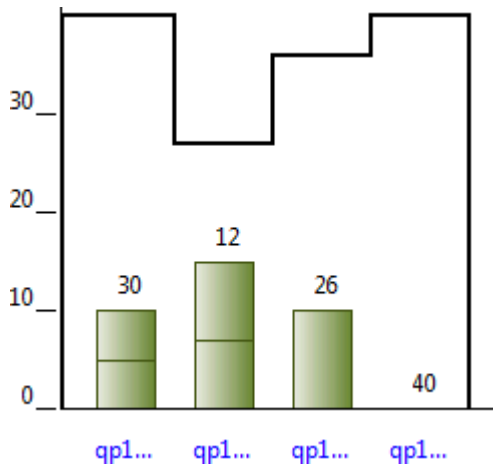
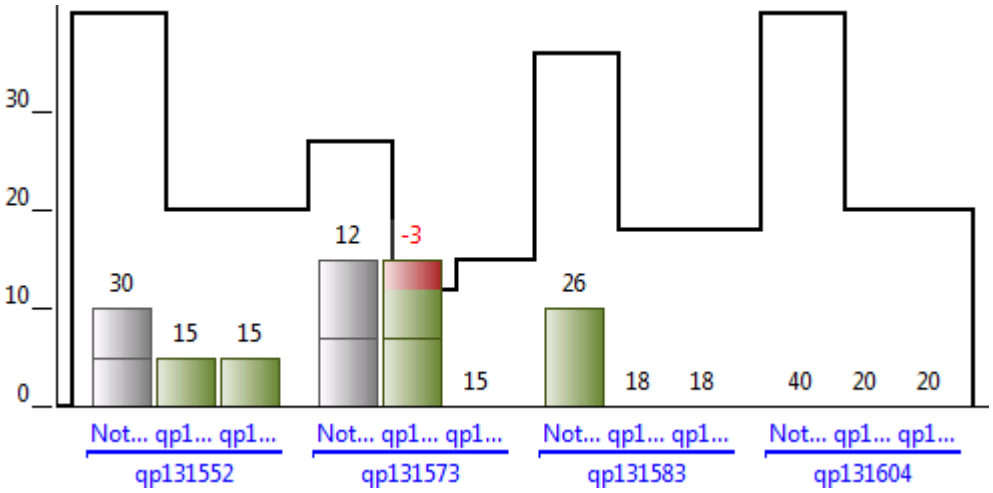


Tip:

To view the complete station names, mouse over the labels or click **Increase Bar Width** .

6. If you are using process resources to represent multiple workers or machines, choose **View Menu → Switch Views → Details**.

   The details view shows processes that are or are not assigned to resources, clustered for each station. Processes that are allocated to resources are displayed as gray in the left station bars, labeled **Not...**, or green if they are not yet allocated to resources. Processes allocated to resources display in green in the resource bars labeled **qp1...**.



   In this example, processes are:

   - Evenly allocated to resources in station **qp131552**.
   - Unevenly allocated to a single resource in station **qp131573**. The amount of time required for these processes exceeds the available resource time.

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- Not allocated in station **qp131583**.
- Not available in station **qp131604**.

7. (Optional) Customize and navigate the line balancing chart.

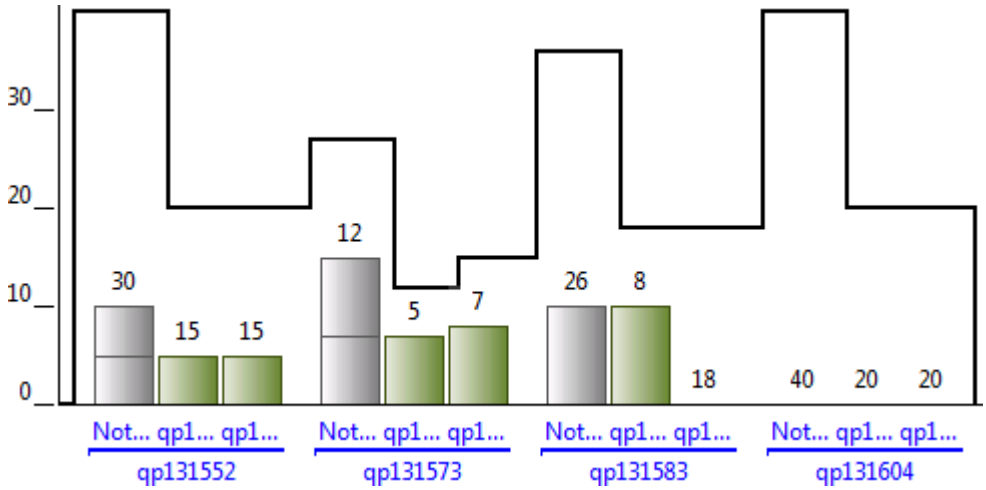
> Note:
>
> You can customize the colors of operations, processes, text, and tooltips using the **MELBChartColors** preference.

8. Select a process to be allocated elsewhere.

   You can:

   - Hover the mouse over a process to view its name, ID, description, and allocated time.
   - Navigate through the stations, resources, and processes in the bar chart using the arrow keys on the keyboard.
   - Select an entire station by clicking its name below the bar chart. Selecting a station in the bar chart also selects it in the plant BOP structure, and vice versa.
   - Press and hold Ctrl or Shift and then select multiple processes.

9. Drag the process to an appropriate station or resource.



> Note:
>
> To remove a resource or operation from a resource bar, drag it back to the station bar, or select it in the resource bar and click **Unallocate** .

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10. Repeat steps 8-9 until all processes are evenly balanced across the line.

> Note:
>
> If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the PlantBOP structure, the **PlantBOP → Open With → Line Balancing Chart** option is not available in the rich client.

Check constraint consistency

After defining precedence constraints in the **Line Balancing Constraints** view, you can check to see if there are any errors in the constraints.

1. In the **Line Balancing Constraints** view, choose **Consistency Check** from the view menu.

   Teamcenter displays the **Constraints Consistency** view listing any inconsistencies occurring in all the constraints defined for a product BOP. In addition, Teamcenter highlights the problematic constraints in red in the **Line Balancing Constraints** view.

2. In the **Constraints Consistency** view, select a violation to see the list of participating operations in the lower section of the view.

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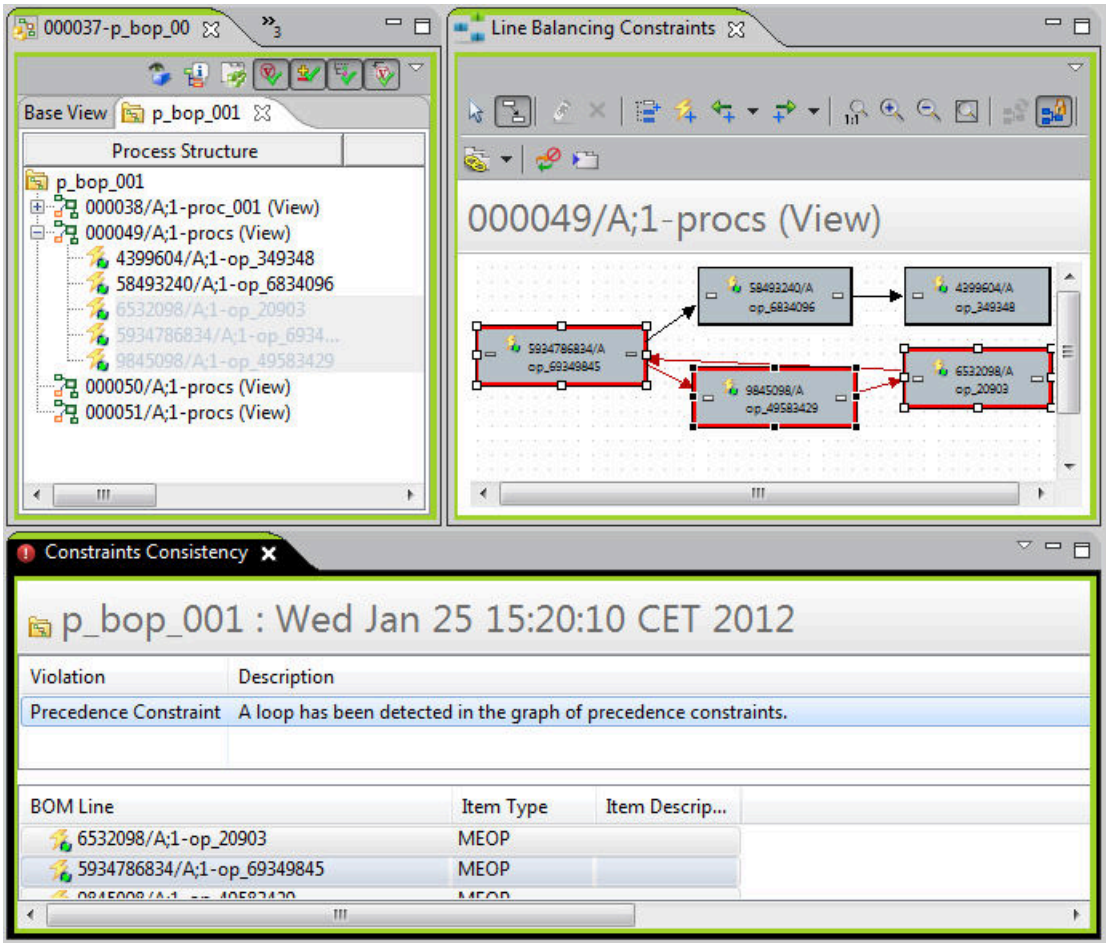

3. (Optional) Turn off the constraint highlighting in the **Line Balancing Constraints** view by choosing **Highlight Check Result→No Highlight** in the view menu.

> Tip:
>
> You can highlight the check results any time, as long as the corresponding result view is not closed.

> Note:
>
> If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the ProductBOP structure, the **ProductBOP→Open With→Line Balancing Constraints** option is not available in the rich client.

Check constraint violation

1. In the **Line Balancing Chart** view, choose **Constraints Violation Check** from the view menu.

   Teamcenter displays the **Constraints Violation** view listing any constraint violations arising from the allocation of the operations to the individual stations within a plant BOP.

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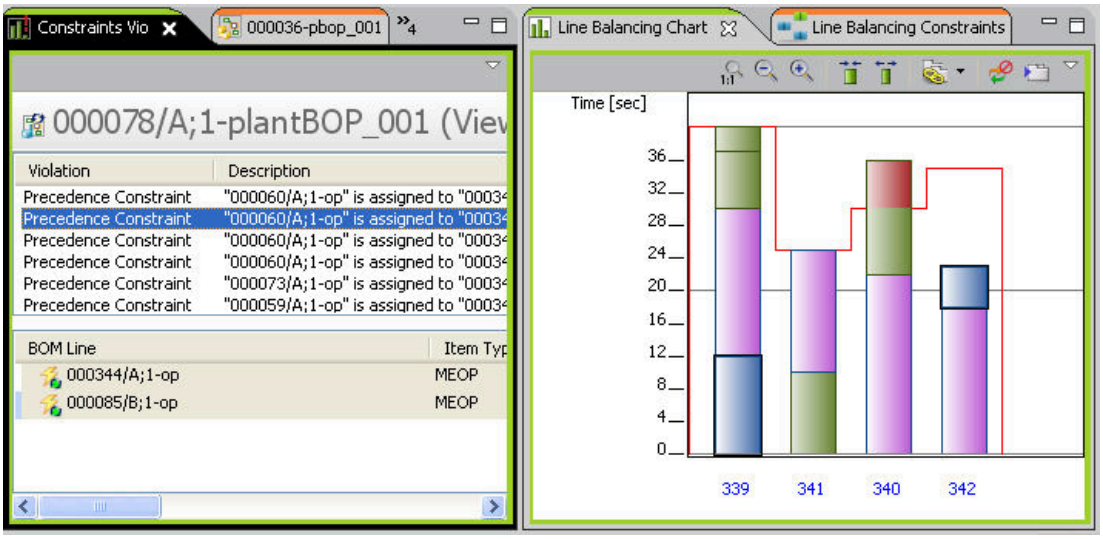
In addition, Teamcenter highlights the operations participating in the violations in pink in the line balancing chart.

You can customize the colors used to represent violations in the line balancing chart using the **MELBChartColors** preference.

2. Select a violation to see the list of participating operations in the lower section of the view.



> Tip:
>
> As you click through the list of violations, watch the highlighting in the **Line Balancing Chart** view. Often, you can see that one operation is highlighted more often than others as a participating member of a violation. By moving this operation first, you may address a large proportion of the violations.

3. (Optional) Turn off the constraint highlighting in the **Line Balancing Chart** view by choosing **Highlight Check Result→No Highlight** in the view menu.

> Tip:
>
> You can highlight the check results any time, as long as the corresponding result view is not closed.

Using the Line Balancing Chart view

The **Line Balancing Chart** view presents a bar chart where the horizontal axis shows the process areas. Each bar represents a station, and each operation allocated to a station is represented as a section of a bar. If a bar lies across multiple operations, it indicates that those operations are a sequential process. The capacity (cycle time * number of workers) is shown as a red line in the graph. If the total allocated time of all the operations at a station exceeds the capacity of the station, operations above the capacity line are displayed in red.

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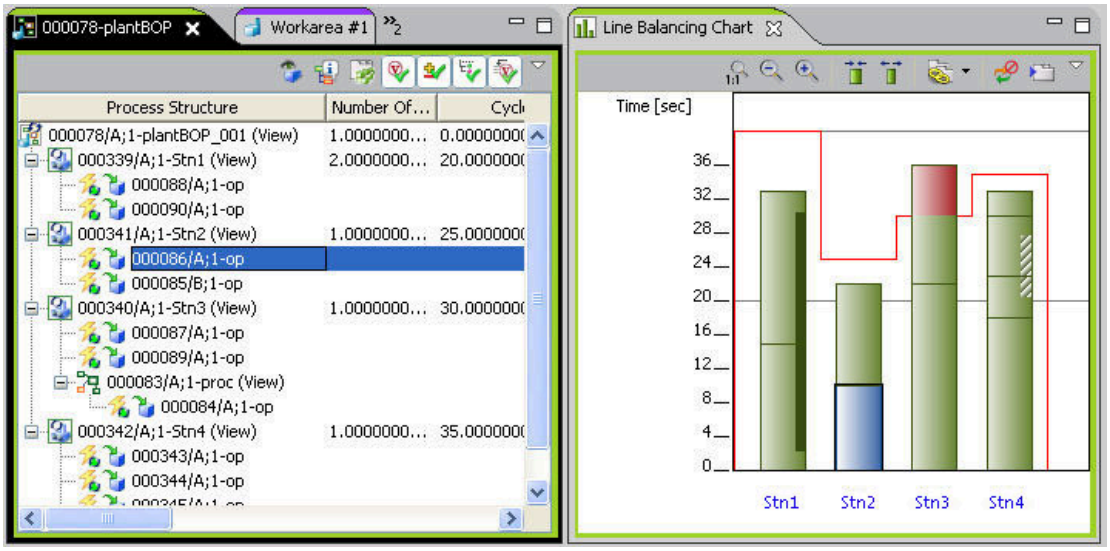
The **MEAllocationLevel** preference defines the types of plant objects to which you can allocate an operation from a product BOP. The line balancing chart displays the business object types specified in this preference (if the type is a process station) as stations in the chart.

The cycle time is shown as red lines in the view. If there are different cycle times for each station, the lines show multiples of the cycle time of the first station (from the top of the plant BOP structure moving downward in the structure) whose cycle time is not equal to zero.



Note:

When calculating the capacity for stations in a structure, Teamcenter also uses the cycle time of the topmost station in the structure. In the preceding figure, the cycle time is 20 and the capacity is 40 because the first station, **Stn1**, has a cycle time of 20 with 2 workers assigned to it. If you change the cycle time of the top-level plant BOP from 0 to 30, the cycle time shown in the chart is 30, and the capacity is then 30 for the stations that have 1 worker and 60 for the station that has 2.

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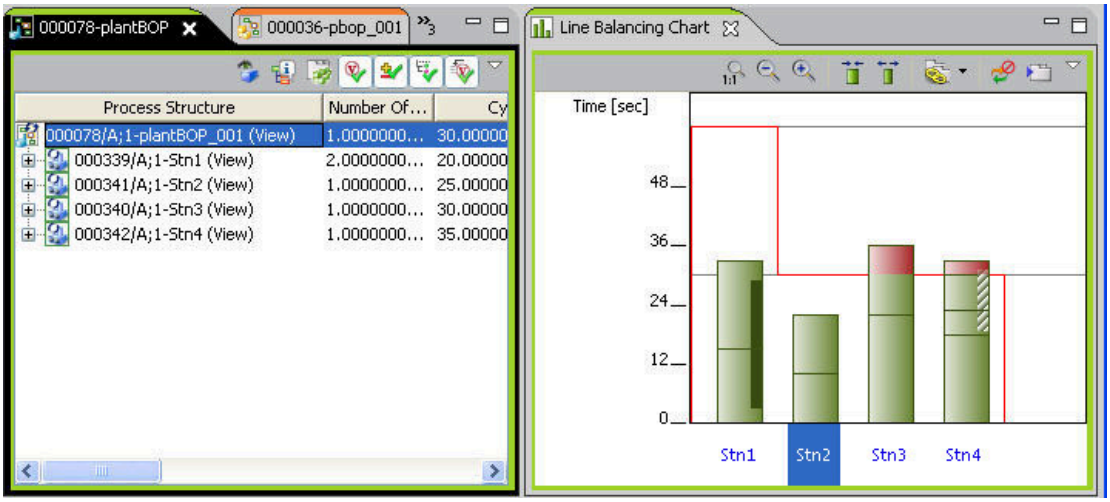

Note:

If operations are created under a process in the plant BOP structure, the **Line Balancing Chart** view will not show the operations. To show the operations, below the process in the **Line Balancing Chart** view, the **MECollectionTypeProcesses** preference must be set up with the process type (for example, **Process**).

