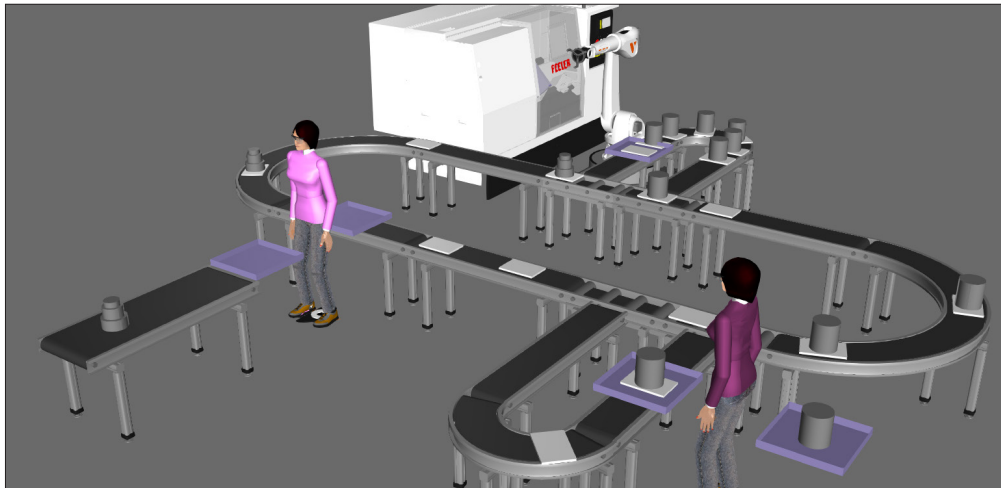


Machine Tending using Different Libraries

Visual Components 4.1 | Version: November 19, 2018



The Visual Components Works library allows you to quickly build and simulate machine tending applications using different resources and machines. The library is flexible and can be used with other component libraries, for example Machine Tending and Conveyors.

In this tutorial, you will learn how to:

- Configure a conveyor loop with branches and simple routing rules.
- Create stations for loading, machining, and unloading products.
- Use human and robot resources to pick and place parts.

This tutorial assumes you have a basic understanding of layout configuration and have completed the "Works Library" course in the Visual Components Academy as well as the "Machine Tending with Feeler Machines" lesson.

Support
support@visualcomponents.com

Community
community.visualcomponents.net

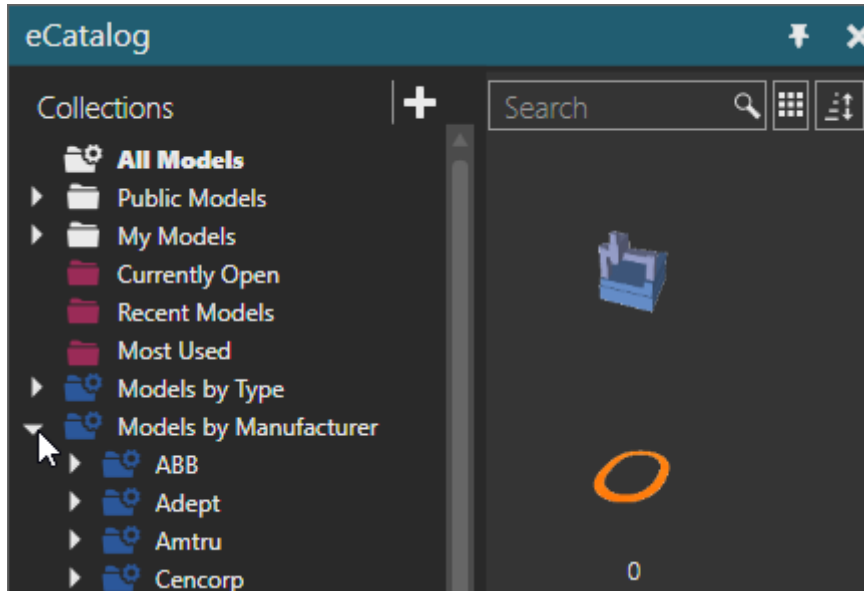
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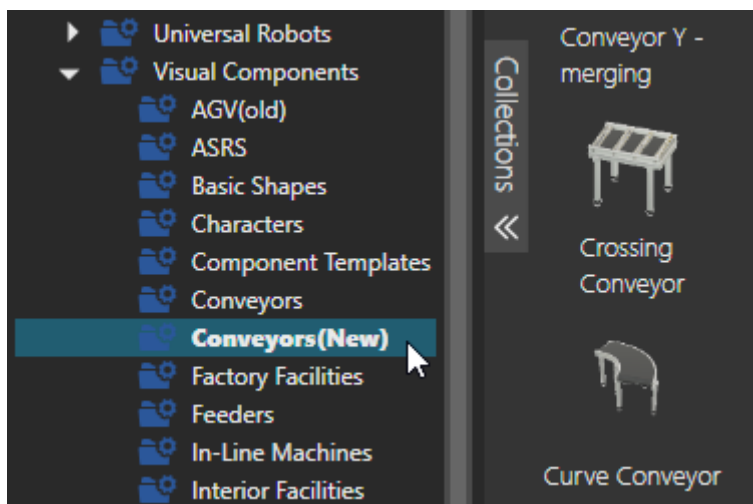
Configure Conveyor Loop

You can use the Conveyors library to build a conveyor line that loops back into itself.

