SIEMENS

Machining Line Planner Help

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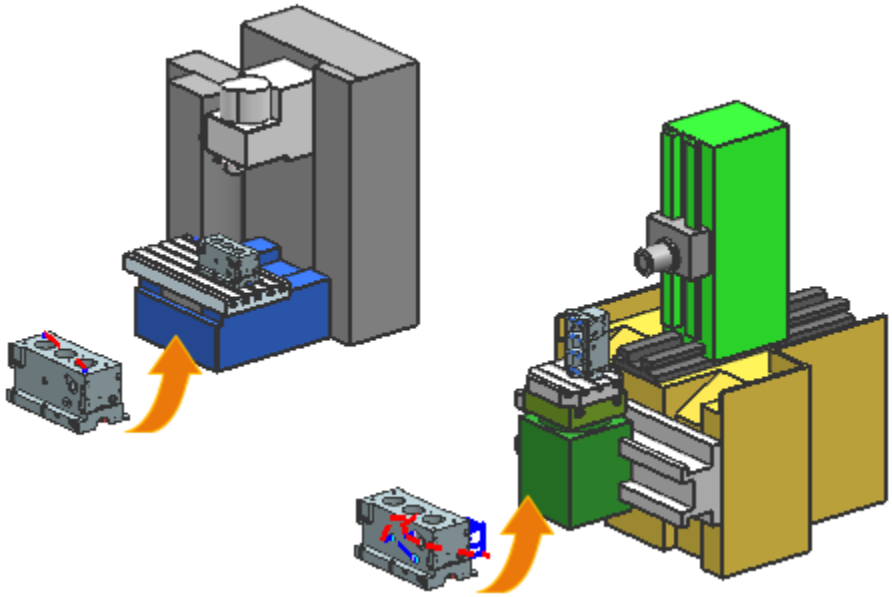
NX Machining Line Planner (MLP)



The Machining Line Planner (MLP) application supports planning for multiple setups and for a machining line with multiple machines.

- Multi-setup planning is typically used in the machinery industry where the main limitation is the capabilities of the machine.
- Machining line planning is typically used in automotive and high volume industries where the main limitation is the cycle time set up for each machine.

Starting with an empty process plan, you load the initial CAM part file, which has all the machining operations required to machine the part geometry. You then create setups and allocate each operation to a specific setup. To help you allocate operations to the appropriate machines, you can apply filters for cycle time, machining direction, sequencing constraints, and tool capacity.

Where do I find it?

Application	Machining Line Planner

Typical workflow for a machining line process plan

1. Create a new part file to contain the **Machining Line Planner** process plan.
2. Load the initial CAM part file into the process plan.
3. Add a process plan setup for each machine station in the machining line.
4. Select source setup filters to help you allocate operations to specific machines.

   The source setup contains all of the unallocated operations from your CAM part file. Typically, the main limitation when you allocate operations is the cycle time capacity of the machine. You can also apply filters for machining direction, sequencing constraints, and tool capacity.
5. Select one of the target setups.
   Each setup that you added in step 3 is a target setup.
6. Allocate operations from the source setup to the target setup.

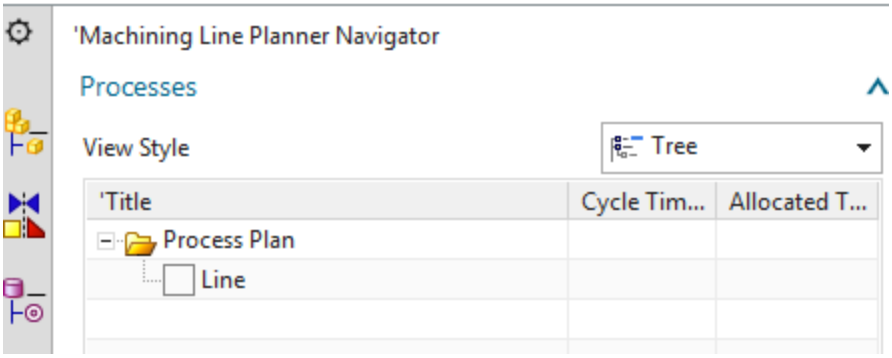
Typical workflow for a multi-setup process plan

1. Create a new part file to contain the **Machining Line Planner** process plan.
2. Load the initial CAM part file into the process plan.
3. Add a process plan setup for each CAM setup.
4. Select source setup filters to help you allocate operations.