Note:

If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the PlantBOP structure, the **PlantBOP → Open With → Line Balancing Chart** option is not available in the rich client.

Navigate and customize the line balancing chart

Do one of the following in the **Line Balancing Chart** view or the **Line Balancing Constraints**:

- Click **Zoom to Fit Height** to increase the size to fit the selected area to the height of the view. If you do not select anything, the command fits all boxes or bars into the view.
- Click **Zoom to Fixed Scale** to allow you to type a magnification scale into the box. Press Enter to initiate the change in scale.
- Click **Actual Size** to display the chart in its original, as-designed size.
- Click to increase the magnification and view a correspondingly smaller area.
- Click to decrease the magnification and view a correspondingly larger area.

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- In the **Line Balancing Chart** view, change the width of the bars in the bar chart by clicking to increase bar width and to decrease bar width.

- If the view contains so much information that you need to scroll to see it all, you can use the **Graph Overview** view to navigate.

  1. Open the **Graph Overview** view by choosing **Window→Show View→Graph Overview**.

     Teamcenter opens an empty **Graph Overview** view.

  2. Select the view that you want to navigate.

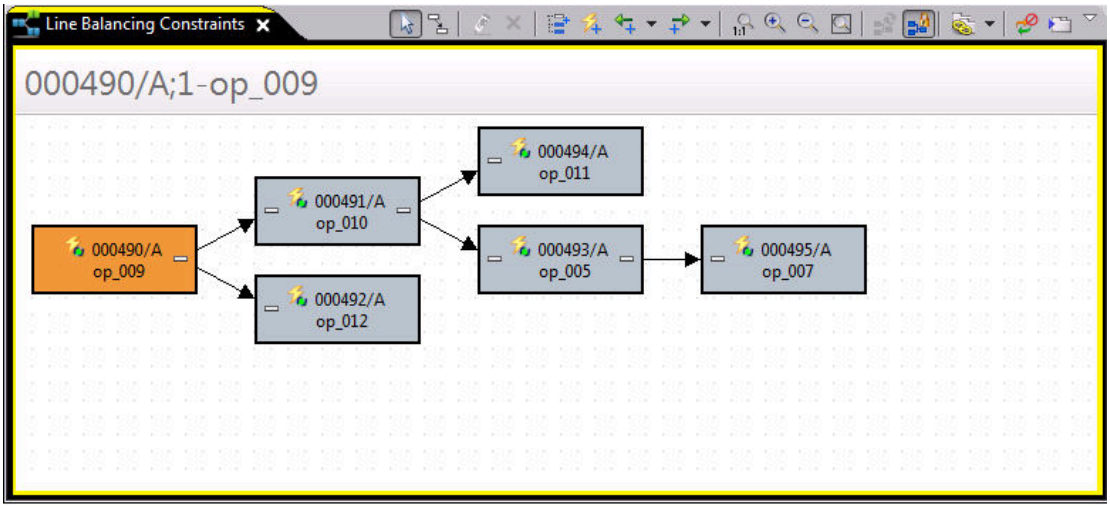
     Teamcenter displays the selected view in the **Graph Overview** view with a blue rectangle overlaying the view. The contents of the selected view are show within the blue rectangle.

  3. Select the blue rectangle and move it to the area of the view that you want to see.

Using the Line Balancing Constraints view

The **Line Balancing Constraints** view helps you define the mandatory sequence of operations.

In this view, arrows between the individual operations indicate the required sequence in which they are to be performed. From this view, you can open the **Constraints Consistency** view to check whether there are any overall constraint violations in the product BOP.



Each process or operation is represented by a box containing the name, ID, and the process or operation symbol. At each side, there is a plus or minus sign representing hidden predecessors or successors, if there are any.

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The scope of the view is colored in orange. When you open the view with a certain scope operation or process, the number of predecessors or successors that are opened with the scope is controlled by the following preferences:

- **MEConstraintViewPreloadedPredecessorLevels**
- **MEConstraintViewPreloadedSuccessorLevels**

> Note:
>
> If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the ProductBOP structure, the **ProductBOP→Open With→Line Balancing Constraints** option is not available in the rich client.

Understanding layout in the Line Balancing Constraints view

Teamcenter can calculate the layout of the boxes in the view automatically, or you can choose to place operations manually. You can also change between these two layout methods. For example, you may want to place a node in a prominent place to do some work on it. Once complete, you can choose to activate the automatic layout mechanism and Teamcenter organizes the layout, or you can choose to remain in manual layout mode, but click **Refresh Layout** to have Teamcenter arrange the nodes.

> Note:
>
> The view layout is always temporary. Teamcenter does not store the position of the nodes.

- Turn on the **Lock Auto Layout** button to let Teamcenter organize the layout of the nodes in the view. When turned on, Teamcenter automatically arranges the nodes after each operation your perform in the view, such as adding new operations or adding or removing constraints.
- Turn off the **Lock Auto Layout** button to manually place the nodes anywhere in the view.
- Click **Refresh Layout** to automatically organize the layout of the nodes in the view.

You specify how Teamcenter lays out newly loaded operations in automatic layout mode using two preferences:

- **MEConstraintsViewAutomaticLayoutOffAppendPositionPref**

  This preference defines the initial position of nodes that are added to the view when automatic layout is turned off.

- **MEConstraintsViewDefaultAutomaticLayoutModePref**

  This preference defines the initial state of the **Lock Auto Layout** button and whether the layout is locked by default.

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Define constraints in the Line Balancing Constraints view

1. Select an operation as scope and choose **Open With→Line Balancing Constraints**.

   Teamcenter displays the **Line Balancing Constraints** with the selected operation as scope.

2. Load additional operations by doing one of the following:

   - Select another process or operation in the product BOP and drag it to the view.
   - Select one or multiple processes or operations in the product BOP and click **Add Selection** .

     This loads all of the selected objects.

   - Select one or multiple processes or operations in the product BOP and click **Add Operations** .

     If you select a process, this loads all the operations under the selected process, including all operations under all subprocesses.

   - Right-click a node, choose **Add Previous Levels** or **Add Next Levels**, and choose the number of levels to load.

     > Note:
     >
     > If there are no constraints between nodes, no additional process or operation is loaded.

3. Draw constraints using the precedence creation mode.

   a. Click the **Create Constraints** button.

      The cursor changes to .

   b. Click the first operation participating in the constraint, and then drag the cursor to the next operation.

   Teamcenter displays an arrow from the first to the second operation.

4. Repeat step 3 until all the operations are joined in the desired sequence.

5. (Optional) Remove a constraint by selecting it and clicking **Delete** .

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Note:

If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the ProductBOP structure, the **ProductBOP→Open With→Line Balancing Constraints** option is not available in the rich client.

Using the line balancing check result views

There are two line balancing check result views:

- **Constraints Consistency** view

  This view opens automatically from the **Line Balancing Constraints** view after you perform a **Constraints Consistency** check. This view displays any circular pattern of constraints that may exist.

- **Constraints Violation** view

  This view opens automatically from the **Line Balancing Chart** view after you perform a **Constraints Violation** check. This view displays any violation of the constraints caused by the allocation of operations to process stations in an order that is precluded by the station flow you set in the PERT chart.

In each of these views, the check displays a list of violations. By clicking each violation, you can see the operations participating in the violation in the bottom section of the view. These views support selection synchronization, meaning that you can select an operation in the plant BOP or product BOP structure and it is automatically highlighted in the check result view and vice versa.

Note:

If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the ProductBOP structure, the **ProductBOP→Open With→Line Balancing Constraints** option is not available in the rich client.

Note:

If the **PSM_Enable_Product_Configurator** preference is set to **true** OR the configurator context is attached to the PlantBOP structure, the **PlantBOP→Open With→Line Balancing Chart** option is not available in the rich client.

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13. Managing and tracking changes

Understanding change

Manufacturing Process Planner provides several tools for managing and verifying changes to your product structures.

- Manufacturing change notices (MCNs) are essentially engineering change notices (ECNs or simply CNs) that are specifically intended for manufacturing rather than engineering needs. Use MCNs to automatically track and update BOP and MBOM changes across views and send only information that has changed in a BOP or MBOM to an enterprise resource planning (ERP) application.

- The **Change Tracker** view displays all changes that took place in a range defined by either unit or date effectivity. These changes can be based on incremental change, on revision effectivity, or on both. Once the change tracker lists the changes, you can mark them to indicate that they have received attention or propagate the changes to a target structure. The view can also be used to find out where and how the item revisions in a change notice affect a particular structure.

- Incremental change management is the process of controlling changes and providing an audit history of a product's definition and configuration.

  Caution:

  Incremental change is an advanced change management tool. If you are planning to use Incremental change, please consult with a Siemens Digital Industries Software representative before deployment.

Using ECNs and MCNs

What are ECNs and MCNs?

An engineering change notice (ECN) records engineering design changes to a product. Manufacturing change notices (MCNs) are essentially ECNs that are specifically intended for manufacturing rather than engineering needs.

Use an MCN to automatically update MBOM and BOP changes across views and send only information that has changed in an MBOM or BOP to an enterprise resource planning (ERP) application. A minimal workflow may include the following.

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1. An upstream board meeting decides on a manufacturing change and informs a lead planner in engineering.
2. In My Teamcenter, the lead planner creates an MCN, determines its status and effectivity, and assigns a process planner to make the necessary updates.
3. In Manufacturing Process Planner, the process planner sets the MCN and makes the requested changes to the MBOM or BOP. Those changes are captured.
4. The lead planner reviews the changes, validates the data, and sends the updated MBOM or BOP data to the ERP.

> Note:
>
> An administrator must set the **MEMCN_management_enabled** preference to **true** to enable change notice revision commands in Manufacturing Process Planner.

Create an MCN

A typical manufacturing change notice (MCN) process begins with an engineering request for a change to a product. In My Teamcenter, a lead planner or administrator must first create the MCN and determine its status and effectivity. This example illustrates how a lead planner may create an MCN after obtaining changes from an ERP system or board meeting and submit it to a process planner.

1. Open My Teamcenter.

2. Create a new MCN.

   a. Choose **File→New→Change**.

   b. In the **New Change** dialog box, in the **Complete List**, select **Manufacturing Change Notice** , and click **Next**.

   c. In the **Description** text box, type text describing the reason for the change notice.

   d. Click **Assign**.

   e. In the **Synopsis** text box, type a brief synopsis of the change.

      The synopsis is the text that appears after the change ID and revision.

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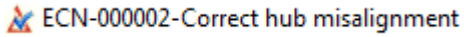
f. Click **Finish** and then click **Cancel**.

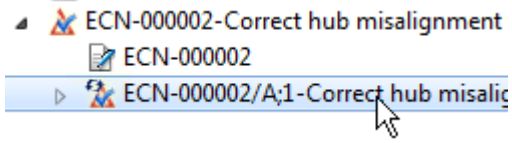
In My Teamcenter, in the **Home** tab, the change notice is displayed.



3. Define a release status.

> Note:
>
> Release statuses are defined by an administrator in the **MEMCN_release_statuses** preference.

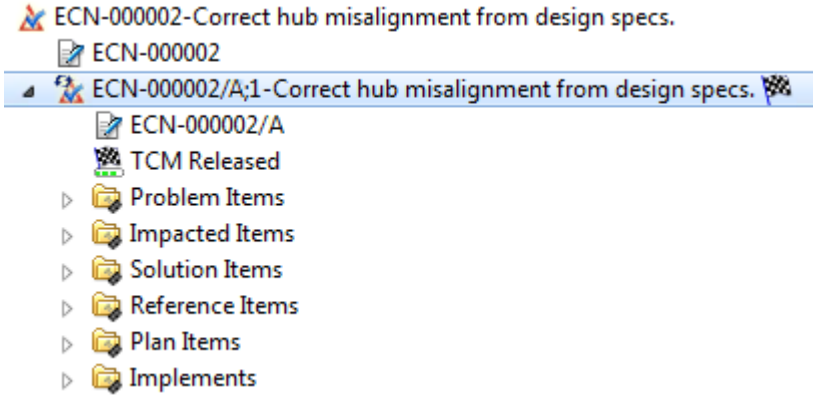
a. Expand the change notice and select the revision row.



b. On the **Summary** tab, in the **Actions** group, click **New Workflow Process**.

c. In the **New Process Dialog** dialog box, from the **Process Template** list, select a release status template and click **OK**.

The MCN reflects your change and a collection of **Items** folders similar to those in Change Manager is displayed.



4. Set the effectivity date range.

a. On the **Home** tab, select the status line, and on the **Viewer** tab, in the **Effectivity Viewer**, double-click the release status.

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b. In the **Release Status Effectivity** dialog box, in the **Effectivity Range** group, select **From Date** and **To Date** values for which the MCN is effective.

5. Inform the process planner of the MCN name and the requested BOP changes from the ERP system or board meeting.

Set a change notice

You can set a manufacturing change notice (MCN) or engineering change notice (ECN or CN) on a bill of process (BOP) or manufacturing bill of materials (MBOM) structure to capture newly created revisions, including allocations from product BOPs, tool assignments, and revisions in operations. The change notice to be set should be valid for the applied configuration of the structure.

> Example:
>
> If a revision rule is set to 10-Jan-2015 through 30-Jan-2015 and the change notice has an effectivity of 20-Feb-2015 through 30-Feb-2015, the change notice cannot be set to the applied configuration of the tree.

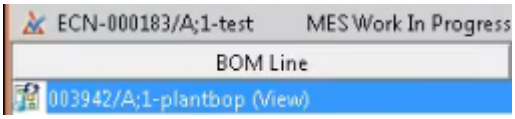
You may have to set a change notice before you can edit certain structures. If you attempt to edit a structure for which change notices are mandatory, or open a collaboration context containing such a structure, you receive a warning. Your administrator configures the types of structures for which the warning is displayed using the role-based **MEMCN_change_notice_mandatory_types** preference.

1. In Manufacturing Process Planner, select the structure to which you want to set a change notice.

2. Select the top line of the structure and choose **Tools→Change Management→Set Change Notice**.

3. In the **Set Change Notice** dialog box, in the **ID** box, type text to help you find your change notice, and in the list below, double-click the change notice.

   The header section lists the change notice and its release status.



4. If you revised the top line of a structure, a new BOP or MBOM is created, the original shows the old revision, and no change notice is set in the new structure. To resolve this problem, do the following.

   a. In the new structure, turn on the change notice and add the top line to it using the **Add to Change Notice** command.

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b. In My Teamcenter, copy the old revision and paste it to the change notice's **Impacted Items** folder.

Unset a change notice

You can unset a manufacturing change notice (MCN) on a bill of process (BOP) or manufacturing bill of materials (MBOM) structure to stop capturing changes.

1. In Manufacturing Process Planner, select the structure that contains the change notice to be unset.

2. Select the top line of the structure and choose **Tools→Change Management→Unset Change Notice**.

   The change notice is removed from the structure window header.

Add objects to a change notice

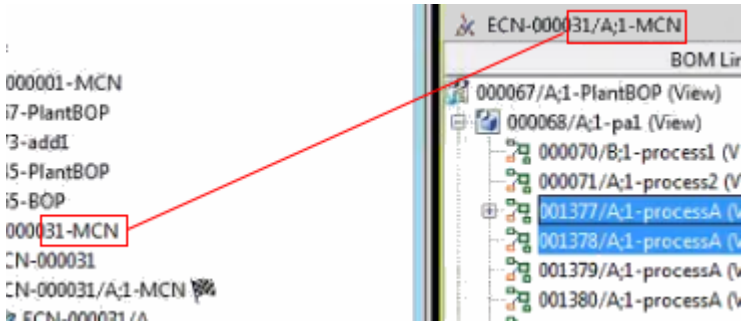
You can add objects to a manufacturing change notice (MCN) or an engineering change notice (ECN or CN) on a BOP or MBOM structure. If the BOP contains custom objects, your administrator must add them to the closure rule **GetChangedProcessLines** in the preference **MEMCN_solution_object_collection_rule** to track those objects.

1. In Manufacturing Process Planner, load the BOP or MBOM and find the set change notice.

2. Select one or more object structures not associated to the change notice that you want to add.

   Tip:

   In the BOP or MBOM header, you can verify that a change notice is associated to at least some objects in the selected structure.



3. Choose **Tools→Change Management→Add to Change Notice**.

4. To add children of the line to the change notice, in the **Add to Change Notice** dialog box, select the **Include subhierarchies** ☑ check box.