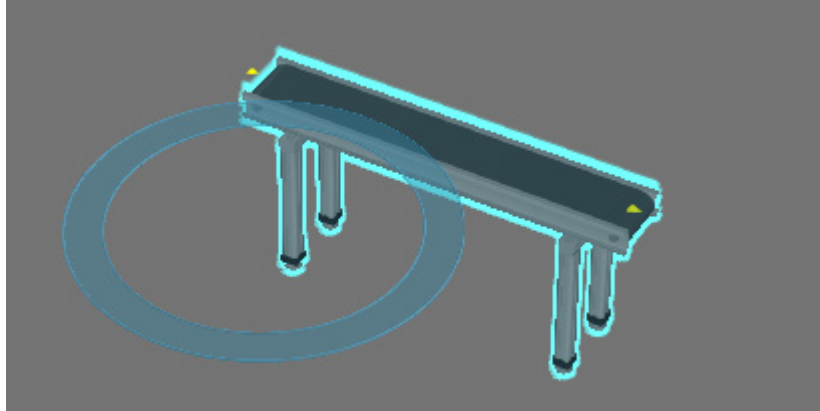
1. In the eCatalog panel, Collections view, expand **Models by Manufacturer**.



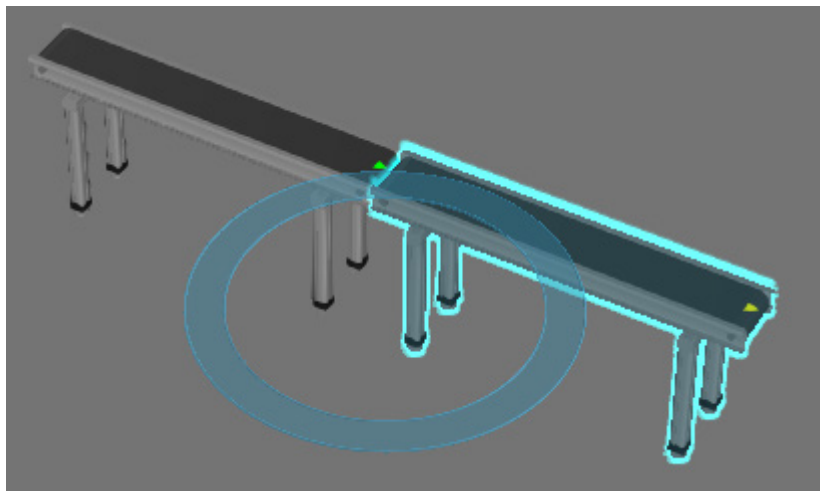
2. Scroll down and then expand **Visual Components**.
3. Click **Conveyors (New)**. This displays a collection of conveyor components.



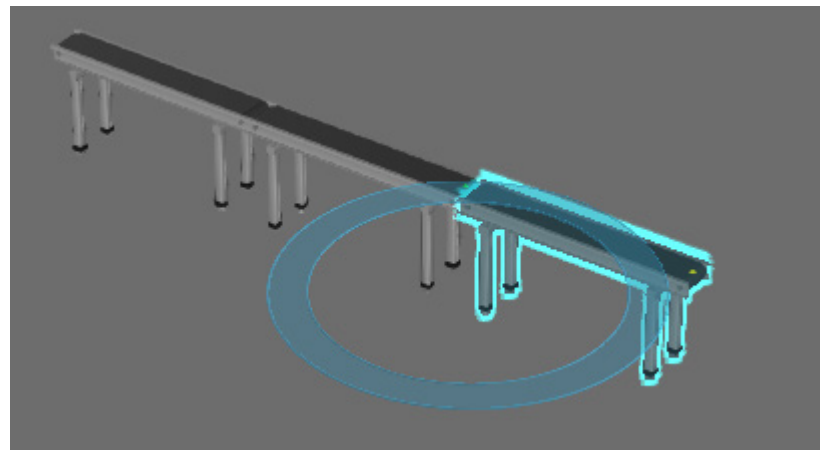
4. Add a **Conveyor** to the 3D world, and then change its ConveyorWidth to **250**.