   Typically, the main limitation for a multi-setup process plan is the machining direction for each CAM setup. You can also apply the other filters.
5. Select a target setup.
   Each setup that you added in step 3 is a target setup.
6. Allocate operations from the source setup to the target setup.

Create a new MLP process plan

1. Choose **File** tab→ **New**.
2. On the **Machining Line Planner** tab, in the **Templates** group, select the units for the process plan.
3. From the **Templates** list, select **Process Plan** and click **OK**.
   NX opens the **Machining Line Planner Navigator**. The **Processes** panel shows a tree containing the **Process Plan** node.



4. Right-click the **Process Plan** node and choose **Load initial Process Plan.**

   Select the CAM setup part file that contains all the machining operations.
   This loads all products, features, machining operations and tools of the selected CAM setup part file into NX MLP.
   The **Resources** panel shows the tools and the machine
   The **Products** panel shows all geometry such as **part**, **blank**, **WORKPIECE** and the **features**.
   The **Operation Sets** panel is initially left empty.

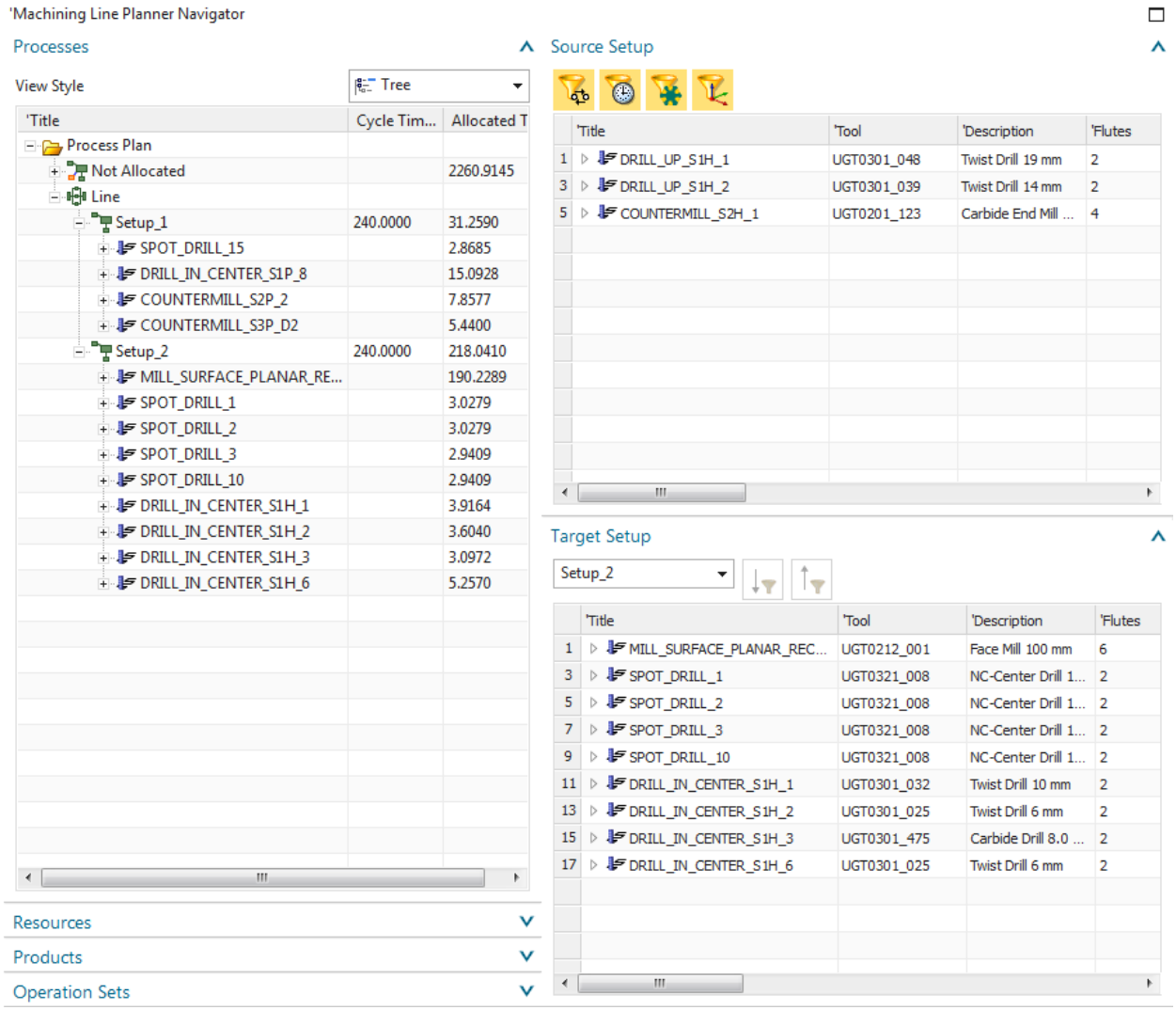
5. Right-click the **Line** node and choose **Add Setup.**

