



Andhra Pradesh State Skill Development Corporation



DIGITAL MANUFACTURING WITH DELMIA

EQUIPMENT ALLOCATION



Equipment Allocation

Equipment Allocation provides tools for balancing operations on resources and checking resource/system utilization.

It includes the following capabilities:

- Managing Resource-System scope
- Assigning resources to operations
- Assigning detailing tasks to operations and resources
- Using the Resource Utilization Gantt chart for capacity planning
- Managing operation and part positions



Module-3. A: Resources

This section provides background information about resources and describes how to insert them in a resource structure.

In this section:

- About Resources
- Inserting a Resource
- Inserting an Existing Product or Resource

A. About Resources

A resource is a device (such as a tool, robot, or machine) used in an item to build a product.

The following topics are discussed:

- Working, Nonworking, and Organizational Resources
- Programmable and Nonprogrammable Resources
- Resource Types
- Detection and Correction of Invalid Resource Structures

B. Working, Nonworking, and Organizational Resources

Depending on how and where they are used, resources can be classified as working, non-working, or organizational.

The working resource defines which resource (for example, a robot, worker, or conveyor) runs an operation. These resources are also known as who resources.

A nonworking resource defines the resource (for example, a tool device) that runs an operation. These resources are also known as with resources.

An organizational resource defines the resource (for example, a station, zone, line, or app) where an operation ran. These resources are also known as where resources.

C. Programmable and Nonprogrammable Resources

A resource is programmable if it can have logic or behavior in context. A resource is nonprogrammable if it can have logic or behavior in reference only, or if it has no logic at all.

A robot is programmable because a robot program, which exists in a certain context, can be added to the robot.

An organizational resource is nonprogrammable. Its logic is only in reference. It cannot have logic or behavior in context.





D. Resource Types

Each resource type has various characteristics (such as the ability to aggregate other resources or to be aggregated by other resources). A resource can be useful for a specific application or for several applications.

The characteristics of each resource type are discussed:

Resource	Category	Logic	Referenced by	Aggregated by	Aggregates
Area	Organizational	None allowed. Nonprogrammable.	A where implement link only	Organizational and Area resources	All types of resources and products
Manufacturing Cell	Organizational	Defined in reference only. Nonprogrammable.	A where implement link only	Organizational and Area resources	All types of resources and products
Robot	Working	Programmable	A who implement link only	Organizational, Manufacturing Product, and Area resources	Products only
Worker	Working	Defined in reference or in context; programmable	A who implement link only	Organizational and Area resources	Products only
Transporter	Working	Programmable	A who implement link only	Organizational, Manufacturing Product, and Area resources	Products and User-Defined resources
Conveyor	Working	Nonprogrammable	A who implement link only	Organizational, Manufacturing Product, and Area resources	Products only
NC Machine	Working	Programmable	A who implement link only	NC Machine, Organizational, Manufacturing Product, and Area resources	Tool Device, NC Machine, and User-Defined resources and products
Industrial Machine	Working	Nonprogrammable, no contextual logic is allowed.	A who implement link only	Industrial Machine, Organizational, Manufacturing Product, and Area resources	Tool Device, NC Machine, and User-Defined resources



Resource	Category	Logic	Referenced by	Aggregated by	Aggregates
					and products
Inspect	Working	Programmable	A who implement link only	Organizational, Manufacturing Product, and Area resources	Tool Device and User-Defined resources and products
Control Device	Working	Programmable	A who implement link only	Organizational, Manufacturing Product, and Area resources	User-Defined resources and products
Logic Controller	Working	Nonprogrammable	A who implement link only	Organizational, Manufacturing Product, and Area resources	Products only
Tool Device	Nonworking	Nonprogrammable	A with implement link only	Tool Device, NC Machine, Industrial Machine, Inspect, Organizational, Manufacturing Product, and Area	Tool Device and User-Defined resources and products
Storage	Nonworking	Programmable	A with implement link only	Organizational, Manufacturing Product and Area resources	User-Defined resources and products
Sensor	Nonworking	Nonprogrammable	A with implement link only	Organizational, Manufacturing Product, and Area resources	Products only
User-Defined	Nonworking	Programmable	A with implement link only	User-Defined, Transport, Storage, Control Device, Tool Device, NC Machine, Inspect, Organizational, Manufacturing Product, and Area resources	User-Defined resources and products
Manufacturing Product	Nonworking	Nonprogrammable	A with implement link only	Organizational and Area resources	All types of resources and products



E. Detection and Correction of Invalid Resource Structures

A resource structure can be invalid for the aggregation rules for resources (for example, after you have imported a data from a previous version). You can use B.I. Essentials to check your resource structure.

For example, before V6R2011, suppose that you enabled a tool device to aggregate content created. You could have transformed that product into any resource type, such as organizational. However, an organizational resource inside a tool device is not a consistent structure. If you import content with an inconsistent structure into the **3DEXPERIENCE** platform, you can correct it.

From V6R2011 onward, when you generate a resource from a product, checks ensure that invalid structures cannot be created.

Resource Structure Check

To access the **B.I. Essentials** list, from the **Tools** section of the action bar, click **B.I. Essentials** . Search **Resource Structure Check** for product content.

Resource Structure Check detects the following anomalies:

- Resource instances that have a type inconsistent with an aggregating parent.
- Behavior representations that do not have their relative resources loaded.
- Contextual behavior representations aggregated under an organizational resource at a level that is too high.

A colored square next to the tree object or the color of the object in the work area indicates the status of the resource.

F. Inserting a Resource

You can create a new resource reference and a corresponding resource instance.

1. Select the root node in the tree and click **Manufacturing Cell** in the **Resource Structure** > **Insert Resource** subtoolbar.

The **Resource/General Resource Typing** dialog box appears.

2. Specify the attributes you want changed in the tab pages:
 - To edit the attributes of the resource reference, use the **Product DS** tab.
 - To edit the main attributes of the resource (such as times and costs), use the **General resource typing** tab.
 - To edit the attributes of the resource instance (such as identifier), use the **Product Instance**.
 - To specify configuration attributes (such as variability space), use the **Configuration** tab.
3. Click **Finish** to create the new resource or product reference at the designated place in the tree.
4. If needed, create other resources in the tree in the same way.

Note: You can create other resources under certain resources in the tree. For example, tool devices and NC machines under a manufacturing cell. For more information, see [About Resources](#).

G. Inserting an Existing Product or Resource

You can insert an existing product or resource either from the current session or a database.

This task shows you how to:

- Query the Database to Retrieve Data
- Search Session Data for the Existing Product or Resource

Before you begin: Open the content.



H. Query the Database to Retrieve Data

You can query the database for the existing product or resource you want to insert.

1. Click **Existing Product or Resource**
2. On the tree, select a parent for the resource.

The **Insert Existing Product or Resource** dialog box appears.

See *Using the Content Chooser* in the *Collaborative Lifecycle User's Guide*.

3. Click **From Search** tab, specify the search attribute and click:
 - **Search**
 - **Advanced Search**

If you select **Advanced Search**, the **Search Criteria** dialog box appears.

4. Specify the required attributes and click **OK**.
5. Select the resources or products in the list and click **OK**.

I. Search Session Data for the Existing Product or Resource

You can search the session data for existing product or resources footprint using 2D Layout for 3D Design capabilities.

1. Click **Existing Product or Resource**
2. On the tree, select a parent for the resource.

The **Insert Existing Product or Resource** dialog box appears.

See *Using the Content Chooser* in the *Collaborative Lifecycle User's Guide*.

3. From the **From Session** tab, click **Retrieve Loaded Data**.

All the (retrieved) objects in the session are displayed.

Note: The resources or products found by the search can be listed in the following ways:

- **Thumbnails**
 - **Tiles**
 - **Details**
4. Click **Select** in the **From Session** tab.
 5. From navigation or a **Search result** dialog box, select the object to insert.
 6. Select the resources or products in the list and click **OK**.

Module-3. B:Resource-System Scope

This section describes how to use Resource-System scope.

In this section:

- About Resource-System Scope
- Defining a Resource-System Scope
- Removing a Resource-System Scope

A. About Resource-System Scope

Resource-System scope is a key functionality for capacity planning in manufacturing. For a given system, it defines the resource scope on which the system (and operations of the system) can be executed.

This scope is a prerequisite for balancing operations on resources.



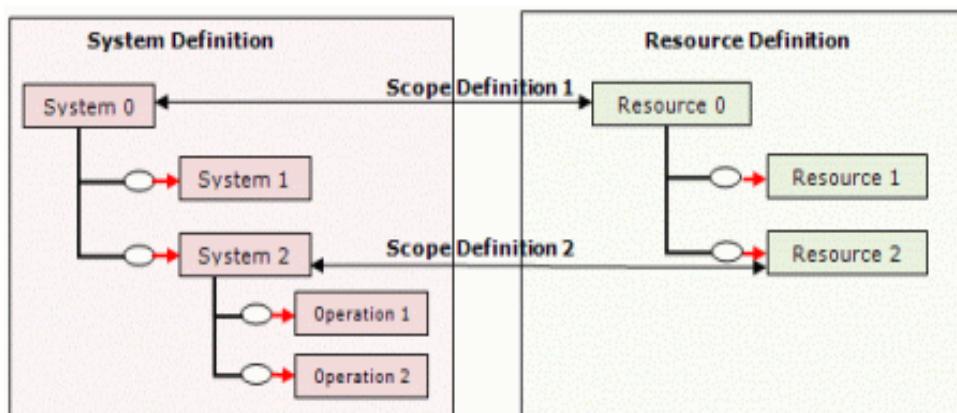
The following topics are discussed:

- Scope Definition Link
- Scope Creation Rules

B. Scope Definition Link

The Resource-System scope is defined by an implement link, or "scope definition link", between a system and an organizational resource.

In the figure below, Scope Definition 1 link means that System 0 is executed on Resource 0. Operations (if any) that are under System 0 must be assigned to resources that are under Resource 0. The scope is between System 0 and Resource 0.



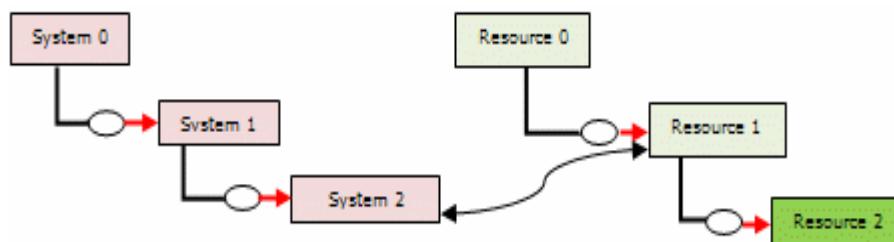
Scope Definition 2 link means that System 2 is executed on Resource 2. Operation 1 and Operation 2 must be assigned by resources under Resource 2. This link defines the resource scope on which the system is executed.

C. Scope Creation Rules

An organizational resource can have several scope definition links to different systems. A system can have several scope definition links to different organizational resources.

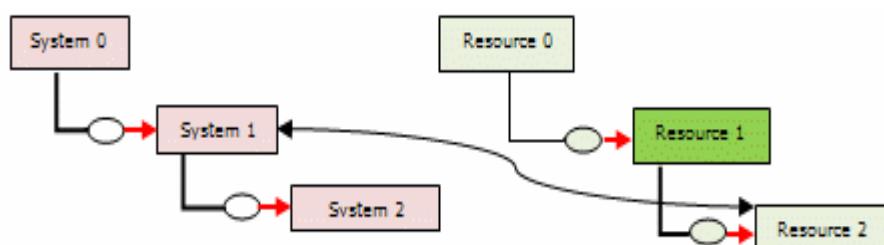
The scope definition link creation is not allowed in the following cases. In such cases, you cannot select the system.

Case 1: Scope Definition link between Resource 1 and System 2 already exists.



If you select Resource 2 and then try to select System 1, you cannot select System 1. The link is not created.

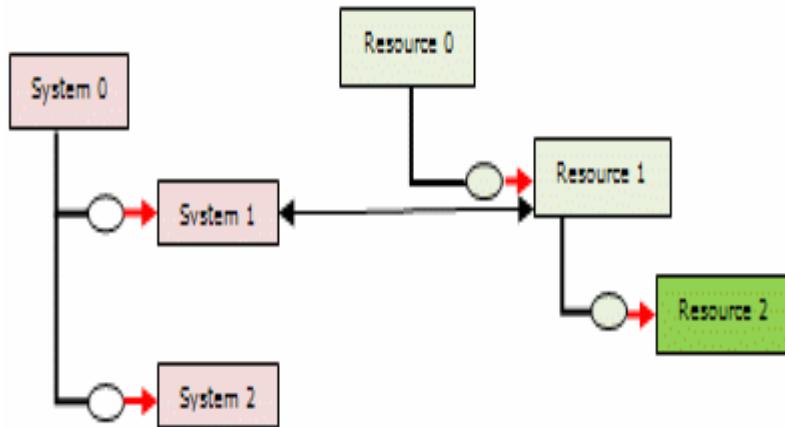
Case 2: Scope Definition link between Resource 2 and System 1 already exists.



If you select Resource 1 and then try to select System 2, you cannot select System 2. The link is not created.



Case 3: Scope Definition link between Resource 1 and System 1 already exists.



If you select Resource 2 and then try to select System 2, you cannot select System 2. The link is not created.

D. Defining a Resource-System Scope

You can define a Resource-System scope. This specifies the resource scope on which the system (and operations of the system) can be executed.

Before you begin: Open content that includes system and resource structures.

- From the **Authoring** section of the action bar, click **Create Resource-System Scope**.

- Select a Resource node in the tree.

This must be an organizational resource such as a Manufacturing cell or an Area.

- Select a System node in the tree.

A message indicates that the Resource-System scope is created.

- To check the scope creation, right-click the Resource and select **Edit > Properties**.

You may have to click the **More** button on the **Properties** dialog box.

- Select the **Resource System Scope** tab in the **Properties** dialog box.

The selected System is listed because it is linked to the Resource by a scope definition link.

E. Removing a Resource-System Scope

You can remove the scope definition link between a resource and a system.

Before you begin: Open content that includes system and resource structures in which scope definition links are defined between a resource and two different systems.

- Right-click the resource and select **Properties**.

In the Resource System Scope tab in the **Properties** dialog box, both systems are listed because they are linked to the resource by scope definition links.

- Close the **Properties** dialog box.

- From the **Authoring** section of the action bar, click **Remove Resource-System Scope**.

- Select the resource.

The Resource System Scope dialog box appears.

Both systems are the candidate links to be removed.

- Select one of the systems and click **OK**.

The Scope Definition Deletion information box appears. It prompts you to confirm the removal. Any assigned operations under the selected system will be unassigned after the removal.

- Right-click the resource again and select **Properties**.

Only the system with the scope link is displayed in the Resource System Scope tab in the **Properties** dialog box.



Module-3. C: Managing Resource to Operation Assignments

This section describes how to manage resource to operation assignments.

In this section:

- Establishing Links Between Resources and Operations
- Managing Resource/Operation Assignments

A. Establishing Links Between Resources and Operations

Assigning links between resources and operations is a key functionality for capacity planning in manufacturing. Operations can be "balanced" on resources to define which resource executes an operation, with what, and where.

The following topics are discussed:

- Working, Nonworking and Organization Resources
- Execute, Used, and Where Links
- Rules for Linking Resources and Operations
- Operation to Resource Assignments Using Drag
- Replace Menu

B. Working, Nonworking and Organization Resources

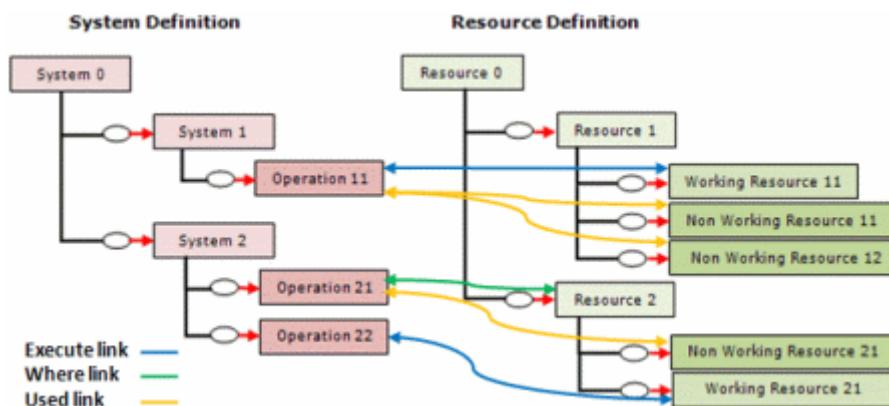
Assigning links between resources and operations is a key functionality in Manufacturing Planning for capacity planning. You can use it to balance operations on resources. Operations are defined in systems. Resource balancing allows:

- Defining which resource will execute an operation. This is a working resource such as Robot or Conveyor. These are also known as 'Who' resources.
- Defining the resource with which an operation will be executed. This is a nonworking resource such as Tool Equipment or Sensor. These are also known as 'With' resources.
- Defining a resource where an operation is executed. This is an organizational resource, such as Manufacturing Cell or Area. These are also known as 'Where' resources.

C. Execute, Used, and Where Links

Execute, Used, and where links connect operations to resources.

An 'Execute link' connects an operation to a working resource. This means that the operation is executed by the linked working resource. An operation can be executed by one working resource only.



In the example above, Working Resource 11 executes Operation 11.

A 'Used link' connects an operation to one or several nonworking resources. This means that the operation uses the linked nonworking resources. An operation can have 0 up to N nonworking resources as used resources.

In the example above, Non Working Resources 11 and 12 are used by Operation 11.

A 'Where link' connects an operation to an organizational resource. This means that the operation will be performed in the footprint area of that organizational resource. An operation can have 0 or 1 localization resource.

In the example above, Operation 21 is localized in Resource 2.



D. Rules for Linking Resources and Operations

There are a number of rules to observe when assigning working, nonworking, and organization resources to operations.

Assigning a Working Resource to an Operation

If the selected operation has no working resource already assigned, the operation is assigned to the selected working resource.

An Execute link is created between the operation and the working resource.

The resource name appears in the Executing Resource column in the Process Gantt charts as the executing resource for the selected operation.

System-Operation	Duration	Begin Ti	End Tim	Executing Resource
Final Assembly	10.00	0.00	10.00	
General System.2	5.00	0.00	5.00	
Loading Operatio	5.00	0.00	5.00	ChuckWorker FA A.1
Assemble Tail Lig	5.00	0.00	5.00	ChuckWorker FA A.1
Visual Checking	1.00	0.00	1.00	ChuckWorker FA A.1

If the selected operation already has a working resource assigned, a dialog box appears: use it to keep or replace the existing resource.

Assigning a Nonworking Resource to an Operation

If the selected operation does not use any nonworking resource or if the selected nonworking resource is not used by the selected operation, the operation is assigned to the selected nonworking resource.

A Used link is created between the operation and the nonworking resource.

The selected resource name appears in the Used Resource column in the Manufacturing System Gantt and Resource Utilization Gantt charts as the used resource for the selected operation.

System-Operation	Duration	Begin Ti	End Tim	Used Resource
Final Assembly	10.00	0.00	10.00	
General System.2	5.00	0.00	5.00	
Loading Operatio	5.00	0.00	5.00	Part Bins Tail Light.1
Assemble Tail Lig	5.00	0.00	5.00	Screw Driver.1,PartBin Screw 10
Visual Checking	1.00	0.00	1.00	

If the selected nonworking resource is already used by the selected operation, a dialog box appears: use it to keep or remove the resource.

Assigning an Organizational Resource to an Operation

If the selected operation has no assigned organizational resource, the operation is localized in the selected organizational resource.

A Where link is created between the operation and the organizational resource.

The resource name appears in the Localization Resource column in the Process Gantt and Resource Utilization Gantt charts as the localization resource for the selected operation.

System-Operation	Duration	Begin Ti	End Tim	Localization Resource
Final Assembly	10.00	0.00	10.00	
General System.2	5.00	0.00	5.00	
Loading Operatio	5.00	0.00	5.00	Station Final Assembly Auto-10.1
Assemble Tail Lig	5.00	0.00	5.00	Station Final Assembly Auto-10.1
Visual Checking	1.00	0.00	1.00	Station Final Assembly Auto-10.1

If the selected operation already has a localization resource assigned, a dialog box appears: use it to keep, remove, or move the resource.



E. Operation to Resource Assignments Using Drag

It is possible to drag an operation to a resource.

The following table summarizes the behavior for dragging an operation on an organizational resource, such as a Manufacturing Cell or Area, directly in the tree.

Operation implemented by a single object	Operation implemented by multiple objects	Drag used with Ctrl
The previous implement link is deleted. The operation is assigned to the organizational resource with a new implement link.	Drag is impossible.	A dialog box appears to indicate that there is already an implement link and requires confirmation before creating a new one. If OK, the operation is assigned to the organizational resource.

The following table summarizes the behavior for dragging an operation on a working resource, such as a Robot or Conveyor, directly in the tree.

Operation implemented by a single object	Operation implemented by multiple objects	Drag used with Ctrl
The previous implement link is deleted. The operation is assigned to the working resource with a new implement link.	Drag is impossible.	A dialog box appears to indicate that there is already an implement link and requires confirmation before creating a new one. If OK, the operation is assigned to the working resource.

It is possible to drag an operation from the tree to the 3D representation of a working resource. In this case, the working resource is assigned to the operation.

If the operation is already assigned to one or more working resources:

- All those resources are unassigned and the operation is assigned to the new working resource.
- If you press Ctrl during the drag, the operation remains assigned to those resources in addition to the new working resource.

The following table summarizes the behavior for dragging an operation on a nonworking resource such as a Tool Equipment or Sensor, directly in the tree.

Operation implemented by a single object	Operation implemented by multiple objects	Drag used with Ctrl
The previous implement link is deleted. The operation is assigned to the nonworking resource with a new implement link.	A dialog box appears to indicate that there is already an implement link and requires confirmation before creating a new one. If valid, the operation assigned to the nonworking resource.	The operation is assigned to the nonworking resource with a new implement link.

F. Replace Menu

The Replace context menu is available in the tree to replace resources.

Replace Commands for Monoselection

You can use the Replace by Existing command to replace the current resource occurrence by another one.

You can use the Replace by Revision command to replace the current resource occurrence by another revision of it.

The Replace by Latest Revision command to replace the current resource occurrence by its latest revision.

The Manage Latest Revisions command displays a Revisions management options dialog box: use it to update several resource occurrences by their latest revisions.

Replace Commands for Multiselection

You can multiselect objects to be replaced. In this case, the following types of replacement can be done:

- N objects replaced by N objects.
- N objects replaced by 1 object.



You can use the Replace Items by Latest Revision command to replace each selected object by its latest revision (N objects replaced by N objects). This command is available if different object types are selected (items and systems, for example).

You can use the Replace Items by Existing command to replace selected objects by a single object of the same type (N objects replaced by 1 object). This command is not available if different object types are selected.

G. Managing Resource/Operation Assignments

You can manage resource and detailing task assignments to operations, and operation and detailing task assignments to resources using the Assignment Manager command.

This task shows you how to:

- Assign Operations to a Resource
- Assign Detailing Tasks to a Resource
- Assign Resources to an Operation
- Assign Resources to an Operation Using the Insert Capable Resource Assistant
- Assign Detailing Tasks to an Operation

Before you begin: Open your resource, system, and item structures and start Equipment Allocation.

H. Assign Operations to a Resource

You can manage operation to resource assignments using the Assignment Manager command.

1. From the Authoring section of the action bar, click Assignment Manager
2. Select a resource in the tree.

The Assignment Manager panel appears with the Operation to Resource Assignment tab selected. It lists assigned and assignable operations of the selected resource.

The screenshot shows the Assignment Manager panel with the 'Operation to Resource Assignment' tab selected. The 'Assigned Operations' section lists three operations assigned to the resource 'Georges A.1 (Georges.1)'. The 'Assignable Operations' section lists two operations that can be assigned to the resource. The 'Case Sensitive' checkbox is unchecked.

Name	Assigned Resource
LoadingBra...Bracket.1)	None
LoadingPa...gPanel.8)	None
Loading Ra...ng Rail2.1)	None

Name	Assigned Resource
Assemble ...ssemble.1)	Lennie A.1 (L...ipeTable.1),
Loading Br...acket 2.2)	Lennie A.1 (L...ipeTable.1),



All the listed operations are derived from the Resource-System scope definition.

The Assigned Operations area lists the operations that are already assigned to the selected resource.

In the Assignable Operations area:

- The tab lists operations that are not assigned to resources of the same resource category as the selected resource.
- The tab lists operations that are already assigned to other resources.

3. You can manage the assignments as follows:

- Assign an operation: in the tab, when you click an operation from the Assignable Operations list, you can assign it to a working resource by clicking Assign Selected Operations .

Note: When you assign an operation clicked from the tab, it creates a new working resource with an implement link to the operation at the targeted position. The previously existing working resource remains in the MBOM structure but its implement link to the product is removed.

In the example above, if the "Assemble operation" is selected, it will be executed by Georges instead of Lennie.

- Assign already assigned operations: in the tab, when you click an already assigned operation from the Assignable Operations list, you can reassign it to the same working resource by clicking Execute Operation by Multiple Resources .

In the example above, if the "Assemble operation" is selected, it will be executed by Georges and Lennie.

- Unassign an operation: in the tab, when you click an operation from the Assigned Operations list, you can unassign it from the working resource by clicking Unassign Selected Operations .
- Filter attribute content: you can filter the content of an attribute column by clicking Filter . A box appears, in which you can specify the data to filter. Then, if you select a column header, the entire column is filtered. To deactivate the filter, click Filter again.
- Filter capable resources: select the Filter for Capable Resources check box to display capable resources among assignable ones. The following capable resources can be displayed:
 - Capable resource references, linked to an item assigned to the current operation
 - Capable resource references, linked to the current operation
 - Capable resource in context, linked to the current operation.
- Customize: you can customize attribute columns by clicking Attributes .

4. Close the Assignment Manager panel to save any modifications made to the assignments.

I. Assign Detailing Tasks to a Resource

You can manage "detailing task to resource" assignments using the Assignment Manager command. For example, you can link a robotic task to a robot resource.

1. From the Authoring section of the action bar, click Assignment Manager .
2. Select a resource in the tree.

The Assignment Manager panel appears, showing the current operation assignments of the selected resource.

3. In the Assigned Operations list, select the line corresponding to the operation.
4. Click the corresponding cell in the Assign/Unassign Detailing column.

If detailing tasks are related to the resource, they are available for selection in a list.

5. Select the detailing task.

The selected detailing task is linked to the resource.



J. Assign Resources to an Operation

You can manage "resource to operation" assignments using the Assignment Manager command.