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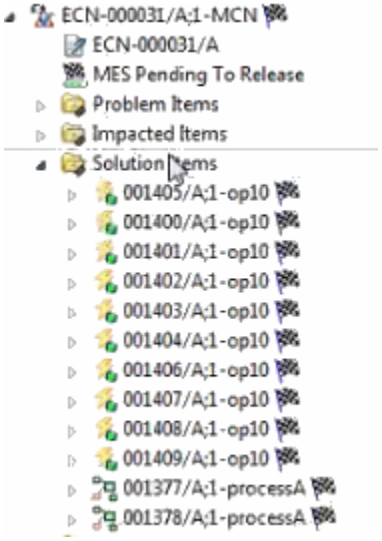
If you do not select **Include subhierarchies**, only the selected line will be added to the change notice.

5. Click **OK**.

On your **Home** tab, the objects are added to the change notice folders.



Remove objects from a change notice

You can remove objects from a manufacturing change notice (MCN) or an engineering change notice (ECN) on a BOP or MBOM structure.

1. In Manufacturing Process Planner, load the BOP or MBOM and locate the structure to which the change notice is set.

2. Select the object structures associated to the change notice that you want to remove.

> Tip:
>
> In the BOP or MBOM header, you can verify that a change notice is associated to at least some objects in the selected structure.

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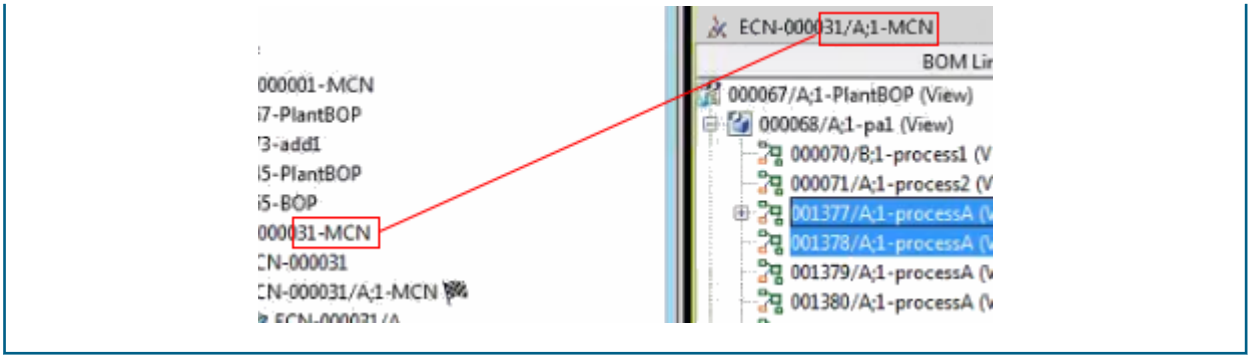

3. Choose **Tools→Change Management→Remove from Change Notice**.

4. To add or remove children of the line from the change notice, in the **Remove from Change Notice** dialog box, select the **Include subhierarchies** ☑ check box.

   If you do not select **Include subhierarchies**, only the selected line will be removed from the change notice.

5. Click **OK**.

The objects are removed from the change notice.

Set an MCN on an MBOM with assigned lines from an EBOM

In a typical process involving a manufacturing change notice (MCN), a process planner may set the MCN with a given revision rule to an MBOM structure and then add elements from an EBOM structure with a different revision rule. This example illustrates such a scenario.

1. In Manufacturing Process Planner, open the MBOM to which an MCN will be applied as well as your **Home** folder.

2. **Set** the MCN.

3. In the MBOM, make any changes requested by the lead planner.

   An item revision is added to the **MCN** folder in your **Home** folder whenever a line is added or revised in the structure view to which the MCN is set. Changes may include any changes to BOM contents such as item, part, or work area.

   In this example, the preference is set to **Pending**.

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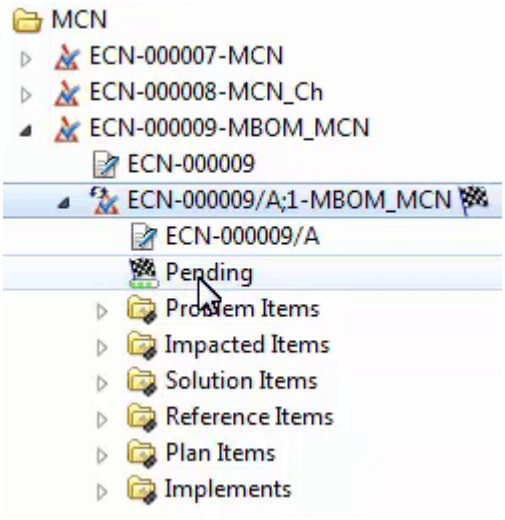

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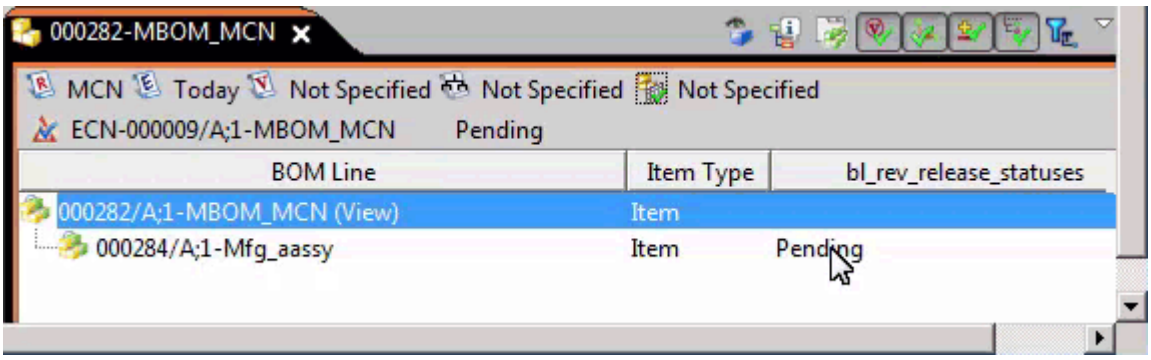
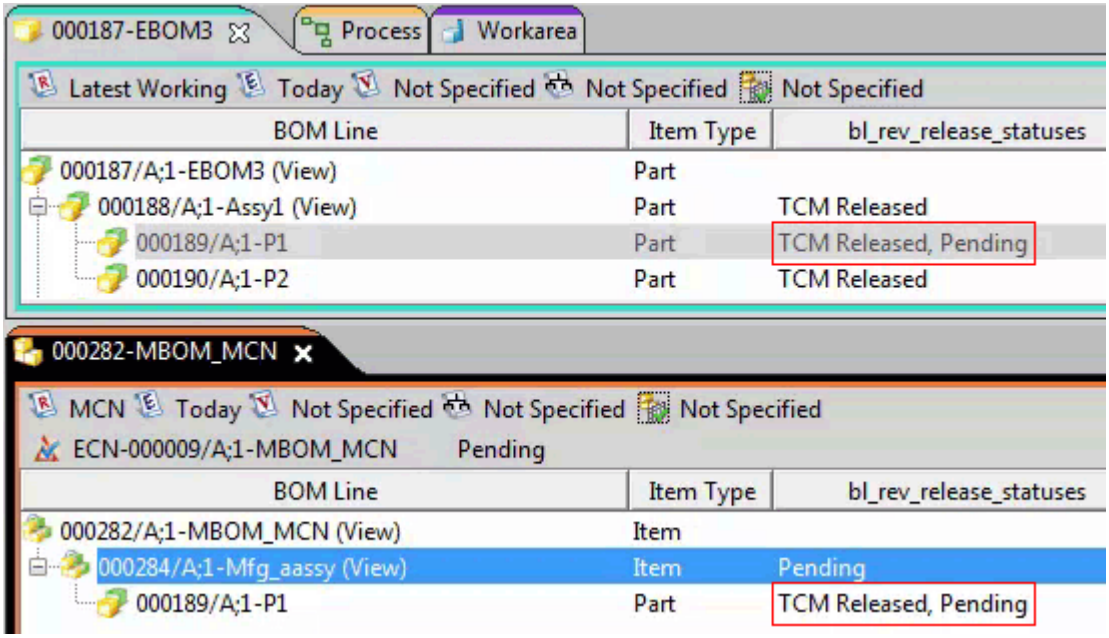
You can also unset and reset the change notice on structures (for example, if a mistake is made or change revoked), and add or remove change notice objects as necessary. Any new nodes added to the MBOM structure inherit the change notice property of the MBOM top line where the change status was set.



4. From an associated EBOM, copy and paste a structure to the MBOM.

The assigned line is pasted with the release status of the EBOM (**TCM Released, Pending**), while the MBOM retains the MCN status (**Pending**).



This information is also captured in the change notice's **Solution Items** folder in your My Teamcenter **Home** folder.

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Note:

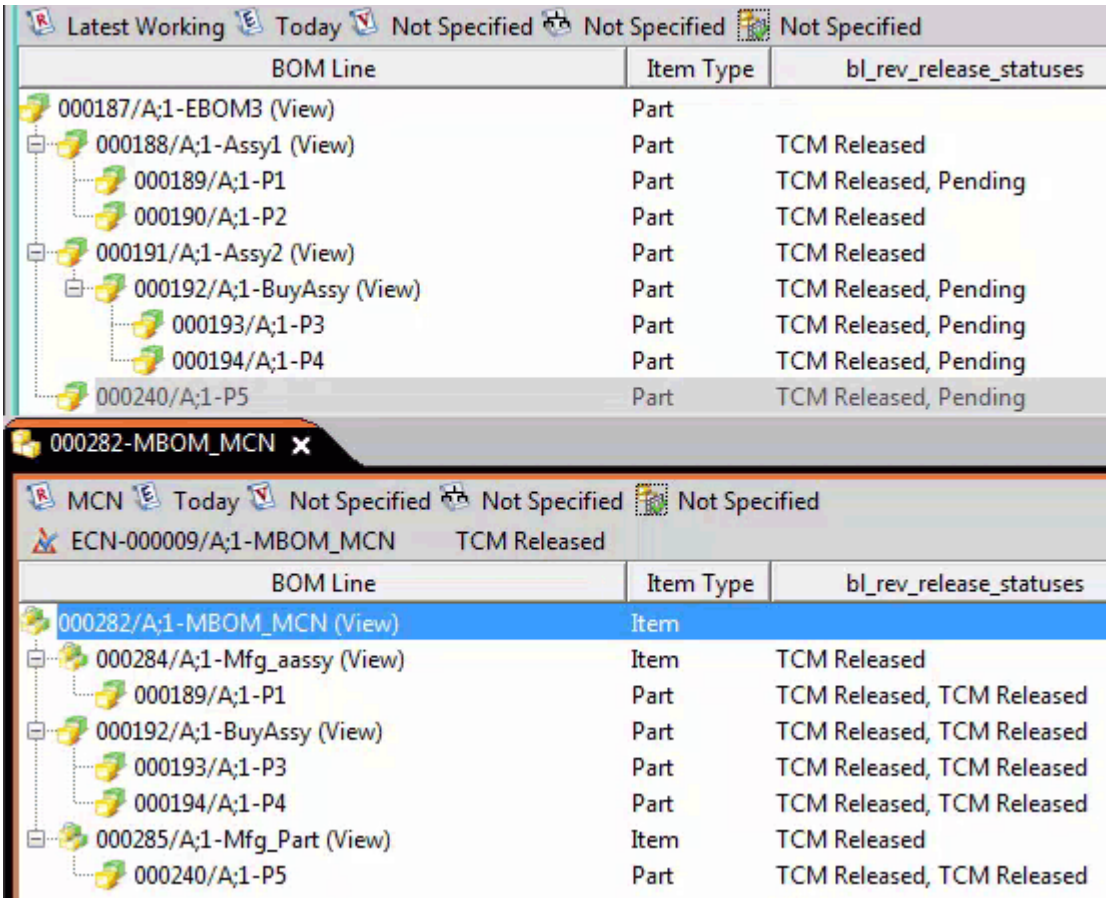
Release statuses are defined by an administrator in the **MEMCN_release_statuses** preference. When a subassembly node is assigned from an EBOM to an MBOM, change notices track the assigned node and its children based on closure rules defined by an administrator in the preference **MEMCN_solution_object_collection_rule** is **GetChangedProcessLines**.

5. When finished, release the MBOM.

   a. In your **Home** folder, double-click the MCN revision.

   b. In the **New Process** dialog box, from the **Process Template** list, select a release status (for example, **Change Pending to TCM Released**) and click **OK**.

   All lines in the MBOM are changed to the released status. If any new revisions were created in the MBOM, the old revisions are displayed in the change notice's **Impacted Items** folder in the My Teamcenter **Home** folder.



6. Select the top line of the MBOM for which you made changes and choose **Tools→Change Tracker**.

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7. Review your changes.

   a. In the **Change Tracker** dialog box, select **Search by effectivity** and the **Revision effectivity** check box and click **Next**.

   b. Select **Already reviewed** and **To review** values for which you want to review changes.

   c. Click **Next** and ensure that the **Revision effectivity** check box is selected.

   d. Click **Next**, select a preferred status, and then click **Finish**.

   e. In the **Change Tracker** view, select each revision change to review the details below it.

   f. (Optional) Click one or more revision changes and click **Create Revision Details Report** to generate an an Excel report containing revision details for one or more revision changes.

      > Tip:
      >
      > Your administrator can customize the report layout and elements using preferences with the suffix **MECTRev**.

   g. Close the report and **Change Tracker** view.

8. Inform the lead planner that the changes have been implemented.

Setting MCN requirements by a structure's root node type and release status

By default, manufacturing change notices (MCNs) are applied to process structures based on the process plan's root node type. If you are using the same structure (for example, a plant BOP) to define multiple projects, and each project requires that an MCN be set when the project moves to a specific phase or release status, you can set Teamcenter to require that an MCN be manually created before work can proceed on the structure.

Use the preference **MEMCN_change_notice_mandatory_types** to define a list of mandatory change revisions for BOP topline item types. The topline item types can optionally include a release status name. For example, if you have multiple plant BOPs, a value of **Mfg0PlantBOP;Pending** in **MEMCN_change_notice_mandatory_types** mandates that an MCN must be manually created for each plant BOP when its release status is pending. Until the association is completed, such structures cannot be edited. Similarly, **Process;TCM Released** applies an MCN to any bill of process whose status changes to **TCM Released**. If anyone attempts to change the structure after the defined status is reached, they will receive an error informing them that they must apply an MCN revision to the structure.

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Note:

- The separator **;** in the **MEMCN_change_notice_mandatory_types** example values above should be the same as that defined in the preference **TcServices_field_separator**. The default value is **;**.
- You must restart the server after adding or changing the preference values.

Review change notice changes and send updated BOP data to ERP

As the last step in a typical process involving an engineering change notice (ECN or CN), the lead planner reviews the changes, validates the data, changes the change notice status, and sends updated BOP data to the ERP/MES. This example illustrates such a scenario.

1. If you have not already done so, open the **Collaboration Context Tree** and BOP views to which the MCN was linked and set.

2. Right-click the top BOP line, choose **Change Management→Set Change Notice**, and apply the appropriate change notice.

3. Right-click the top BOP line again and choose **MES→Validate for Execution**.

   In the **Validate MES Data** dialog box, the **Structures to Validate** list shows the change notice and structure to be validated.

4. In the **Validity Checks to Perform** list, select the **Check Object Validation** check box ☑ and any validity checks you want to perform, and click **OK**.

5. If an **MES Data Validation Result** view is displayed, open the view and review and correct any validation errors, modifying them as necessary and validating until no errors are reported.

6. In the **Collaboration Context** view, right-click the collaboration context and choose **MES→Release to Execution Plan**.

   The workflow is initiated. In the **Release to Production** dialog box, the collaboration context is displayed as the execution plan, **ReleaseToProduction** as the workflow, and the change notice as the change object.

7. Click **OK**.

   In your **Home** folder, the released data is displayed as an application interface object with a date stamp, and within it is a request object.

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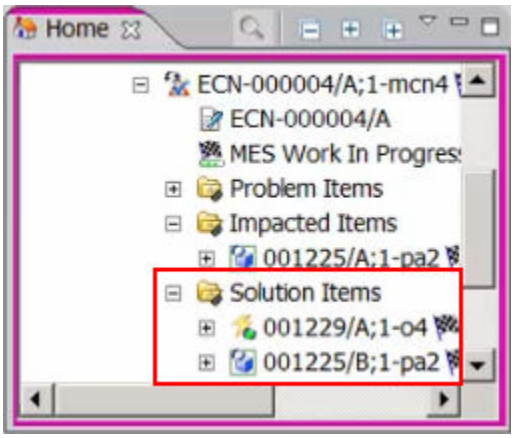
Review a change notice

Using the change tracker, you can review the details of change notices for item revisions that appear in that change notice's **Solution Items** folder in My Teamcenter.



> Note:
>
> You can also track structure changes using the change tracker.

1. (Optional) Open the MBOM or BOP that contains lines that are modified by the change notice you want to review and select the change notice that you want to review.

2. Choose **Tools→Change Tracker**.

   The **Change Tracker** dialog box opens with the **Search by change notice** option selected by default. If you completed step 1, your change notice appears in the **Change Notice** box.