5. Clone the conveyor and connect it to the end of the line.



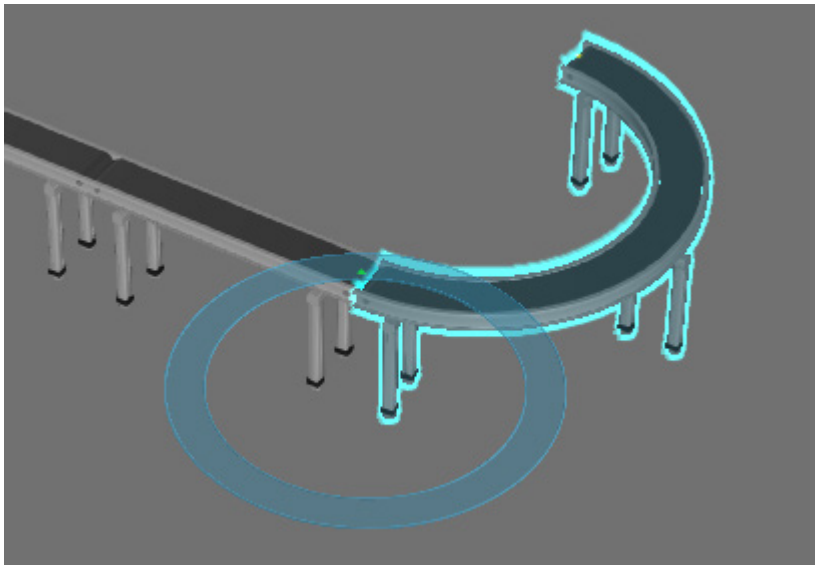
6. Clone the copied conveyor and connect it to the end of the line.



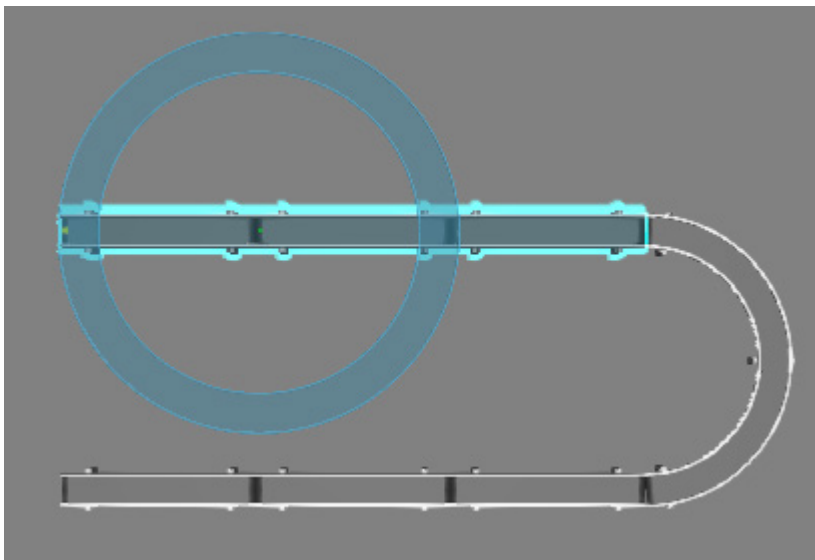
7. Add a **Curve Conveyor** to the 3D world, and then change its Direction to **Left** and ConveyorAngle to **180**.

Backface Mode	Feature	
ConveyorRadius	1000	mm
ConveyorAngle	180	°
Direction	Left	
ConveyorWidth	500	mm
ConveyorHeight	700	mm

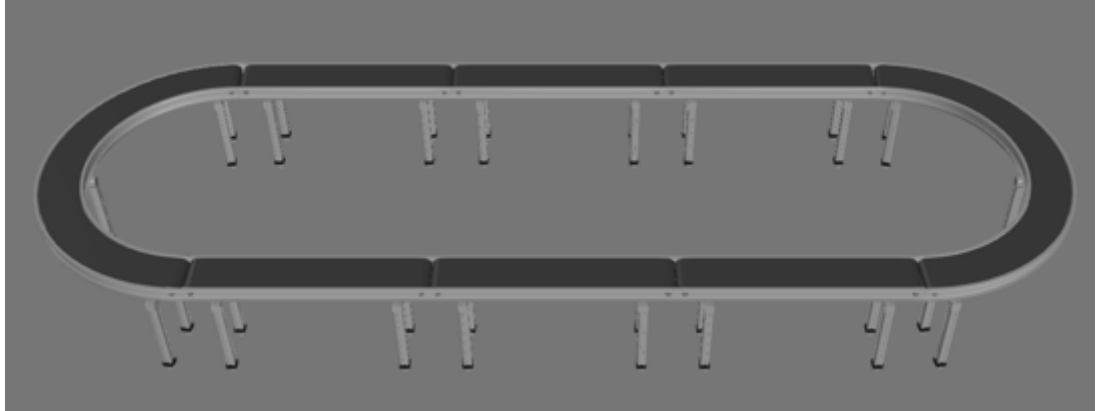
8. Connect the curve conveyor to the end of the line.