1. From the Authoring section of the action bar, click Assignment Manager .
2. Select an operation in the tree.

The Assignment Manager panel appears.

3. Select the Resource to Operation Assignment  tab.

The assigned and assignable resources are listed for the selected operation.

The screenshot shows the Assignment Manager panel with the 'Resource to Operation Assignment' tab selected. The 'Assigned Resources' section lists two resources: 'PartBin A....(PartBin.1)' and 'PipeTable ...ipeTable.1', both assigned to the role 'Used'. The 'Assignable Resources' section lists two resources: 'Georges A...eorges.1' and 'Lennie A.1 (Lennie.1)', both currently executing. There are arrows indicating the transfer of resources between the two lists.

Name	Role	Assign/Unassing Detailing
PartBin A....(PartBin.1)	Used	None
PipeTable ...ipeTable.1	Used	None

Name	Role
Georges A...eorges.1	Executing
Lennie A.1 (Lennie.1)	Executing

All the resources that are listed are derived from the Resource-System scope definition.

The Assigned Resources area lists the resources that are already assigned to the selected operation. In the example above, one resource is already assigned to the selected operation.

In the Assignable Resources area:

- the  tab lists the working resources that are not assigned. One or more working resources can be assigned to the operation.
 - the  tab lists the nonworking resources that are not assigned. One or more nonworking resources can be assigned to the operation.
4. You can manage the assignments as follows:
 - Assign a resource: in the  tab, when you click a resource from the Assignable Resources list, you can assign it to the operation by clicking Assign Selected Resources . The item is added to the Assigned Resources list.

Note: When you assign a resource clicked from the  tab, it creates a new operation with an implement link to the resource at the targeted position. The previously existing operation remains in the MBOM structure but its implement link to the resource is removed.

- Unassign a resource: in the  tab, when you click a resource from the Assigned Resources list, you can unassign it from the operation by clicking Unassign Selected Resources . The item is added to the Assignable Resources list.
 - Filter attribute content: you can filter the content of an attribute column by clicking Filter . A box appears in which you can specify the data to filter. Then, if you select a column header, the entire column is filtered. To deactivate the filter, click Filter  again.
 - Customize: you can customize attribute columns by clicking Attributes Customization .
5. Close the Assignment Manager panel to save any modifications made to the assignments.



K. Assign Resources to an Operation Using the Insert Capable Resource Assistant

You can manage "resource to operation" assignments using the Insert Capable Resource Assistant in the Assignment Manager command.

Note: If an operation is linked to an item, you can check that the item is linked to at least one capable resource using the Manage Capable Resources command. For more information, see *Manufactured Item Definition User's Guide: Managing Capable Resources*.

1. From the Authoring section of the action bar, click Assignment Manager .
2. Select the operation in the tree.
- The Assignment Manager panel appears.
3. Select the Resource to Operation Assignment  tab.
4. Click Insert Capable Resource Assistant  in the tab page.

The Insert Capable Resource Assistant panel appears. It lists all the capable resources that are linked to the item that implements the operation. It also lists all the capable resources directly linked to the operation. These capable resources are retrieved from the database.

5. Assign one of the capable resources to the operation as follows:
 - a. Select a resource in the list
 - b. Click Assign Selected Resources .
 - c. Select an organizational resource node in the tree.

The selected resource is inserted under the organizational resource in the tree and is assigned to the operation.

6. To filter the content of an attribute column, click Filter . A box appears in which you can specify the data to filter.
7. Close the Assignment Manager panel to save any modifications made to the assignments.

L. Assign Detailing Tasks to an Operation

You can manage "detailing task to operation" assignments using the Assignment Manager panel. For example, a robotic task of a robot resource can be linked to a manufacturing planning operation.

1. From the Authoring section of the action bar, click Assignment Manager .
2. Select an operation in the tree.
- The Assignment Manager panel appears.
3. Select the Resource to Operation Assignment  tab.

The assigned and assignable resources are listed for the selected operation.

4. In the Assigned Resources list, select a line corresponding to an executing resource.
5. Click the corresponding cell in the Assign/Unassign Detailing column.

If detailing tasks are related to the resource, they are available for selection in a list in this column.

6. Select the detailing task.

The selected detailing task is linked to the operation.

When several working resources are assigned to an operation, you can assign the detailing to one or more resources using the Assign/Unassign Detailing column of the panel.

M. Managing Inconsistent Links for Capable Resources in Context

You can use the **Manage Inconsistent Links for Capable Resources in Context** command to restore coherent resource and process structures.

This enables you to fix incomplete or obsolete implement links between capable resources and operations due to deletions, updates, or new revisions.

Before you begin: Open data containing resource and process structures in your app. The structures must contain inconsistent Capable Resources-System/Workplan links.

1. Select a workplan or an operation.
2. From the Authoring section of the action bar, click Manage Inconsistent Links for Capable Resources in Context .



The Manage Inconsistent Links for Capable Resources in Context panel appears. It displays the list of broken or obsolete implement links found for the selected object and its children.

The columns in the panel are as follows:

- Suggestion to Perform: The proposed action to fix the inconsistent link. Initially and by default, these are:
 - Delete Operation: By default, if no capable resource for rerouting is found in the session.
 - Ignore: By default, if several capable resources for rerouting are found in the session.
 - Reroute: By default, if only one capable resource for rerouting is found in the session and a configuration mode is selected for the session (Define Effectivity or Session Effectivity).
 - Evolve Instance-Reroute: If only one capable resource for rerouting is found in the session and no configuration mode is selected for the session.
- Rerouting Proposal: A capable resource for rerouting the link. This may be:
 - None: If there are no capable resources for rerouting in the session.
 - Ambiguous: If there are several capable resources for rerouting in the session.
 - The resource instance name: If there is only one capable resource for rerouting in the session.
- Previous Resource: The capable resource involved in the inconsistent link.

Note: Manage the selected operations with Center Tree Properties , and Reframe On.

3. Select a Delete line and click Apply.
- The implement link between the capable resource and the operation is deleted.

4. Select a Reroute line and click Apply.
- The implement link is rerouted to the capable resource.

5. Select an Evolve Instance-Reroute line and click Apply.
- The operation is evolved (split), and the implement link is rerouted to the capable resource.

6. Select an Ignore line and click Apply.
- Nothing happens: the inconsistent link remains the same.

7. Right-click the Ignore line and select another suggestion to perform (Delete, Reroute, or Evolve Instance-Reroute), then click Apply.

The inconsistent links are fixed and disappear from the panel.

N. Creating Time Constraint Links Between Operations

You can create time constraint links to specify synchronization or precedence constraints between operations.

When you create time constraints between parent objects, the start times and end times of the child objects are automatically updated.

Time constraints are displayed in the Process Gantt as arrows connecting operations.

Dropping an operation or a system and its children from one system to another keeps external time

constraints (outside the System structure) if the Keep Time Constraints option in Me > Preferences > App Preferences > Simulation > Process Engineering > Equipment Allocation > System/Operation Management > Drag and Drop Operation in System Structure is selected.

This task shows you how to:

- Create a Precedence Link
- Create a Start-Start Link
- Create an End-End Link
- Create an End-Start Link
- Delete a Time Constraint Link

Before you begin: Select a system and open the Process Gantt .

Tip: You can access the commands described below by pressing Ctrl + dragging an operation to another in the Process Gantt. Without the Ctrl key, a product flow is created instead.



O. Create a Precedence Link

You can create a precedence link to specify a precedence constraint between two operations in the same system.

1. From the **Authoring** section of the action bar, click **Create Precedence Link** .
2. Select two operations in the following order:
 - a. Select the operation that must be completed first.
 - b. Select the operation that must start once the first operation is completed.

The precedence link is created and appears in the **Process Gantt**:



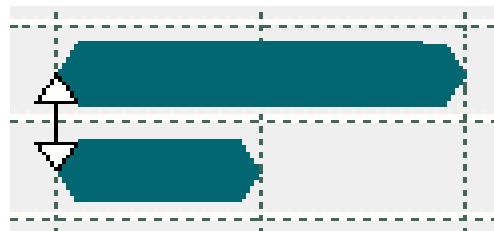
P. Create a Start-Start Link

You can create a start-start link to specify a synchronized start between two operations in the same system.

1. From the Authoring section of the action bar, click **Create Start-Start Link** .
2. Select two operations that must be launched at the same time.
3. Optional: Specify a delay. Right-click the arrow to open the context menu and click **Constraint Properties** .

Note: To edit the delay, double-click the arrow in the Process Gantt.

The start-start link is created and appears in the Process Gantt:



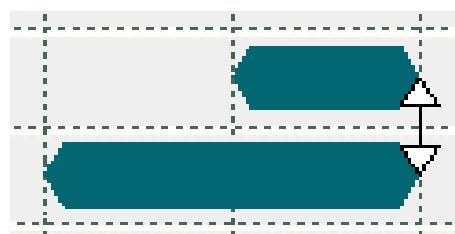
Q. Create an End-End Link

You can create an end-end link to specify a synchronized end between two operations in the same system.

1. From the Authoring section of the action bar, click **Create End-End Link** .
2. Select two operations that must end at the same time.
3. Optional: Specify a delay. Right-click the arrow to open the context menu and click **Constraint Properties** .

Note: To edit the delay, double-click the arrow in the Process Gantt.

The end-end link is created and appears in the Process Gantt:





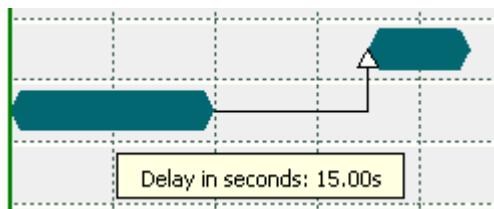
R. Create an End-Start Link

You can create an end-start link between two operations of the same system. The link specifies that the first operation must end at the same time that the second one starts.

1. From the Authoring section of the action bar, click Create End-Start Link .
2. Select two operations in the order of the following constraint:
The first operation must end at the same time that the second one starts.
3. Optional: In the Set Delay dialog box, enter a fixed delay between the end of the first operation and the start of the second one, then click OK.

Note: To edit the delay, double-click the arrow in the Process Gantt or right-click the arrow and click Constraint Properties .

The end-end link is created and appears in the Process Gantt:



S. Delete a Time Constraint Link

You can delete a time constraint link between two operations in the same system.

1. In the Manufacturing System Gantt, right-click the arrow representing the link.
 2. Select Delete Constraint .
- The link is deleted from the Process Gantt.

Module-3. D: Time Types on Operations

This section describes how to define and use time modes in the properties of an operation.

In this section:

- About Time Modes on Operations
- Using Time Modes on Operations
- Updating the Simulated Time

A. About Time Modes on Operations

Manufacturing planning scenarios are based on Gantt resolution of operations executed with different resource types (such as workers and machines). The duration of each operation is computed depending on the resource where the operation is balanced. An operation duration is computed using different methods, which are based on estimated time, measured time, analyzed time or simulated time.

The following topics are discussed:

- Time Modes, Systems, and Operations
- Operation Properties: Time Mode

B. Time Modes, Systems, and Operations

Manufacturing planning scenarios are based on Gantt resolution of operations executed with different resource types (such as workers, robots, and machines). To be as accurate as possible in the planning, the duration of each operation must be computed depending on the resource where the operation is balanced. The duration can be estimated, measured, calculated, or simulated.

In the Gantt chart, operations are displayed after their start and end times are computed by the time solver. An operation computation time can come from different computation modes.

In order to manage the time solving of operations having different time modes, you have the possibility to define directly on operations the time mode to be taken into account. So you can manage the time solving of several operations when their duration computation type is different.



The following Time Mode options are available in the Properties of an operation:

Estimated Time	A user-defined duration, corresponding to an estimated value. Operation duration is retrieved from the "Estimated Time" attribute.
Measured Time	A measured user-defined duration, corresponding to a measured value. Operation duration is retrieved from the "Measured Time" attribute.
Analyzed Time	The time specified using Time-Motion Study standards. Operation duration is retrieved from the Time Analysis defined on the Operation.
Simulated Time	The time obtained by the simulation of the operation. Operation duration is retrieved from the results of the simulation. For more information, see Updating the Simulated Time .
Work Instruction	Operation duration is computed from the duration of the children Work Instructions.
User Defined	Operation duration is retrieved from the DELPLMCustomizedTimeOnOperationID Business rule.

C. Operation Properties: Time Mode

The Properties dialog box of the operation proposes Time Mode options.

Proposed values are:

- Estimated time
- Measured time
- Analyzed time.
- Simulated time
- Work instruction.

At operation creation, the default option is Estimated Time.

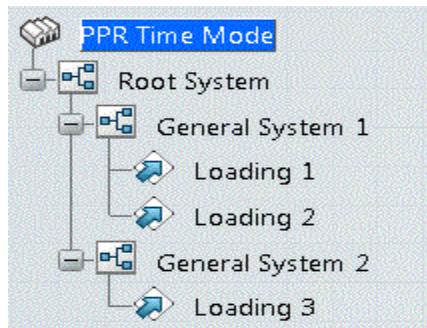
Time value editing is possible for Estimated Time and Measured Time. The other time modes are authored using Time-Motion Study (for Analyzed Time) and detailing applications (for Simulated Time).

D. Using Time Modes on Operations

You can use various time modes on operations: estimated, measured, simulated, and analyzed times.

In the task below, only estimated and analyzed times are shown, and measured and simulated times work in a similar way.

1. Open a system structure with operations similar to the one below in your app.



2. Defined time modes and estimated time values in the Properties dialog boxes of the operations as



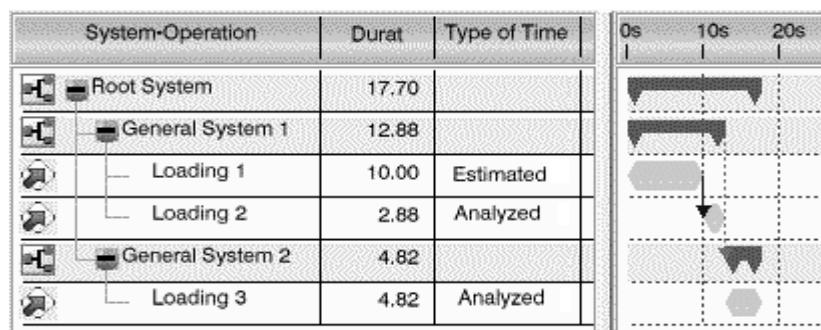
follows:

- Right-click Operation 1 and specify the Time Mode as Estimated Time and the Estimated time to 10.
 - Right-click Operation 2 and specify the Time Mode as Analyzed Time and the Estimated time to 7.
 - Right-click Operation 3 and specify the Time Mode as Analyzed Time and the Estimated time to 25.
3. In the Gantt chart, create precedence time constraints between the Operations 1 and 2.
 4. Using the Time-Motion Study app, create a time analysis for Operation 2:
 - a. Enter a name and the required subsystem and click Finish.
 - b. In the STM interface that opens, define, and save the time analysis.

See the *Time-Motion Study User's Guide* for more information.

In the same way, create a time analysis for Operation 3.

Click Process Gantt to display the Gantt chart.



The times in the Duration column are the times that were specified on the operations, which may be estimated or analyzed times.

E. Updating the Simulated Time

The simulated time associated with an operation is obtained from simulation results. You cannot specify or update it yourself. To update the simulated time, you need to configure and launch a new simulation.

1. Right-click an operation, and select Properties.
2. From the Time Mode list, select Estimated Time.
3. In the Estimated Time field, enter a value greater than the time you expect the operation to take.

Note: If the Estimated Time is smaller than the actual duration computed for the operation, then the simulation stops at the Estimated Time value, even if the operation has not been completed.

4. Load your data in an app that supports level 3 simulation (Behavior and Associated Detailing simulation mode), for example:

- Assembly Definition
- Assembly Evaluation
- Assembly Experience
- Assembly Path Optimization
- Ergonomics at Work
- Ergonomics Evaluation
- Robot Simulation

5. Click Play to launch the simulation.
6. Update the Simulation Options:
 - a. Check the Update Cycle Time option.
 - b. Under Resource Simulation Level of Detail, select Simulation Specification Behavior and Associated Detailing.
 - c. Check the Graphics Update options.

Click Play again to launch the simulation one more time.

Load your data back into .

Right-click the operation, and select Properties.

The Time Mode is now defined as Simulated Time.



From the Authoring section of the action bar, click Process Gantt and verify that the Simulated Time is updated.

Module-3. E: Using Operation Positions

This section gives background information about operation positions, and shows how to define and copy a operation positions.

In this section:

- About Operation Position
- Defining an Operation Position
- Define an Operation Position Using Cumulative Snap
- Copying an Operation Position
- Defining and Copying an Operation Position Using Product Build-Up

A. About Operation Position

An operation position is defined by resource selection. You can adjust the position using the Robot manipulator. You can then use it in simulation to see product positioning.

This capability is especially useful in systems simulation to ensure that placement of parts is correct during manufacturing.

To define an operation position, the operation must be realized by at least one resource. The position is defined relative to the root of the product.

The ability to position a group of operations relative to the "scoped resource" gives more flexibility for the user. The scoped resource is the resource with a scope link to the system.

Resource types are as follows:

- Area or Manufacturing Cell (that is, an organizational resource)
- Robot, Worker, Transport, Conveyor, NC Machine, Industrial Machine, Inspect, Control Equipment, or Logic Controller (that is, a working resource)
- Tool Equipment, Storage, Sensor, Manufacturing Product, or User Defined Resource (that is, a nonworking resource).

Resource categories are as follows:

- Organizational, Working, or Non-working (for resources that are not assigned to any operation)
- Localization, Executing or Used (for resources that are assigned to operations).

The following topics are discussed:

- Operation Position by Copy from One Operation to Another
- Operation Position for a Group of Operations
- Operation Position Relative to the Scoped Resource
- Operation Position Removal

B. Operation Position by Copy from One Operation to Another

You can copy an operation position relative to the same resource type or category, or relative to the scope. A resource used in the definition of an operation position is called a "positioning resource".

If the copied operation is based on a given resource, by default all operations realized by that resource are eligible for copy.

In the Copy Position dialog box:

- Extend to Type means that all operations realized by a resource of the same type as the positioning resource are eligible for copy. In this case, the position is relative to each resource separately.
- Extend to Category means that all operations realized by a resource of the same category as the positioning resource are eligible for copy. In this case, the position is relative to each resource separately.

When a position is copied with respect to another resource, the position is relative. For example, if the position of the copied operation is "in front of" the worker, all operations have a position "in front of" the worker whoever the worker may be.



Copy Relative to Same Resource

If an Operation A has a position defined relative to a Resource A, you can copy this position and apply it to any operation realized by Resource A.

All the possible operations are proposed for multiselection.

If Operation A has a position, copying defines a position for compatible selected operations.

Only an operation with the same scope can be candidate for the copy, since all operations must be realized by the same resource.

In the figure below, if Operation Ap is selected for a copy relative to same resource, Operations B and Dp are candidates for the copy of position defined on Operation Ap, since they are realized by Station.1.

Station.1 defines the position on Operation Ap. For this copy, the positions refer to Station.1.



Then if Operation Dp is selected for copy, the previous position defined on Dp is overwritten by the copied position.

If Operation Dp is selected for a copy relative to same resource, Operations B and C are candidates for the copy of position defined on Operation Dp since they are realized by resource Key. Key defines the position on Operation Dp. For this copy, the positions refer to Key.

Note: The copied position in "same resource" mode results in an identical position of the root product to produce for each operation selected.

Copy Relative to Same Resource Type

If an Operation A has a position defined relative to a Resource A, you can copy this position and apply it to any operation realized by a resource of the same type (such as Robot or Worker).

All the possible operations are proposed for multiselection.

Any operation with no relationship with the scope can be candidate for copy, since all operations are not to be realized by the same resource (only the type is considered).

Copy Relative to the Same Resource Category

If an Operation A has a position defined relative to a Resource A, you can copy this position and apply it to any operation realized by a resource of the same category (such as Executing or Used).

All the possible operations are proposed for multiselection.

Any operation with no relationship with the scope can be candidate for the copy, since all operations are not to be realized by the same resource (only the category is considered).



Copy Position and Working Resources

The Copy Position command displays all working resources in the Copy Position dialog box, although only one is to be selected.

In the case of extending the working resources, a selector in the New Positioning Resource column of the dialog box lets you choose the working resource used for positioning.

There are two cases:

- When an extend mode is selected, the copied position copied refers to a working resource. All operations assigned to this working resource are candidates for the position copy.

Note: The Current Positioning Resource column indicates the resources for operations that already have a position.

- When you select an extend mode, more resources are available for the position copy. A Select a resource selector is displayed to indicate that an indetermination must be resolved.

For example, if two operations are both assigned to two working resources, you must select which one is the positioning resource.

The Extend to category: Executing case could give more choices (for example, if robots or conveyors are also available). For multiselection, select the rows by pressing Ctrl + clicking OK.

C. Operation Position for a Group of Operations

You can define a single operation position related to a single resource that is shared by a group of compatible operations.

If you start the Operation Position > Define Position contextual command on several selected operations, the list of compatible operations is given. The listed operations must have a common resource or must share the same scope.

Then a single common position for all operations is defined. This single position is related to a single resource shared by all the operations. This resource could be the scoped resource.

The position used for the entire group is based on the first compatible operation of the group. If an incompatible operation is selected, it is ignored.

D. Operation Position Relative to the Scoped Resource

You can define a single operation position relative to the scoped resource.

In the case where all operations are directly under an organizational scoped resource, the organizational resource cannot be assigned to operations.

Since the organizational scoped resource groups the operations, the operation position should be defined relative to this resource.

In the Operation Position > Define Position contextual command, the list of possible resources for the operation position includes a scoped resource. The scoped resource is found first from the localization resource.

If the operation is not realized by an organizational resource (for example, if it has no localization resource), the scoped resource is found from the executing resource.

If the operation is not realized by an organizational or working resource (for example, it has no localization resource and no executing resource), the scoped resource is found from one of the used resources (since they share the same scope).

The scope is restricted to the lower scope linking the system above the operation. If selected operations are linked to several scopes, there is no common scoped resource and it is impossible to define an operation position.

Note: An eligible operation must be realized by at least one resource. It is impossible to position relative to the scoped resource an operation with no resource assigned.

E. Operation Position Removal

You can use the Operation Position > Remove Position contextual command to remove an operation position.

F. Defining an Operation Position

You can define an operation position with respect to a resource. In this case, a product is positioned relative to the resource that realizes the operation. Similarly you can define a position for a group of operations. In this case, the operations have a position defined by a common resource.



This task shows you how to:

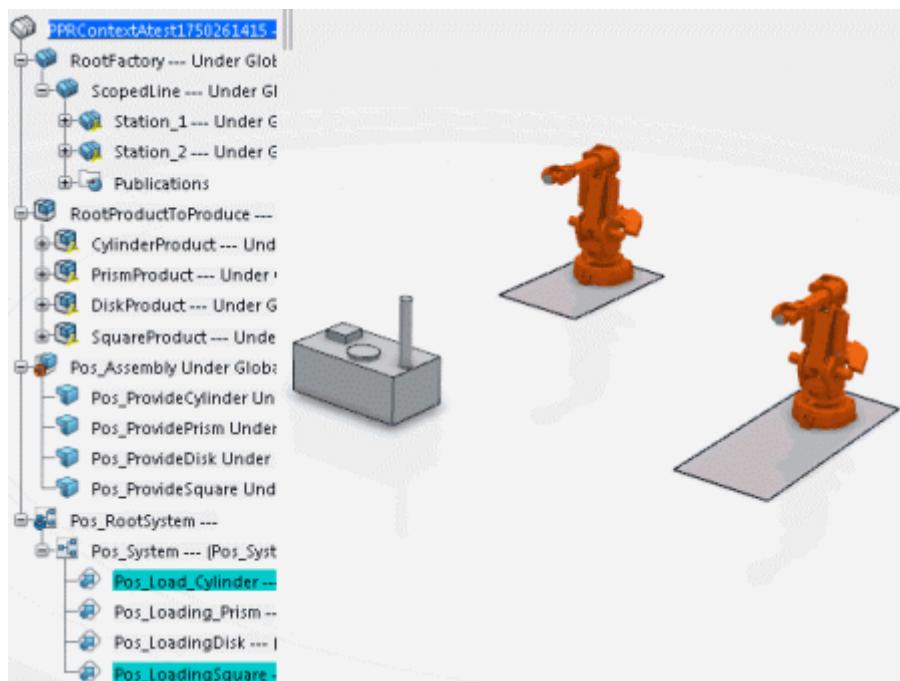
- Define an Operation Position on Several Operations
- Remove an Operation Position

Before you begin: Open your product, resource, item, and system structures and start Equipment Allocation.

G. Define an Operation Position on Several Operations

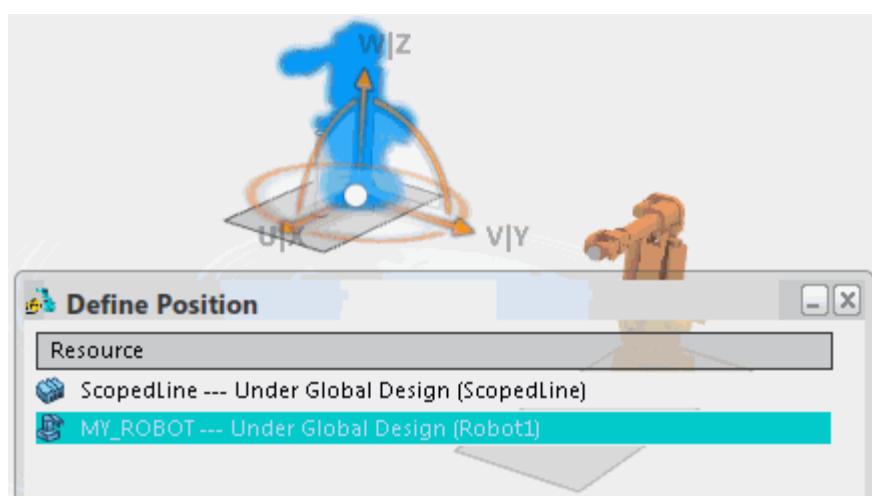
You can define an operation position for a group of operations. In this way, products can be positioned relative to a resource that realizes the group of operations.

1. Pre-select two operations in the tree, right-click them and select Operation Position > Define Position.



An information box appears indicating that the two selected operations are compatible for positioning.

2. Click OK in the information box.
3. In the Define Position dialog box that appears, select Robot1 and click OK.



The cylinder and square are displayed in position with respect to the Robot1.

Notes:

- If the resource used for positioning is changed, the product moves to the new position.
- If several working resources are assigned to the operation, they are all listed. However, only one working resource can be selected.