3. If you did not complete step 1, click 🔍, and in the **Search Change Notice** dialog box, locate and select the change notice you want to review and click **Finish**.

   In the **Change Tracker** dialog box, your change notice appears in the **Change Notice** box.

4. Click **Finish**.

   The change tracker results view is displayed, with any lines in the change notice's **Solutions** folder displayed at the top. Revisions that are found in the MBOM or BOP are displayed in blue.

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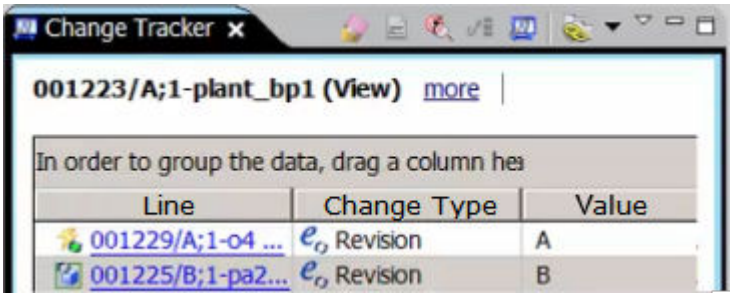


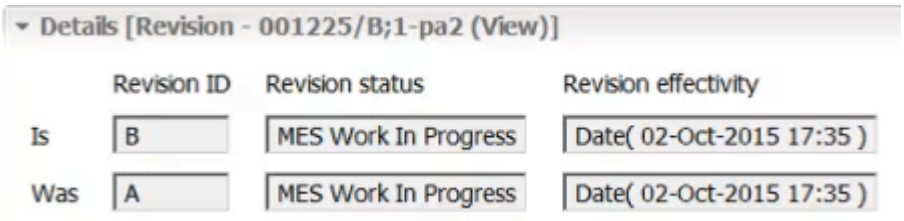
Note:

You can view additional change notice search criteria, including the change notice owner, status, and effectivity, by clicking . If a line does not show a blue underline, details may be unavailable. This result occurs if a revision is:

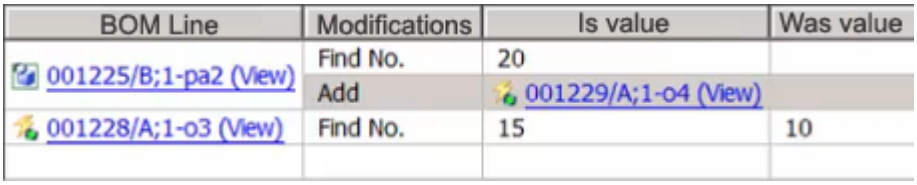
- Configured out from the structure.
- Configured elsewhere in the structure.
- Outside the search scope.
- Set in another structure.

5. Select a line.

If you select a line with a previous revision (for example, 001225/B), the **Is** line displays the most current revision and the **Was** line displays the previous revision. This area lets you review revision status and effectivity. If you select a line with no previous revision (for example, 001229/A), there is no **Was** line.



Other changes are displayed at the bottom of the dialog box.



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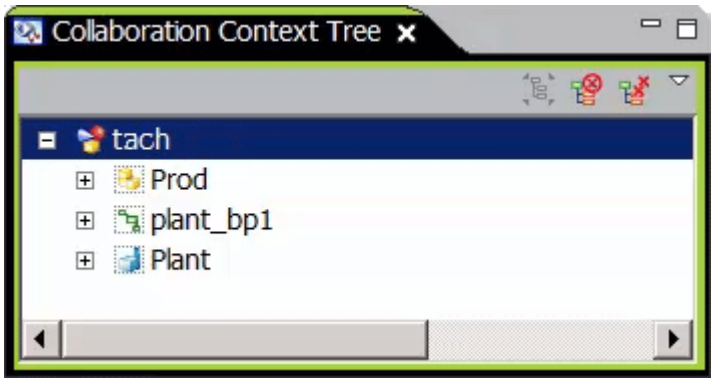
In this example, the **Modifications** value **Add** indicates that in BOM line 001225/B, new operation 001229 was added. In BOM line 001228/A, a **Find No.** was changed from a value of 10 to 15 in the operation.

Export a custom workflow with an active change notice to ERP

For custom workflows, you can initiate a workflow with an active manufacturing or engineering change notice and collaboration context, make changes required of that workflow during your process, and export the workflow to a Manufacturing Execution System (MES) from outside the collaboration context tree. This example demonstrates this process using a simple custom workflow with a review task and a validate, release, and export handler.

1. In My Teamcenter, locate the collaboration context object to which the custom workflow applies.



> Note:
>
> You cannot use an execution plan type collaboration context object.

2. Select the collaboration context and choose **File→New→Workflow**.

   In the **New Process Dialog** dialog box, the process name is the same as the collaboration context.

3. From the **Process Template** list, select a custom template.

4. Locate and right-click an active change notice to associate with the workflow and choose **Copy**.

5. On the **Attachments** tab of the **New Process Dialog** dialog box, click .

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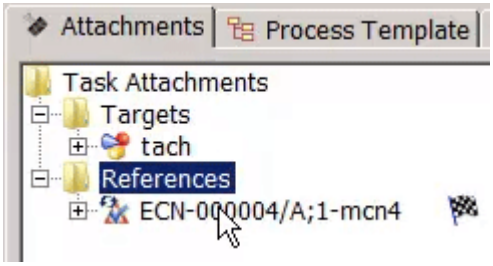
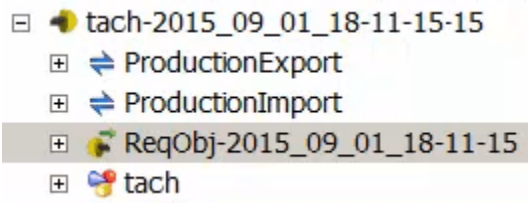
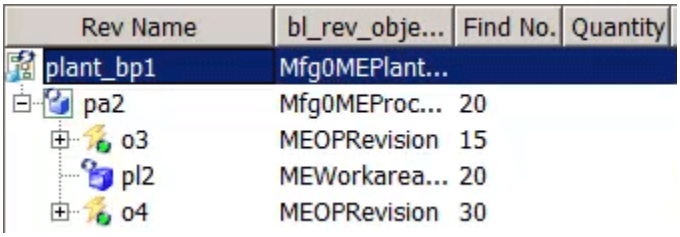
The change notice is attached to the workflow as a reference and the validate, release, and export handler is activated.



In My Teamcenter, workers complete any tasks assigned to them. When the work is complete, the handler submits the results and a new item, named for the collaboration context object with a date/time stamp, is available. It contains a new request object that contains all data added to the workflow.



When the request object is selected, the data is displayed in the viewer.



Using the change tracker

Tracking and propagating changes to a structure

As the manufacturing planning cycle progresses, one of the challenges the manufacturing engineer experiences is keeping up-to-date with changes in the product. Parts may be revised, added, removed, and BOM line properties may be changed. You can easily discern which changes are made to a product structure using the **Change Tracker** view.

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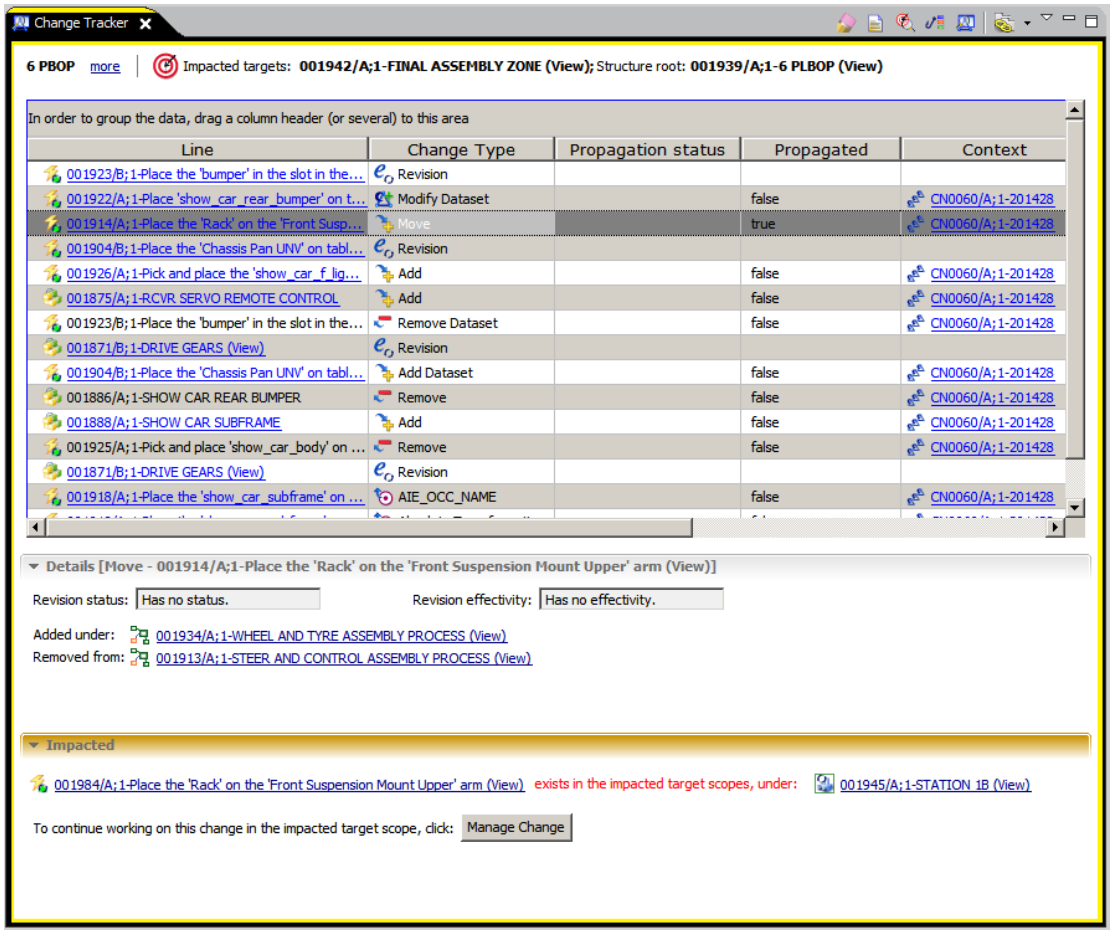

This view displays all the changes that took place in a range defined by either unit or date effectivity. These changes can be based on incremental change or on revision effectivity (or both). Once the **Change Tracker** view lists the changes, you can work through the changes, marking them to indicate that they have received attention or propagating the changes to a target structure.

Note:

- The change tracker does not search for changes that have an end date or expiration unit within the specified range.
- If both unit and date effectivity are specified in the revision rule, only unit search is supported. You cannot search for a combination of these.
- You can also use the change tracker to review change notice details. For more information, see *Review a change notice*.

For each change resulting from an added part or changed properties, the change tracker can provide you with suggestions on where to propagate the changes in a target structure. The change tracker finds the candidate source lines based on three mechanisms.

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- Consumed siblings

  Teamcenter checks if any of the siblings of the added line exist in the target structure. If they do, it offers the sibling's parent as a possible target to receive the change.

- Existing logical assignment designator

  Teamcenter checks if a line in the target structure has the same logical designator.

- Line already exists in target structure

  Teamcenter checks if the added or modified line already exists in the target structure.

You can use the change tracker to find changes between any two structures. You can propagate changes between a product BOP and a plant BOP.

The following prerequisites are necessary to run the change tracker.

- The structure's revision rule has to have either unit or date effectivity specified.
- **Show Unconfigured Changes** must be turned off.
- To propagate to an impacted structure, incremental change must be turned on in the impacted structure.

Run the change tracker to track structure changes

You can track changes to structures using the change tracker.

> Note:
>
> You can also review change notice details using the change tracker.

1. Select the line for which you want to track structure changes and choose **Tools→Change Tracker**.
2. If it is not already selected, in the **Change Tracker** dialog box, select **Search by effectivity**.
3. To search for incremental status changes to the structure, and use effectivity to configure the associated changes, select the **Incremental change** and/or **Revision effectivity** check boxes and click **Next**.

   If you selected the revision effectivity check box, Teamcenter displays the **Change Tracker** dialog box with the current unit configuration set in the **To Review** box.

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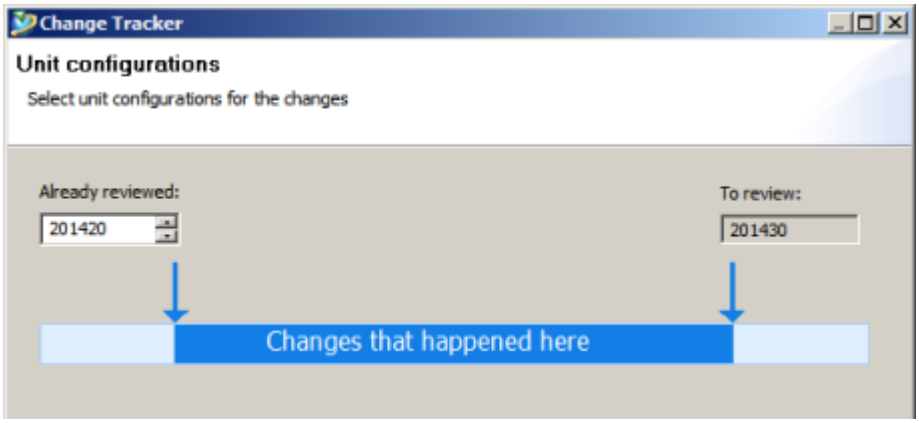

4. If you selected the revision effectivity check box, specify the unit or the date from which you want to begin comparing and click **Next**.

   Whether the change tracker sets the range according to date or unit is dependent on the type of effectivity you set on the structure. If you selected the incremental change check box, a list of status search filters is displayed.

5. If you selected the incremental change check box, select one or more statuses to filter your search to include only structural changes with those statuses, and click **Next**.

6. Select the types of change mechanism that you want to use to check for changes and click **Next**.

7. (Optional) Select the owning users whose changes you want to reflect in the comparison. This filters the results down to the changes of the selected owner.

   You can filter for revision effectivity and incremental change independently.

8. (Optional) Further filter the comparison results based on status by clicking and selecting the status.

   You can filter for revision effectivity and incremental change independently.

9. Click **Finish**.

   Teamcenter displays the **Change Tracker** view with all the changes listed.

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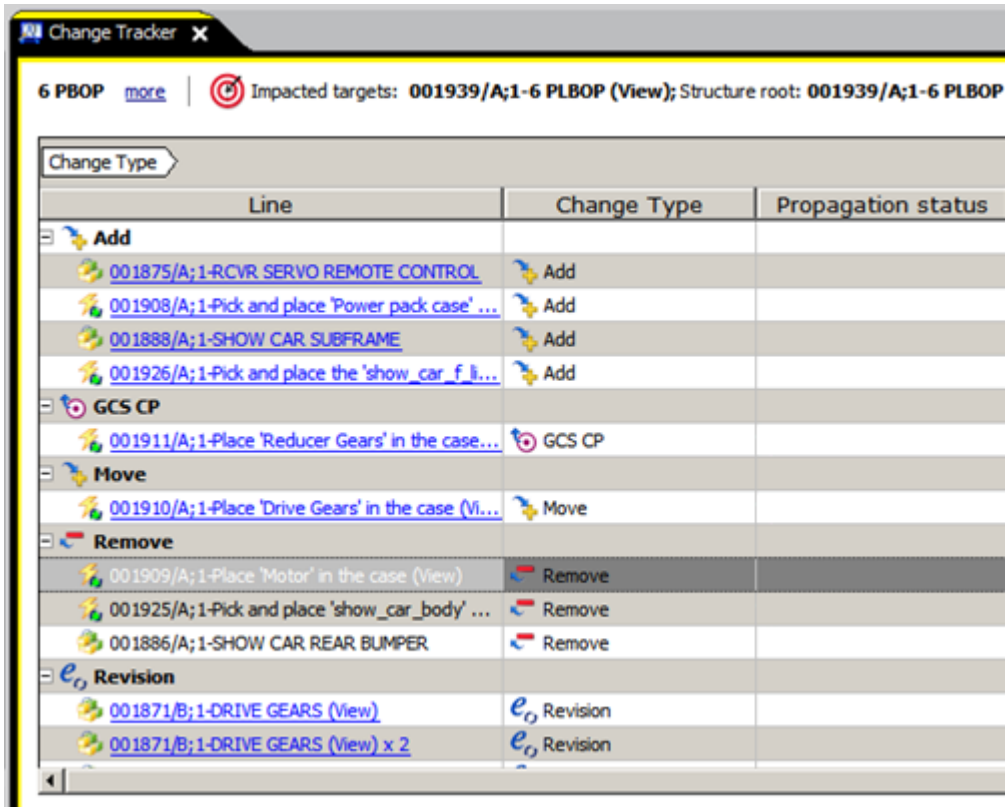
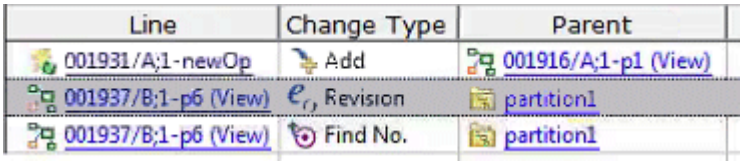


Tip:

Parent, the last column in the **Change Tracker** view, displays the parent of each line. Change the order of columns to review this information.