9. In the 3D world, select the first three conveyors in the line, copy and paste them, and then connect them to the other end of the curve conveyor.



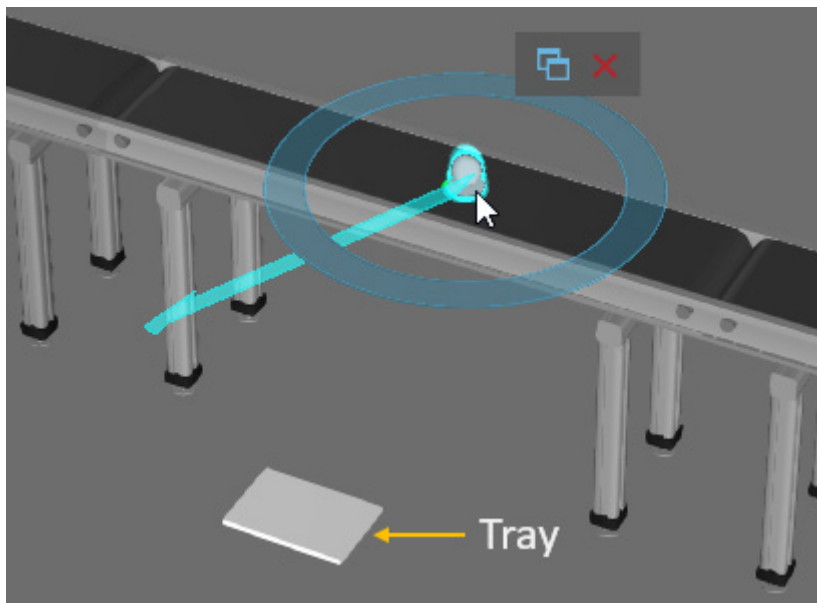
10. Clone the curve conveyor and connect it to the line to form a loop.



Fill Line with Trays

A Warmup Feeder component can be used to put trays on a conveyor line. The feeder can create any component in the 3D world and directly connect to the path of a conveyor. Note that during a simulation, the feeder is hidden.

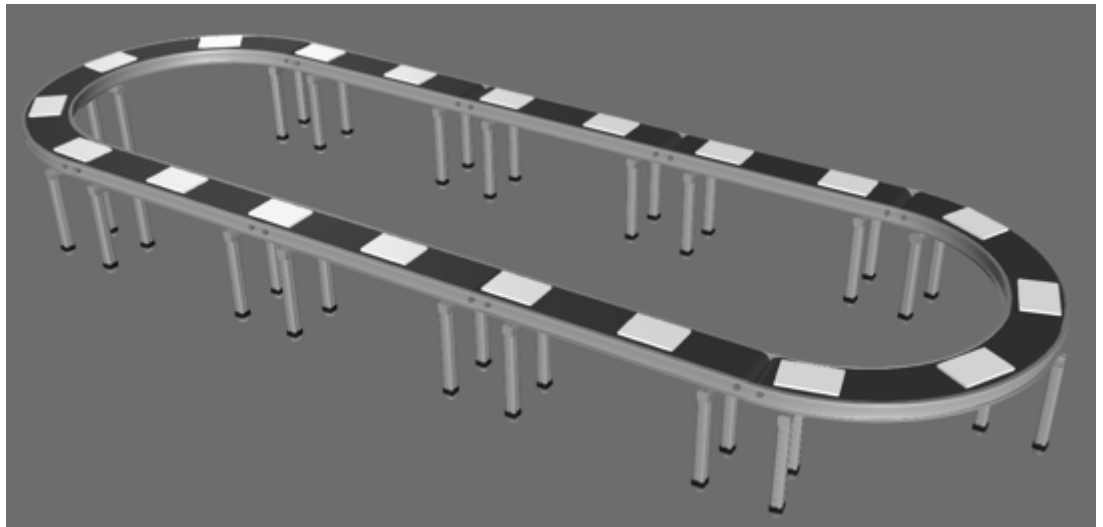
1. In the eCatalog panel, under Visual Components, click **Products and Containers**.
2. Add a **Parametric Pallet** to the 3D world, and then change its Name to **Tray**.
3. In the eCatalog panel, under Visual Components, click **Feeders**.
4. Add a **Warmup Feeder** to the 3D world, and then connect it to the path of a conveyor.