4. Select the root System in the tree and click Manufacturing System Gantt from the action bar. The two selected operations have a position defined by a common resource Robot1.

System-Operation	Executing Res	Localization Res	Resource used for positioning
Pos_RootSystem ---			
Pos_System --- (Pos_Sy			
Pos_Load_Cylinder -	Robot1	Station_1.1	Executing(Robot1)
Pos_Loading_Prism	Robot2	Station_2.1	
Pos>LoadingDisk ---	Robot2		
Pos>LoadingSquare	Robot1		Executing(Robot1)

Note: A Cumulative Snap command is available in the Define Position dialog box for quick and accurate positioning of a product relative to a resource.

H. Remove an Operation Position

You can remove an operation position that is defined on one or more operations.

1. Pre-select the operations with a defined position, right-click them and select Operation Position > Remove Position.

An information box appears indicating the operations whose position is to be removed.

2. Click OK in the information box.

The operation position is removed.

3. Select the root System in the tree and click Manufacturing System Gantt .

System-Operation	Executing Res	Localization Res	Resource used for positioning
Pos_RootSystem ---			
Pos_System --- (Pos_Sy			
Pos_Load_Cylinder -	Robot1	Station_1.1	
Pos_Loading_Prism	Robot2	Station_2.1	
Pos>LoadingDisk ---	Robot2		
Pos>LoadingSquare	Robot1		

There are no longer any resources used for positioning the operations: the previously defined position is removed from the operations.

I. Define an Operation Position Using Cumulative Snap

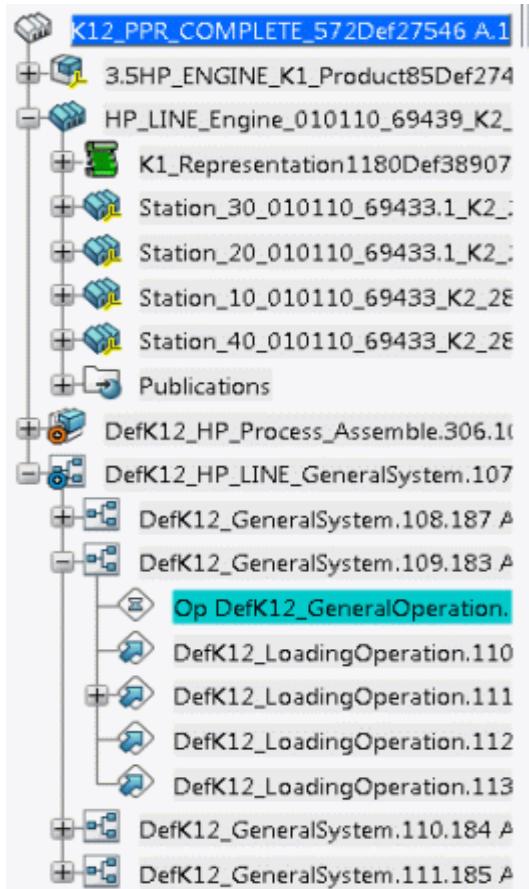
You can use the Operation Definition and Cumulative Snap capabilities for a quick and accurate positioning of a product relative to a resource.

Note: In the Operation Definition capability, the product is positioned relative to the resource that realizes the selected operation.

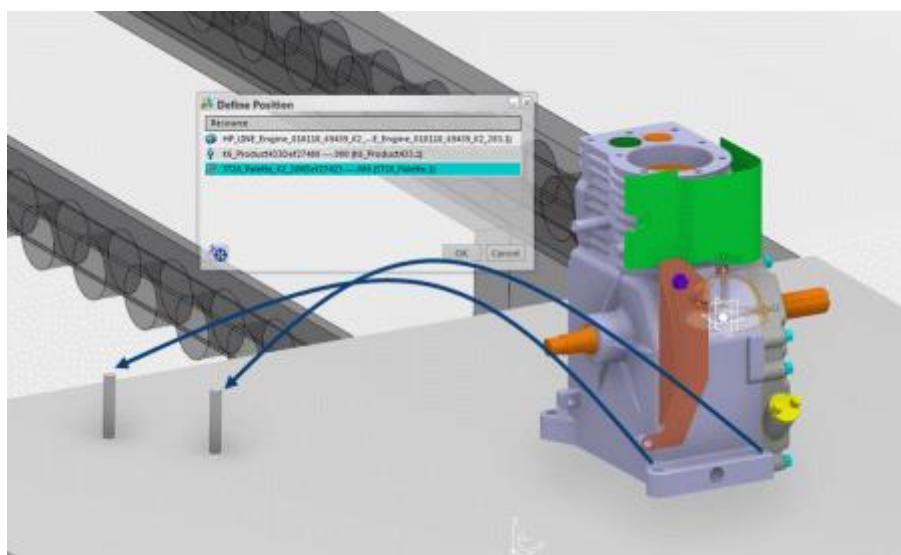
Before you begin: The purpose of the scenario is to position an engine assembly on two locating pins on a palette on a given station in an assembly line. To reproduce this scenario, open a PPR Context similar to the one used here and start Equipment Allocation.



1. Right-click the general operation in the tree and select Operation Position > Define Position.



2. In the Define Position dialog box that appears, make sure that the palette resource is selected. The image below shows how the two holes on the base of the engine assembly are to be positioned on the two locating pins.



3. Using the Robot, move the engine assembly vertically above the palette, so that it is at a level above the top of the locating pins.
4. In the Define Position dialog box, click Cumulative Snap.

The Cumulative Snap dialog box appears. It comprises:

- A drop-down list of options for specifying the type of geometry to use in the snap
- Two commands for inverting the snap direction by a 180 degree rotation of the U-axis or V-axis.



5. Select Arc center from the drop-down menu, and select the first hole on the base of the engine.
6. Select Line only from the drop-down menu, and select a locating pin on the palette.
7. Using the Robot, move the engine so that the center of the hole and the axis of the locating pin are aligned.

The first constraint is defined.

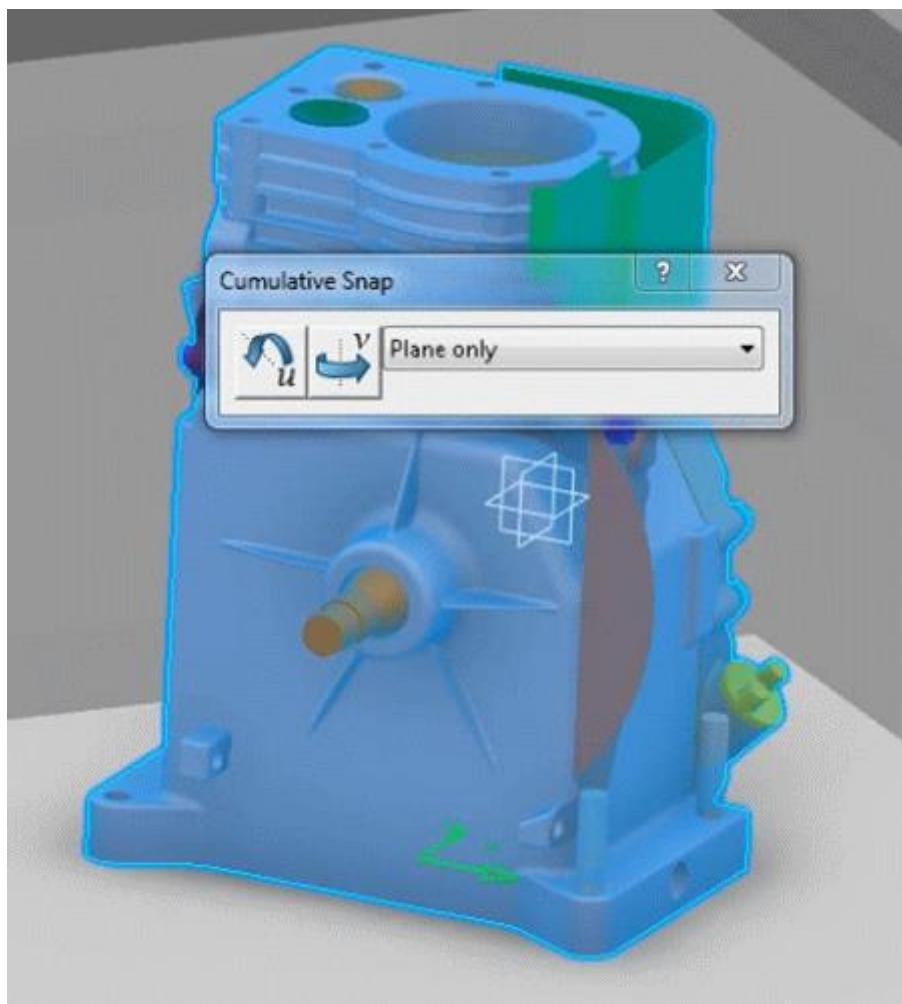
8. Select Arc center from the drop-down menu, then select the second hole on the base of the engine.
9. Select Line only from the drop-down menu, and select the other locating pin on the palette.
10. Using the Robot, move the engine so that the center of the second hole and axis of the second locating pin are aligned.

The second constraint is defined. The first constraint is also respected.

Note: The holes are aligned with the locating pins, but the engine is not yet lying on palette.

11. Select Plane only from the drop-down menu, then select the base of the engine.
12. Using the Robot, move the engine so that it lies on the palette, and is positioned using the locating pins.

The third constraint is defined. The second and third constraints are also respected.



13. Close the Cumulative Snap dialog box. In the Define Position dialog box, click OK to define the new operation position.

J. Copying an Operation Position

You can copy an operation position from one operation to another.

1. Define a position on the operation TSTLoadingCylinder relative to the resource UserResource1.2.
2. Define a position on the operation TSTLoadingCube relative to the resource RobotCube.
3. Pre-select LoadingCylinder, which has a defined position, and select Operation Position > Copy Position.

The Copy Position dialog box appears.



The Current positioning Resource column indicates that there is an existing position on TSTLoadingCube. All new positioning resources are proposed as UserResource1.2 because the copied position is defined on UserResource1.2.

Copy Position from TSTLoadingCylinder A.1

Positioning resource :UserResource1.2, Type:User Defined, Category:Used

Extend to type: User Defined
 Extend to category: Used

Operation	New positioning Resource	Current positioning Resource
TSTLoading1User A.1	UserResource A.1 (UserResource1.2)	-
TSTLoading2User A.1	UserResource A.1 (UserResource1.2)	-
TSTLoadingToolDevice A.1	UserResource A.1 (UserResource1.2)	-
TSTLoadingCube A.1	UserResource A.1 (UserResource1.2)	RobotCube A.1 (RobotCube.1)

4. Select the check box Extend to type: User Defined.
The Current positioning Resource column shows that only operation TSTLoadingCube has a position: it is relative to resource RobotCube.1

When several resources of the type User Defined are possible, the text Select a resource gives access to a drop down list. You can select a new positioning resource from the list.

Copy Position from TSTLoadingCylinder A.1

Positioning resource :UserResource1.2, Type:User Defined, Category:Used

Extend to type: User Defined
 Extend to category: Used

Operation	New positioning Resource	Current positioning Resource
TSTLoadingCube A.1	Select a resource	RobotCube A.1 (RobotCube.1)
TSTLoading1User A.1	UserResource A.1 (UserResource1.2)	-
TSTLoading2User A.1	Select a resource	-
TSTLoadingToolDevice A.1	UserResource A.1 (UserResource1.2)	-

5. Select the check box Extend to category: Used.
When several resources of the category Used are possible, the text Select a resource gives access to a drop down list. You can select a new positioning resource from the list.

6. Select new positioning resources for the operations.

Copy Position from TSTLoadingCylinder A.1

Positioning resource :UserResource1.2, Type:User Defined, Category:Used

Extend to type: User Defined
 Extend to category: Used

Operation	New positioning Resource	Current positioning Resource
TSTLoadingCube A.1	UserResource A.1 (UserResource1.3)	RobotCube A.1 (RobotCube.1)
TSTLoading1User A.1	UserResource A.1 (UserResource1.2)	-
TSTLoading2User A.1	UserResource A.1 (UserResource1.2)	-
TSTLoadingToolDevice A.1	ToolDevice A.1 (ToolDevice1.1)	-

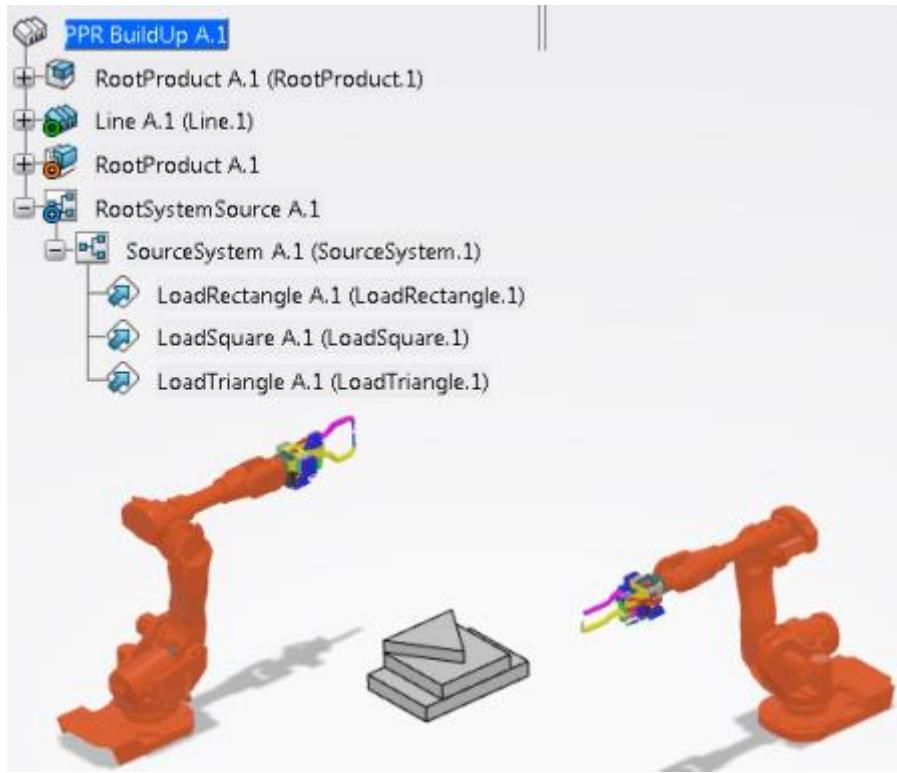
7. Click OK to accept the new operation positions.



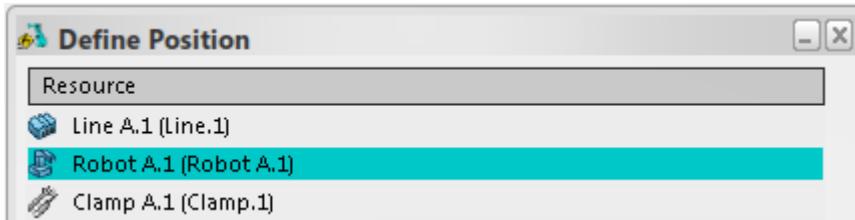
K. Defining and Copying an Operation Position Using Product Build-Up

When defining or copying an operation position, you can use Product Build-Up Options to show the currently provided part and the previously assembled parts in different colors.

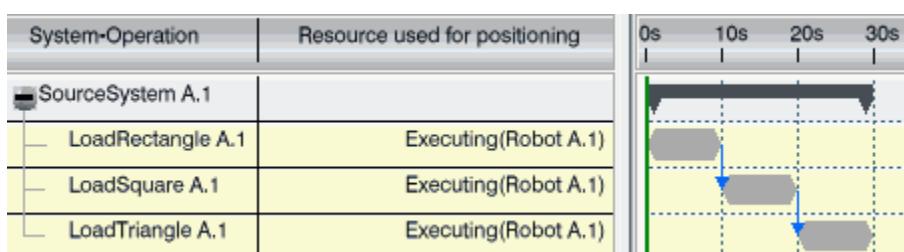
1. Open a PPR Context that has product, resource, item, and system structures, and start Equipment Allocation.



2. In the tree, preselect the three operations, right-click them, and select Operation Position > Define Position.
3. In the Define Position dialog box that appears, select the robot resource and click OK.



4. Select the source system in the tree and click Process Gantt from the action bar. The three operations have a position defined by the robot resource.

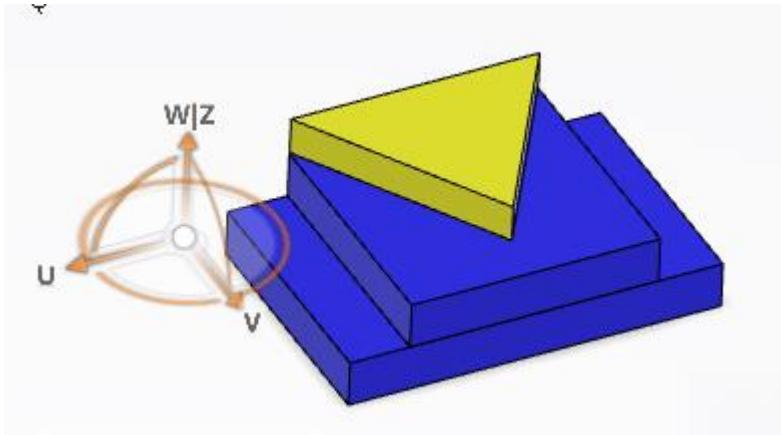


5. Right-click the "LoadTriangle" operation in the tree and select Operation Position > Define Position.
6. Click Product Build-Up Options at the right edge of the work area. The Product Build-Up Options panel appears. For more information, see Product Build-Up Options Panel.

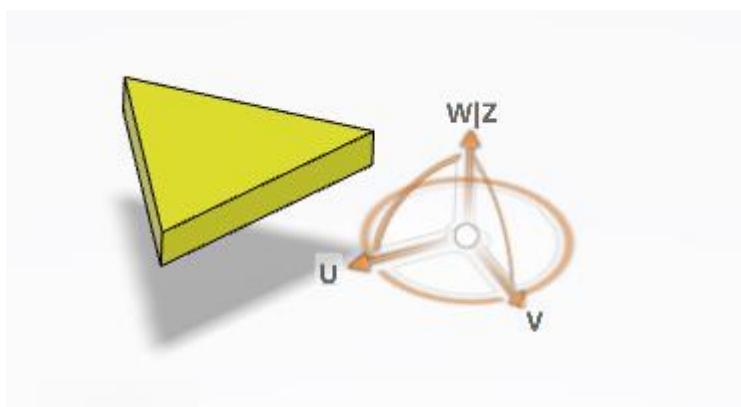


Note: The Resources Display build-up options can be used when defining or copying a position to show all resources, show assigned resources only, or hide all resources.

7. Select the Current and Previous in System check boxes.
The currently provided part is displayed in yellow. The previously assembled parts are displayed in blue.



8. Click the Hide button next to the Previous in System option.
The currently provided part is displayed in yellow. The previously assembled parts are hidden.



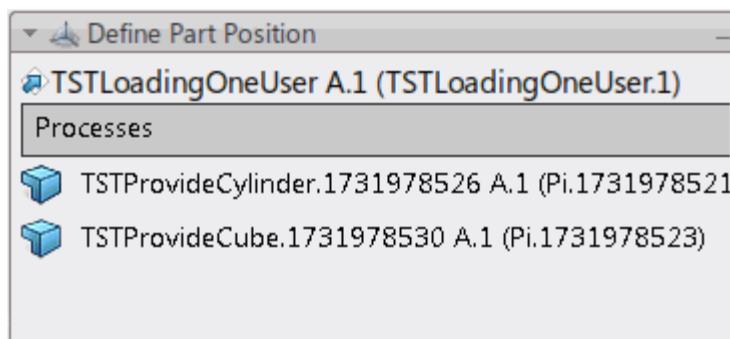
L. Defining a Part Position

You can define a position for parts on an operation that has implemented items. Part position is taken into account for product buildup, systems simulation, assembly simulation, and so on.

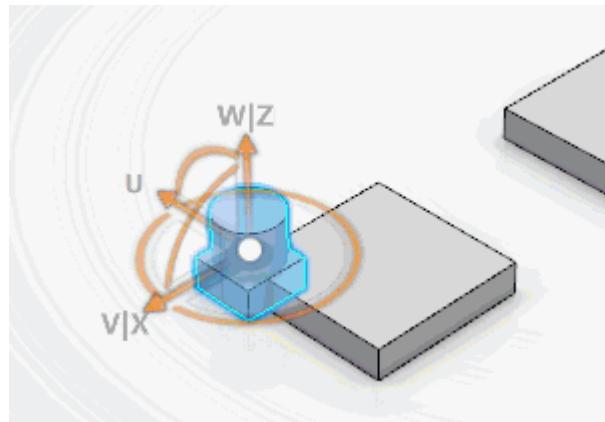
Before you begin: Open your content, which should include product, item, and system structures, and start Equipment Allocation.

1. Right-click an operation that has implement links to items and select Part Position > Define Part Position.

The Define Part Position dialog box appears, which lists the implemented items.



The Robot is attached to the product assigned to the first item. A context toolbar is also displayed.



Note: If you select an operation that does not have implement links to items, you can select items directly in the tree.

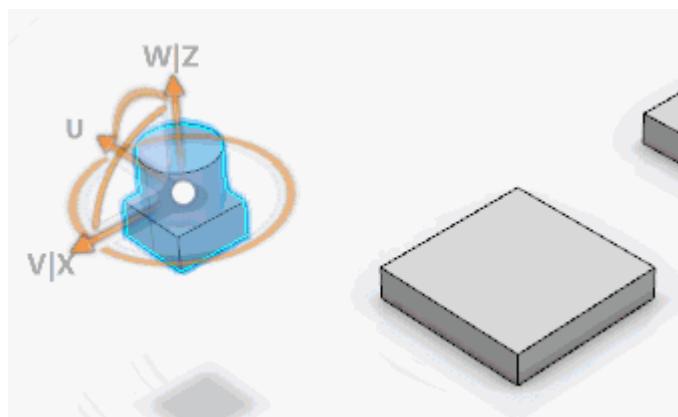
2. If needed, use the commands of the context toolbar:

- Cumulative Snap : You can select any geometric element from the selected product and snap it to other geometric elements of the other products. All the selected products move to the new position.
- Attach/Detach : On launching the command, the Robot is snapped to the center of the first selected product in attached mode. To modify the position of the selected products, you can move the Robot to any position. All the selected products simultaneously move relative to the Robot. In attached mode, the Robot is colored orange.

If you want to put the Robot in a different location, you must detach the Robot from the product. You can then place the detached Robot anywhere in the work area without moving the products. In detached mode, the Robot is colored gray.

- Restore Position : You can restore the position of currently selected products to their design position relative to the root product.
- Activate/Deactivate Dynamic Clash: When dynamic clash is enabled, you can detect if the defined position is in collision with the environment when the objects are moved using the Robot.

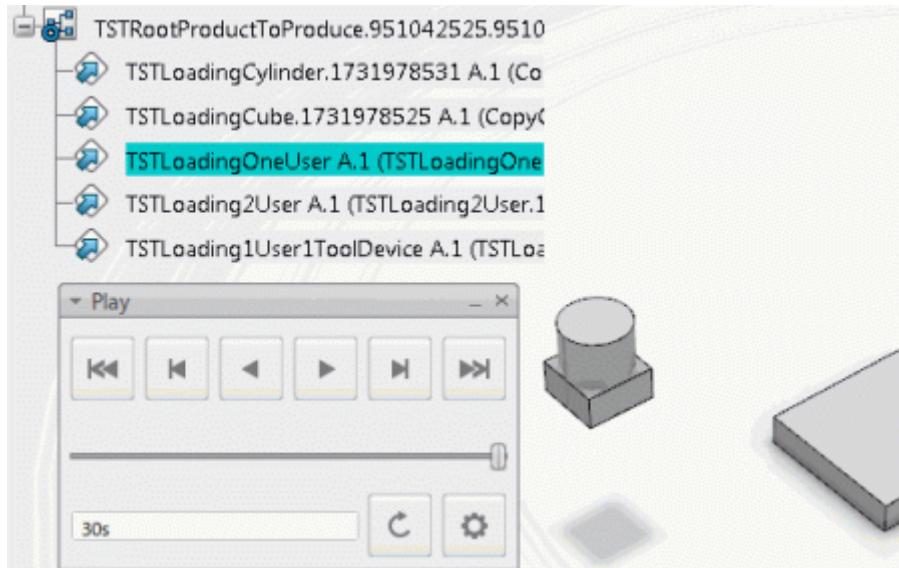
3. Use the Robot to position the products assigned to the items.



4. Click OK in the context toolbar to define the part position.

5. Click Play in the Compass to simulate the system.

The part position is taken into account in the simulation.



Note: You can remove a part position using the Part Position > Remove Part Position context command

M. Defining a Resource Position

You can define a resource position relative to an item, to a manufactured product, or to another resource. Only resources assigned to operations can be selected.

1. In the tree, right-click an operation and select Resource Position > Define Resource Position .
 2. In the work area, select a resource already assigned to the operation.
- Multiselection is possible by pressing Ctrl or Shift before selection.
3. Use the Robot to move the resource to the desired location.
- The moved resource is listed in the Define Resource Position dialog box.

Alternatively, you can click Add  to display the resource in the Define Resource Position dialog box.

4. Optional: Use the following context toolbar commands:
 - Cumulative Snap : lets you select any geometric element from the selected resource and snap it to other geometric elements of the other resources. All the selected resources move to the new position.
 - Attach/Detach : snaps the Robot to the center of the first selected resource in attached mode. To modify the position of the selected resources, the Robot can be moved to any position. All the selected resources are simultaneously moved relative to the Robot.

If you want to put the Robot in a different location, you must detach the Robot from the resource. You can then place the detached Robot anywhere in the work area without moving the resources. In detached mode, the Robot is colored gray.

- Activate/Deactivate Dynamic Clash : detects if the defined position is in collision with the environment when resources are moved using the Robot.
5. In the Define Resource Position dialog box, select a reference object for positioning the resource:
 - Implemented Item: positions the resource relative to the item implemented by the operation. You can select this option only if the operation implements a single item. This option is selected by default.
 - Build up: positions the resource relative to the manufactured product position. This option is selected by default if no item or more than one item is/are implemented by the operation.
 - Layout: positions the resource relative to its parent resource.
 - User defined referential: positions the resource relative to the item or resource of your choice. Use the  button to select the item or resource.

The resource is positioned relative to the selected reference object.

6. To specify the duration of the resource position, choose one of the following items from



the Applicability list:

- Operation: the resource remains on the selected position for the entire operation duration.
- System: the resource remains on the defined position until a new position is detected, or until the end of the system.

To stop System applicability on a resource before the end of the system, use Release from the context toolbar.

Module-3. F: Cycle Time Management

This section describes how to manage cycle times for systems.