   You add a setup for each station in the machining line, or for each CAM setup in a multi-setup process plan.
   The setup defines how the part is fixed on the machine. You select the machine and fixtures, then place the part and fixtures on the machine in NX CAM. Use the **Open with Manufacturing** command to switch to NX CAM.

6. In the **Source Setup** panel, select filters to control which operations you can assign to the target setups.
   The panel initially contains all machining operations defined in the process plan.
7. In the **Target Setup** panel, select a setup.
   In the **Source Setup** panel, NX displays only the machining operations that match the constraints of the selected filters. For example, if you select a target setup that has 60 seconds of cycle time available, NX shows only operations that require 60 seconds or less.
8. In the **Source Setup** panel, select one or more operations.
9. In the **Target Setup** panel, click **Allocate Operation**
   NX allocates the selected operations to the **Target Setup**.
10. Right-click the **Setup** node and choose **Open with Manufacturing**.
    NX switches to the NX CAM file representing the **Setup**. In NX CAM you can make any required adjustments, such as changing details of the operations or the fixturing.
11. To switch back to NX MLP, use the **Machining Line Planner** button in the Tool bar, or press **Ctrl-Tab.**

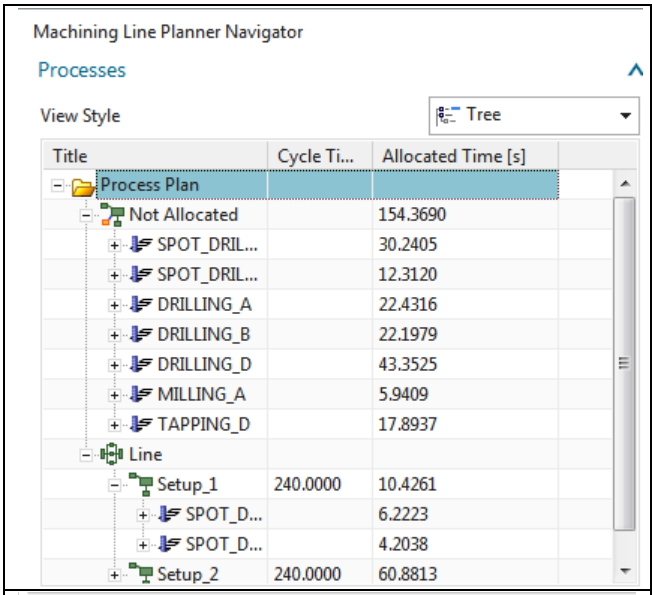
NX MLP User Interface

The Machining Line Planner Navigator lets you define **Setups** or a **Machining Line** and supports the allocation of **Operations**.



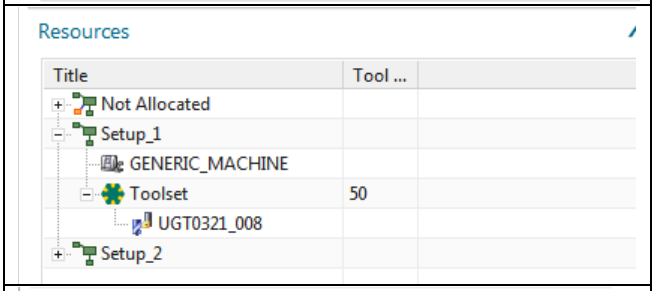
The **Machining Line Planner Navigator** consists of a tree view at the left hand side and a table view at the right hand side. The tree view columns show details such as **Toolpath Time** and **Cycle Time**.