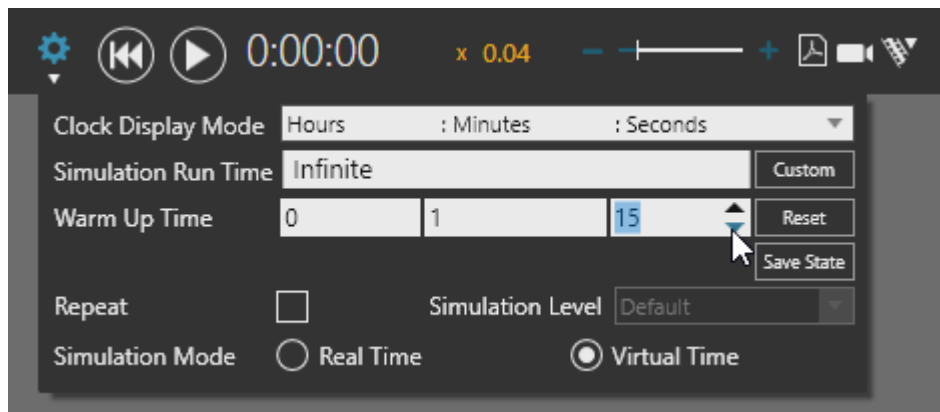
5. In the Component Properties panel, set ReferencePartName to **Tray**, PartCount to **19**, and CreationInterval to **4**.

Backface Mode	On
ReferencePart...	Tray
ParentCompon...	Conveyor #2
ParentBehaviour	Conveyor #2::Path__HIDE__
PartCount	19
Hide	<input type="checkbox"/>
	Center On Path
ProdID	Empty
ConveyorWidth	250
CreationInterval	4

6. Run the simulation, verify trays move along the conveyor line, and then reset the simulation.



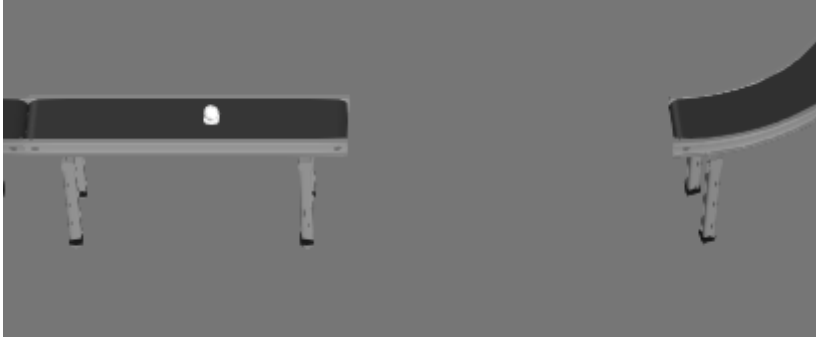
7. (Optional) Make the **Tray** component invisible. It is being used as a template, so it can be hidden. The trays created by the Warmup Feeder during a simulation will be visible.
8. (Optional) On the Simulation controls, click the **Gear** icon to access simulation settings, and then set Warm Up Time to **1** minute, **15** seconds. This is the amount of time it takes to populate the entire line with trays. When you start the simulation, you can jump to this point in time.



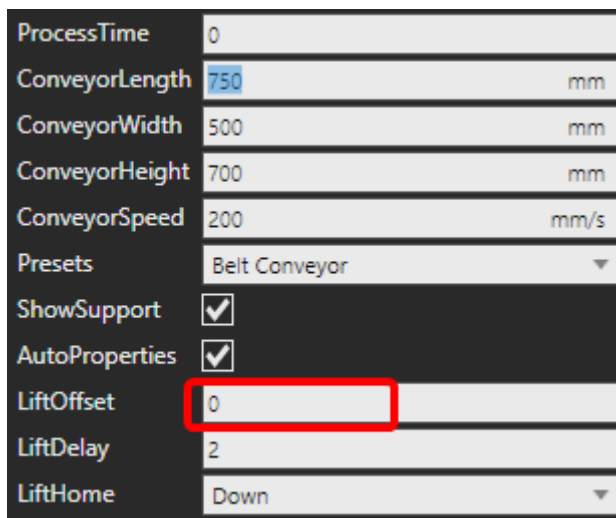
Add Branch to Loop

You can branch out from a loop and then reconnect to it.