In this section:

- About Cycle Time Management
- Defining Cycle Times
- Displaying System Utilization
- Displaying Resource Utilization

A. About Cycle Time Management

Cycle time describes the period required to complete one cycle of a system. The cycle time is defined in the system properties.

- Cycle Time Definitions
- Cycle Time System Inheritance
- Cycle Time Display

B. Cycle Time Definitions

This describes the cycle time definitions.

Leaf System

System with no child system. In the Process Gantt Chart panel, cycle time is displayed only for leaf systems.

Leaf Organizational Resource

Organizational resource with no organizational resource child.

Utilization

Displayed in the Process Gantt Chart, it is the ratio in percentage between the total time of the operations and the system cycle time.

Displayed in the Resource Utilization Gantt Chart and Resource Balancing panel, it is ratio in percentage between the working resource total time and the working resource cycle time.

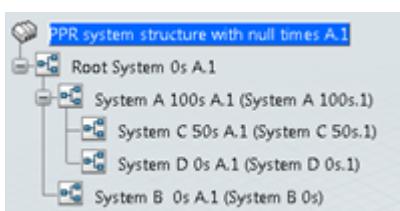
Idle Time

Displayed in the Resource Utilization Gantt Chart and Resource Balancing panel, it is the time during which a resource is not used.

C. Cycle Time System Inheritance

When a system has a zero cycle time, it automatically inherits its parent system cycle-time. If the parent system itself has a zero cycle time, it remains zero.

For example, in this figure, defined cycle times are written next to the system:



Because of the inheritance principle, the result is:

- Root System has a zero cycle time, but it does not change because it has no parent.
- System D has a zero cycle time, so it inherits its parent System A cycle time: 100 sec.



- System B has a zero cycle time, but its parent Root System is zero, so System B stays with a zero cycle time.
- The other cycle times do not change.

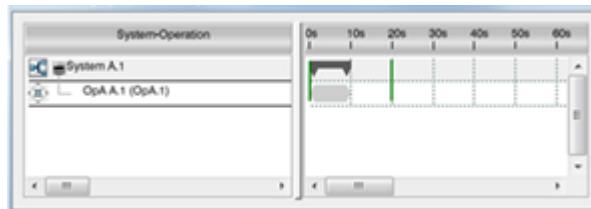
D. Cycle Time Display

Once cycle times are defined for systems, they are displayed in different panels and Gantt charts.

Process Gantt Chart

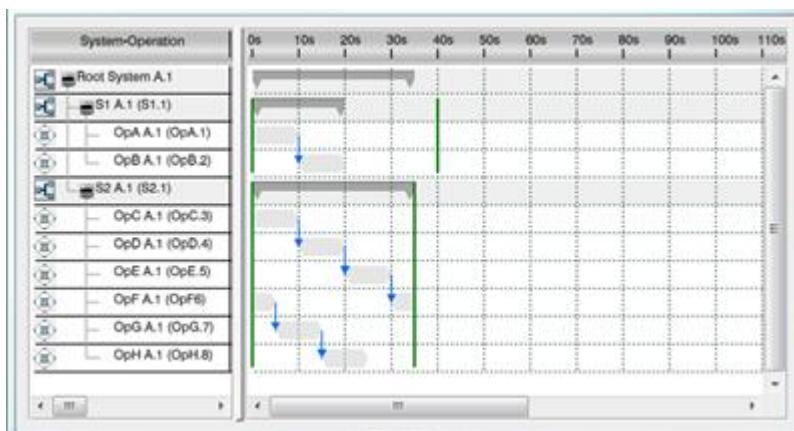
In the Process Gantt Chart, cycle time is displayed by two vertical green bars called cycle bars. They appear if the system is a leaf system and has operations.

The cycle bars stretch from the top of a system row to the bottom of its last operation row.

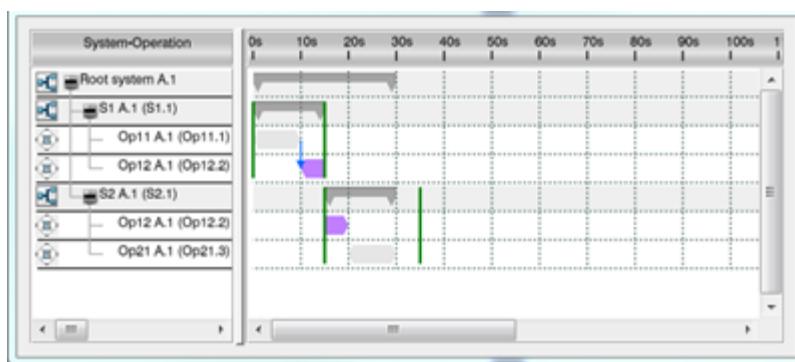


If the leaf system has a zero cycle time, only the first bar is displayed.

When operations exceed the cycle time, in system view and product flow on cycle time view, they are cut and displayed underneath. For example, in the image below, OpF to OpH exceed the cycle time.



In the case of drifting operations, the drifted operations are colored violet.

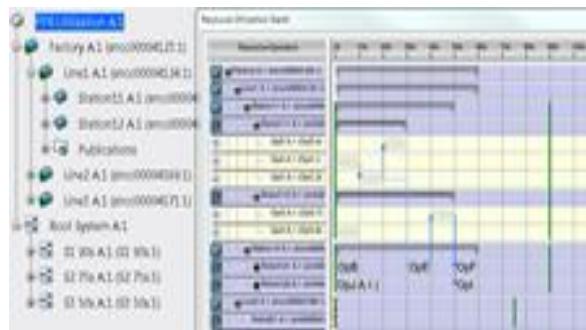


Resource Gantt Chart

In the Resource Utilization Gantt Chart cycle time is displayed by two vertical green cycle bars. They appear for leaf organizational resources and their working resource children. The cycle time is the one inherited from the organizational resource that has a scope with a system. This resource has the same cycle time as the system.



For example, in the case below:



The organizational resource Line1 has a scope with the system S1 that has a cycle time of 90 seconds. Line1 has organizational resources as children: Station11 and Station12. Station11 and 12 inherit the cycle time of S1. They do not have child organizational resources, so the cycle time is displayed with green bars. The working resources under Station11 and 12 also inherit the same cycle time.

E. Defining Cycle Times

You can define different cycle times on systems part of the same system structure.

1. In the tree, right-click a system node and select Properties.
2. In the Reference tab of the Properties dialog box, enter an appropriate cycle time, in seconds.

F. Displaying System Utilization

You can display the utilization of systems in a column of the Process Gantt chart.

Before you begin: Cycle times must be defined on systems.

1. From the top bar, select Me > Preferences > App Preferences > Simulation > Digital Manufacturing Apps Common Services > Manufacturing Planning Apps Common Services > Utilization.
2. In the Utilization Computation section, select the Calculate and display utilization of systems and working resources option.
3. From the Tools section of the action bar, click B.I. Essentials .
4. In the B.I. Essentials, select Systems Utilization.

The utilization colors are displayed in the tree.

5. You can also see the utilization of the systems in the Process Gantt chart: from the Authoring section of the action bar, click Process Gantt .

The utilization is displayed in the Utilization column.

G. Displaying Resource Utilization

You can display the utilization of working resources.

Before you begin:

- Cycle times must be defined on systems.
- A Resource-System scope is defined.

1. From the top bar, select Me > Preferences > App Preferences > Simulation > Digital Manufacturing Apps Common Services > Manufacturing Planning Apps Common Services > Utilization.
2. In the Utilization Computation section, select the Calculate and display utilization of systems and working resources option.
3. From the Tools section of the action bar, click B.I. Essentials .
4. In the B.I. Essentials, select Resources Utilization.

The utilization colors are displayed in the tree and on the 3D representation of resources, if any.

5. You can also see the utilization of the resources in the Resource Utilization Gantt chart: from the Authoring section of the action bar, click Resource Utilization Gantt .

The utilization is displayed in the Utilization column.



Module-3. G: Process Gantt Chart

This section describes how to use the Process Gantt chart.

In this section:

- About the Process Gantt Chart
- Using the Process Gantt Chart
- Managing Display of Systems in the Process Gantt Chart
- Displaying B.I. Essentials Colors in the Process Gantt Chart
- Using Value Added Information in the Process Gantt Chart
- Locating an Object in the Process Gantt Chart Using Auto-Scroll
- Exporting Process Gantt Chart Information to an XML File
- Customizing Columns of the Process Gantt Chart

A. About the Process Gantt Chart

The Process Gantt chart provides a System/Operation view and an interface for displaying systems and their operations. It also allows for creating new operations, inserting them from a catalog or a library, and linking them with time constraints.

The Process Gantt does not manage flow between systems. Flow is created, modified, or deleted in the System Editor.

The following topics are discussed:

- Opening the Process Gantt
- Columns in the Process Gantt
- Tree Expansion
- Cycle Time Display
- Flow View and System View
- Operation Creation
- Operation and System Reordering
- Product Flow and Constraint Creation
- Operation Colors
- Specifying Scale Units
- Modification of an Operation Duration
- Value Added Information
- Time Bar for Point Fastening Operations in the Gantt Chart

B. Opening the Process Gantt

The Process Gantt chart is opened by selecting the Process Gantt command, then selecting either the root system or a child system under the root system.

Multi-selection is not available. Only one system and its children are displayed in the Process Gantt.

If a child system is selected:

- The constraints between operations are taken into account even if they are not displayed in the Gantt scope.
- The product flow is taken into account even if it is outside what is displayed in the Gantt scope.



C. Columns in the Process Gantt



The columns of the Process Gantt chart display information about systems, operations, parts, fasteners, and resources. Any of the columns (except System-Operation) can be hidden/shown by right-clicking in the header area and clearing /selecting any of the column check box options.

The columns in this Gantt chart are as follows:

- System-Operation: Displays a tree view of the systems and operations.
- Duration: Difference between the start and end time.
- Begin Time: Start time of an operation.
- End Time: End time of an operation.
- Associated Parts: Instance names of the assigned parts of an operation. Parts may be displayed as a list with a separator (,).
- Type of Time: Estimated, simulated, or analyzed time of an operation.
- Utilization: Percentage of time for which a resource is used.
- Value Added: The value added is an optional attribute that can be defined in each operation of the system. This value is shown for each operation, and the average value of all operations is shown for the system. For more information, see [Value Added Information](#).
- Number of Fasteners: Displays the number of assigned fasteners for operation and resources. The first number on the resource indicates the number of fasteners assigned directly to this resources behavior. The number in brackets is the sum of the fasteners assigned to the resources direct behavior and all fasteners assigned to all child behaviors.
- Number of Spots: Displays the number fastener spots. See [Time Bar for Point Fastening Operations in the Gantt Chart](#)
- Executing Resource: The working resource assigned to the operation.
- Localization Resource: The organizational resource assigned to the operation.
- Used Resource(s): The not working resources assigned to the operation.
- Resource used for positioning: The resource used for parts positioning for a given operation.

To hide/show any of the columns (except System-Operation), right-click in the column header area and deselect/select any of the column check box options.

To change the column size, place your cursor over the edge of the column. The cursor changes to arrow shape. Move the cursor left or right to change the column size.

To move a column, select the column. The cursor changes to hand shape. Move the selected column to left or right as required.

You can use the Customize Column(s) contextual command to customize the columns of the Gantt chart with operation, system, and resource attributes or any new customized attributes.

D. Tree Expansion

A set of contextual commands is available for expanding and collapsing the tree in the Gantt chart.

When you right-click any row of the Gantt chart, the following commands are available in the Tree Expansion contextual menu:

- Expand First Level: Displays the first level child row.
- Expand Second Level: Displays the first and second level child rows.
- Expand All Levels: Displays all the child levels of the selected row.
- Collapse All: Collapses the row and hides all its child rows.
- Expand Selection: Displays a Specification depth dialog box where you can specify a tree depth for the expansion. You can select one of the available depth levels (1 to 5) or all levels, or key in a positive number.

E. Cycle Time Display

The cycle time of systems is displayed in the Process Gantt chart.

Cycle time is displayed by two vertical green bars. They appear if the system is a leaf system and has operations. The cycle bars stretch from the top of the system row to the bottom of its last operation row. If the leaf system has a zero cycle time, only the first bar is displayed.

F. Flow View and System View



A Flow view and a System view are available in Process Gantt chart.

- Flow View: This view displays the flow between systems. It takes into account the full product flow and time constraints between operations. You can use this view to display the product flow according to the cycle time.
- System View: This view shifts every system instance at zero begin time. All systems are seen in parallel.

To switch from one view to the other, right-click the root object of the Gantt chart and select either Flow View or System View in the context menu.

The Flow View / System View is managed for all open Process Gantt charts.

G. Operation Creation

An operation can be created under a system or under another operation in the Process Gantt chart.

This is done as follows:

- Select the command of the required operation type.
- Select a system in the Gantt chart or any of its operations (parent of the new operation).
- Enter its name in the pop-up that appears.

The new operation is then displayed under the system after the last operation (if a system was selected) or under the operation, if an operation was selected.

It is also possible to copy, paste, and delete operations in the Process Gantt chart. The Gantt chart is updated after the copy, paste, or delete.

H. Operation and System Reordering

Operations and systems can be reordered in the Process Gantt chart.

To reorder operations and systems, drag and drop a row (system or operation) on another one. The tree is also updated after the drag and drop.

Multi-Selection is not available. Only child nodes belonging to the same parent can be reordered in the Process Gantt chart.

I. Product Flow and Constraint Creation

Product flows and time constraints can be created in the Process Gantt chart by dragging and dropping systems/operations and using contextual commands.

The following drag and drop capabilities are possible in the Gantt chart:

- From a system to another system.
- From an operation to another operation.
- From a system to another operation.
- From an operation to another system.

In each case, a product flow is created.

If the drag and drop of a system or an operation to another system is done with the Ctrl key pressed, a context toolbar will appear with the following commands:

- Create Product Flow to create a product flow between the system or operation and the other system.
- Move to System to move the system or operation to the other system.

If the drag and drop of a system to an operation is done with the Ctrl key pressed, a context toolbar will appear with the following command:

- Create Product Flow to create a product flow between the system and the operation.

If the drag and drop of an operation to another operation is done with the Ctrl key pressed, a context toolbar will appear with the following commands:

- Create Product Flow to create a product flow between the two operations.
- Create Precedence Link to create a precedence constraint between the two operations.
- Create Start-Start Link to create a start -start synchronization link between the two operations. Both operations will start at the same time.
- Create End-End Link to create an end-end synchronization link between the two operations.



Both operations will end at the same time.

- Create End-Start Link to create an end-start synchronization link between the two operations. You can specify a delay between the end of one operation and the start of the other.
- Move Operation to move the operation under another operation. The dragged operation becomes the child of the other operation.

For more information, see [Creating Time Constraint Links Between Operations](#).

Note: You can access the Constraint Properties panel to edit time constraints and manage product flows by right-clicking the arrow, then by clicking Constraint Properties in the context menu.

J. Operation Colors

In the Process Gantt chart, colors can be assigned to systems using the Color in Gantt View contextual command.

In the context menu, the following commands are available:

- Color by Resource: when activated, operations are colored according to their implementing resource in the Process Gantt chart.
- Default Colors: when activated, the default color is applied to operations.

K. Specifying Scale Units

To specify the scale units of the Process Gantt chart, right-click the title bar showing the time units and select Set Scale Units.

The dialog box that appears allows you to specify the time unit (seconds, minutes, and so on), the zoom, and the scale to be applied to the Gantt chart. A preview allows you to try out any entered values before accepting them.

L. Modification of an Operation Duration

In the Process Gantt chart, time can be edited if it concerns an operation (and not a system) which has no child and it is displayed in estimated time.

The estimated time is the only time that can be modified manually. Simulated and analyzed times are deduced, so they cannot be modified by defining a value.

To modify the estimated duration of an operation, do one of the following:

- Right-click the operation, select Properties then modify the estimated time value.
- Double-click the Duration column and modify the value in the pop-up that appears.
- Double-click the End Time column and modify the value in the pop-up that appears.
- Increase the length of the bar representing the operation.
- Double-click the bar representing the operation. A Properties dialog box appears to let you modify the duration as well as the name of the operation.

Note: The operation must not have any children. An operation that has children is like a system: its duration is the sum of all the durations of its children.

When an operation duration is 0, the operation is represented by a red symbol.

Note: You cannot edit a begin time for an operation or a system. Begin times are deduced by solving the constraints specified.

M. Value Added Information

The value added is an optional attribute that can be specified on each operation of the system. This value is shown for each operation, and the average value of all operations is shown for the system.

Value added of an operation is an estimate of how much time that the operation is used for assembly. It is expressed as a percentage. If no time of the operation is spent on assembly, the value added can be specified as 0%.

Value added can be used on an operation that has its time mode defined as Estimated time or Analyzed time. For value added based on Estimated time, the value is defined in the operation's Properties dialog box. For value added based on Analyzed time, the value is defined using Edit Time Analysis. See the *Time-Motion Study User's Guide* for more information.

Sometimes operations have time modes defined as Simulated time or Work instruction. In this case, the value added is the percentage defined in Value Added Ratio on Estimated Time in



the Properties dialog box.

Note: This information is only displayed in the Gantt chart when the Display value added ration on system option is selected in Me > Preferences > App Preferences > Simulation > Digital Manufacturing Apps Common Services > Manufacturing Planning Apps Common Services > Process Gantt.

You can display a value added categories bar on top of the system cycle bar. The value added categories are defined on the time analysis of an operation. You can specify the color of each category in Me > Preferences > App Preferences > Simulation > Process Engineering > Time-Motion Study > Value Added (for example, green for value added, red for nonvalue added, and so on). The total value for each category is computed for all the operations in the system.

Note: This information is only displayed when the Display value added categories from Time Analysis on system option is selected in the Me > Preferences > App Preferences > Simulation > Digital Manufacturing Apps Common Services > Manufacturing Planning Apps Common Services > Process Gantt.

This option also enables a value added categories bar to be displayed in the Resource Balancing panel.

N. Time Bar for Point Fastening Operations in the Gantt Chart

The length of the time bar for a Point Fastening operation depends if it is related to an item with fasteners or fastener groups linked to it or not.

Two fastener models are supported in Process Planning and Fastener Planning: the fastener model and the fastener group model.

Both fastener models handle "spots" that define the position of fasteners. A spot is where a fastening action is done, which is important to describe the Point Fastening operation.

- In the fastener model, there is one spot per fastener.
- In the fastener group model, there can be one of more spots per fastener.

Note: Fastener groups can no longer be created, but existing fastener groups are supported.

The length of the time bar for a Point Fastening operation is as follows:

- A Point Fastening operation can be created in Process Planning or Fastener Planning from scratch with no related item. In this case, the time bar value in the Gantt chart is the estimated time (10sec, par default).
- If a Point Fastening operation is related to an item with no fasteners linked to it, the time bar value is the estimated time (10sec).
- A Point Fastening operation can be related to an item with one or more fasteners or fastener groups linked to it. In this case, then the time bar value is an estimated time computed as follows:

Estimated time = time per fastening * number of spots

The time per fastening is 2.5sec by default.

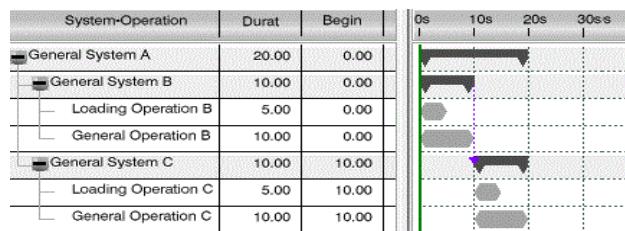
O. Using the Process Gantt Chart

You can use the Process Gantt chart to display systems and their operations, create operations, and create time constraints between operations.

1. From the Authoring section of the action bar, click Process Gantt
2. Select a system in the tree or System Editor.

This can be the root system or a child system under the root system.

Multi-Selection is not available. Only one system and its children are displayed in the Process Gantt. The image below shows an example of a Process Gantt chart:



3. Click Create Precedence Link and select Loading Operation B then General Operation B in



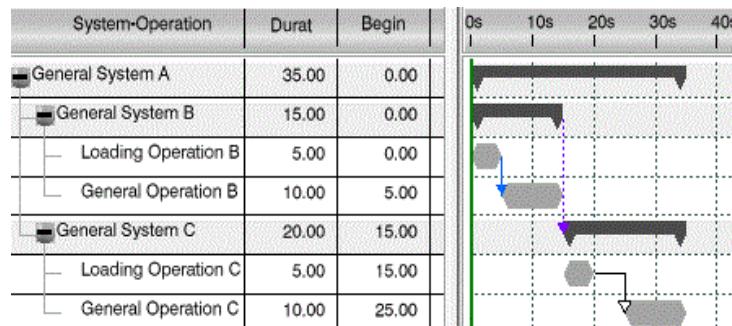
the Process Gantt chart.

A precedence constraint link appears in the Process Gantt chart between the two operations.

Note: Another way of creating this type of constraint is by dragging and dropping one operation on the other.

- Select Create End-Start Link and select Loading Operation C then General Operation C in the Process Gantt chart. In the pop-up that appears, specify a delay of 5 seconds between these two operations.

A synchronization link appears in the Process Gantt chart between the two operations.

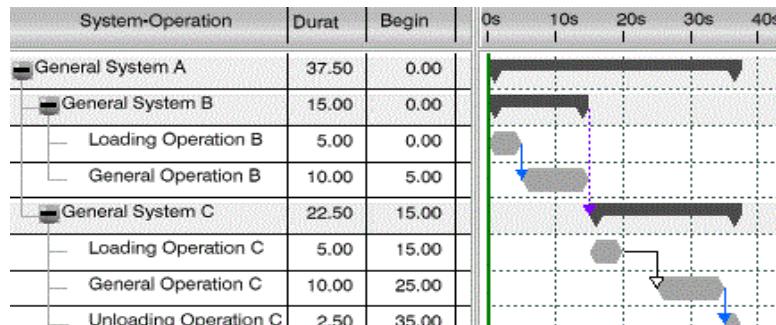


Note: Another way of creating this type of constraint is by dragging and dropping one operation on the other while pressing the Ctrl key. You then select Create End-Start Link from the context toolbar that appears.

- Select General System C in the Process Gantt chart and click Unloading .

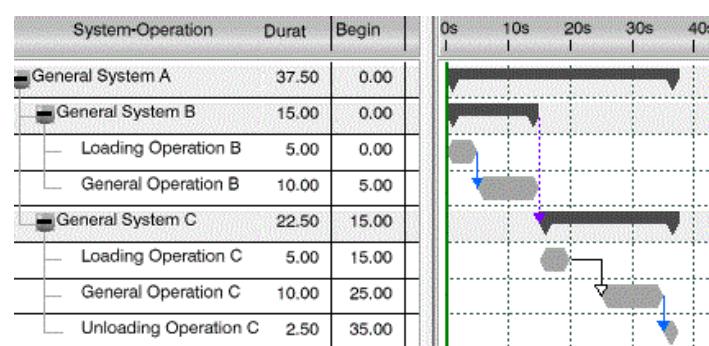
In the Operation attributes dialog box that appears, enter an appropriate name and specify an estimated time of 2.5 seconds.

The new operation is created after the last operation in the selected system.



- Create a precedence constraint link between General Operation C and the Unloading Operation C that you just created.

The link appears in the Process Gantt chart between the two operations.



You can choose to display or hide precedence constraints and synchronization links in the Process Gantt chart. Right-click in the chart and select or clear the corresponding check box options in the context menu.

P. Managing Display of Systems in the Process Gantt Chart



You can display systems in different views of the Process Gantt chart to have a better view of the systems, product flows, and cycle times.

This task shows you how to:

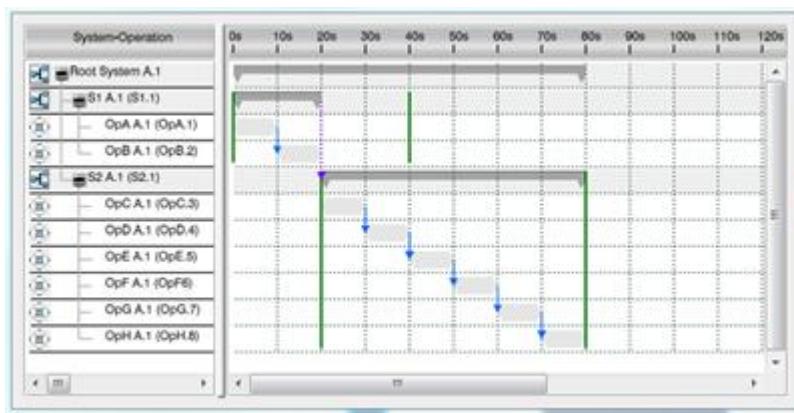
- Display Systems According to Product Flow
- Display Systems in Parallel
- Display Systems According to Cycle Time

Q. Display Systems According to Product Flow

You can display the flow between the systems.

1. Right-click the root object of the Process Gantt chart.
2. In the context menu, select Flow View.

The full product flow and time constraints between operations are displayed.

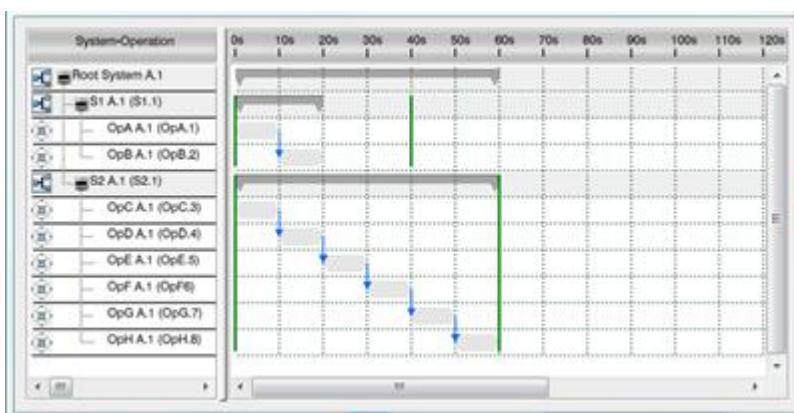


R. Display Systems in Parallel

You can display systems at zero begin time. Aligning systems in parallel is useful to see how they are balanced.

1. Right-click the root object of the Process Gantt chart.
2. In the context menu, select System View.

The system instances are displayed as if they begin at 0 sec. Time constraints between operations are displayed.