If a change is applicable to the configured structure and took place within the range specified, it is listed in the **Change Tracker** view. You can click each line in the top part of the view to display additional information about the change in the **Details** section below it. The **Details** section lists:

- For an addition, the line under which the change was added.
- For a deletion, the line from which the line was removed.
- For a moved line, the line from which the moved line was removed and the line under which the moved line is pasted.
- The revision status of each selected change.

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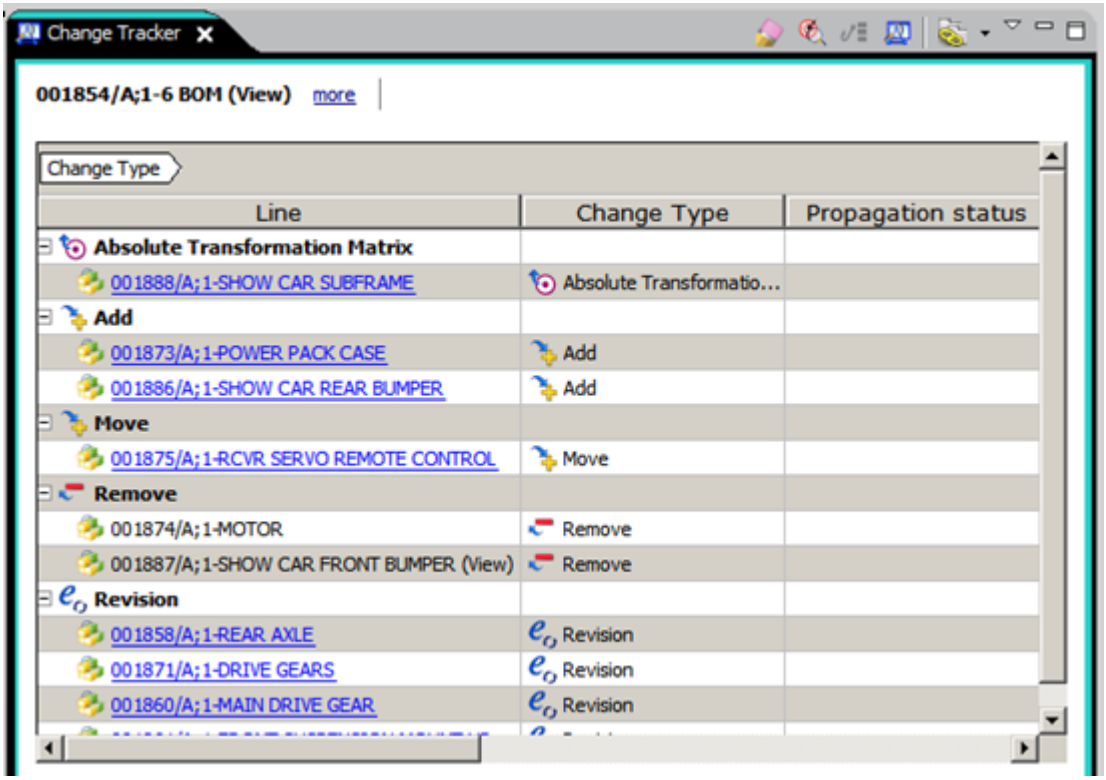
- The revision effectivity of each change.
- For lines with changed attributes, the value in place at the lower limit of the effectivity range of the search and the new value.
- For lines with changed datasets, the dataset at the lower limit of the effectivity range of the search and the new dataset.

10. (Optional) Group results by one or more columns.

    a. Drag one or more column headers to the area above the table.

    Teamcenter reorganizes the table to display the data grouped in the order of the column headers in the list.



    b. Ungroup the table by right-clicking the column headers in the list at the top of the table and choosing **Ungroup by**.

View change tracker settings

- At the top of the **Change Tracker** view, beside the name of the tracked structure, click **more**.

  Teamcenter displays the **Change Tracker Search Criteria** dialog box. This dialog box displays all the settings and configuration information in place when you ran the search.

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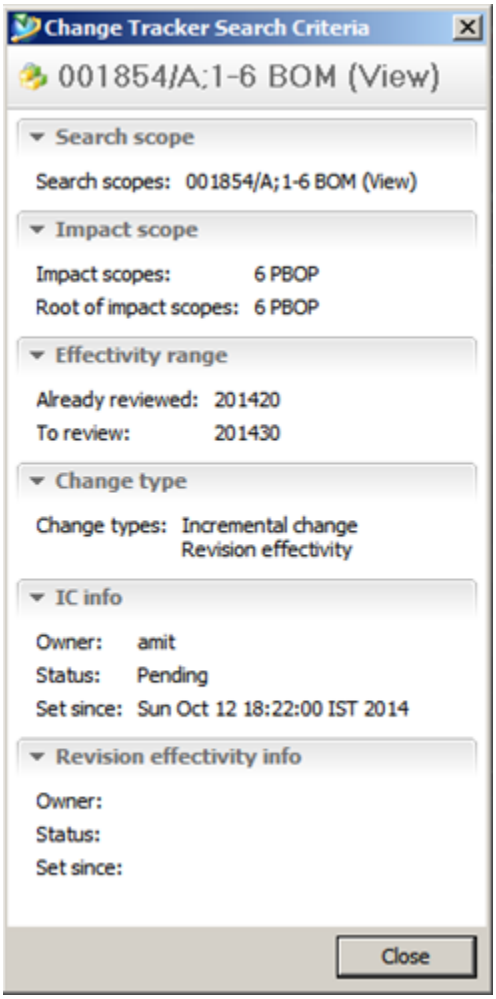

Incorporate changes into a target structure

To find out whether the selected change has been incorporated into a consuming structure (a target scope), use the **Impacted** section of the **Change Tracker** view. For each change in the view, the **Impacted** section lists:

- Lines in the target scope impacted by the change.
- Potential lines in the target scope to which a change might be applied.

> Note:
>
> Incremental change must be active in the target structure before you can propagate changes.

1. Select the scope in the impacted structure and click .

   The impacted structure is the target structure to which you want to propagate the changes found by the change tracker.

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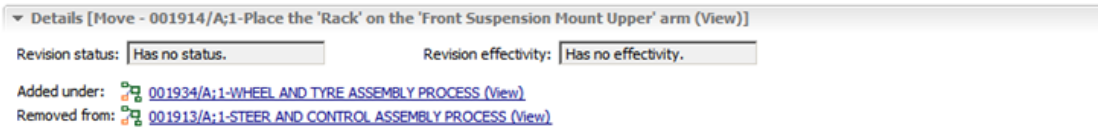
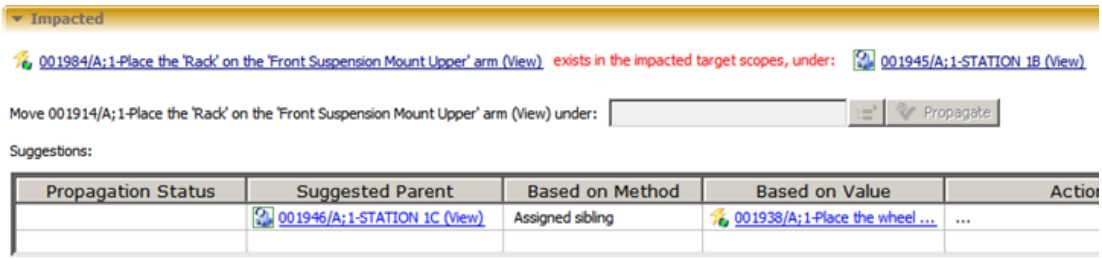
2. Select a change in the top part of the **Change Tracker** view.

   Teamcenter displays details about the change in the **Details** section of the view. For example, if you select a move change, the **Details** pane displays the parent line before the move and after it.



   The **Impacted** section displays whether the changed line exists in the target structure.



   The **Impacted** pane varies according to whether a change is due to an added line, a removed line, or a change in properties.

3. Do one of the following:

   - Add the line to the target structure.
   - Remove the line from the target structure.
   - Propagate property changes to the target structure.

   You cannot propagate revision effectivity changes.

Propagate an added line to the impacted structure

When running the change tracker, you can select a change resulting from an added line and add this line to a target structure using the **Impacted** section of the **Change Tracker** view.

> Note:
>
> Incremental change must be active in the target structure before you can propagate changes.

1. Select the added line in the top part of the **Change Tracker** view.

2. Do one of the following.

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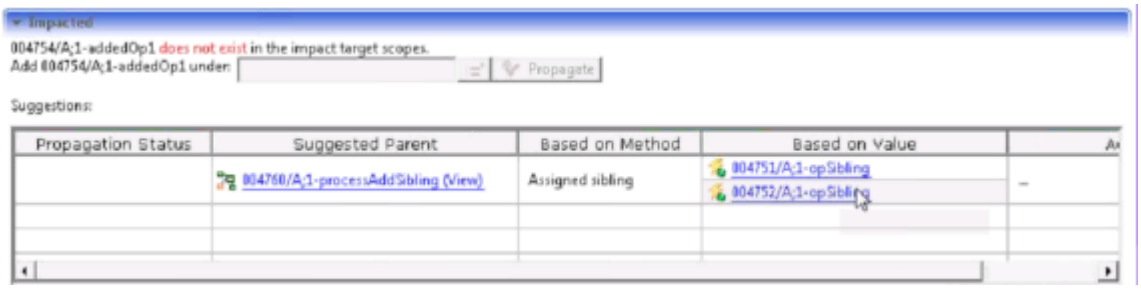
- To add the line to the target structure manually, select a target parent line, click , and click **Propagate**.

- To have Teamcenter find lines that are eligible to receive the change:

  a. Click **Give me suggestions**.

  Teamcenter presents a table listing candidate lines, as well as the method which it used to find the lines.



  Teamcenter uses the following methods to make suggestions:

  - Consumed siblings

    Teamcenter checks if any of the siblings of the added line exist in the target structure. If they do, then it offers the sibling's parent in the impacted structure as a possible target to receive the change.

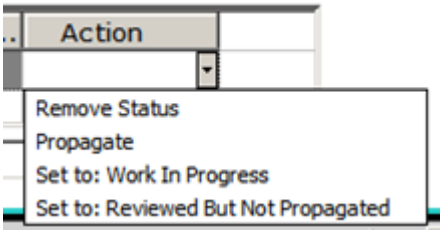
  - Existing logical assignment designator

    Teamcenter checks if a line in the target structure has the same logical designator.

  - Line already exists in target structure

    Teamcenter checks if the added or modified line already exists in the target structure.

  b. In the **Actions** column, select the action you want to perform.



  - Select **Propagate** to update the target structure with the change.

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The **Propagation Status** columns are updated with the symbol.

- Select **Work in Progress**.

  The **Propagation Status** columns are updated with the symbol.

- Select **Reviewed But Not Propagated**.

  The **Propagation Status** columns are updated with the symbol.

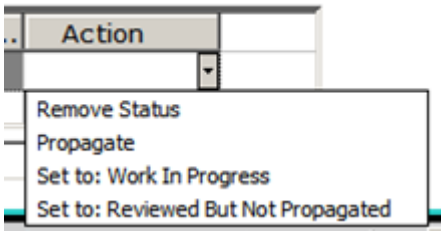
The **Propagation Status** column in the upper table (the list of changes) can contain more than one action symbol. For example, if you add the same line multiple times in the target structure, you can mark one change as **Reviewed But Not Propagated** and the other as **Work in Progress**.

Remove a line from an impacted structure

1. Select the deleted line in the top part of the **Change Tracker** view.

2. Do one of the following in the **Action** column:

   - Select **Propagate** to remove the line from the impacted structure.



     The **Propagation Status** columns are updated with the symbol.

   - Select **Work in Progress**.

     The **Propagation Status** columns are updated with the symbol.

   - Select **Reviewed But Not Propagated**.

     The **Propagation Status** columns are updated with the symbol.

The **Propagation Status** column can contain more than one action symbol. For example, if you add the same line multiple times in the target structure, you can mark one change as **Reviewed But Not Propagated** and the other as **Work in Progress**.

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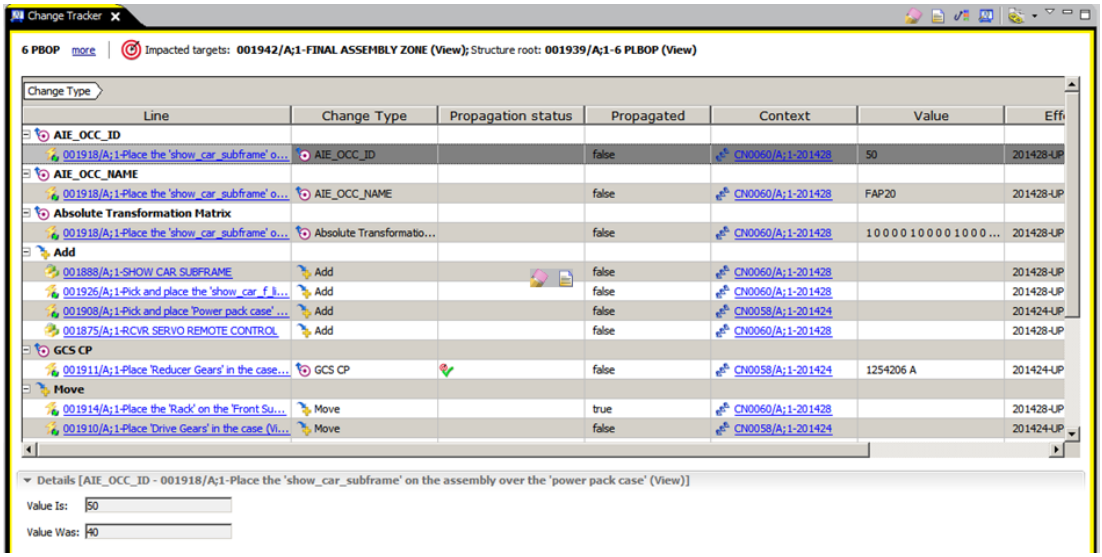
Propagate property changes to an impacted structure

When running the change tracker, you can select a change resulting from property changes in a line and propagate these changes to a target structure using the **Impacted** section of the **Change Tracker** view.

> Note:
>
> Incremental change must be active in the target structure before you can propagate changes.

1. Select a property change in the top part of the **Change Tracker** view.

   Teamcenter displays details about the changed properties in the **Details** section of the view.



2. Click **Compare to target** in the **Impacted** section.

   The **Impacted** section displays the target line that does not yet contain the changes. If the source line exists multiple times in the target structure, each target structure is listed here.

   Teamcenter displays the affected properties and their values in columns. Any differences in property values are shown in red. In the following example, the source line exists twice in the target structure. Using the buttons, you can switch the comparison of the source line to each of the target lines.

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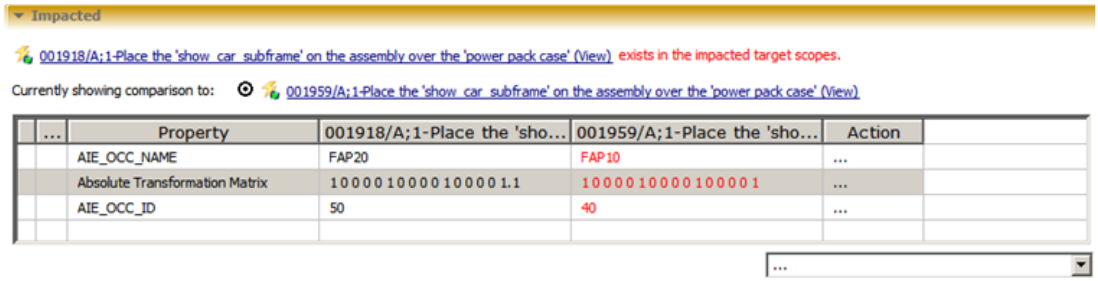

3. In the **Action** column, select the desired action. Alternatively, if you want to apply the same action to all the lines with the changed properties, click the **...** list below the table and select the appropriate action.

> Tip:
>
> If there are multiple impacted lines in the target structure with the same item ID, your administrator can set the preference **MECTImpactedLinesSearchProperties** to narrow the list. By default, the property **bl_item_item_id** exists in the preference but other properties (for example, the value **bl_plmxml_abs_xform**) can be added to further narrow the list.

Compare changes in attachments

You cannot propagate changes to attachments, nor can you set a propagation status.