The **Tree View** consists of four trees:

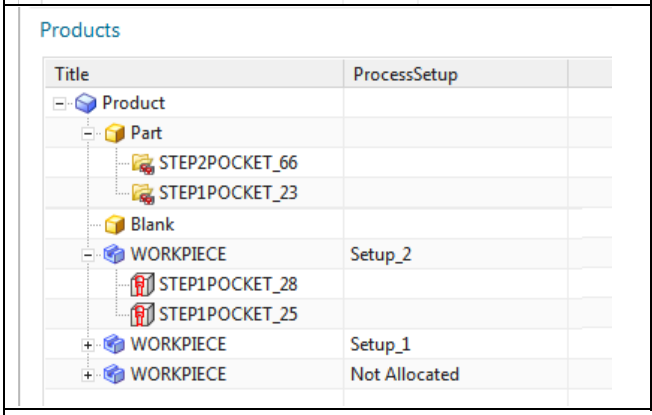


The **Processes** tree shows the **Process Plan.**

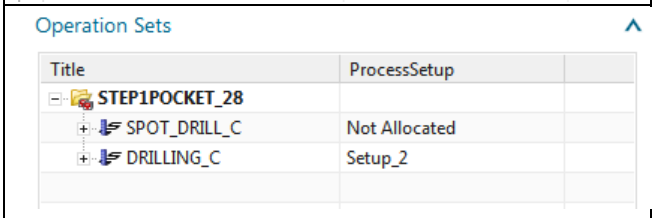
- The **Not Allocated** node displays the operations which are not allocated to a setup.
- The **Line** node displays a sub-node for each setup. The operations allocated to each setup are shown under the corresponding setup node.



The **Resources** tree displays a node for each setup that contains the machine and the tools used by the operations in that setup.



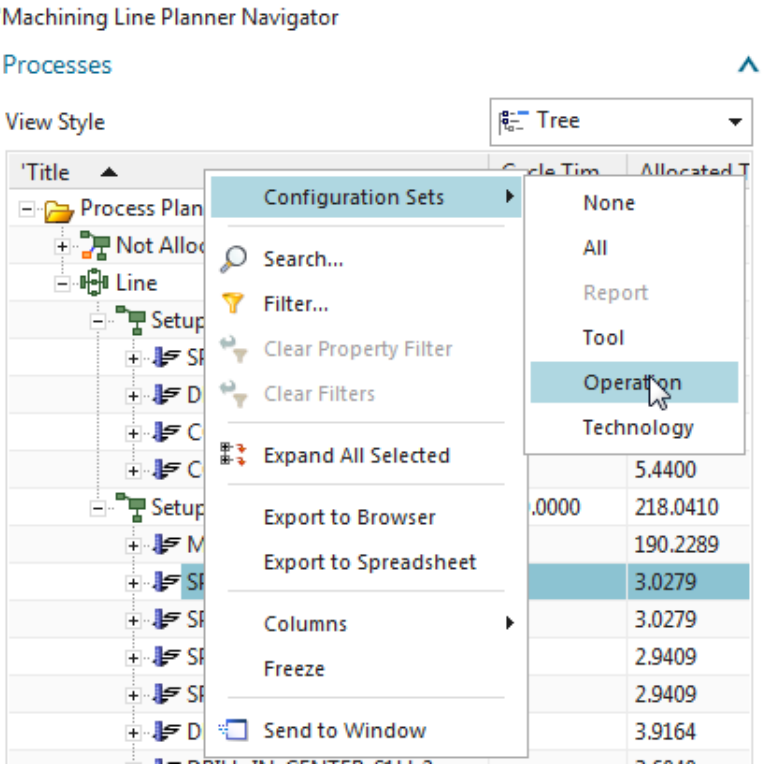
The **Products** tree shows the **Part** and **Blank** of the products machined on the **Line**, the **Workpiece** of each **Setup**, the **Machining Features** of the **Part** and the **Blank** and the **Intermediate Features** machined in each of the **Setups**



The **Operation Sets** tree shows the **Operation Set** of the **Feature** or **Operation** on which the command **Send to Operation Set View** is executed.
The **Operation Set** consists of the **Operations** that machine the feature, the corresponding **In-Process Features**, and the **Tools** used by the **Operations.**