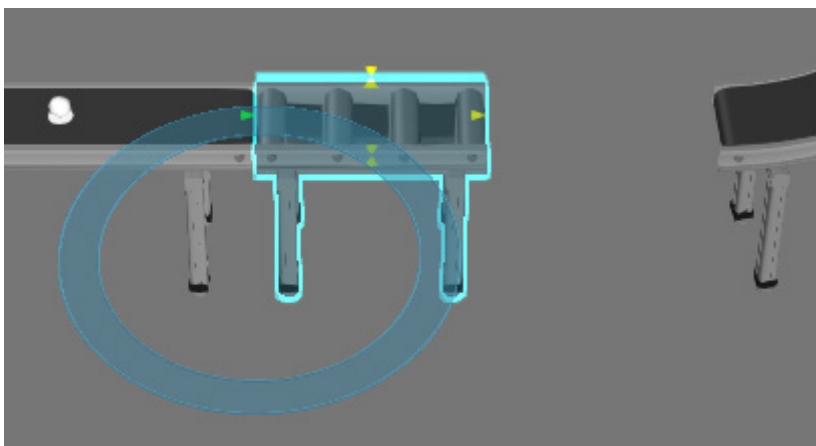
1. Delete a **conveyor** from the main loop to form a gap in the line.



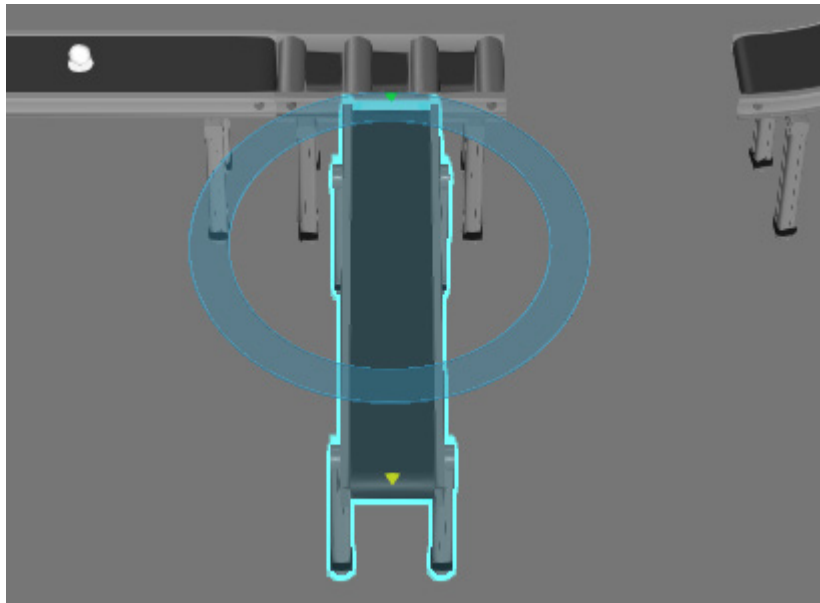
2. In the eCatalog panel, under Visual Components, click **Conveyors (New)**.
3. Add a **Crossing Conveyor** to the 3D world, and then change its ConveyorLength to **750** and LiftOffset to **0**.



4. Connect the crossing conveyor to the beginning of the gap.



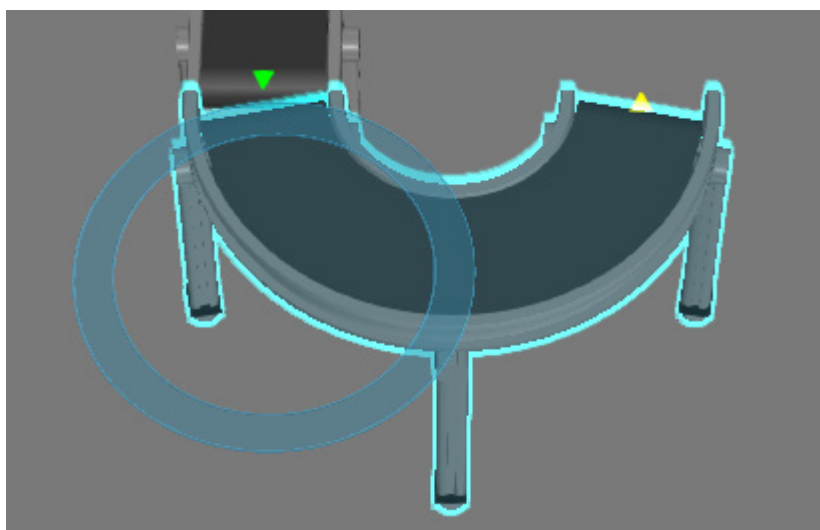
5. Add a **Conveyor** to the 3D world, and then connect it to the right side of the crossing conveyor.