1. Select a change that represents a changed attachment. These are listed as **Modify Dataset**.

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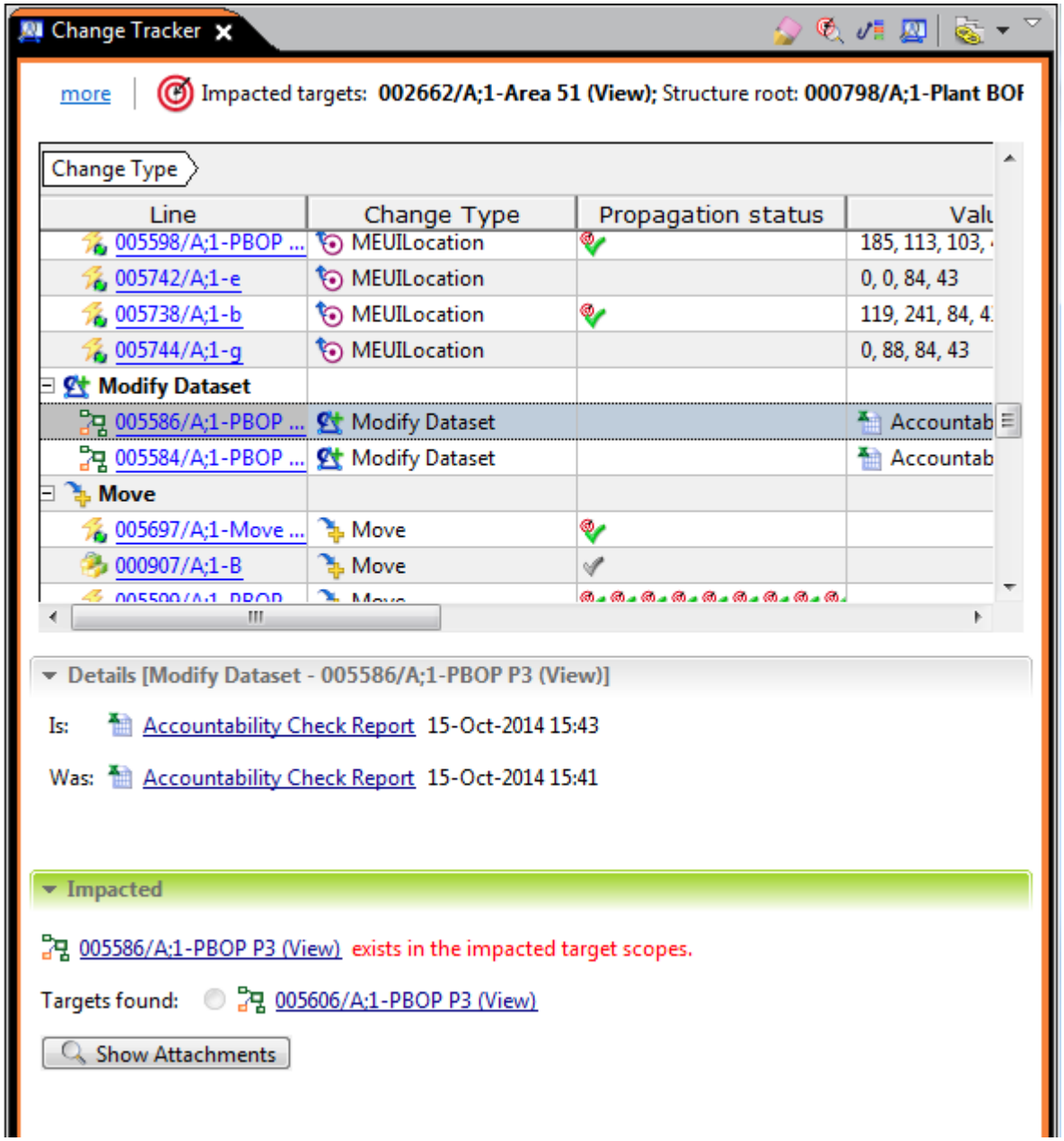

Teamcenter displays the name of the attachments before the change and after the change in the **Details** pane.

2. (Optional) Click **Show Attachments** to view the **Attachments** view for the impacted structure.

3. Click each attachment to view its state before and after the change.

   - To paste added attachments to the impacted line:

     a. Right-click the changed line and choose **Open With→Attachments**.

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b. Copy the attachment.

c. Paste the attachment to the impacted line in its **Attachments** view.

- To remove attachments from the impacted line, click **Show Attachments** and remove the attachment from the impacted line.
- To compare the two attachments, open both.

> Note:
>
> You can open only attachments for which the supporting software is installed on your system and for which Teamcenter is configured to open the file type. For example, if you do not have Microsoft Office installed, you cannot open a .pptx attachment.

Create a revision details report

You can select multiple groups of revision changes in the change tracker and then generate an Excel report. The report compares each revision change from the earliest to the latest groups.

1. Run the change tracker.
2. In the **Change Tracker** view, select one or more lines in the results list.
3. Click **Create Revision Details Report** .
4. In the **Create Revision Details Report** dialog box, specify a file name or location or accept the defaults, select the **Open Report File** check box, and click **OK**.
5. Review the Excel report.

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Effectivity Range - Alread						
Effectivity Range - To Review						
Change Types		Revision effectivity				
Revision Effectivity Info						
Owner						
Status						
Set Since						
			Modified Property			Additiona
Revised Lin	Find N	Change Type	Is	Was	Changed Lin	Find No	CustomProp1
000800;A line1	10	Revision	b	a			line1CustomProp1Value
000800;A line1	10	Revision status	TCM_Released	TCM_Released			line1CustomProp1Value
000800;A line1	10	Revision effectivity	5(000029)	5(000			line1CustomProp1Value
000800;A line1	10	Revision Description	new desc	old desc			line1CustomProp1Value
000800;A line1	10	Add	000801;a child1				
000800;A line1	10	Remove		000802;a child2			
000800;A line1	10	Variant Condition	color=red	color=blue	000806;a child7	30	child7CustomProp1Value
000800;A line1	10	Variant Condition	color=blue	color=red	000806;a child7	30	child7CustomProp1Value
000800;A line1	10	Revision	b	a			line1CustomProp1Value
000800;A line1	10	Revision status	TCM_Released	TCM_Released			line1CustomProp1Value
000800;A line1	10	Revision effectivity	5(000029)	5(000			line1CustomProp1Value
000800;A line1	10	Revision Description	new desc	old desc			line1CustomProp1Value
000800;A line1	10	Add	000801;a child1				
000800;A line1	10	Remove		000802;a child2			

Note:

You can customize the report layout and elements using **MECTRev** preferences.

Revision details report preferences

Revision details report output is controlled by the preferences below.

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Change Tracker Revision Details Report

Date	2015-03-02
Time	4:58:54 PM
User	guthrie
Structure Name	000370/A;1-Plant BOP (View)
Revision Rule	
- Effective Date	Date(Today)
- End Item	
- Effective Unit	
Variant Rule	music = bose AND music = sirius;
Search Criteria	
- Search Scopes	000625/C;2-p4 (View);
- Effectivity Range - Already	Date(21-Jan-2015 00:00)
- Effectivity Range - To Revie	Date(Today)
- Change Types	Revision
- Owner	
- Statuses	
- Set Since	Date(31-Dec-1969 19:00)

Revised Line				Modified Property		Changed Line			Additional Properties	
BOM Line	No.	All Notes	Type	Is	Was	BOM Line	No.	All Notes	BOM Line	Find No.
000625/C;2-p4 (View)	50	Usage_PartNumber: part number 1	Revision	C	A				000625/C;2-p4 (View)	50
000625/C;2-p4 (View)	50	Usage_PartNumber: part number 1	Release Status	MES Work In Progress	MES Released				000625/C;2-p4 (View)	50
000625/C;2-p4 (View)	50	Usage_PartNumber: part number 1	Revision Effectivity	01-Mar-2015 00:00 to UP (NONE)	01-Jan-2015 00:00 to UP (NONE)				000625/C;2-p4 (View)	50
000625/C;2-p4 (View)	50	Usage_PartNumber: part number 1	Find No.	12	10	000627/A;1-op2 (View)	12	Ignore Partial Match: true	000627/A;1-op2 (View)	12
000625/C;2-p4 (View)	50	Usage_PartNumber: part number 1	Variant Conditions	music = radio/cd		000627/A;1-op2 (View)	12	Ignore Partial Match: true	000627/A;1-op2 (View)	12

Preference Name	Values in this example
MECTRevEffectivityAdditional Properties	bl_indented_title bl_sequence_no
MECTRevEffectivityChildLineCompareProperties	bl_sequence_no bl_variant_condition
MECTRevEffectivityLineIdentificationProperties	bl_sequence_no bl_all_notes

Managing incremental changes

Managing incremental changes

Incremental change management is the process of controlling changes and providing an audit history of a product's definition and configuration. An incremental change collects together a number of structure changes to a component such as addition or removal of components or changes to attachments (data). Effectivity can be applied to incremental changes to configure the associated changes. This method of change control allows several independent structure changes to be made concurrently, including the addition or removal of unrelated components. Those changes can be implemented in any sequence.

The following actions constitute a reason for creating a change in manufacturing:

- Adding and removing existing processes and operations from parent processes.

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- Replacing a process or operation with another process or operation.
- Adding, removing, or replacing relationships between a top-level process and a target product, process, and plant with other product and plant objects.
- Adding, removing, or replacing items from the setup structure at the operation level. This includes consumed items, work areas, and resources.
- Adding, removing, or replacing objects that are attached to a process or an operation such as datasets, forms, and other items.
- Adding, removing, or replacing objects in an activity folder with other objects such as other activities, tools, and programs.

A single change can add or remove multiple objects from an item or item revision. A single object can be added to an item or item revision with different effectivities by several changes and removed with different effectivities by several other change objects.

You can also create a baseline item revision by configuring all the incremental changes.

Note:

- Precedence relations between operations in a manufacturing process are not supported within Manufacturing Process Planner.
- You can create incremental change (IC) information about occurrence groups and their content (children). However, configuring the view to show or hide configured changes does not work for this information. Only incremental change information that is common with the base view (in the item structure) is filtered.

Show or hide incremental change management

Using incremental change management is optional. To use it, your administrator must set the **Incremental_Change_Management** preference to **true**. When this preference is set to **false**, the incremental change toolbar is not visible and any loaded items or relationships under incremental change control display in a different color.

You can specify whether incremental change is applied per structure or per application using the **MEIncrementalChangeMode** preference. If set to **structure**, incremental change is relevant only for the selected structure and for the secondary views connected to the selected structure. In this mode, each structure can use its own incremental change.

Turn off incremental change tracking

- Click the button in the toolbar.

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Teamcenter removes the header information from the view and stops tracking edits.

Customize buttons

Incremental changes are displayed by icons at the beginning of a structure line. When you add or remove a structure line, Teamcenter displays a plus or minus icon in front of the respective line.

- Customize when incremental change icons are displayed by choosing **Tools→Incremental Change→Display Icons** and selecting the contexts in which you want to see the icons.
- Choose **Tools→Incremental Change→Display Icons→Hide/Remove Icons** to always hide the display of the icons in the tree structure.

Setting up incremental change

Before using incremental change, you must complete several setup procedures, including creating the necessary change types, providing users with access, defining releases statuses, and writing revisions rules.

Create a new incremental change

1. Click the **Create Incremental Change** button .

   Teamcenter displays the **Create/Revise Incremental Change** dialog box.

2. Click the **IC Attributes** tab and set the following incremental change attributes:

   - Type an ID and revision for the change object. Alternately, click **Assign** to let the system assign this information for you.
   - (Optional) Type a description for the incremental change.
   - Select a change type from the **Incremental Change Type** list. Note that some of these types may be for general changes, not incremental changes.

3. Click the **Effectivity** tab and specify whether to set effectivity for the incremental change using unit serial numbers or dates by doing one of the following:

   Note:

   You cannot specify an effectivity until the incremental change is released. An incremental change may be released by a workflow process that is specific for your company or site.

   If you do not specify an effectivity, Teamcenter creates the change object without a status.

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The administrator determines the initial release status of all new incremental changes by setting a site preference. If the preference is not set, you cannot set effectivity while creating the incremental change. You must release the incremental change (revision) separately with the appropriate process. Once the release status is attached, you can set the effectivity on the incremental change.

- Click **Units** and specify the range of serial numbers to which the effectivity is to be applied. You can also click one of the following buttons:
  - **UP** button to define an unlimited effectivity from a starting number. For example, typing **1-UP** means the change is effective from unit 1 upward.
  - **SO** button to define an effectivity until all stock is exhausted. For example, typing **1-SO** means the change is effective from unit 1 until no stock remains.

  > Tip:
  >
  > The tooltip provides you with more information about the formatting for this entry.

- Click **Dates** to set effectivity based on calendar dates. Multiple date ranges can be entered. To set a date:
  - Type the start and end dates for the effectivity period into the **From Date** and **To Date** cells in the date table.
  - Select a date in the calendar table and click **Set Date** to specify both the **From Date** and the **To Date** entries.

When the correct effectivity is shown, click **OK**.

4. If unit effectivity is set, populate the **End Item** box on the **Effectivity** tab using one of the following methods:
   - From the list of most recently used end items
   - Using the **Search** function to open an item by name or ID
   - By pasting an item from the clipboard
5. Click **OK** to finish creating a new incremental change and close the dialog box, or click **Cancel** to cancel the operation.

   Teamcenter creates a copy of the new incremental change in your **New Stuff** folder.
6. At an appropriate time, the designated user or a workflow process approves the change object by adding the release status. The change object is now *locked* and you cannot use it to track further changes to the process or operation.

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Note:

You can use a Workflow handler that renames the status and retains the effectivity, for example, the **add_status** handler with a **–remove** option.

Showing unconfigured changes

You can configure the display of the tree table to show the following:

- All components and attachments.
- Only those components and attachments that are configured by the current revision rule.

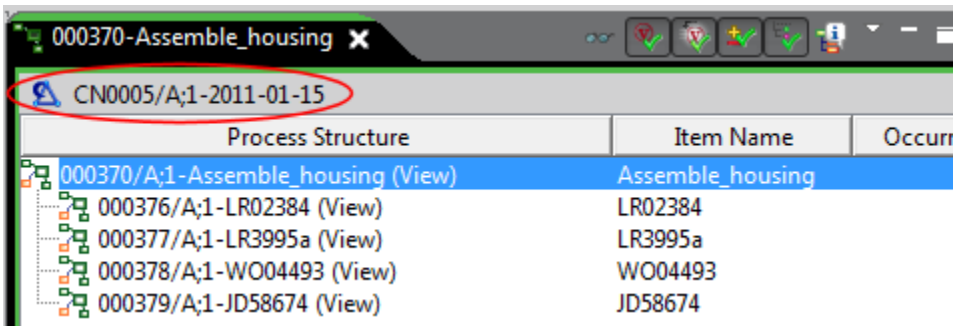
To control the display of unconfigured changes:

- Choose **Show Unconfigured Changes** from the view menu to toggle between showing all lines or only those set by the current revision rule.

To identify changes made in the current context, click the **Changed by Current IC Edit Context** column header to re-sort the structure into changed and unchanged lines. This allows you to more easily identify the changes made to the structure in the current context.

Find and make active an existing change object

When an incremental change is active, all edits are made in the context of that incremental change. Teamcenter shows the ID and name of the active incremental change in the structure view header.



You can also view the active incremental change in the **Configuration Information** dialog box by clicking .

1. Click the **Select an Incremental Change context** button .

   Teamcenter displays the **Select an Incremental Change context** dialog box.

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2. Type either the name or ID of the change object to be displayed. You can use wildcard search characters, if necessary.

3. Click **Find**.

   All change objects matching your selection criteria are displayed in the dialog box. Use the navigation buttons at the bottom of the dialog box to navigate the list.

4. To select an incremental change object for display, double-click the change object in the dialog box list.

View or edit information about an incremental change

Do one of the following:

- Click the **View/edit current IC information** button .
- Click **More IC Info** in the **Incremental Change** data tab.

Teamcenter displays the **View/edit Change** dialog box, which includes the following tabs:

- **IC Attributes** shows the change object name, description, and tag type.
- **Incremental Changes** shows the individual changes to activities, components, attachments, created/deleted data, and predecessors that are tracked against this incremental change.

  > Note:
  >
  > A replacement is shown as an override.

- **Effectivity** allows you to view and edit the effectivity of the change object if you have the access permission to do so. Double-click a specific release status to open a dialog box containing all the effectivity information for the selected release status.
- **Intents** displays the intents for which the incremental change is valid.

  You can create a new intent by clicking the **Intent** button and typing the appropriate information in the **Create Intent** dialog box. You can then add the intent to the incremental change by ensuring it appears in the **Intent to add** box and clicking **+**. You can also search for existing intents and add them to the incremental change.

  > Note:
  >
  > To make the **Intents** tab visible, set the **EnableIntents** preference to **true**.

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You can also use the icons on a structure line to identify adds, removes, and absolute occurrences. For attachments, these icons are displayed in the **Attachments** view, not the structure view.

View incremental changes for a structure

To view all the incremental changes associated with a structure, select a line in the structure and choose **Open with→Incremental Change**. For each line, this view lists:

- **Type**

  For attachments only, specifies the type of incremental change, **create**, **delete**, **add**, or **remove**. Note that edits to attachments are shown as **create** types.

- **IC Context**

  Specifies the incremental change objects affecting the structure, listed in the order they are applied.

- **Release Status**

  Specifies the release status of the incremental change object, for example, **Production**.

- **Effectivity**

  Specifies the date or unit number effectivity of the incremental change.

- **IC Configured By**

  Specifies the revision rule that configures the incremental change for this structure. This allows you to see if an incremental change is configured and, if so, how it is configured.

For attachment changes, the affected lines and changed relationships are also listed. For occurrence attribute changes, the affected attributes and changed values are also listed.