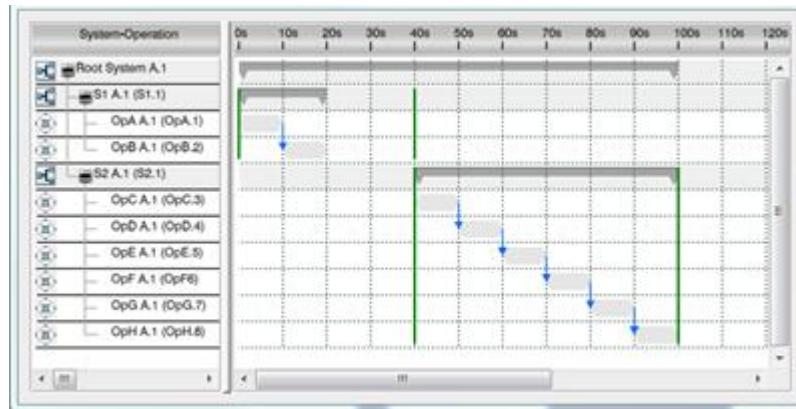


S. Display Systems According to Cycle Time

You can display the product flow of the systems according to the defined cycle time.

1. Select Me > Preferences > App Preferences > Simulation > Digital Manufacturing Apps Common Services > Manufacturing Planning Apps Common Services > Process Gantt.
2. Select the Display product flow on cycle time option.
3. Right-click the root object of the Process Gantt Chart and select Flow View.

The systems are displayed according to the cycle time: for example, the second system begins at the end of the first system cycle time. Time constraints between operations are displayed.

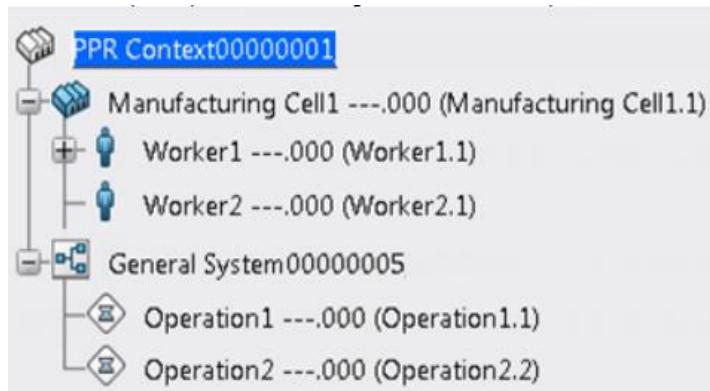


T. Displaying B.I. Essentials Colors in the Process Gantt Chart

You can select a B.I. from the B.I. Essentials list, to display colors in the Process Gantt chart to reveal information about operation status.

Context:

In this example, Operation1 is assigned to Worker1. Operation2 is not assigned to a resource.



1. Select the General System in the tree.
2. From the Authoring section of the action bar, click Process Gantt .

The Process Gantt chart appears showing the system structure. The bars representing the operations are colored gray, which is the default color.

3. From the Tools section of the action bar, click B.I. Essentials .
 4. Click Operation to Working Resource Assignment Status from the list.
- The B.I. Essentials list appears.
- The bars representing the operations are colored according to the B.I. colors. Operation1 is colored green and Operation2 is colored red.
5. Assign Operation2 to Worker2 by dragging and dropping the operation on the resource in the tree. Both operations are now colored green in the Process Gantt chart.

Note: When the B.I. Essentials list is closed, the bars representing the operations are colored gray again.

U. Using Value Added Information in the Process Gantt Chart

You can define a value added attribute on each operation of a system. This value can then be shown in the Process Gantt chart for each operation. The average value of all operations is shown for the system.

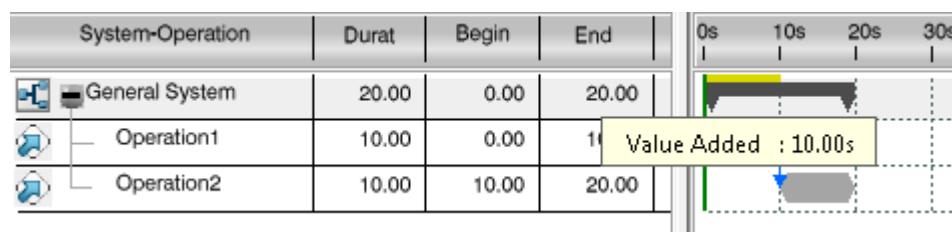
1. From the Authoring section of the action bar, click Process Gantt .

The Process Gantt chart appears showing the system structure.



2. Right-click Operation1 and define Value Added Ratio on Estimated Time to 60% in the Properties dialog box that appears.
3. Right-click Operation2 and define Value Added Ratio on Estimated Time to 40%.
4. In Me > Preferences > App Preferences > Simulation > Digital Manufacturing Apps Common Services > Manufacturing Planning Apps Common Services > Process Gantt, select the Display value added ratio on system option.

A yellow bar representing the value added appears on top of the blue system bar. A tooltip on the system bar gives detailed information, including the value added for the system (50%).



Value added for the system and operations is also displayed in the Value Added column.

Note: System value added=Sum(Operation value added*Operation duration)/(total time)=(60*10+40*10)/20=50%.

V. Locating an Object in the Process Gantt Chart Using Auto-Scroll

You can search for an object in the Process Gantt chart using the Find panel. The Process Gantt chart then automatically scrolls to the located object.

1. From the Authoring section of the action bar, click Process Gantt .
- The Process Gantt chart appears showing the system structure.

2. Click Ctrl+F to open the Find panel.
3. In the Name field of the General tab, enter the name of an object that is not visible in the Process Gantt chart (for example, Loading_1).
4. Press Find and Select.

The Process Gantt chart automatically scrolls to the searched object. The corresponding line is highlighted in the chart.

W. Exporting Process Gantt Chart Information to an XML File

You can export information from the Process Gantt chart to an XML file.

Filtering and premises details information is also exported to an XML file even if it is not displayed in the Process Gantt chart.

The Export as XML contextual command is available on any row of the Process Gantt chart. It exports information such as object name and type, begin time, and duration to an XML file.

1. From the Authoring section of the action bar, click Process Gantt .
 2. Right-click the first row of the Process Gantt chart and select Export to XML.
- A file-browser dialog box appears.

3. Specify the name and location of the XML file, then click Save in the dialog box.
The Process Gantt chart information is exported to the XML file.

The XML file contains information about all the columns of the Process Gantt chart that are not hidden.

X. Customizing Columns of the Process Gantt Chart

You can customize the columns of the Process Gantt chart with operation, system, and resource attributes or any new customized attributes.



- From the Authoring section of the action bar, click Process Gantt
- Select a system in the tree or System Editor.

The Process Gantt appears.

- Right-click the root node in the Process Gantt chart and select Customize Column(s).

The Customize dialog box appears.

- Select the Object Type, then select one or more available attributes in the Available Attributes column and use the arrows to pass the attributes to the Displayed Attributes column.
- Click OK.

New columns corresponding to the selected attributes appear in the Process Gantt chart.

Module-3. H: Resource Utilization Gantt Chart

This section describes how to use the Resource Utilization Gantt chart.

In this section:

- About the Resource Utilization Gantt
- Using the Resource Utilization Gantt
- Display B.I. Essentials Colors in the Gantt Chart
- Locate an Object in the Gantt Chart Using Auto-Scroll
- Exporting Gantt Chart Information to an XML File

A. About the Resource Utilization Gantt

The purpose of the Resource Utilization Gantt is to provide a Resource-Operation view. It also allows assigning operations to resources, and setting a time mode on operations.

The following topics are discussed:

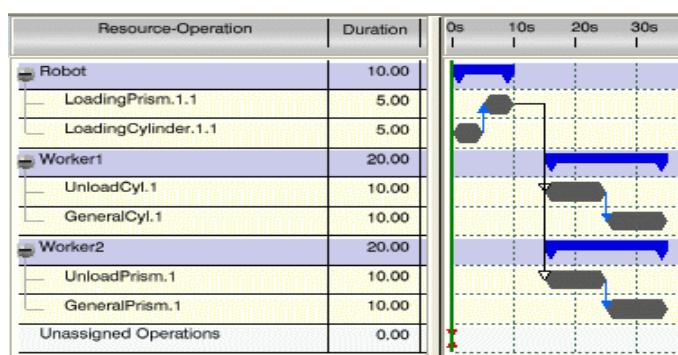
- Opening a Resource Utilization Gantt
- Columns in the Resource Utilization Gantt
- Tree Expansion
- Which Objects Are Displayed
- How Objects Are Displayed
- Cycle Time Display
- Assigning Operations to a Resource
- How Links Between Resource and Operation Are Displayed
- Time Modes for Operations in the Resource Utilization Gantt

B. Opening a Resource Utilization Gantt

The Resource Utilization Gantt is opened by selecting Resource Utilization Gantt in the action bar then selecting one or more resources. It is also possible to select one or more resources and then select the command.

Multiselection of resources is possible for the Resource Utilization Gantt in the tree or the work area. For nonworking resources, make sure that they are selected in Me > Preferences > App Preferences > Simulation > Digital Manufacturing Apps Common Services > Manufacturing Planning Apps Common Services > Resource Gantt.

In this case, the Gantt chart can have several root resources.





Multiselection is allowed: you can open several Resource Utilization Gantt charts simultaneously on different working resources.

You can open a Manufacturing System Gantt at same time as a Resource Utilization Gantt.

Note: A suitable Resource-System scope must be defined. Otherwise, a warning message appears, and the Resource Utilization Gantt does not open. For example, you cannot open the Gantt chart on a parent resource when the scope is specified between a child resource and a system.

C. Columns in the Resource Utilization Gantt

The columns of the Resource Utilization Gantt chart display information about systems, resources, operations, parts, and fasteners. Any of the columns (except Resource-Operation) can be hidden/shown by right-clicking in the header area and deselecting/selecting any of the column check box options.

The columns in this Gantt chart are as follows:

- Resource-Operation: Displays a tree view of the resources and assigned operations. Unassigned operations are also listed in a separate node.
- Duration: Difference between the start and end time.
- Begin Time: Start time of an operation.
- End Time: End time of an operation.
- Idle Time: Time during which the resource is not used.
- Utilization: Percentage of time that a resource is used.
- Associated Parts: Instance names of the assigned parts of an operation. Parts may appear as a list with a separator.
- Type of Time: Estimated, simulated, or analyzed time of an operation.
- Number of Fasteners: Displays the number of assigned fasteners for operation and resources. The first number on the resource indicates the number of fasteners assigned directly to this resources behavior. The number in brackets is the sum of the fasteners assigned to the resources direct behavior and all fasteners assigned to all child behavior.
- Number of Spots: Displays the number fastener spots.
- Localization Resource: The organizational resource assigned to the operation.
- Used Resource(s): The nonworking resources assigned to the operation.
- Resource used for positioning: The resource used for parts positioning for a given operation.

To change the column size, place your cursor over the edge of the column, the cursor changes to arrow shape. Move the cursor left or right to change the column size.

To move a column, select the column, the cursor changes to hand shape. Move the selected column to left or right as required.

Note that you can use the Customize Column(s) contextual command to customize the columns of the Gantt chart with operation, system, and resource attributes or any new customized attributes.

D. Tree Expansion

A set of contextual commands is available for expanding and collapsing the tree in the Gantt chart.

When you right-click any row of the Gantt chart, the following commands are available in the Tree Expansion contextual menu:

- Expand First Level: Displays the first level child row.
- Expand Second Level: Displays the first and second level child rows.
- Expand All Levels: Displays all the child levels of the selected row.
- Collapse All: Collapses the row and hides all its child rows.
- Expand Selection: Displays a Specification depth dialog box where you can specify a tree depth for the expansion. You can select one of the available depth levels (1 to 5) or all levels, or key in a positive number.

E. Which Objects Are Displayed

For a given working and nonworking resource, the Resource Utilization Gantt displays the list of operations that it executes. It takes into account the other working and organizational resources that aggregate the working resource.



Working Resources	Nonworking Resources
Worker	Tool Equipment
Robot	Storage
NC Machine	Sensor
Industrial Machine	Manufacturing Product
Inspect	User-Defined Resource
Transport	-
Conveyor	-
Logic Controller	-
Control Equipment	-

Operation Colors

In the Resource Utilization Gantt chart, colors can be assigned to resources using the Color in Gantt View contextual command.

In the context menu, the following commands are available:

- Color by System: when activated, colors assigned to systems in the Process Gantt chart are applied to child operations in the Resource Utilization Gantt chart.
- Default Colors: when activated, the default color is applied to operations.

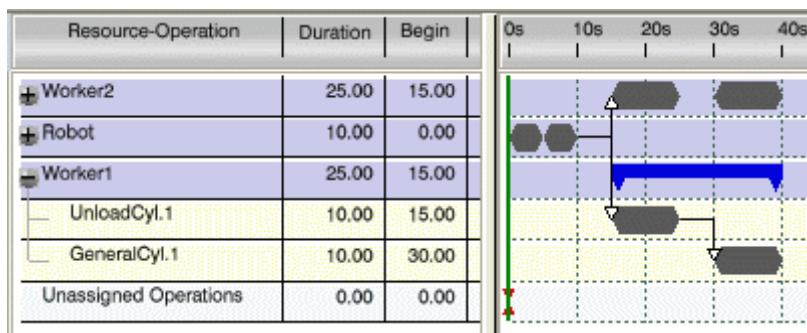
F. How Objects Are Displayed

Operations can display in a collapsed or expanded view. Error cases (overlapping operations, for example) are highlighted in red.

Collapse and Expand View

In the collapsed view (when no overlapping problem occurs): operations are displayed in same line.

When two operations are done by the same resource and a delay exists, a blank space is inserted on the collapsed view.



In the expanded view:

- One line per operation: the constraints between operations are symbolized by an arrow.
- One line by resource.

Note: The Resource Utilization Gantt does not take into account the Display collapsed rows in stacked mode option in Me > Preferences > App Preferences > Simulation > Digital Manufacturing Apps Common Services > Manufacturing Planning Apps Common Services > Gantt Common.

You can select an operation inside the collapsed row, for dragging or right-clicking to open the context menu.

Overlapping Operations

The Resource Utilization Gantt can detect the case in which a resource executes several operations at the same time. This is an error case known as overlapping, which must be resolved.

This error is indicated in the Gantt chart by highlighting the concerned line and coloring the resource bar in red in the collapsed view.

You can solve an overlapping case by adding a constraint such as a Previous Cycle Link between operations or by modifying begin or end times.



G. Cycle Time Display

The cycle time of systems is displayed in the Resource Utilization Gantt.

Cycle time is displayed by two vertical green cycle bars. They appear for leaf organizational resources and their children. The cycle time is the one inherited from the organizational resource that has the scope with a system. This resource has the same cycle time as the system.

H. Assigning Operations to a Resource

You can use the Resource Utilization Gantt to assign operations to a resource. You can use dragging to assign or unassign operations in the Gantt chart.

If you use a command available outside the Gantt chart, you can select the operations in the Gantt chart after launching the command.

Constraints are always taken into account, whether the status of the operation is assigned or not.

Unassigned operations are listed in an independent Unassigned Operations node and so are available to be assigned to resources.

Unassigned operations are:

- Operations that are defined in a system but are not assigned to any resources.
- Operations that are assigned to hidden resources. To make sure that the resources are visible, select the resource type in Me > Preferences > App Preferences > Simulation > Digital Manufacturing Apps Common Services > Manufacturing Planning Apps Common Services > Resource Gantt.

You can use dragging to manage operation-resource assignments.

Assign an operation to a resource

Drag an operation in an Unassigned Operations row and drop it on a resource.

Unassign an operation from a resource

Drag an operation that is assigned to a resource and drop it in an Unassigned Operations row.

Balance an operation from one resource to another one (same type of resource)

Drag an operation that is assigned to a resource and drop it on a resource row.

If the resources are different (working and nonworking resources), the operation is assigned to both resources. The Gantt chart shows two instances of the assigned operation, one under each resource row. The start and end positions of the operation are the same in each row.

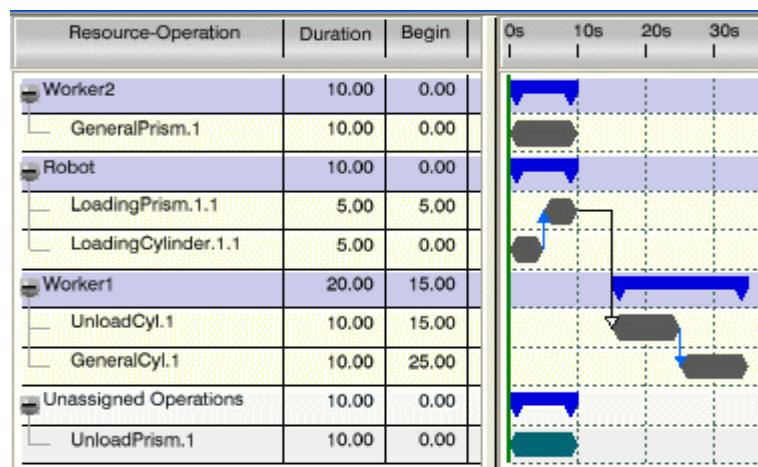
Assign an operation to an additional resource

While keeping the Ctrl key pressed, drag an operation that is already assigned to a resource and drop it on another resource row. The Gantt chart shows two instances of the assigned operation, one under each resource row. The start and end positions of the operation are the same in each row.

Unassign an operation that is assigned to several working resources

Drag the operation and drop it in the Unassigned Operations row. All assignments to the resources are removed. The row from which the operation was dragged is removed and the operation appears in an Unassigned Operations row.

You can select several operations to assign or unassign them by pressing Ctrl.





How Links Between Resource and Operation Are Displayed

Three kinds of links are available between operation and resource:

- Execute
- Used
- Where

Each operation in a Resource Utilization Gantt has two resource columns: Used

Resource and Localization Resource. The Executing resource is implicit, as this is the resource that has the operation as a child.

I. Time Modes for Operations in the Resource Utilization Gantt

A time mode is specified on operations. The Type of Time column is available for operations and displays the specified time mode.

The different time modes are as follows:

- Estimated time is user-defined (the default value is 10 seconds).
- Simulated time is the result of a simulation.
- Analyzed time is the result of a time analysis.
- Work Instruction shows any work instructions under the operations in the Gantt chart with estimated time.

J. Using the Resource Utilization Gant

You can link operations to resources using the Resource Utilization Gantt chart.

Before you begin: Open your session content, which must have resource and system structures, and start your app.

1. From the **Authoring** section of the action bar, click **Resource Utilization Gant**
2. Select an organizational resource in the tree or work area.

If you want to open the Resource Utilization Gant for several organizational resources, multiselect the resources while pressing **Ctrl**.

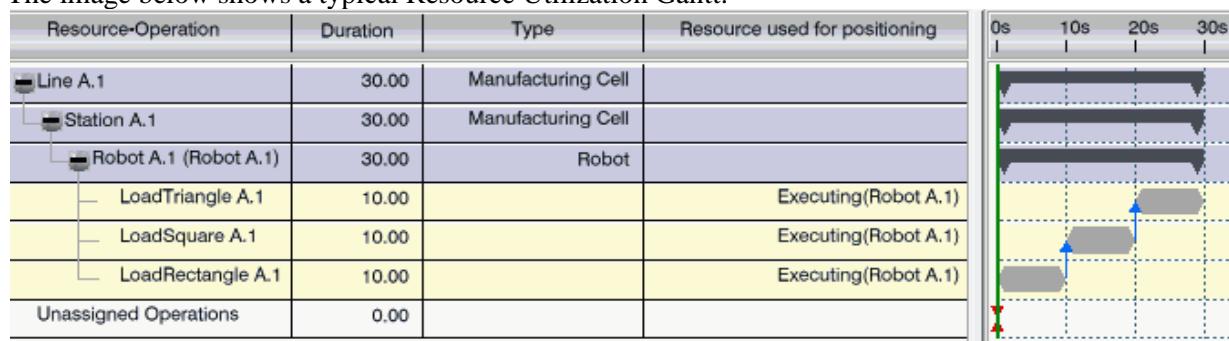
3. From the action bar, click **Assignments Manager**

The **Resource/Operation Assignment** panel appears.

4. Using the panel, select a resource and a nonassigned operation.

The operation is assigned to the resource, and it is positioned under the resource node in the **Resource-Operation** column of the Resource Utilization Gant.

The image below shows a typical Resource Utilization Gant.



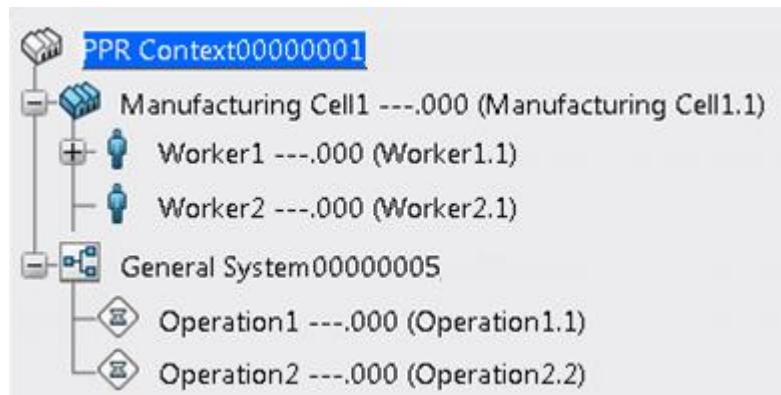


K. Display B.I. Essentials Colors in the Gantt Chart

You can select a B.I. from the B.I. Essentials list, to display colors in the Gantt chart to reveal information about operation status.

1. Open your session data and start the desired Manufacturing Planning application.

In this example, Operation1 is assigned to Worker1. Operation2 is not assigned to a resource.



2. Select the Manufacturing Cell organizational resource in the tree.
3. From the **Authoring** section of the action bar, click **Resource Utilization Gantt** .

The Gantt chart appears, showing the resource-operation view. The bars representing the operations are colored gray, which is the default color.

4. From the **Tools** section of the action bar, click **B.I. Essentials** .

The **B.I. Essentials** list appears.

5. From the list, select **Operation to Working Resource Assignment Status**.

The bars representing the operations are colored according to the B.I. colors. Operation1 is colored green and Operation2 is colored red.

6. Assign Operation2 to Worker2 by dragging and dropping the operation on the resource in the tree.

Both operations are now colored green in the Gantt chart.

Note: When the B.I. Essentials list is closed, the bars representing the operations are colored gray again.

L. Locate an Object in the Gantt Chart Using Auto-Scroll

You can search for an object in the Gantt chart using the Find panel. The Gantt chart then automatically scrolls to the located object.

1. Open your session data and start the desired Manufacturing Planning application.

2. From the Authoring section of the action bar, click Resource Utilization Gantt .

The Gantt chart appears, showing the resource-operation view.

3. Press Ctrl+F to open the Find panel.
4. In the Name field of the General tab, enter the name of an object that is not currently visible in the Gantt chart (for example, Loading_1).



5. Press Find and Select.

The Gantt chart automatically scrolls to the searched object. The corresponding line is highlighted in the chart.

Note: You can use other capabilities in Find panel to search for objects. For example, in the Advanced tab, you can use attribute criteria such as Estimated time when searching for an operation.

M. Exporting Gantt Chart Information to an XML File

You can export information from the Resource Utilization Gantt chart to an XML file. The Export as XML context command is available on any row of the Gantt chart to export information. Such as object name and type, begin time, and duration to an XML file.

Before you begin: Open your session data and start the desired Manufacturing Planning app.

1. From the **Authoring** section of the action bar, click **Resource Utilization Gantt**
2. Right-click the first row of the Gantt chart and select **Export to XML**.

A file browser dialog box appears.

3. Specify the name and location of the XML file, then click **Save** in the dialog box.

The Gantt chart information is exported to the XML file.

The XML file contains information about all the columns of the Gantt chart that are not hidden.

Module-3. I: Resource Balancing

This section provides background information about resource balancing and describes how to balance resources using the bar chart and data table of the Resource Balancing panel.

In this section:

- Balancing Operations on Working and Nonworking Resources
- Comparing Configurations in Resource Balancing
- Calculating Time Based on Effectivity in Resource Balancing
- Displaying B.I. Essentials in Resource Balancing
- Exporting Resource Balancing Information to an XML File

A. Balancing Operations on Working and Nonworking Resources

You can balance operations on working and nonworking resources using the **Resource Balancing** command.

Before you begin: Open your session content, which should include an organizational resource with three working resources and three systems with operations. A Resource-System scope is required.

The scenario below also applies to nonworking resources.

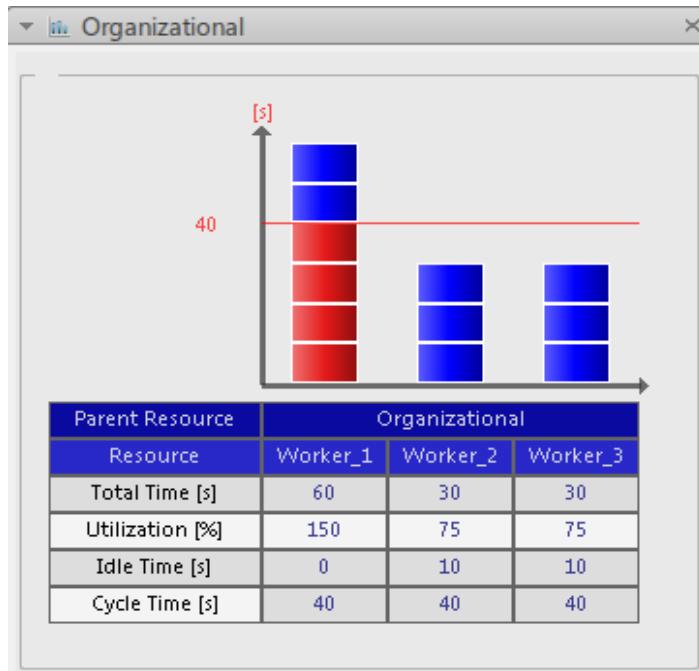
1. Select the organizational resource in the tree.
2. From the **Authoring** section of the action bar, click **Resource Balancing**

The **Resource Balancing** panel appears. This is the global panel showing the operations assigned to all the working resources under the selected organizational resource. Useful information also appears in the table under the bar chart:



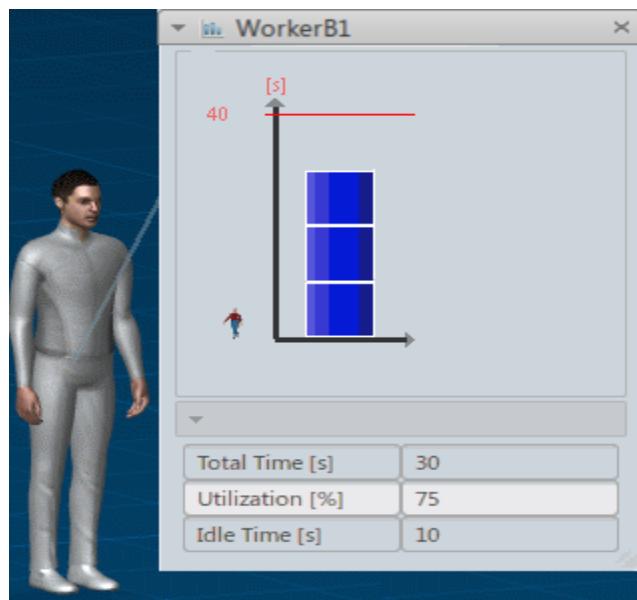
- Total time of the operations assigned to the working resource
- Percentage utilization of the working resource
- Idle time of the working resource
- Cycle time defined on the root system

The colored rectangles in the bar chart show the operations assigned to each resource. By default, the operations are represented by blue rectangles. Parallel operations (that is, operations that are done at the same time on a given resource) are represented by red rectangles.