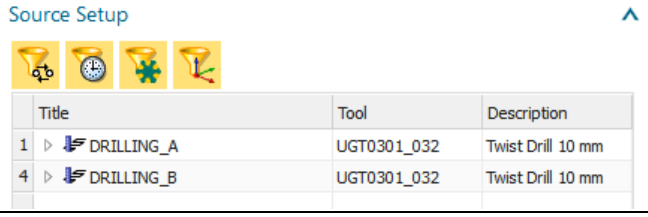
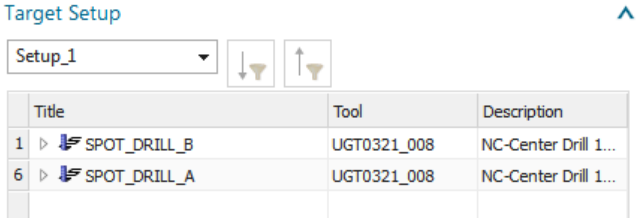
The **ProcessSetup** column shows which **Setup** each operation is allocated to.

To control the columns shown in the **Processes** tree view, right-click a column heading and choose **Configuration Sets**.



You can also search through the contents of the Tree View and filter the nodes to display.

The Table View consists of two tables:

	The **Source Setup** table displays the **Operations** which are not yet allocated NX displays only the operations that pass the selected **Machining Line Setup Filters**.
	The **Target Setup** table displays the **Operations** allocated to the selected setup.

The Table View has the same search, filter and column configuration capabilities as the Tree View.

Commands

Machining Line Navigator node commands

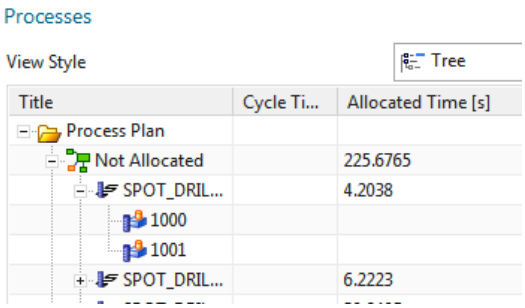
The following commands are available when you right-click a node in the **Machining Line Navigator**.

Load initial Process Plan

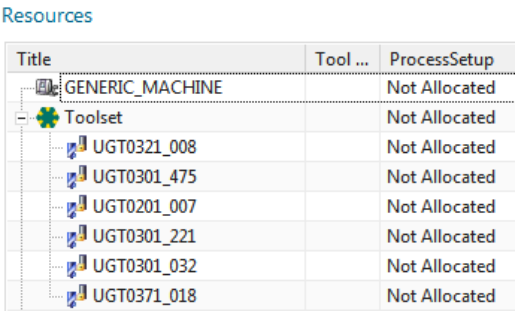
Available on the **Process Plan** node.
Loads the CAM part to machine to the process plan. The operations defined in the CAM part are shown in the tree view of the **Processes** panel and in the table view of the **Source Setup** panel.

The command creates:

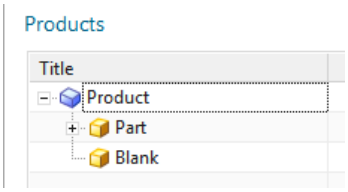
- In the **Processes** panel, a **Not Allocated** node under the **Process Plan** node. Under the **Not Allocated** node there is an operation node for each operation in the CAM part. Under the operation nodes, there is a node for each **Feature** machined by the operation.



- In the **Resources** panel, **Toolset** and a **Tool** node for each **Tool** used in the initial Process plan.



- In the **Products** panel, a **Product** node. Under the **Product** node there is a **Part** and a **Blank** node. Under the **Part** node, there is a **Feature** node for each feature in the CAM part.



Add Setup

Available on the **Line** node.
Adds a **Setup** to the machining line. For each setup you add, NX creates a CAM part to store the operations allocated to that setup.

Open with Manufacturing

Available on **Setup** nodes.
Opens the CAM part that corresponds to the **Setup**. The **Machining Line Planner** part remains open in the current NX session. To switch back to the **Machining Line Planner** part, click the **Machining Line Planner** application icon in the Ribbon bar, or press Ctrl-Tab.