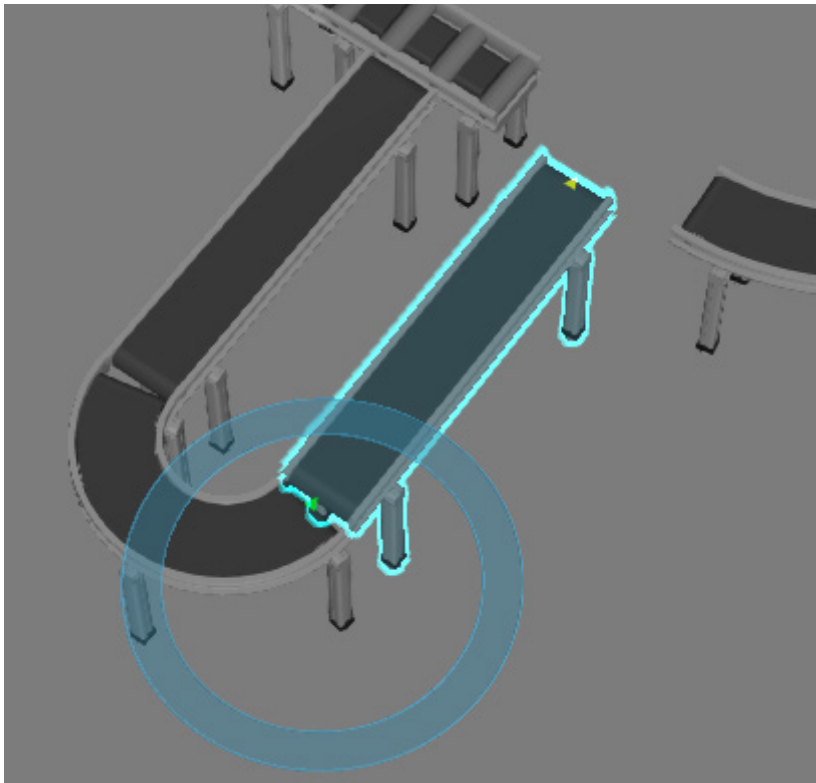
6. Add a **Curve Conveyor** to the 3D world, and then change its ConveyorRadius to **375**, ConveyorAngle to **180**, and Direction to **Left**.

Backface Mode	Feature	
ConveyorRadius	375	mm
ConveyorAngle	180	°
Direction	Left	
ConveyorWidth	500	mm
ConveyorHeight	700	mm

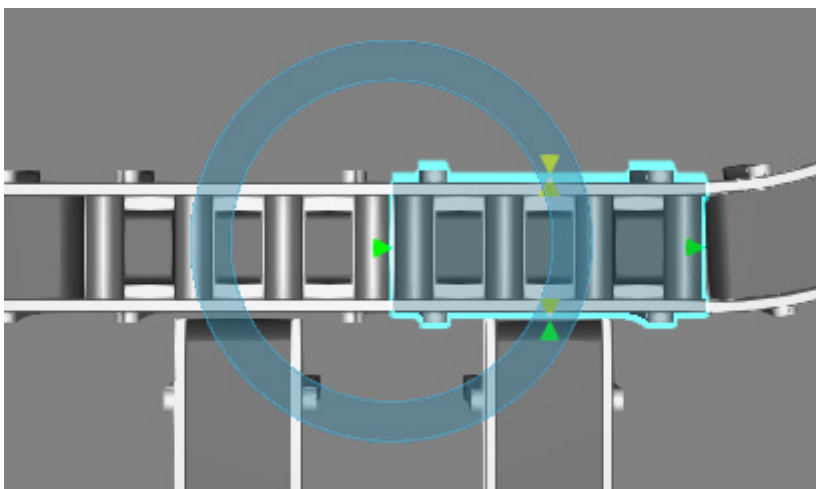
7. Connect the curve conveyor to the end of the conveyor in the branch.



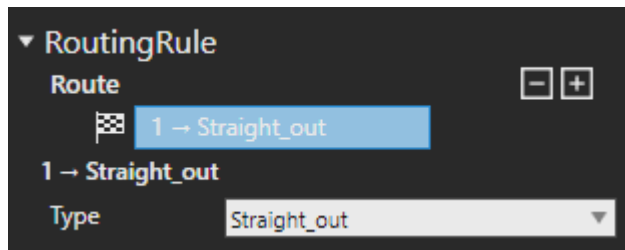
8. Add a **Conveyor** to the 3D world, and then connect it to the end of the curve conveyor in the branch.