To see more information about an incremental change, double-click the line in this pane; Teamcenter displays the changes made by the incremental change.

Find recently used change objects

Click the **Most Recently Used** button ( ) to display a list of previously used incremental changes from which you can choose.

Track attachments with incremental changes

You can create an attachment to an item revision and track its status with an incremental change object, as follows:

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1. Ensure you have created the appropriate incremental change object and that it is active. The active incremental change is shown in the structure view header.

2. Select the structure line corresponding to the *item revision* under which you want to create the attachment.

3. Choose **Open with→Attachments**.

4. Select the root node (item revision) in the **Attachments** pane.

5. Create a new attachment by choosing **File→New→Dataset/Form**.

   Alternatively, you can attach an existing object by copying the dataset or form to the clipboard, then pasting it to the root node (item revision) in the **Attachments** view.

Track changes to an attachment

To track changes (edits) made to an attachment, select the attachment (dataset or form) and choose **Tools→Incremental Change→Edit Attachment**.

Teamcenter also tracks edits if you double-click the dataset or form. With a dataset, the change is tracked when you open the form to edit; with a form, the change is tracked only when you click **OK** or **Apply**. Teamcenter tracks the changes by creating a copy of the dataset or form.

The **Attachments** pane displays the appropriate version of the attachment according to the configured incremental change against which the edits were tracked.

> Note:
>
> You can view the original, unchanged attachment in My Teamcenter.
>
> If you open an attachment, check it out, and then close it, the checkout lock is not retained. The checkout is retained only if you save the attachment at least once before closing it.

Track the creation or deletion of an attachment

You can track the creation of a dataset or form against an incremental change, so that the attachment itself has an effectivity that is derived from the effectivity of the incremental change; this is in addition to the effectivity applied by the incremental change that attaches the attachment to an item revision. This feature may be useful if the attachment is attached to more than one item revision.

- To track the creation of an attachment, select the attachment in the **Attachments** pane and choose **Tools→Incremental Change→Create on Object**.

- To track the deletion of an attachment, select the attachment in the **Attachments** pane and choose **Tools→Incremental Change→Delete on Object**.

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Track changes retrospectively

If you forgot to activate an incremental change, you can retrospectively track changes by making the incremental change active and doing one of the following:

- Select the item or attachment that you wanted to track as *added* and choose **Tools→Incremental Change→Add**.
- Select the item or attachment that you wanted to track as *removed* and choose **Tools→Incremental Change→Remove**.

Teamcenter saves edits immediately to the database. It is not necessary to choose the **Save Changes** command.

You can only make changes to the *active* incremental change, that is, the one shown in the structure view header. If you try to edit an incremental change that is not configured by the current revision rule, Teamcenter displays an error message.

Remove incremental changes

You can remove individual incremental changes one of two ways, from the **Incremental Change** view or with an **Incremental Change** menu command.

> Note:
>
> You require write access to edit structures with incremental changes in this way.

For structure and attachment changes:

- If the corresponding change is a remove, Teamcenter deletes it.
- If the corresponding change is an add and the user has write access to the parent BVR, Teamcenter deletes the add but not the occurrence. If you want to remove the occurrence, choose **Edit→Remove**. If the user does not have write access, the deletion request fails.

For occurrence attribute changes, if the change to undo is an add and it is the only change to the attribute, the change and the override value are both deleted. In other cases, only the change is deleted.

Remove an individual change from the incremental change information pane

1. In the **Incremental Change** view, select the structure line of the occurrence or attachment whose changes you want to remove.
2. Select the change to undo and click **Undo Change**, depending on the change type that you want to remove. You can undo multiple changes in a single operation.

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Remove changes from an item with the Remove Changes command

1. To remove changes to an occurrence, select the corresponding structure line.

   To remove changes to a dataset or form, select it in the **Attachments** view.

2. Choose **Tools→Incremental Change→Remove Changes**.

   Teamcenter displays the **Remove Incremental Changes** dialog box.

3. Select the check box next to each change you want to remove, or click **Select All** to remove all changes, then click **OK**.

> Note:
>
> Occurrence attributes are not displayed in the **Remove Incremental Changes** dialog box; you can only undo them from the **Incremental Change Information** pane.

Split an incremental change

You may want to change the effectivity of some of the incremental change elements in an incremental change. As all elements of an incremental change have the same effectivity, you can only accomplish this by moving some of the incremental change elements into a different incremental change. To do this, choose **Tools→Incremental Change→Split**. You can move the incremental changes to an existing change object or create a new change object for the purpose.

Working with incremental change baselines

Create an incremental change baseline item revision

Changes to a process plan can be managed by making incremental changes, which are tied to incremental change objects. This enables you to track and configure the changes without forcing you to create a new revision. After making several sets of incremental changes, you may want to roll up the changes made into a new baseline revision. The baseline item revision allows you to create a new revision of an item by capturing all the changes made using incremental change objects until the configuration date or unit number. The baseline item revision can be created at any stage.

1. Select an item revision and choose **Tools→Incremental Change→Incremental Change Baseline**.

   Teamcenter displays the **Baseline** dialog box.

2. Type a name and a description. Teamcenter displays the selected item revision and revision ID by default. These boxes cannot be edited.

3. Click **OK**.

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Baselining structures with active incremental changes

Optionally, when you create an incremental change of an item revision, any incremental changes that are active are carried forward or rolled up. An active change is any incremental change that has an **out** effectivity equal to or greater than the baseline effectivity, including any open-ended effectivity.

When you carry forward a change, the affected object of the change is copied to the new item revision. The copy of the affected object is qualified to the same incremental change. Consequently, the old and new copies of the affected object share the same change effectivity.

When you roll up a change, *only* the affected object of the change is copied forward. The qualification is not present on the new item revision.

Determining active changes

Teamcenter drops, rolls up, or carries forward changes to the new item revision, depending on the following conditions. (**X** indicates the baseline, which may be a unit number or date.)

Lower end	Higher end	Drop, roll up, or carry forward?	Explanation
<X	**<X**	Drop	The change was effective in the past with respect to the baseline and will not be effective in the future. The change is dropped.
<=X	**>=X**	Carry forward	The change is effective and remains effective to a certain point in the future. Beyond that point, the change is not configured and is therefore carried forward.
<=X	**UP**	Carry forward if **Pending** status or roll up if **Secured** status.	The change is effective and remains effective in the future. It can be rolled up into the next revision. However, if the incremental change is not released, it can be edited and such edits may be reverted. Therefore, if the status is **Pending**, changes are carried forward.
>X	**>X,UP**	Carry forward	The change is effective in the future, so is carried forward.

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Note:

Teamcenter supports discontinuous effectivity, with multiple **out** effectivities. If any of the effectivities is equal to or greater than the baseline effectivity, the change is considered active.

When you create the baseline, changes that are past effective are dropped, irrespective of status. For example, if you create a baseline at unit 25, there may be changes on an incremental change with effectivity on units 5 to 15. All these changes are dropped because they are past effective. If you subsequently change the effectivity of this incremental change to span or cross baseline unit 25, you must recreate the baseline to take the effectivity change into account.

Teamcenter determines if an effectivity is *applicable* in the current context. An item revision under incremental change may have several status objects attached to it, and the objects may be different types. A revision rule may have several entries configured by effectivity, and the entries may specify different status and effectivity types. To determine if an effectivity statement on an incremental change revision applies to the revision rule, Teamcenter checks that the combination of status type and effectivity type (date or unit) match an entry in the revision rule.

Carrying forward or rolling up active changes

Teamcenter carries forward active changes if:

- The change is currently active and the qualifying incremental change is not released, or
- The change will be configured in the future.

It copies the affected object to the new item revision. It also connects the new copy of the affected object by an incremental change element (ICE) to the same incremental change as the original affected object.

Teamcenter rolls up active changes if the change is currently active and the qualifying incremental change is released. It copies *only* the affected object to the new item revision.

ICEs link affected objects to *revisions* of incremental changes. As an incremental change evolves, the affected object may be qualified by several ICEs to multiple revisions of the same incremental change. If you do not assign explicit **out** effectivities, but supersede them with later **in** points (for example, A: 1–UP, B: 10–UP, C: 20–UP), multiple revisions of the same incremental change may be considered active. If the baseline effectivity is equal to or more than 20, the latest in rule determines that C is the currently configured revision. However, as you may subsequently change any effectivity, Teamcenter carries forward the affected object with ICE qualification to all of these active incremental change revisions.

Dropping inactive changes

If Teamcenter determines that a change is not active, it is dropped from the new item revision. If the affected object is added by the incremental change, because the relevant change is no longer

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active, Teamcenter omits the affected object from the new item revision. If the object is removed by the incremental change, the removal is reversed and the affected object is copied forward without the incremental change qualification.

Modify a process or plant structure

If a process structure or plant structure is write-protected, you can still modify its structure with incremental changes. You can also add datasets or forms to an item revision or remove them from a revision by defining an incremental change.

Exporting and importing incremental change data

About exporting and importing incremental change data

You can export changes (deltas) to the structure if they are tracked by incremental changes in two formats—TC XML using a briefcase file or PLM XML. Teamcenter allows you to export the structure changes alone (not the entire structure) without needing to create a new revision. The exported changes contain all the relevant data required by the importing site to achieve the same structure configuration as exists at the exporting site. You can export multiple independent, dependent, or overlapping incremental changes in a single action.

When you use this feature, you must ensure the structure is configured with the required effectivity and revision rules before initiating the export. Effectivity and revision rules are not exported with the changes; you must ensure they are identical in the exporting and importing sites separately.

Teamcenter tracks and exports the following changes when they are tracked by incremental changes:

- Adding a new or existing line to the structure
- Adding a new or existing subassembly to the structure
- Removing a line or subassembly from the structure
- Modifying relative occurrence properties
- Creating or modifying absolute occurrence properties
- Adding a new or existing attachment to a line, for example, a form or dataset
- Deleting an attachment
- Modifying an attachment

When exporting incremental change data using PLM XML:

- The structure must be fully configured.

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- Any related changes that are not tracked by an incremental change are not considered for export.
- Changes in the context of incremental changes are considered as export candidates. For example, if you add, modify or remove a structure line in the context of an incremental change, all of its parents up to the top level are exported in addition to the affected line. However, the siblings of lines affected by the incremental changes are not exported.
- If you add, modify, or remove a subassembly under an incremental change, its children exported even though they are not directly affected under the incremental change.

You can create an incremental baseline for a structure that was already exported. This action creates a new revision of the structure. As active changes are carried forward into the new incremental change baseline revision, you may add new incremental change elements (ICEs) affecting the new structure revision to the incremental change revision that is the parent of the original active ICEs. (This incremental change revision may already be exported for the original structure.) Because the new ICEs do not affect the revision of the structure that was exported when you perform a TC XML export, they are exported as a stub. The incremental baseline action has no additional effect on the export of the original structure and the incremental change revisions that affect it.

Export incremental change data using a briefcase file

1. Choose **Tools→Export→To Briefcase**.

   Teamcenter displays the **Export To Briefcase Via Global Services** dialog box.

2. Click the **Display/Set export options** button in the bottom right-hand corner of the dialog box.

   Teamcenter displays the **TIE Export Configured Export Default** dialog box.

3. Select the check box corresponding to each of the export options you want to use and then click **OK**.

   Teamcenter closes the **TIE Export Configured Export Default** dialog box.

4. In the **Export To Briefcase Via Global Services** dialog box, enter all the required information including **Reason**, **Target Sites**, **Option Set**, **Briefcase Package Name**, **Revision Rule**, and **Variant Rule**, and then click **OK**.

   > Note:
   >
   > Ensure you select the **TIEConfiguredExportDefault** transfer option set to export incremental change based deltas.

   Teamcenter displays the **Remote Export Options Setting** confirmation dialog box.

5. Click **Yes**.

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Teamcenter starts the export of the product structure using the options you entered.

Import incremental change data using a briefcase file

1. Choose **Tools→Import→From Briefcase**.

   Teamcenter displays the **Import from Briefcase Without Global Services** dialog box.

2. Navigate to or type the path and file name of the briefcase file in the **Briefcase File** box. Select **TIEConfiguredImportDefault** from the **Option Set** list.

3. Click the **Display/Set export options** button and select the desired options.

4. (Optional) Select the **Site Check-In after import** box. If you select this box, all objects that are checked out to the unmanaged site are checked in during the import process. Otherwise, you must check them in individually after they are imported.

5. Click **Yes** to begin the import.

> Note:
>
> The importing site does not verify it has the same base structure against which the delta was calculated.
>
> If you select a collaboration context for export of incremental change deltas, the export file includes the structure context and configurator contexts contained in it, as well as the configured incremental change data.

Export incremental change data using PLM XML

1. Choose **Tools→Export→To PLMXML**.

   Teamcenter displays the **PLMXML Export** dialog box.

2. Enter the required export directory, file name, choose the appropriate IC delta transfer mode (for example, **ConfiguredDataExportDefault**), and then click **OK**.

   Teamcenter displays a confirmation message if the export is successfully completed. It generates the output PLM XML file in directory the location shown in the **PLMXML Export** dialog box.

Import incremental change data using PLM XML

1. Choose **Tools→Import→From PLMXML**.

   Teamcenter displays the **PLMXML Import** dialog box.

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2. Enter the name of the PLM XML file to import, choose the appropriate IC delta transfer mode (for example, **ConfiguredDataImportDefault**), select the required incremental change context, and then click **OK**.

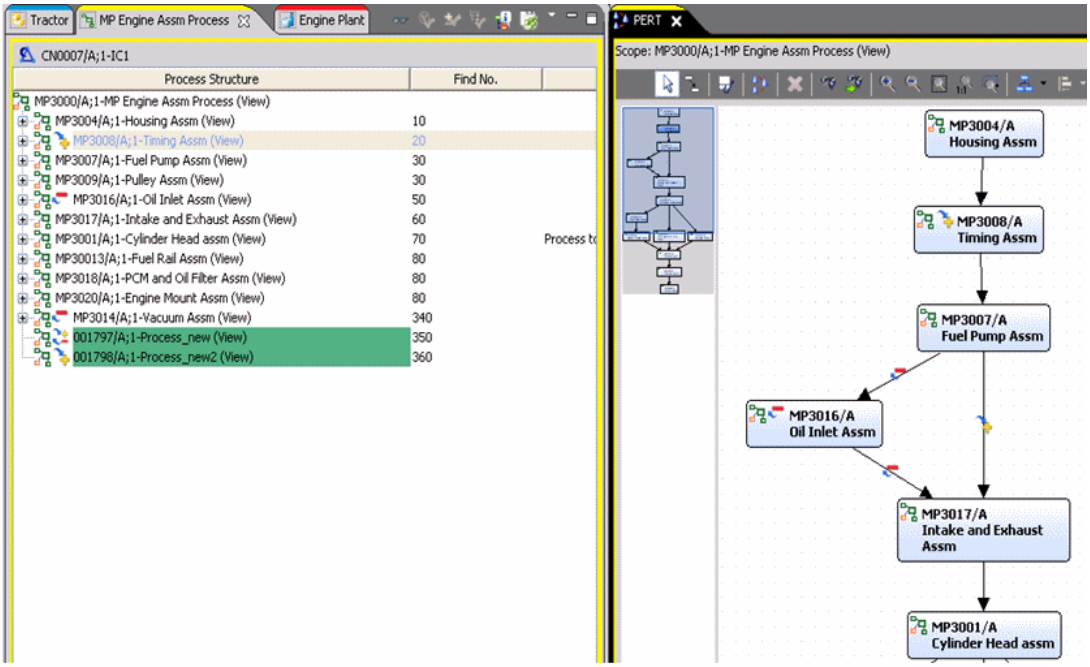
   Teamcenter displays a confirmation message if the import is successfully completed. It imports only changes to the structure, as captured in the exported PLM XML file.

Working with incremental changes and predecessors

About incremental changes and predecessors

A *predecessor* represents a sequential relationship between two processes, operations, or activities; the predecessor must complete before the second process, operation, or activity. You can use this relationship to track changes to the sequence of operations in a process or to activities in an operation. For example, you can use it to define a flow of operations or processes to be effective from a certain date or unit number. If you use a change object to add a predecessor, the change effectivity is attached to the predecessor and the predecessor becomes effective as of that change.

The following figure shows how Manufacturing Process Management displays the predecessors of a process or operation. If a + sign appears on the symbol, the predecessor was added with an incremental change; if a – sign appears on the symbol, the predecessor was removed with an incremental change.



Incremental changes on predecessors

Add an incremental change on a predecessor

1. Open the **PERT** view.

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2. Create a new flow between (sequence) between the related processes or operations.

Remove an incremental change from a sequence

If you remove or delete a predecessor, it remains displayed in the **PERT** view but is marked for deletion when the relevant change becomes effective.