Notes:

- If you right-click the **Parent Resource** cell in the table, a context menu appears for showing or hiding empty resource columns in the bar chart. An empty resource column has no assigned operations.
 - **Manage Resource Visibility:** provides a dialog box for showing or hiding any resource column, whether it is empty or not.
 - **Show All Empty Resources:** shows all empty resources.
 - **Hide All Empty Resources:** hides all empty resources.
 - **Small Duration Mode:** shows operations with no defined duration.
 - **Actual Duration Mode:** when the operation rectangles are shown in **Small Duration Mode**, this command switches to the default mode.
- You can select one or more working resources in the tree and click **Resource Balancing** to display an individual panel for each resource. You can show or hide the value list for a resource using the small arrow button on the panel. The value list shows the total time, utilization, and idle time for the resource. If several individual panels are displayed, clicking the expander of any panel hides or shows the value lists in all the panels.
- You can customize the colors of the rectangles in the bar chart in **Me > Preferences > App Preferences > Simulation > Process Engineering > Equipment Allocation > Balancing**.



2. From the **Authoring** section of the action bar, click **Resource Utilization Gantt**

The Gantt chart shows that some of the operations are sequenced, others are not.

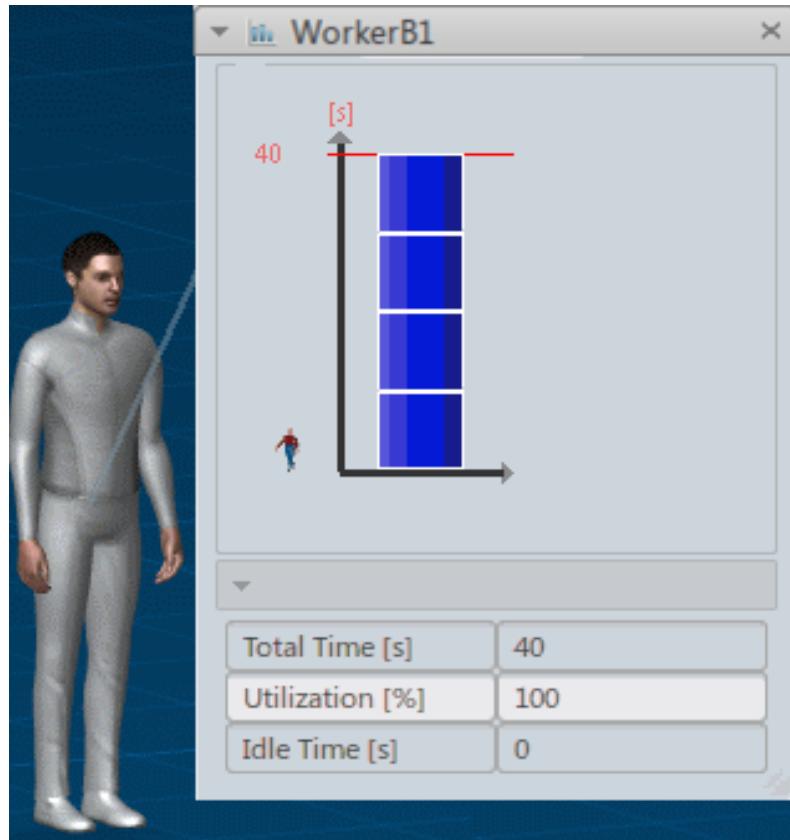


For WorkerA, there are four operations in parallel: these are the operations that show up in red in the **Resource Balancing** panel.



3. Drag an Unloading operation from WorkerA to WorkerB.

The operation is added to WorkerB.



4. In the same way, drag another Unloading operation from WorkerA to WorkerC.

The operation is added to WorkerC. The Gantt chart is also updated to show that the operations are now added to WorkerB and WorkerC.

Note: You can drag an operation:

- Between different individual bar charts
- Between the bar chart and the tree
- Between the bar chart and the 3D resource object
- Between columns of the bar chart to modify the assignment of the operation.

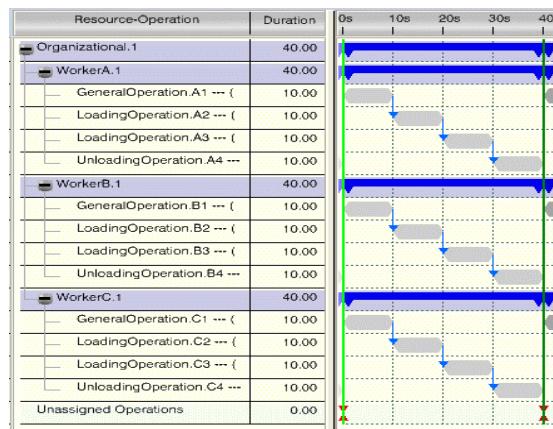
You can drag an operation from a working resource to a nonworking resource and vice versa. In this case, the operation is assigned to both resources and existing constraints are kept.

You can drag an operation from one individual working resource panel to another working resource panel to assign the operation to the new working resource. If the operation was previously assigned to one or more working resources:

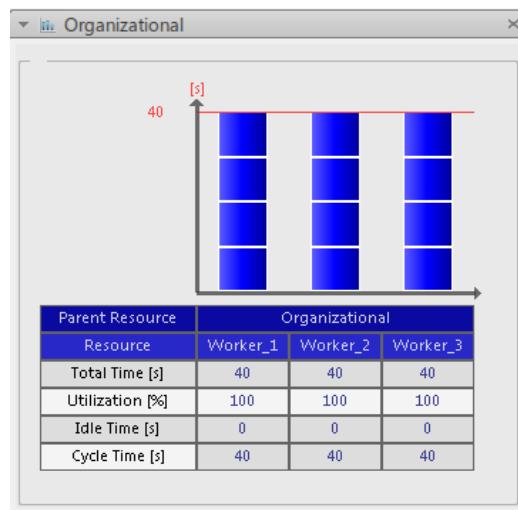
- All those resources are unassigned and the operation is assigned to the new working resource.
- If you press **Ctrl** during the drag, the operation remains assigned to those resources in addition to the new working resource.



- Sequence the operations in the Gantt chart.



The bar chart and the information in the table are updated accordingly (total time, utilization, and so on).



- Select a rectangle representing an operation in the WorkerA column of the bar chart.

The rectangle changes from dark blue to light blue and a tooltip gives information about the operation. The operation is also highlighted in the tree.

- Right-click an operation.

A context menu appears, allowing you to create, edit, or delete time analyses, or to modify operation properties.

- Create a time analysis on the operation.

For more information, see the *Time-Motion Study User's Guide*.

- Right-click the operation and select **Properties**, then change **Time mode** to **Analyzed time** in the **Properties** dialog box.
- Right-click the **Total Time** cell in the table.



A context menu appears, allowing you to change time type displayed on operations:

- Estimated Time
- Simulated Time
- Analyzed Time
- Time Type Defined On Operation

11. Select **Time Type Defined on Operation**.

The bar chart is updated to show analyzed time on the operation with the time analysis.

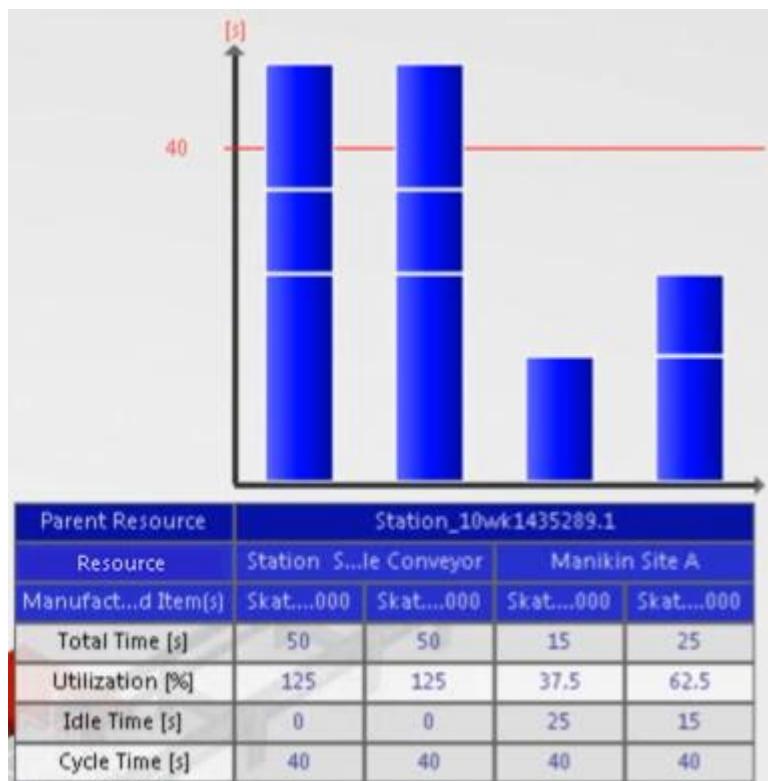
B. Comparing Configurations in Resource Balancing

You can now use the Resource Balancing panel to show and compare operation balancing on working resources for different configuration filters.

Before you begin: Open your session content that should comprise product, item, system, and resource structures. Suitable product configurations must be defined.

1. In Me > Preferences > App Preferences > Simulation > Process Engineering > Equipment Allocation > Balancing, select the [Consider configuration on system](#) option.
2. Select an organizational resource in the tree.
3. From the Authoring section of the action bar, click **Resource Balancing** .

The **Resource Balancing** panel appears.

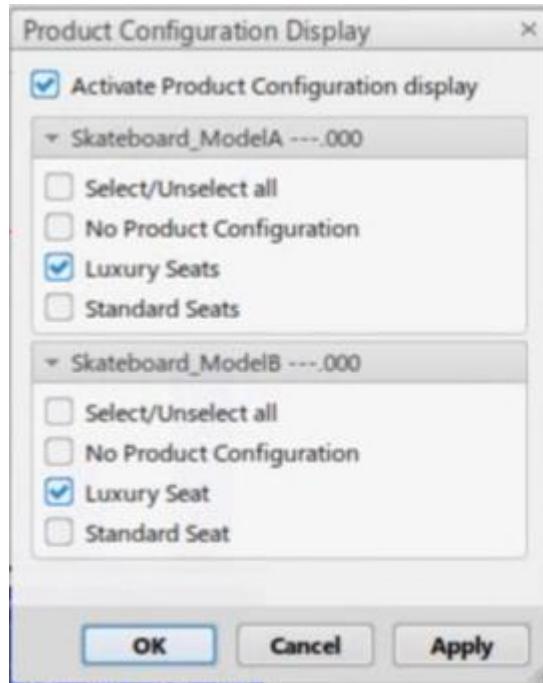


4. Right-click the **Parent Resource** cell in the table of the panel, and select **Product Configuration Display**.

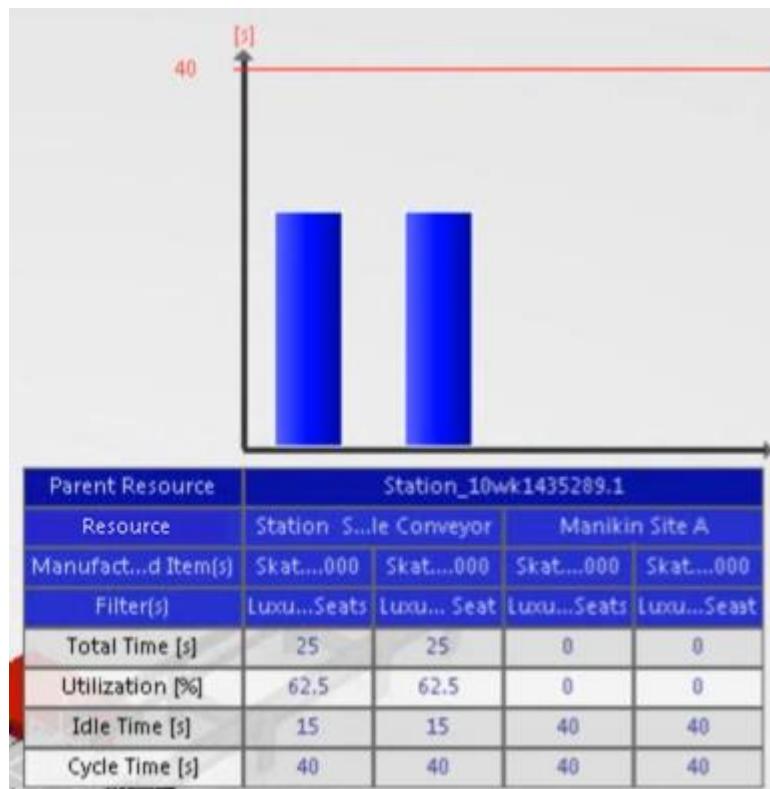
The **Product Configuration Display** panel appears.



5. Select the **Activate Product Configuration Display** check box in the panel, select the "Luxury Seat" configuration under each of the root items and click **OK**.



The operations with "Luxury Seat" effectivity are displayed on the **Resource Balancing** panel.

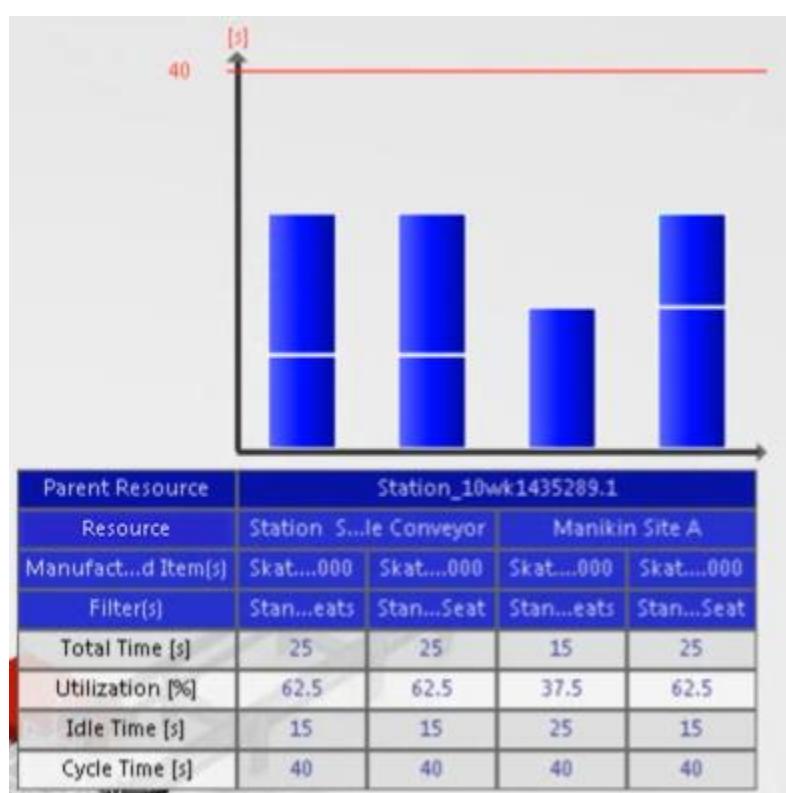


6. Right-click the **Parent Resource** cell in the table of the panel, and select **Product Configuration Display**.



- In the **Product Configuration Display** panel, select the "Standard Seat" configuration under each of the root items and click **OK**.

The operations with "Standard Seat" effectivity are displayed on the **Resource Balancing** panel.



Note: The **Product Configuration Display** panel lets you activate the product configuration display. You can then drag and drop operations across resources that have the same configuration. If the effectivities of the source and target resources are different, the drag and drop is not possible.

C. Calculating Time Based on Effectivity in Resource Balancing

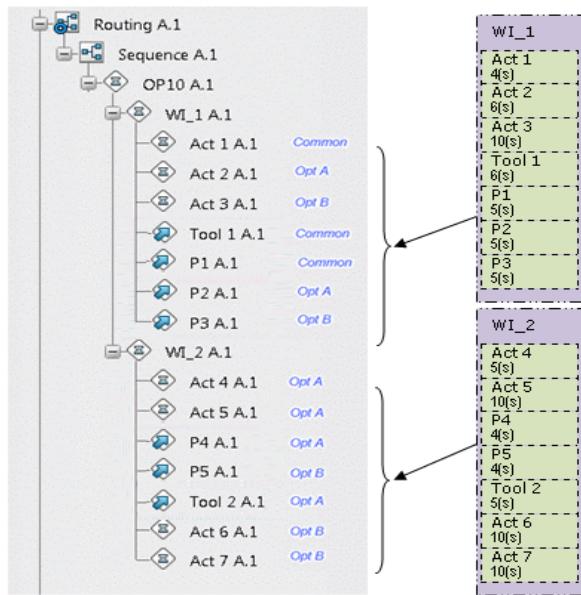
You can calculate parent operation time that excludes child operations whose effectivity does not match configuration filters.

- Open your session content.

The content should comprise:

- A system structure with operations whose child operations have configuration filters applied
- A resource structure with working resources (Worker_1 and Worker_2) in two different stations of a manufacturing cell.



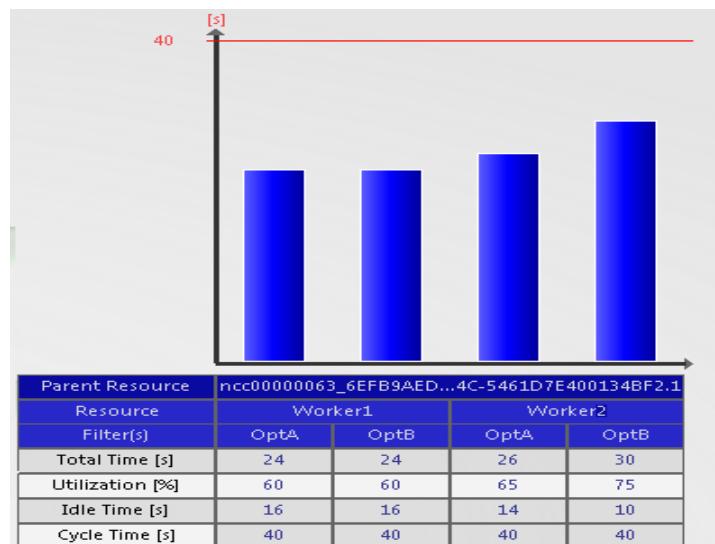


Note: The Sequence system contains an operation Op10 that contains operations WI_1 and WI_2, whose child operations have configuration filters applied.

In this example, the configuration filters are called Opt A and Opt B:

- Operations Act 2, P2, Act 4, Act 5, P4, and Tool 2 are configured with Opt A.
 - Operations Act 3, P3, P5, Act 6, and Act 7 are configured with Opt B.
 - Operations Act 1, Tool 1, and P1 are not configured.
- Assign Operation WI_1 to Worker_1 and Operation WI_2 to Worker_2.
 - Select the Manufacturing Cell resource in the tree.
 - From the **Authoring** section of the action bar, click **Resource Balancing** .

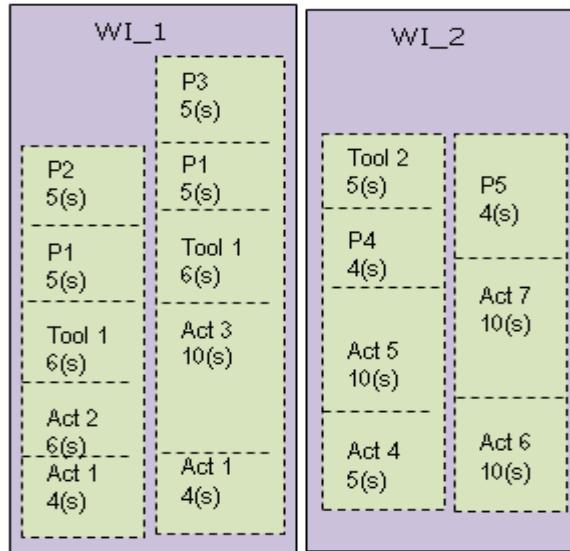
The **Resource Balancing** panel appears.



The panel shows four dedicated configuration filter columns (two for Worker_1 and two for Worker_2) based on the configuration filters Opt A and Opt B.



The total time for operations WI_1 and WI_2 is calculated for each configuration.



The calculation takes into account the child operations whose effectiveness matches the column configuration filter.

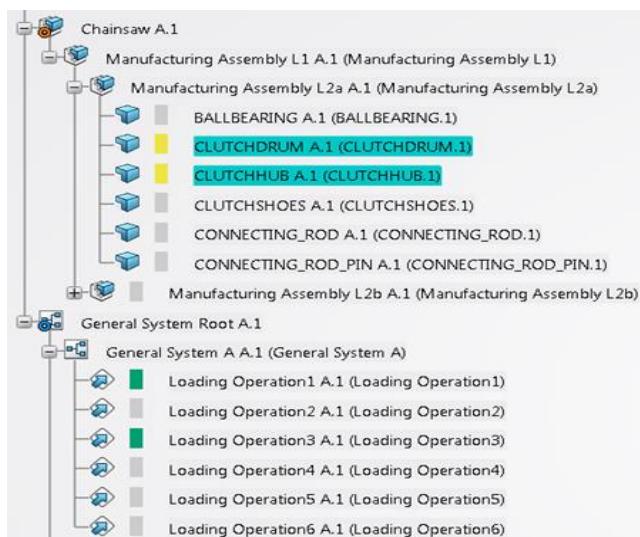
Note: The dragging of operations is not available in resource balancing while configurations are applied.

D. Displaying B.I. Essentials in Resource Balancing

You can display B.I. Essentials colors in the Resource Balancing bar chart.

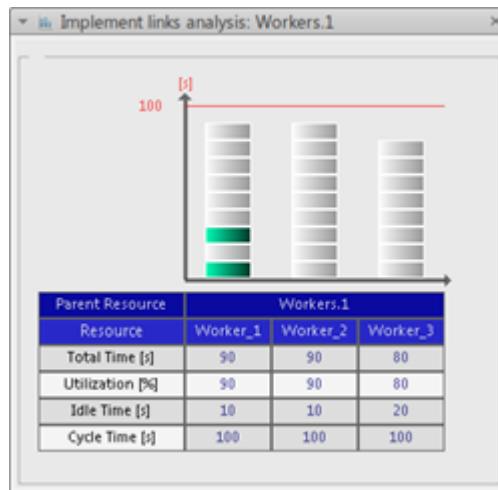
1. In the tree, select a resource and from the Authoring section of the action bar, click Resource Balancing .
 2. From the Tools section of the action bar, click B.I. Essentials .
 3. Select, for example, Implement links analysis.
- The Resource Balancing bar chart becomes grey.
4. From the tree, select provided parts.

Note: To change the B.I. Essentials colors, double-click the colored circles in the B.I. Essentials panel. The provided parts are colored yellow in the tree, indicating that they are both implemented and implementing objects.





The related operations are colored green in the Resource Balancing bar chart and in the tree, indicating that they are implementing objects of the provided parts.



E. Exporting Resource Balancing Information to an XML File

You can export resource balancing information to an XML file for organizational and working resources. The Export to XML contextual command is available on the first column of the bar chart in the Resource Balancing panel. You can generate an XML file for the resource on which resource balancing is running.

Before you begin: Open your session content that should comprise a resource structure.

1. Select an organizational resource in the tree.
2. From the **Authoring** section of the action bar, click **Resource Balancing** .

The **Resource Balancing** panel appears.

3. Right-click the first column of the bar chart in the panel, and select **Export to XML**.

If a working resource was selected, right-click anywhere in the bar chart in the individual panel.

A dialog box appears.

4. Specify the name and location of the XML file, then click **Save** in the dialog box.

The resource balancing information is exported to the XML file.

The XML file contains information such as:

- Resource Name
- Parent Resource Name
- Related Manufacturing Item
- Applied Filters
- Total Utilization Time
- Idle Time
- Cycle Time
- List of Operations
- Operation Time
- Filters Applied on the Operations



Note: In a multimodel session, you can select either one or all of the root items in the **Visible Root Items Selection** panel. If all root items are selected, all the information present in the **Resource Balancing** panel is exported to the XML file.

F. Calculating Resource Utilization

The utilization of working resources is calculated based on busy time compared to the cycle time. A resource is busy for the duration of the operations with respect to the defined control flow, parallel activities, and times when the resource is not busy.

The following topics are discussed:

- Utilization Criteria
- Utilization Computation

Utilization Criteria

You can specify criteria for resource utilization, such as percentage values and color coding for each range.

Up to four ranges between 0% and greater than 100% are available. A color is assigned for each range. Based on colors, you can see how well or badly a resource is used.

For example, if the cycle time is 60 sec and the range goes from 50% to 75%, the corresponding time range is $60 \times 50\% = 30$ sec to $60 \times 75\% = 45$ sec.

If the resource is used from 30 to 45 sec or 50% to 75%, it is marked in the defined color of this range.

You can specify Resource utilization options in Me > Preferences > App Preferences > Simulation > Digital Manufacturing Apps Common Services > Manufacturing Planning Apps Common Services > Utilization.

Utilization Computation

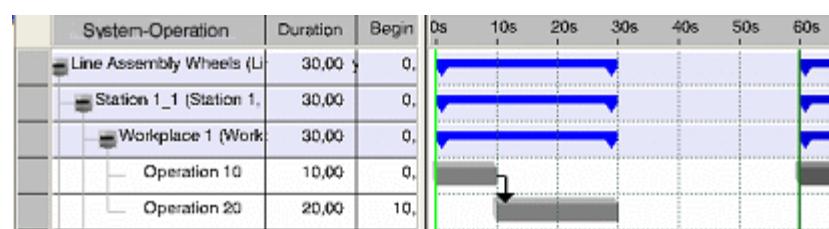
Resource utilization is the coefficient of resource busy time/system cycle time expressed as a percentage. It is calculated for working resources only.

$$\text{Resource utilization}[\%] = (\text{resource busy time}/\text{cycle time}) \times 100$$

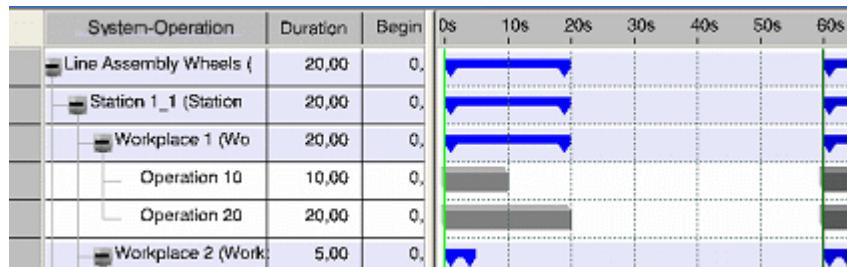
The resource busy time is the duration of operations with respect to the defined control flow, parallel activities, and times when the resource is not busy.