Split Operation

Available on **Operation** nodes.
Replaces an operation that machines more than one feature with multiple operations that each machine one feature.

Split by Direction

Available on **Operation** nodes.
Replaces an operation that machines features with more than one machining direction with multiple operations that each machine from one direction.

Send to Operation Set View

Available on **Operation** and **Feature** nodes.
Displays the operation set of the selected operation or feature in the **Operation Sets** view.

An **Operation Set** contains the set of operations that machine a single machining feature, the corresponding **In-Process Features**, and the tools used by those operations.

Additional Machining Line Navigator commands

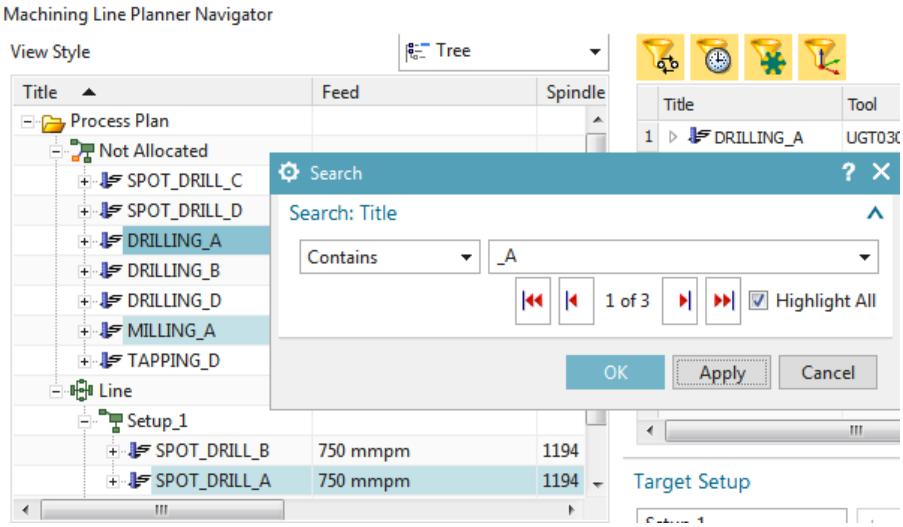
The following commands are available when you right-click a column heading in the **Machining Line Navigator**.

Configuration Sets

Controls the columns displayed in the **Processes** tree view.

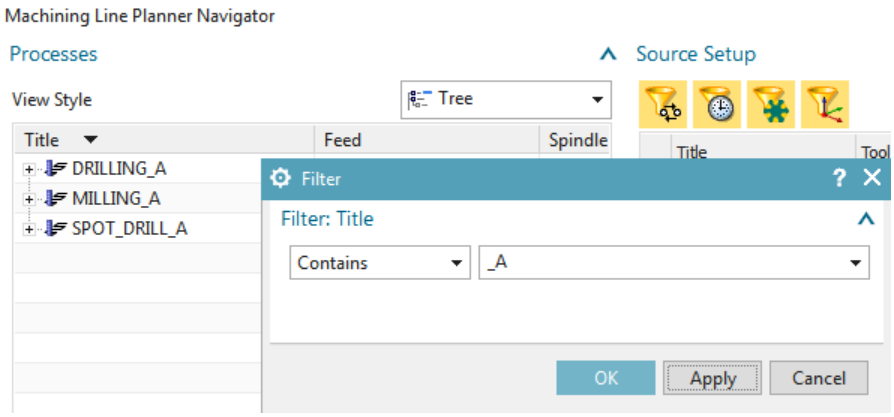
Search

Lets you search the selected tree view to find nodes that match the specified text and condition. For example, you can search for nodes that contain, or do not contain, _A.



Filter

Filters the selected tree view to display only nodes that match the specified text and condition. Note: Expand the tree view to display all of the nodes before applying the filter.