To remove an incremental change from a sequence, do the following:

1. Open the **PERT** view on a process.

2. Select the sequence line and click **Delete** from the PERT toolbar.

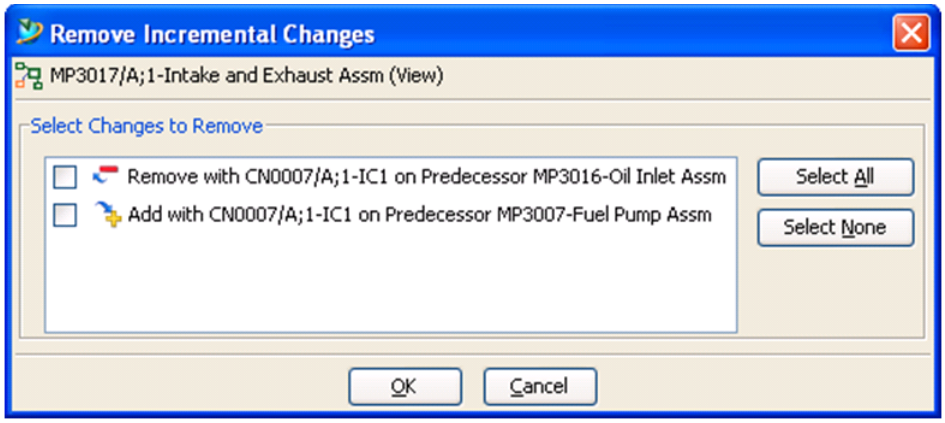
Roll back incremental changes on the sequence

1. Open the **PERT** view on the process.

2. Select the target node of the sequence on which you want to remove incremental changes.

3. Choose **Tools→Incremental Change→Remove Changes**.

   Teamcenter displays the **Remove Incremental Changes** dialog box.



4. Select the desired change and click **OK**.

   Teamcenter removes the selected changes.

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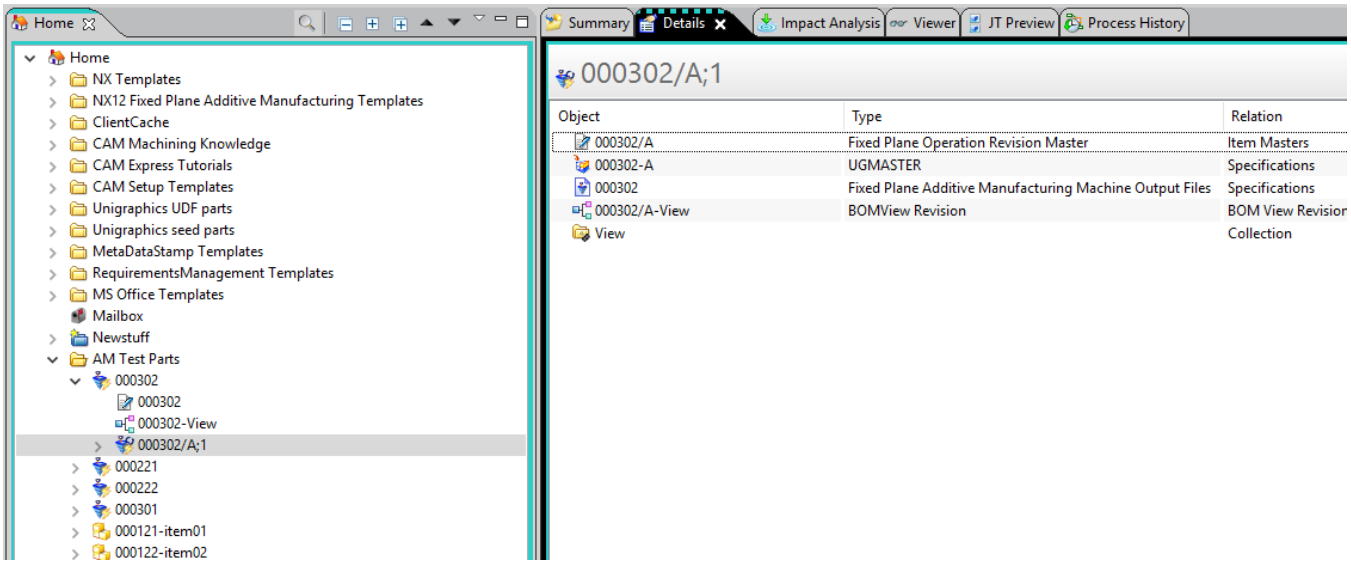
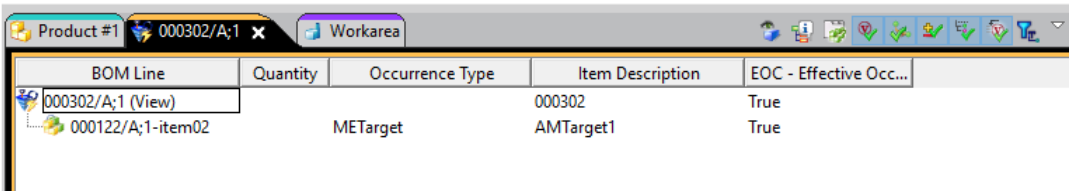
14. NX fixed plane Additive Manufacturing Integration

Using NX fixed plane Additive Manufacturing Integration

The image below shows a fixed plane Additive Manufacturing operation with added geometry and 3D printer files, generated in the NX Additive Manufacturing application. When you save the NX part, printer files are imported into the Teamcenter database as datasets under the fixed plane Additive Manufacturing activity.



The fixed plane Additive Manufacturing operation can be sent to Manufacturing Process Planner or Part Planner, where the operation structure can be seen.



When you open an operation revision in the **Activities** tab, the datasets under the fixed plane Additive Manufacturing Activity can be seen. Every named reference contains an output file.

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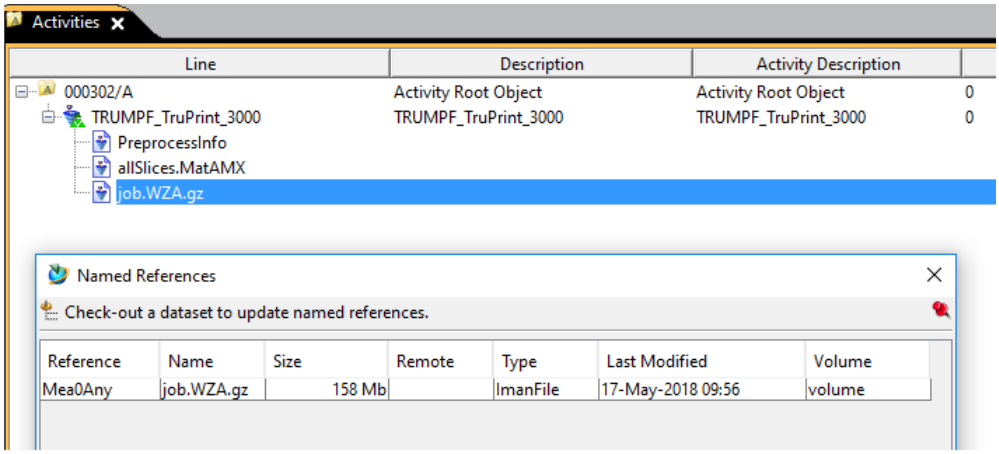
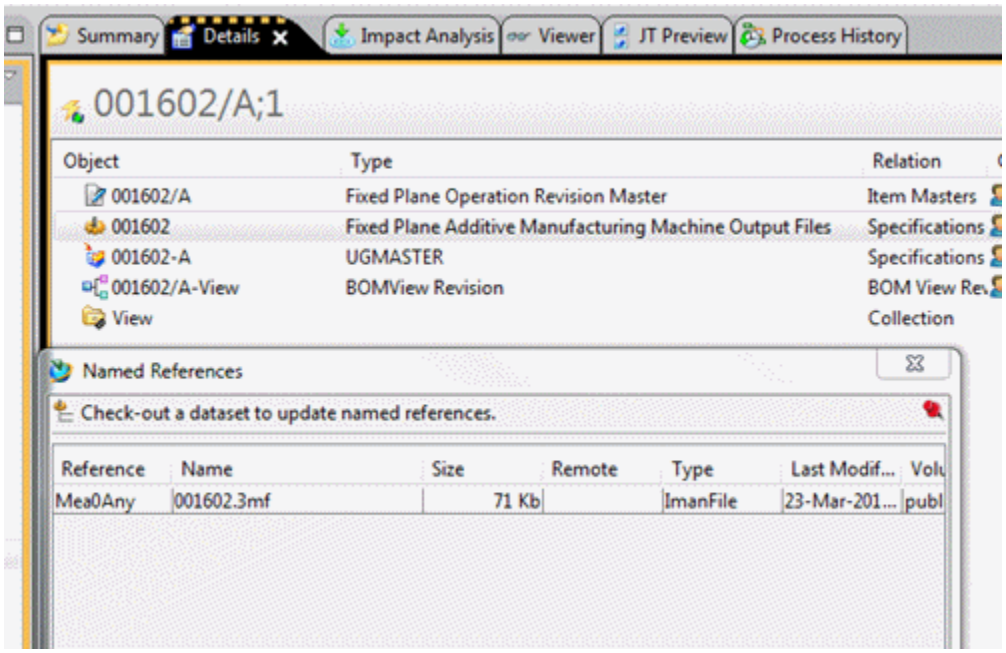


When you import **Additive Manufacturing** printer files, all output files are imported into datasets under a fixed plane Additive Manufacturing activity. There is one exception, in which the output file with extension **.3mf** is attached to a revision object. You can see this when the revision object is opened in the **Named References** dialog box.



Note:

Before you can use NX fixed plane Additive Manufacturing Integration, it must be installed.

Installing NX Fixed Plane Additive Manufacturing Integration

Before you can use NX Additive Manufacturing Integration with Teamcenter, the **NX Fixed Plane Additive Manufacturing Integration** application in the **Part Manufacturing** group must be activated

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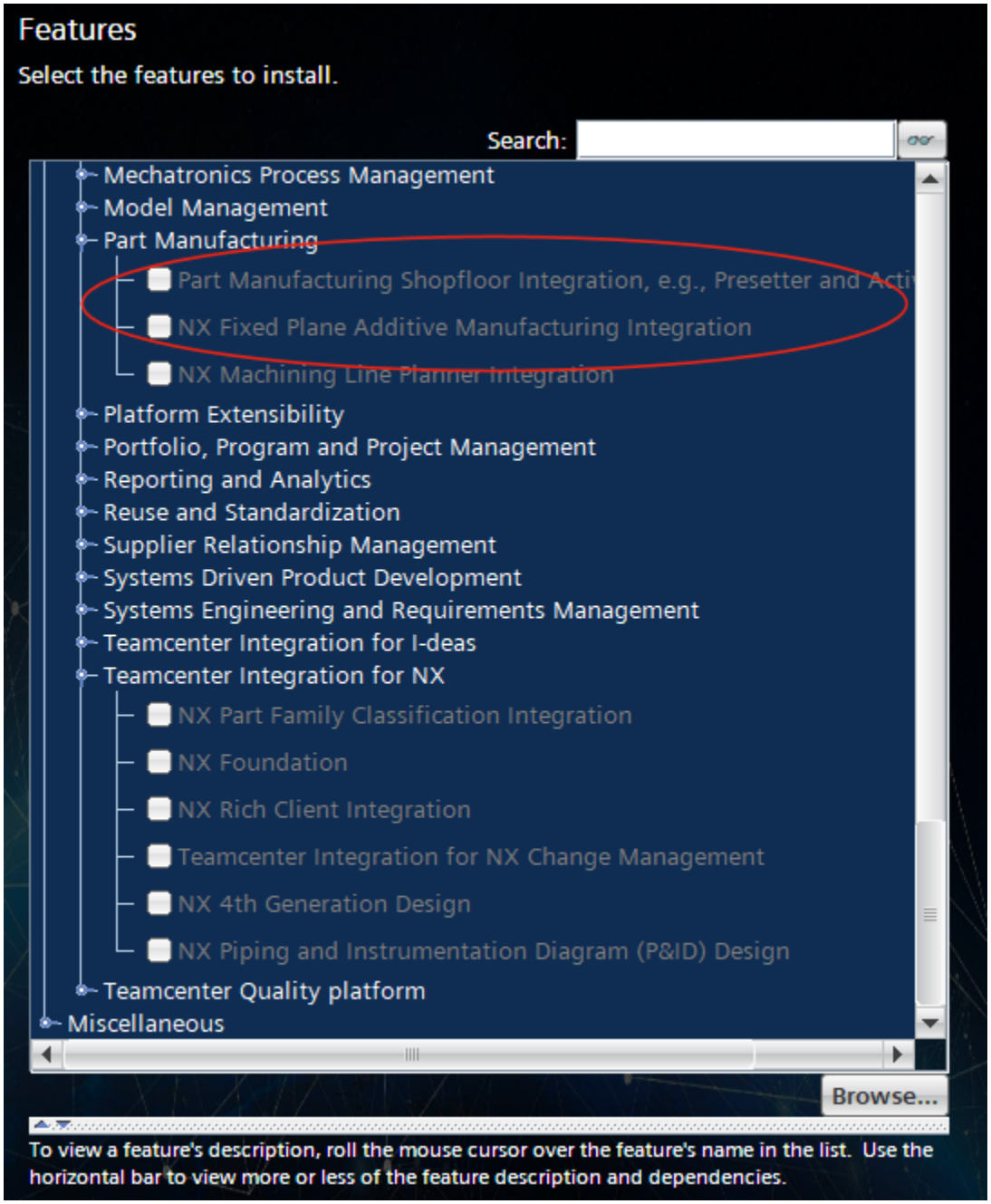
in the Teamcenter Environment Manager. By default the **NX Fixed Plane Additive Manufacturing Integration** feature is not selectable.



You select **NX Foundation** to enable the **NX Fixed Plane Additive Manufacturing Integration** option, and can then select it.

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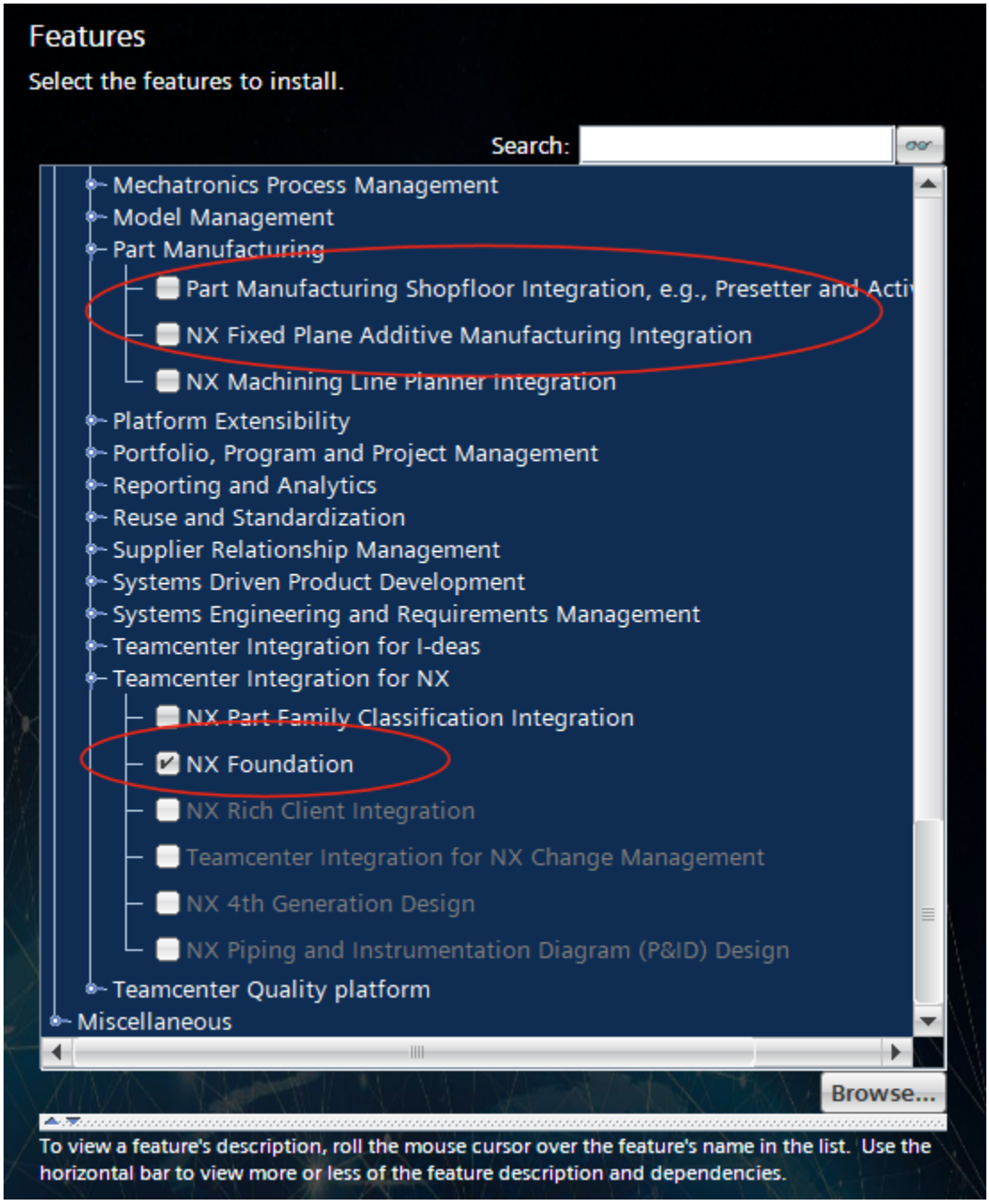

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