The cycle time is the cycle time of the system, propagated in the cycle time attribute of the resource itself or its parent. If no valid cycle time can be retrieved, utilization is 0. Resource utilization is not persistent: it is available in the session only.

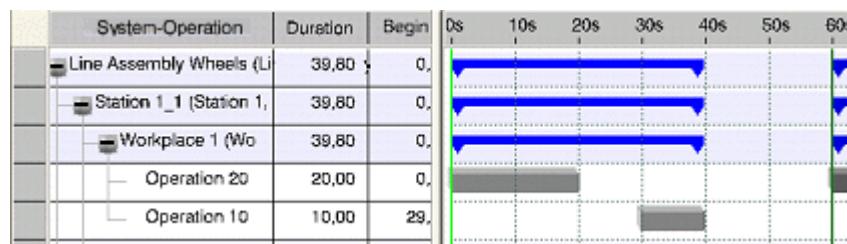
In the example below, the busy time of resource "Workplace 1" is 30 sec and the cycle time is 60 sec. The resulting utilization is 50%.



In the example below, the busy time of resource "Workplace 1" is 20 sec and the cycle time is 60 sec. The resulting utilization is 33.33%.



In the example below, the busy time of resource "Workplace 1" is 30 sec (20 sec + 10 sec) and the cycle time is 60 sec. The resulting utilization is 50%.



Note: If you assign multiple working resources to an operation, the operation time is taken into account for each of the resources.

Module-3. J: Using the Relations Panel

This section describes the Relations panel that, for a selected object, lists all the related objects in the current session.

In this section:

- About the Relations Panel
- Listing Related Objects in the Relations Panel
- Loading Related Objects in Session Using the Relations Panel

A. About the Relations Panel

When an object is clicked in the tree, the Relations panel provides a list of all the relations with the other objects in the current session.

- Relations Listed After Object Selection
- Lock Mode for Input Selection
- Display of First Upper Scope Objects
- Cross Highlighting
- Panel Update Capabilities

B. Relations Listed After Object Selection

When you select an object, the Relations panel lists all the relations with the other objects in the current session.

Note:

- You can start and update the panel with one or more selected objects. These objects must be of the same type.
- You can select one or more listed objects directly in the panel.
- You can edit properties of objects that are listed in the panel.
- You can delete relations between objects using Remove Relation from the context menu. Remove Relation does not support Multi-Selection.

Relations listed in the panel depend on the selected objects, and can include scope links, implement links, data requirements, product flows, time constraints, and so on. For example, if you select a product, all



items that have scope and implement links with it are listed in the panel. If you select an operation, all items and resources that have relations with it are listed in the panel, including scope, implement, and requirement links as well as time constraints.

For more information about possible relations, see the list of the Table 1.

C. Lock Mode for Input Selection

The Lock mode lets you restrict input selection to the Relations panel.

Lock mode is enabled and disabled by clicking the icon at the top of the panel.

In Lock mode , you can select objects in the panel or update the panel by double-clicking an object of the panel. However, the panel is not updated if you select objects outside the panel, such as selecting objects in tree. If the selected objects are in one or more lists of the panel, the corresponding list objects are highlighted.

In Unlock mode , selecting objects outside of the panel updates the panel with these objects. You can Multi-Select objects in the panel and in the tree at the same time.

D. Display of First Upper Scope Objects

All the implemented objects of all the first upper scopes are displayed in the implemented objects list.

Selecting a first upper scope object highlights the corresponding implemented objects in the implemented objects list.

E. Cross Highlighting

You can cross highlight objects between the Relations panel and the tree is available.

Selecting an object in the Relations panel highlights the selected object in tree and on the tiles if your app has a grid editor.

For each object shown in the Relations panel, it is possible to select it by a single click. This object is then highlighted in the tree.

Double-clicking an object in the panel will define this object as current, and update the panel accordingly. In addition, other applications and panels such as the 3D View panel take the objects clicked in the Relations panel into account.

F. Panel Update Capabilities

The Properties panel is updated after structure modifications and during systems simulation.

The Relations panel is updated to reflect modifications in the model structure (such as adding a new item, operation or resource, creating new implement links, and so on).

The Relations panel is integrated in systems simulation. The panel is refreshed with the focused objects of the simulation each time these objects change. The Lock mode has no effect on systems simulation.

G. Listing Related Objects in the Relations Panel

When you select a product, item, resource, system, or operation, the Relations panel lists all the relations with the other objects in the current session.

1. From the Authoring section of the action bar, click Relations .

An empty Relations panel appears.

2. Select an item in the tree.

You can select an item tile if your app has a grid editor.

The Relations panel lists the relations of the selected item with products, systems, operations, and resources as well as data requirement and precedence links.



The Relations panel displays the following information:

- Relations with Products:**
First Upper Scope(s): Prcs0 A.1 to Prd0 A.1
Implemented Product(s):
Prd1 A.1 (Prd1.1)
- Relations with Systems and Operations:**
First Upper Scope(s): Prcs0 A.1 to Sys0 A.1
Implementing Operation(s):
LoadingOperation1 A.1
- Data requirements:**
Predecessors: Successors:
Prcs0 A.1
- Precedences**
- Relations with Resources**

3. Select an operation in the tree.

You can select an operation tile if your app has a grid editor.

The Relations panel lists the scope links and implement links of the selected operation with items and resources, as well as the time constraints with other operations.

The Relations panel displays the following information:

- Relations with Manufactured Items:**
First Upper Scope(s): Sys0 A.1 to Prcs0 A.1
Implemented Manufactured Item(s):
Provide1 A.1 (Provide1.1)
- Relations with Resources:**
First Upper Scope(s): Sys0 A.1 to Org0 A.1
Implementing Resource(s):
Who | Conveyor1 A.1 (Conveyor1.1)
- Time Constraints**



H. Loading Related Objects in Session Using the Relations Panel

You can display linked objects that are not loaded in session and load these objects in session using the Update from database command in the Relations panel.

Before you begin: Load a Manufacturing Assembly and a System structure in your session. In this scenario, one or more items implemented by an operation must not be loaded in session.

- From the Authoring section of the action bar, click Relations

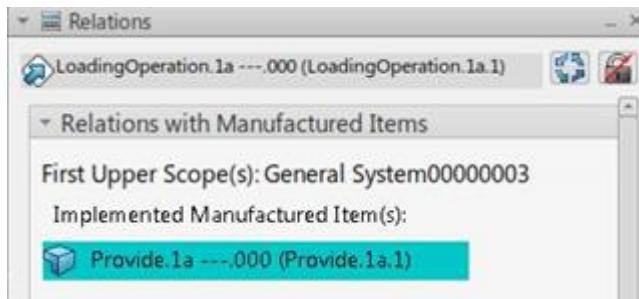
An empty Relations panel appears.

- Select an operation in the tree (LoadingOperation.1a, for example).

You can select an operation tile if your app has a grid editor.

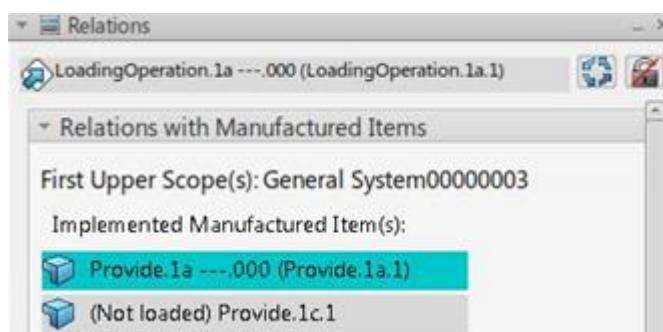
In this scenario, an item implemented by the selected operation is not loaded in session.

The Relations panel lists the related objects of the selected operation that are loaded in session.



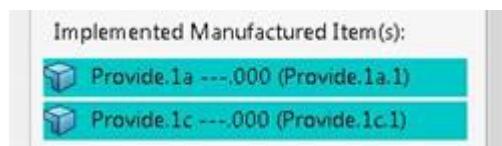
- Click Update from database in the panel.

The objects that are related to the selected operation that are not loaded in session are listed in the panel. They are prefixed with the text "Not Loaded" (item Provide.1c, in this example).



- Double-click the unloaded item in the panel.

The item (Provide.1c, in this example) is loaded at its correct location in the System structure, and it is listed in the Relations panel.



I. Using the 3D View in Equipment Allocation

You can use the 3D View panel to visualize the 3D representation, FTA annotations, and product build-up of a selected item, product, system, operation, or resource.

The following scenario illustrates how to use the 3D View panel on a selected manufacturing assembly.

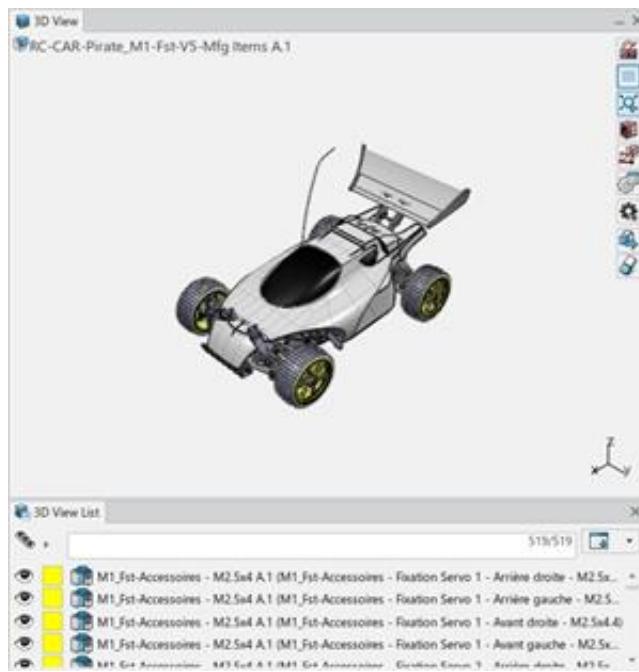
The same procedure can be used for a product, system, operation, or resource.

- Select a manufacturing assembly in the tree.
- From the Authoring section of the action bar, click 3D View
- To show the 3D View List panel, from the 3D View panel, select List Shown

The manufacturing assembly is displayed in the 3D View panel according to design colors. This is the default option.



The 3D View List panel lists the products implemented by the selected manufacturing assembly. The colored square next to the product indicates the build-up category.



4. To manage the display of the implemented products, select General Options in the 3D View panel.
5. To apply the build-up colors of the manufacturing assembly in the 3D viewer, select Show Build-Up Colors ON .



Notes:

- To manage the displayed build-up categories, select Display Options in the 3D View panel.
- You can click Product Build-Up options at the right edge of the work area to display the Product Build-Up options panel.
- For more information about the 3D View panel and the product build-up, see the Common Services for Process Engineering Apps User's Guide.

J. Unloading Objects

You can unload objects from an assembly or system if they are no longer used in session. Unloading object lets you display useful objects only and frees up memory.



This task shows you how to:

- Unload Objects
- Unload Evolved Instances of Objects

Before you begin: Save the objects before unloading them.

Unload Objects

You can unload instances of objects using Unload from a context menu or Tools section of the action bar. To use Unload from a context menu, select objects that are either systems or operations.

- An unload operation cannot be undone. To reload unloaded objects, reopen the content.
- The unload operation deletes the history of all finished actions. Therefore, you cannot undo or redo actions after unloading objects, even on objects that are kept in session.
- You cannot unload a root object from the tree.
- The selected objects are unloaded from all editing tabs.

 1. In the tree, right-click one or more instances of objects.
 2. From the context menu, select Unload.
 3. To confirm the unload operation, click OK.

The object and its children are unloaded and no longer displayed.

Unload Evolved Instances of Objects

You can unload all the evolved instances of objects belonging to the same node using Unload Evolved Instance.

1. From the Authoring section of the action bar, click Unload Evolved Instance
2. In the tree, select a node containing the evolved instances to unload.
3. To confirm the unload operation, click OK.

All evolved instances belonging to the selected node are unloaded and no longer displayed.

K. Reordering Objects in the Tree

You can reorder items, systems, and operations in the tree, manually or based on alphabetical order of display names.

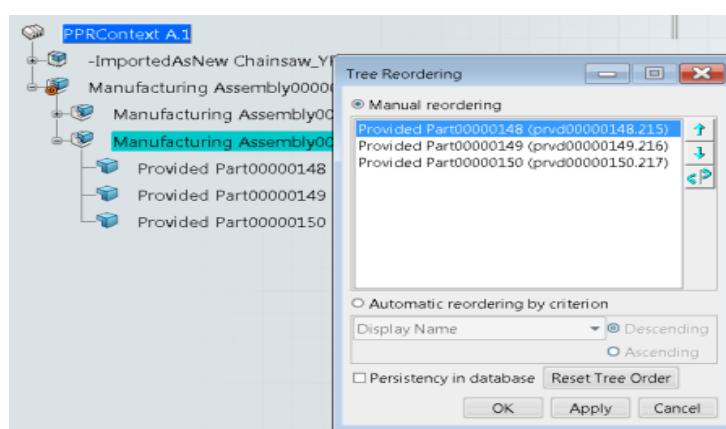
The scenario below illustrates reordering items. A similar procedure can be applied to reorder operations or systems.

Systems and operations can be reordered in the Gantt chart, if a system or operation is present in the session or by drag and drop.

Before you begin: Load your session content, which must include a Manufacturing Assembly structure.

1. In the tree, select a manufacturing assembly that comprises items.
2. From the Authoring section of the action bar, click Tree Reordering

The Tree Reordering dialog box appears. The Manual reordering mode is defined by default. The items of the assembly are listed in the dialog box.





3. Reorder the items as follows:

- Select the item you want to move and click Selection
- Select another item: the first item is to be moved before this one.
- Click Apply to change the order of the items in the tree.

You can use the Up or Down arrow to move the selected item up or down the list.

- Optional: Select Automatic reordering by criterion. Then reorder the items based on the alphabetical order of the display name or an attribute from the list such as creation date or last modification.
- Optional: Select the Persistency check box if you want to memorize this tree structure for the next session.

In that case, the next time the structure is opened, the objects are listed in the newly defined order.

- Click OK to save the new order of the objects in the tree.

Note:

- You cannot reorder the objects that are directly under the PPR Context.
- Tree Reordering can be run from the tree, the Item Editor, the System Editor, or the Gantt chart. After running the command, the tree, and Gantt chart are updated.

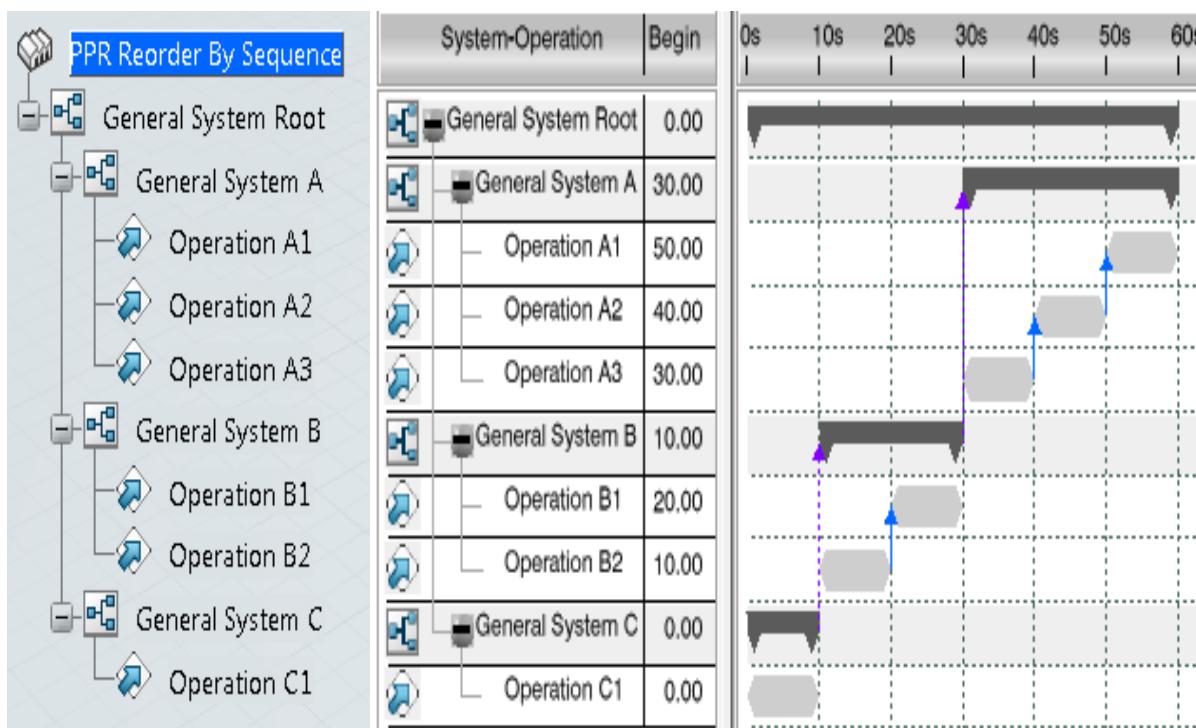
L. Ordering by Sequence

You can sort operations and systems in the tree and Gantt chart by taking into account their sequencing. That is, the Begin Times of the operations.

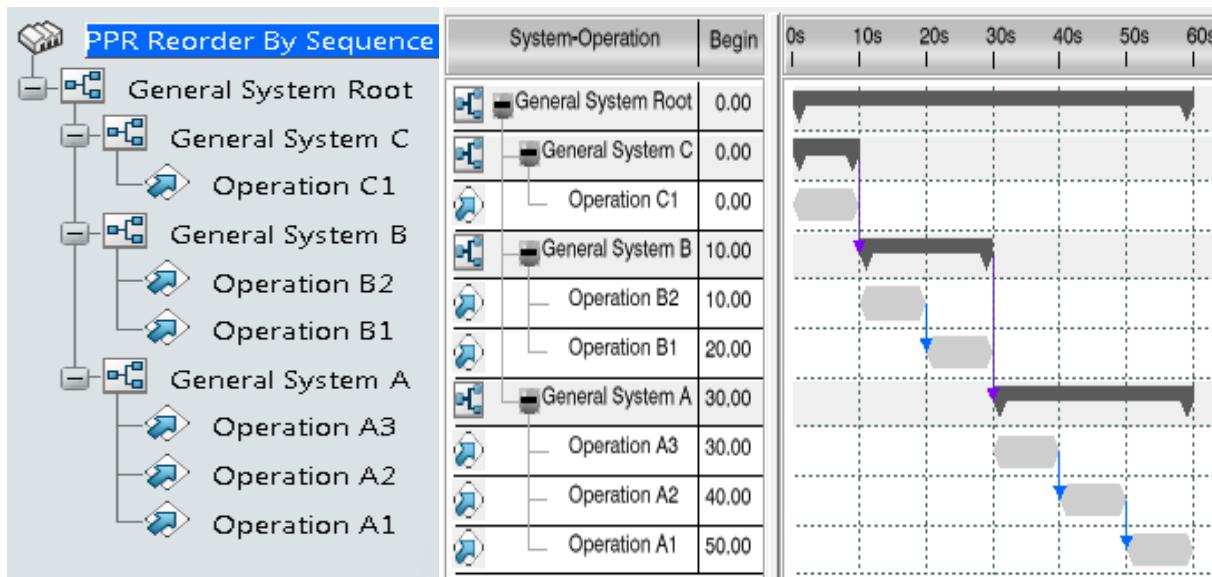
Note: The Gantt chart is not available in some apps.

- Load your session data: it must include a System structure with operations.

For example, a typical tree and Gantt chart are as follows:



- Select the root system.
 - From the Authoring section of the action bar, click Order by Sequence .
- The tree and Gantt chart are reordered according to the Begin Times of the operations as follows:



Notes:

- Once the command is run, the changes are persistent. If required, the Tree Reordering command can be used to modify the sequencing order.
- The layout of the System and Operation tiles in the System Editor are not changed when this command is run.

M. Selecting PPR Objects in the Tree

You can use various selection modes to select items, systems, operations, or resources from the tree in a single click.

The following scenarios illustrate how to use the selection modes on systems. You can use the same procedures on items, operations, or resources.

This task shows you how to:

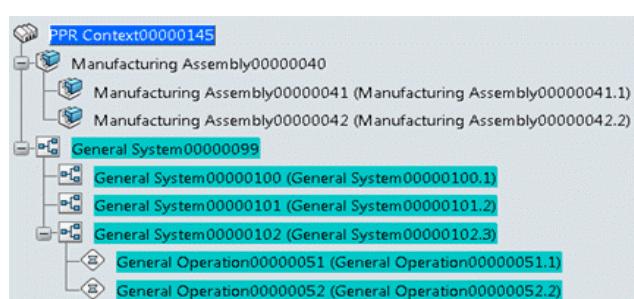
- Use Select Children
- Use Select Others
- Use Select All
- Use Select Inversion
- Use Select Parent
- Use Select Siblings
- Use Select All Leaves

Before you begin: All the commands described below are also available from the context menu. Right-click an object in the tree, then go to Selection mode.

Use Select Children

You can use Select Children to select all the children of an item, system, or resource in the tree.

- Select the root system in the tree.
 - In the View section of the action bar, click Select Children .
- The root system and all of its child systems and operations are selected.



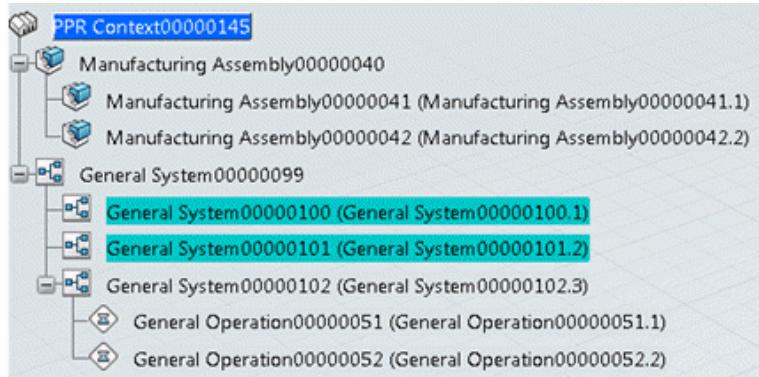


Use Select Others

You can use Select Others to select all items, systems, or resources in the tree other than those selected earlier.

1. Select the third child system of the root system in the tree.
2. In the View section of the action bar, click Select Others .

The two other child systems of the root system are selected.

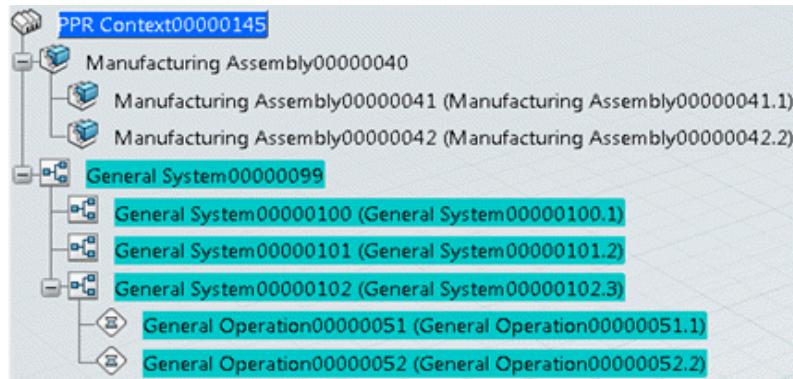


Use Select All

You can use Select All to select all the children of a root item, system, or resource in the tree.

1. Select one of the operations in the tree.
2. In the View section of the action bar, click Select All .

The root system and all of its child systems and operations are selected.

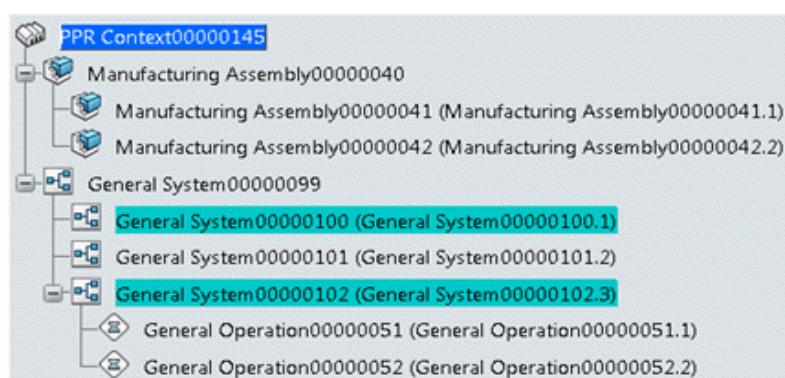


Use Select Inversion

You can use Select Inversion to select all the children of a root item, system, or resource in the tree.

1. Select the second child system of the root system in the tree.
2. In the View section of the action bar, click Select Inversion .

The two other child systems of the root system are selected.



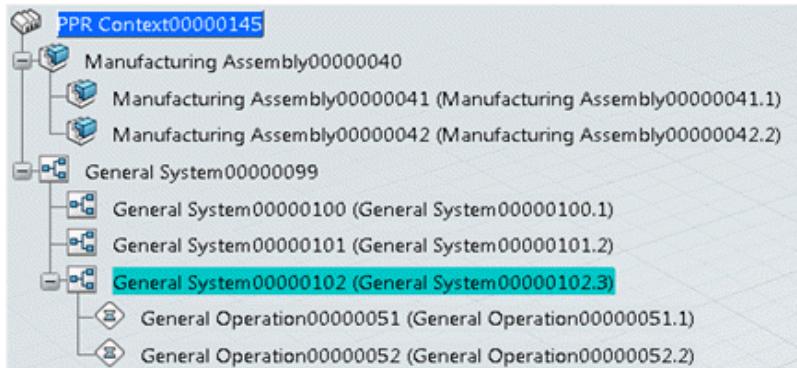


Use Select Parent

You can use Select Parent to select the parent of an item, system, or resource in the tree.

1. Select one of the operations in the tree.
2. In the View section of the action bar, click Select Parent .

The parent system of the operation is selected.