Export to Browser

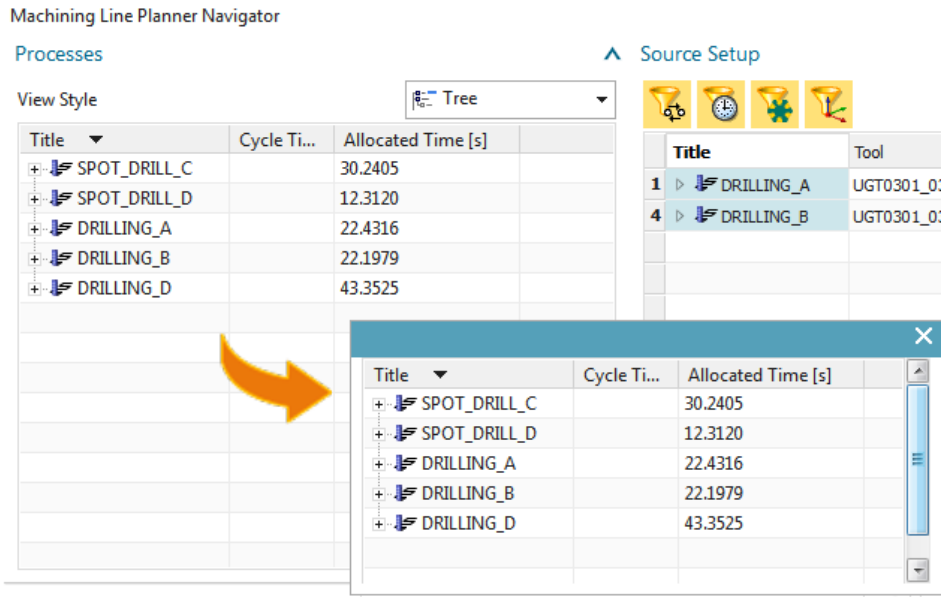
Exports the current state of the selected tree view to your browser. Expand or collapse the nodes as required before exporting the view.

Export to Spreadsheet

Exports the selected tree view to a spreadsheet. Note: You must close the spreadsheet to continue working in NX.

Send to Window

Sends the selected tree view to a separate window.



Icon commands

The following icon commands are available in the **Machining Line Navigator**.

Allocate Operation

Allocates the operation or operations selected in the **Source Setup** to the selected **Target Setup**.

- If you select an operation in the **Target Setup**, NX places the allocated operations before the selected operation**.**
- If you do not select an operation in the **Target Setup**, NX places the newly allocated operations after any previously allocated operations.

Deallocate Operation

Removes the selected operation or operations from the **Target Setup**, and places them back in the **Source Setup** so that you can allocate them to a different target setup.

Machining Line Setup Filters

Several **Machining Line Setup Filters** are available to help you allocate operations to the **Setups**. When you select filters while allocating, the **Source Setup** only displays the operations that meet the criteria used by the filters.

Sequence Constraints Filter

The **Sequence Constraints Filter** ensures you allocate operations in their required sequence.
For example, a threaded hole requires three machining operations; spot-drilling, drilling and tapping, which can only be executed in that order. The NX CAM **Create Feature Process** command creates sequence constraints between the operations such that NX must do the spot-drilling operation before the drilling operation, and must do the drilling operation before the tapping operation. The **Sequence Constraints Filter** makes sure that:

- When none of the three operations are allocated to a setup yet, NX displays only the spot-drilling operation in the **Source Setup**. The other two operations are filtered out.
- After you allocate the spot-drilling operation to the **Target Setup**, NX displays the next operation, the drilling-operation, in the **Source Setup**.
- After you allocate the drilling-operation, NX displays the tapping operation in the **Source Setup**.

Time Filter

The **Time Filter** ensures that you do not exceed the **Cycle Time** defined for a Setup by filtering out operations that would exceed the **Cycle Time** upon allocation.

Tool Capacity Filter

The **Tool Capacity Filter** ensures that you do not exceed the **Tool Capacity** defined for the setup's toolset by filtering out operations that would exceed the **Tool Capacity** upon allocation.

The setup's toolset **Tool Capacity** defines the maximum number of different tools that fit in the tool storage.

Direction Filter

The **Direction Filter** ensures that you allocate only operations that match the machining direction that is defined in the **Target Setup**. The operations that are already allocated to the **Target Setup** define the allowed machining directions. If the **Target Setup** does not contain any operations, the **Direction Filter** allows all directions when you allocate the

Global Technical Access Center

Installation assistance

For additional installation assistance, or to report any problems, contact the Global Technical Access Center (GTAC).

Website:
http://support.industrysoftware.automation.siemens.com/gtac.shtml

Phone:
United States and Canada: 800-955-0000 or 714-952-5444

Outside the United States and Canada: Contact your local support office.

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