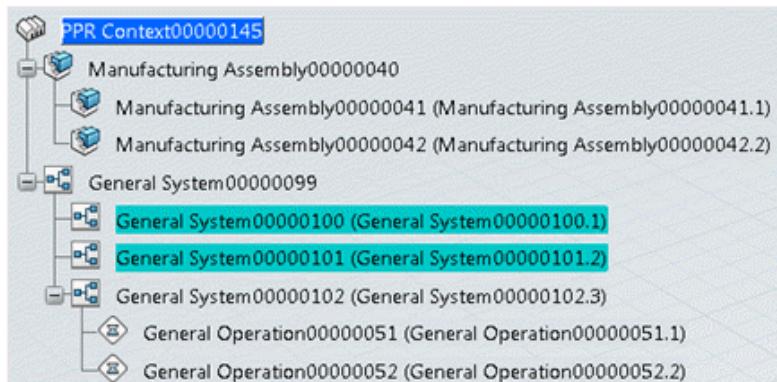


Use Select Siblings

You can use Select Siblings to select all the siblings of an item, system, or resource in the tree.

1. Select the third child system of the root system in the tree.
2. In the View section of the action bar, click Select Siblings .

The two sibling systems of the system are selected.



Use Select All Leaves

You can use Select All Leaves to select all leaf nodes under an item or a system in the tree.

1. Select the root system in the tree.
2. In the View section of the action bar, click Select All Leaves .

All the leaf-systems and leaf-operations of the root system are selected.

Note: Time Analysis and Work Instructions are not considered leaf nodes.





N. Using the Spreadsheet

You can use the spreadsheet to browse and edit planning content.

This task shows you how to:

- Insert PPR Objects
- Manage PPR Object Attributes
- Filter PPR Objects
- Group PPR Objects
- Manage Presets
- Export Content

Before you begin:

1. Open a PPR Context with a root Manufacturing Assembly in your app.
2. To open the spreadsheet panel, click PPR Spreadsheet  from the Authoring section of the action bar and select the root Manufacturing Assembly.

Tip: To make the spreadsheet dialog boxes floatable, click Show Preferences  and select the Show Managers as Floatable option .

Insert PPR Objects

Using the spreadsheet, you can insert PPR objects such as items, operations, and systems.

The scenario below illustrates how to insert several unloading operations.

1. In the spreadsheet, click Insert New Content .
2. From the list, select the type of PPR object you want to insert.
3. In the box, enter the number of PPR objects you want to insert.
4. Click Validate  to confirm the insertion.

Manage PPR Object Attributes

You can hide or show, reorder, and edit attributes.

1. In the spreadsheet, click Attributes Manager .

The list of available attributes appears, in the order of the spreadsheet.

2. To manage attributes display, use the following commands:

Command	Description
	Hides or shows all attributes.
 / 	Hides or shows a single attribute.
 / 	Moves the selected attribute up or down the list.

3. To edit an attribute, select its value in the spreadsheet and enter a new one.

Filter PPR Objects

You can filter PPR objects based on attribute values.

1. In the spreadsheet, select an attribute then click Filters Manager .

The list of available values for the attribute appears.

2. To filter values of the attribute, use the following commands:

Command	Description
	Hides or shows all attribute values.
 / 	Hides or shows a single attribute value.



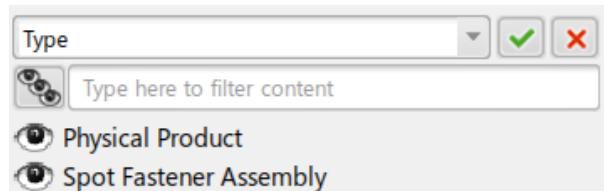
Group PPR Objects

You can create grouping nodes to group PPR objects based on attribute values. This enables you to select and edit all objects in a group simultaneously.

The scenario below illustrates how to group objects by type.

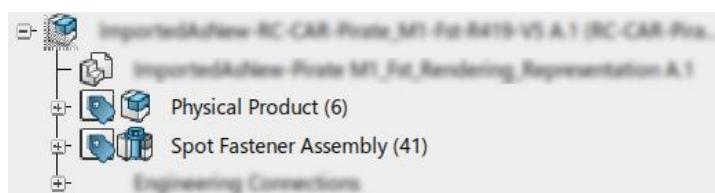
1. In the spreadsheet, click Groups Manager
2. Click Create Group
3. From the list, select an attribute such as Type.

The list of available values for the attribute appears.



4. Using Hide and Show , display only the values for which you want to create a group.
5. Click Validate .

A grouping node is created for each value.



Manage Presets

You can save the current configuration of the spreadsheet or apply an existing one.

1. In the spreadsheet, click Presets Manager
2. To save the current configuration of the spreadsheet:
 - a. Optional: In the box, enter a name for the preset.
 - b. Click Create Preset

A preset containing the current attributes, filters, and groups of the spreadsheet is created.

3. To apply a preset to the spreadsheet, click Load Preset

You can revert to the default configuration by clicking .

4. To update a preset with the current configuration of the spreadsheet, click Save Preset

Export Content

You can export the spreadsheet content as a text, CSV, or TSV file.

1. Select the spreadsheet content.

Note: If only one line is selected, it will be the only line exported. To export the entire spreadsheet content, select all the lines.

2. Click Export Content
3. Specify the folder in which to export the file, name the file, and choose a file type from the list.
4. Click Save.

A file containing the selected spreadsheet content is created in the specified folder.

O. Activating Root Items

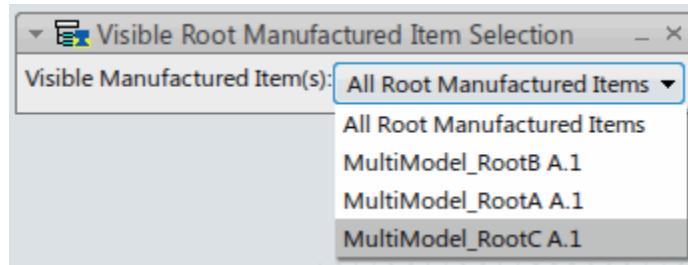
In a Multi-Model session, you can display the parts implemented by either one or all the root items in the System Editor and the buildup.

Before you begin: Load a Multi-Model session, that is, a session in which several products (root products)



can be realized by several items (root items).

- From the Authoring section of the action bar, click Visible Root Item
- The Visible Root Items Selection panel appears in which you can select either one or all of the root items.



- Select All Root Items in the list.
 - Press the F5 key.
- All the parts implemented by items of all the root systems are listed in the F5 list.

Parts	Man. Items	Operations	Fasteners
Name			
MultiModel_PartBigCylinder.1			
MultiModel_PartBigSquare.1			
MultiModel_PartBigTriangle.1			
MultiModel_PartSmallCylinder.1			
MultiModel_PartSmallSquare.1			

- Select one root item in the list.
 - Press the F5 key.
- Only the parts implemented by items of the selected root are listed in the F5 list.

Parts	Man. Items	Operations	Fasteners
Name			
MultiModel_PartSmallTriangle.1			
MultiModel_PartBigTriangle.1			

P. Using the Sheet Editor

The Sheet Editor allows you to view and edit the properties of multiple objects in a spreadsheet view.

- Select several items that are under the same node.
 - From the Authoring section of the action bar, click Sheet Editor
- The Sheet Editor dialog box appears.
- Click the Name cell of an item and modify the name. Rename the other items in the same way.
 - Multi-Select the Estimated time cells of the items and enter a new value in one of the cells.

	Display Name	Name	Estimated Time
✓	26942A...151 ---	MfgAssembly01	25s
✓	26942P...147 ---	PPart01	25s
✓	26942A...152 ---	MfgAssembly02	25s
✓	26942P...148 ---	ProvPart02	25s



5. Click Commit to save your modifications in the session.
If you want to keep the new values, you must save your modifications.
 6. Close the Sheet Editor dialog box.
 7. Select several operations that are under the same system and click Sheet Editor .
- The Sheet Editor dialog box appears.
8. Click the Title cell of an operation and modify the operation title. Rename the other operations in the same way.
 9. Multi-Select the Estimated time cells of the operations and enter a new value in one of the cells.

	Display Name	Estimated time	Title
<input checked="" type="checkbox"/>	Loading Op...49 ---.000	12s	LoadOpA
<input checked="" type="checkbox"/>	Loading Op...49 ---.000	12s	LoadOpB
<input checked="" type="checkbox"/>	Loading Op...49 ---.000	12s	LoadOpC

10. Click Commit to save your modifications in the session.
If you want to keep the new values, you must save your modifications.
- For more information, see the Collaborative Lifecycle User's Guide: Using Attributes with the Sheet Editor.

Q. Using the Manage Origins Panel

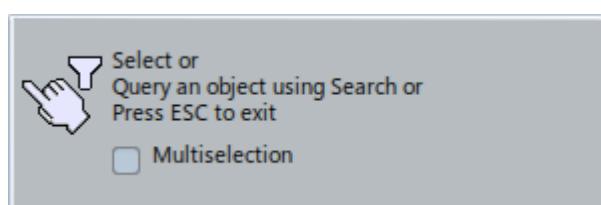
You can use the Manage Origins panel for assigning or removing origin links on items, systems, operations, or resources. An origin link is defined between objects of the same type and lets you determine from which object the selected object was derived. For example, a locally manufactured product could be derived from a centrally manufactured product.

The following scenario illustrates how to use the Manage Origins panel for items. The same procedure can be used for systems, operations, or resources.

1. From the Authoring section of the action bar, click Manage Origins .
- The Manage Origins panel appears.
2. Select an item in the work area or tree (Provided Part01, for example).



3. Click Add an Origin in the panel.
- The Applicative Search is activated in the top bar and a small panel appears.





- Select an item in the work area or tree, or using the search facility.

For more information, see [Using the Applicative Search](#).

If you selected Provided Part02, for example, an origin link is assigned between Provided Part01 and Provided Part02.

- Click Add an Origin , then select another item.

If you selected Provided Part03, for example, an origin link is assigned between Provided Part01 and Provided Part03.

Note:

- You can use Reconnect on Revision in the panel to reconnect the selected object. These objects include item, system, operation, or resource, and can be reconnected to a new revision of the object even if it is not loaded in the session. A panel is displayed to let you select any available revision of the selected object.
- You can delete origins using Delete in the panel.
- You can filter origins using Edit Filters in the panel. A Filter section appears that lets you filter values on selected columns.
- You can manage origin attributes using Edit Attributes in the panel. An Attributes section appears that lets you hide/show columns of attributes.
- You can manage panel preferences (status bar and messages) using Preferences in the title bar of the panel.

R. PPR Configuration Filtering

The Filter PPR Content command enables you to filter content in root products, items, and systems that have predefined configurations. Filtering is done directly in an authoring session. Resource roots are not supported.

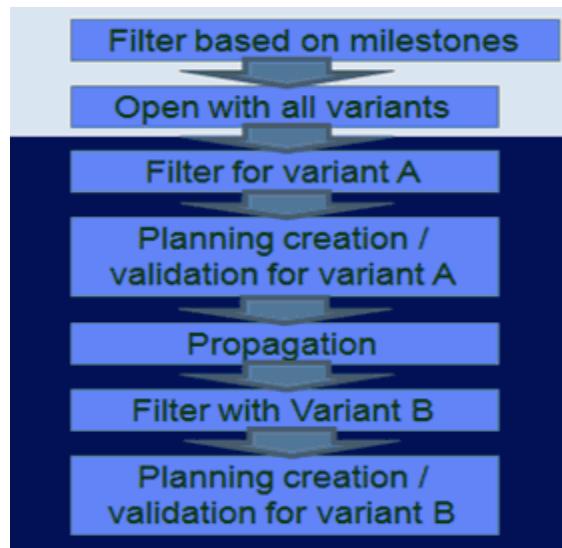
The following topics are discussed:

- General Principle
- Switching to an Authoring Session From Manufacturing Finder
- PPR Configuration Filtering Panel
- Techniques
- Assignment Commands Behavior After Filtering the Tree

General Principle

For a given root, which can be a product, a system, or an item, you can filter the content in the authoring session by predefined configurations.

Here is the workflow to load a configuration-filtered PPR content with two predefined configurations, A, and B.





The example below shows a root with two variants, A, and B.



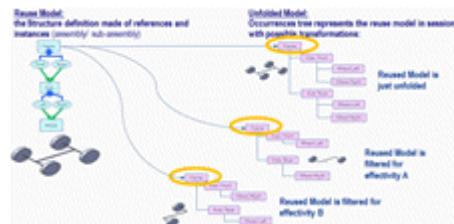
The behavior is as follows:

- If no filter is applied to the root, all the child content is visible.
- If Effectivity B is selected, only the content with no effectivity and the one with Effectivity B is visible.
- If Effectivity A is selected, only the content with no effectivity and the one with Effectivity A is visible.

Switching to an Authoring Session From Manufacturing Finder

You can filter PPR content that has predefined configurations directly in an authoring session, which avoids switching back and forth from the Manufacturing Finder.

The figure below represents the tree visibility from the model structure in session. The filtered tree shows the visible occurrences according to their variant.



The occurrence tree is created according to the reference and instance original structure: four occurrences for each wheel, two for each axle, and one frame.

In the model structure, there is only one reference for the frame, the axle, and the wheel. For example, the same wheel reference has its 3D duplicated and is instantiated twice with four different positions.

In this example, effectivities A and B have been defined on the wheels and their related axles. When you switch from effectivity A to effectivity B, then the 3D visibility changes.

All the modifications - such as deleting an element in the tree, creating an implement link - are persistent in the authoring session even if you switch from one variant to another. This means that you can go back and forth, switching filters, and making modifications without losing them.

Note: The occurrence tree differs from the model assembly. All the related occurrences from the model assembly are created in the session. The purpose of the filter is to make only the required ones visible for the predefined configuration.

PPR Configuration Filtering Panel

The PPR Configuration Filtering panel allows you to filter content in root products, items, and systems that have predefined configurations.

The panel appears when you select Filter PPR Content in the Authoring section of the action bar. All root elements have a dedicated list to filter content with predefined configurations. There can be several root products, items, and systems: the panel shows a list for each root loaded in the authoring session.

From each list, you can select predefined configurations already defined on the root element.

From each list, you can select the required predefined configuration to make the content related to this predefined configuration visible.

If No Filter is defined, then no filter is applied and all the content is visible for this related root object. The list shows all the predefined configurations defined on the root. Default value is No Filter, so all the children with variants under the root are visible in the tree.

You can select a predefined configuration from a list and select the Replicate predefined configuration check box. Then the selected predefined configuration is automatically replicated to the lists for each root element below, depending on the business logic customization.



It is possible to customize this filter using business logic. For more information, see Replicate Predefined Configurations to Remaining Roots (DELPPRFindSimilarConfigIndexInOrderedList_ID).
If No Filter is defined in one of the lists and you select the Replicate predefined configuration check box, No Filter is replicated to all the lists for root elements.

Techniques

You can consider a planning with a predefined 3 doors configuration for a car assembly.
The context defined on the car is Nb_of_doors (Number of doors).

The screenshot shows the 'Properties' dialog box for a 'Manufacturing Assembly'. The 'Current selection' is set to 'Manufacturing Assembly00000002_0E86DD69-0000-28B8-'. The 'Configuration' tab is selected. In the 'Context' section, there is a table with two rows: 'Name' (Nb_of_doors) and 'Description' (Car assembly context). In the 'Criteria' section, under 'Evolution', 'Date' is checked. Under 'Variant', 'Configuration Feature' is checked. In the 'Predefined Configurations' section, there is a table with three rows:

	Name	Model...onary	Apply...g View	Descript
3 doors	Nb_of_doors	Official		
4 doors	Nb_of_doors	Official		

At the bottom right of the dialog box are 'More...', 'OK', 'Apply', and 'Close' buttons.

The 3 doors content is filtered from a root product, item, and system.

An Nb of doors context has to be defined on the root product, the root item, and the root system each with three variants: Three doors, four doors, and five doors.



Filter with Root Product, item, and System

If you want to see only product content related to the 3 doors model assembly, you must select 3 doors on the product filter in the authoring session. Then select Apply.

You can apply several filters at the same time.

You may require to filter a planning with the 3 doors variant for the root product, the root item, and the root system. In this case, you can select the 3 doors effectivity for each root, then select Apply.

The tree visibility changes and only the elements with 3 doors effectivity and elements with no effectivity are visible under the different root objects.

Filter with Same Context Defined on Root and Its Children

The filter options only apply on the root with its defined context. So the predefined configuration clicked in the PPR Configuration Filtering panel filters the child content according to this predefined configuration. However, it is possible to have the same context defined on one of the children.

Sometimes one effectivity is selected for a root element in the PPR Configuration Filtering panel. In this case, only the content with the same effectivity and with a parent with the same context is visible in the authoring session.

Consider an example with a root with two contexts and three effectivities: the figure below shows what is visible if you switch filters in the lists from no filter, effectivity A, and effectivity B.



Element 4 and Element 4.1 are visible for effectivity A and effectivity B. This is because the context defined in Element 4 is different from the one defined in the root, Context 1.

Element 1.1 is visible if you select the effectivity A from the filter selection since Element 1 and the root have the same context, Context 1.

Assignment Commands Behavior After Filtering the Tree

You can use a filter from the PPR Configuration Filtering panel. In this case, the occurrence creation is different for the tree and some elements are no longer visible and some occurrences no longer exist.

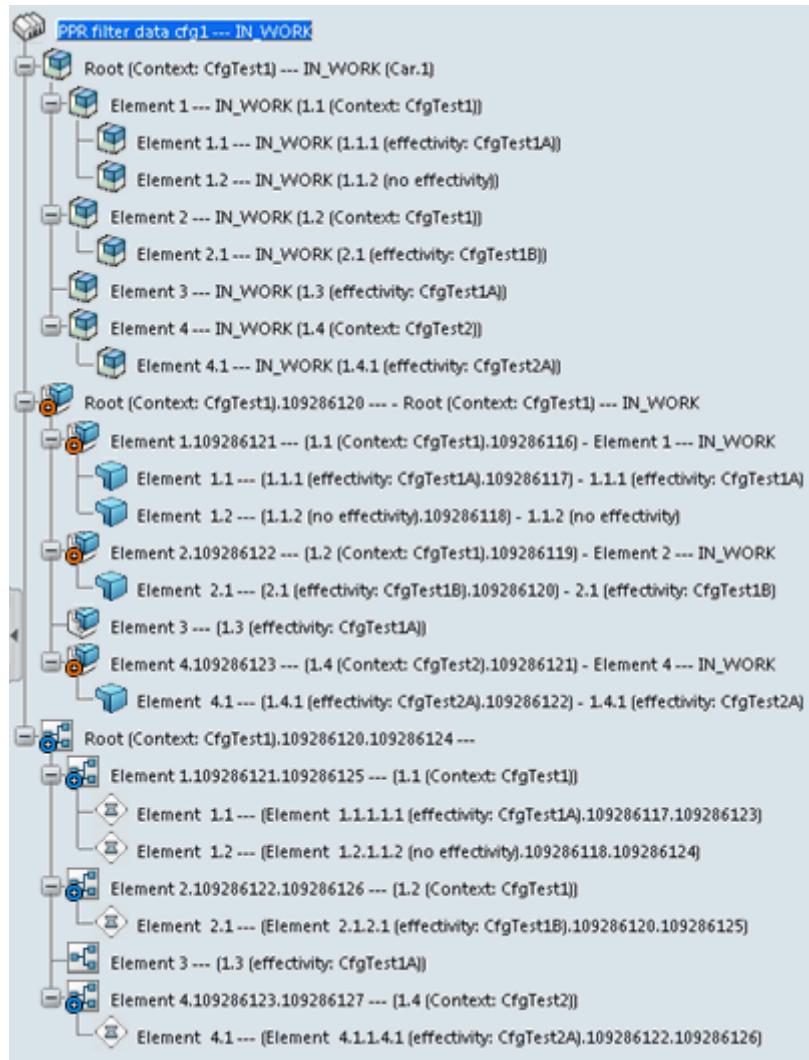
This section demonstrates filtering the product tree to see results with the F5 list, the Assignment panel, and the Assignment Assistant commands.

Consider the predefined configurations created for two contexts similar to that shown in Filter with Same Context Defined on Root and Its Children.

In the tree in the example below, the context and predefined configuration respect this scheme. The context and predefined configurations are:

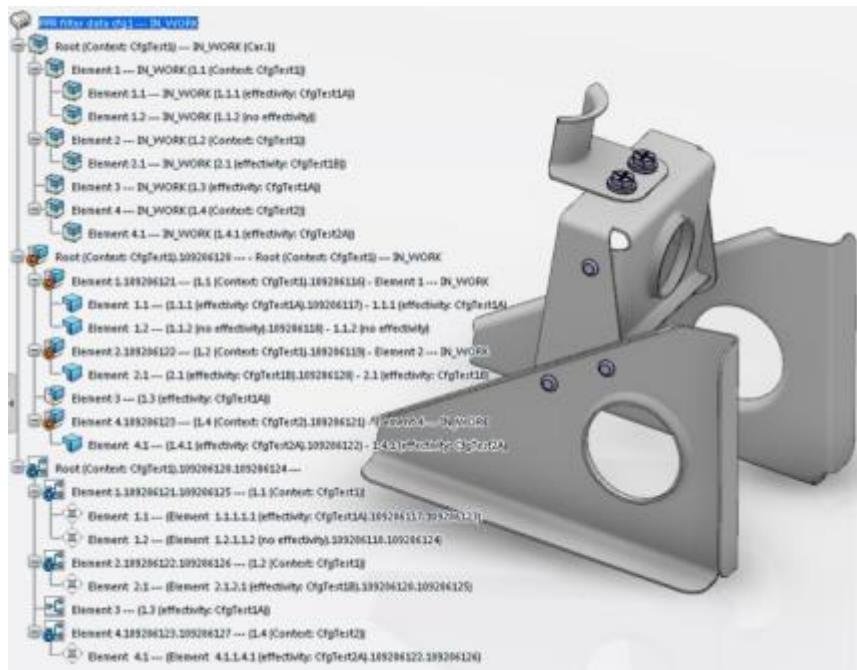
- Context 1 stands for CfgTest1
- Context 2 stands for CfgTest2
- Effectivity A stands for CfgTest1A
- Effectivity B stands for CfgTest1B.
- Effectivity B stands for CfgTest2A.

Here is a view of the tree with those contexts and variants:



The required scopes between products, items, and systems must be created. Also, the required implement links between products and items, and between items and operations must be created.

Here is the 3D representation of the product assembly before filtering:



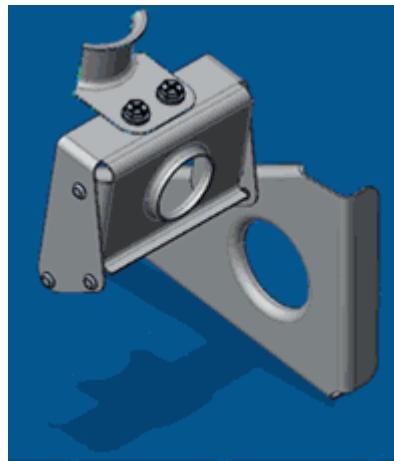


Product Assembly Filter with PPR Configuration Filtering

To filter the product tree for the CfgTest1B variant, select the list of the product roots and select CfgTest1B.

In this case, some occurrences are removed from the authoring. The products Element 1.1 and Element 3 are no longer visible in the tree.

When the tree is filtered, the 3D representation of the assembly changes and the new representation looks like this, with Element 1.1 no longer visible:



F5 List

You can run the F5 list command after product filtering in Manufactured Item Definition. In this case, the product Element 1.1 is no longer in the Assigned Parts list for the Provided Part Element 1.1 and the 3D representation is no longer visible.

After filtering in Process Planning, the 3D representation is no longer visible and the product Element 1.1 is no longer in the Parts list for the operation Element 1.1.

Assignment Panel

You can run the Assignment panel from the Provided Part Element 1.1 after filtering in Manufactured Item Definition. In this case, it shows that the assigned product Element 1.1 is no longer listed in the Assigned Products tab for the Provided Part Element 1.1.

You can run the Assignment panel from the operation Element 1.1 after filtering in Process Planning. In this case, it shows that the assigned product Element 1.1 is no longer listed in the Products column for the Provided Part Element 1.1.

Assignment Assistant

You can run the Assignment Assistant from the Manufacturing Assembly Element 1 after filtering in Manufactured Item Definition. In this case, it shows that the assigned product Element 1.1 is no longer listed in the Assigned Products field. It also shows that the 3D representation is no longer visible in the 3D window.

You can run the Assignment Assistant from the System Element 1 after filtering in Process Planning. In this case, it shows that the assigned product Element 1.1 is no longer listed in the Assigned Products field. It also shows that the 3D representation is no longer visible in the 3D window.

S. Using Resource Context Menu

You can right-click a resource in the work area, tree, or Gantt chart to access a context menu for managing resources (properties, copy/paste, reframe, and so on).

This task shows you how to:

- Reframe On
- Copy a Resource
- Delete a Resource
- Edit Resource Properties



Reframe On

You can use Reframe On to center a resource in the work area.

1. Open a resource in Equipment Allocation.
2. Right-click a resource in the work area or the tree and select Reframe On.

The selected resource is centered in the application window.

Copy a Resource

You can Copy/Paste a resource in the work area, tree, or Gantt chart.

1. Open a resource in Equipment Allocation.
2. Right-click a resource in the work area, tree, or Gantt chart and select Copy or press Ctrl + C on the keyboard.
3. Right-click target parent node and select Paste from the context menu or press Ctrl + V on the keyboard.

A new resource is created below the target parent node.

Delete a Resource

You can delete a resource in the tree or Gantt chart.

1. Open a resource in Equipment Allocation.
2. Right-click a resource in the tree or Gantt chart and select Delete or press Del on the keyboard.

Resource instance is deleted from the database.

Edit Resource Properties

You can edit the attributes of a resource in the Properties dialog box.

1. Open a resource in Equipment Allocation.
2. Right-click a resource in the work area, tree, or Gantt chart and select Properties.

The Properties dialog box appears. The properties of selected resource are organized in tab pages:

- Reference
- Instance
- Graphic
- Configuration
- Effectivity
- Resource

3. Modify the attributes of the resource, as required.
4. Click OK.

The changes are applied to the resource.

T. Using B.I. Essentials in Equipment Allocation

B.I. Essentials enables you to obtain the assignment status of operations on working resources. It also allows you to analyze implements links, and utilization of resources.

1. To access the B.I. Essentials list, from the Tools section of the action bar, click B.I. Essentials.

The B.I. Essentials list appears.

In the B.I. Essentials list, the following B.I. are proposed:

- Operation to Working Resource Assignment Status
- Resources Utilization
- Implement Links Analysis

2. Select a B.I. from the list.

Colors are applied to objects in the tree accordingly.



THANK YOU