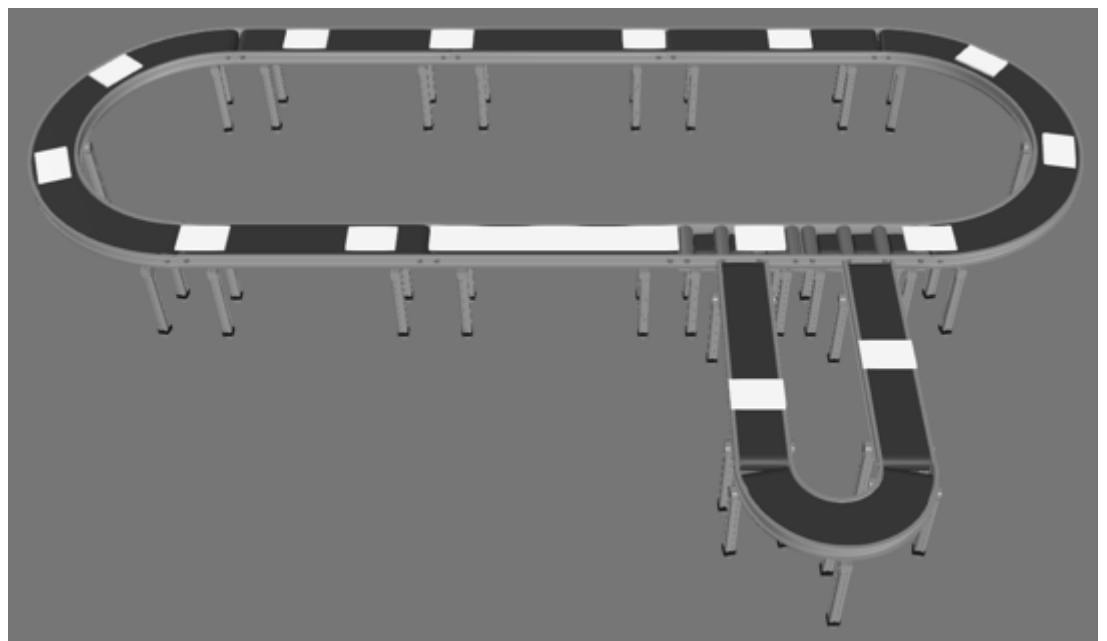
9. Clone the crossing conveyor, and then connect it to fill the gap and connect the end of the branch to the main loop.



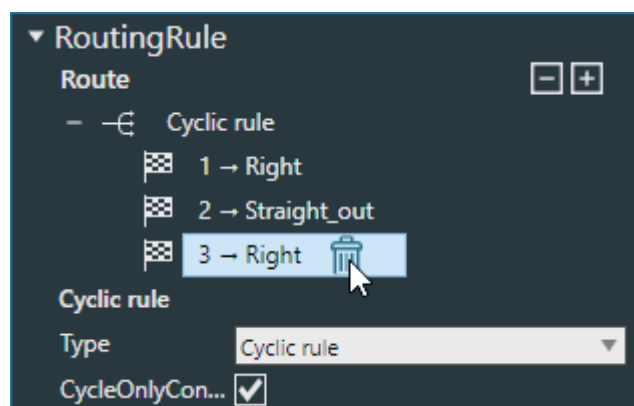
10. In the Component Properties panel, expand **RoutingRule**, and then replace the Cyclic Rule with **Straight_out**. This means any arriving part will be sent straight out of this conveyor.



11. Run the simulation, verify every other tray moves to and from the branch back to the main loop, and then reset the simulation.



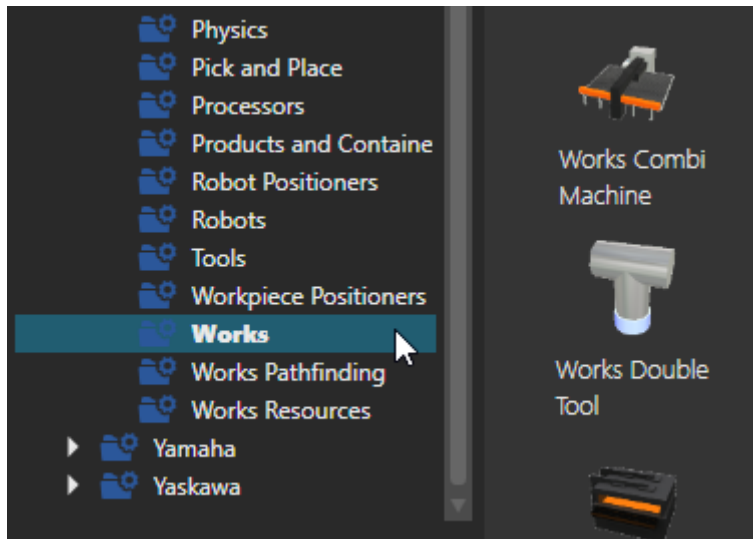
12. (Optional) In the 3D world, select **Crossing Conveyor**, and then in its route, delete the last nested rule of **Right**.



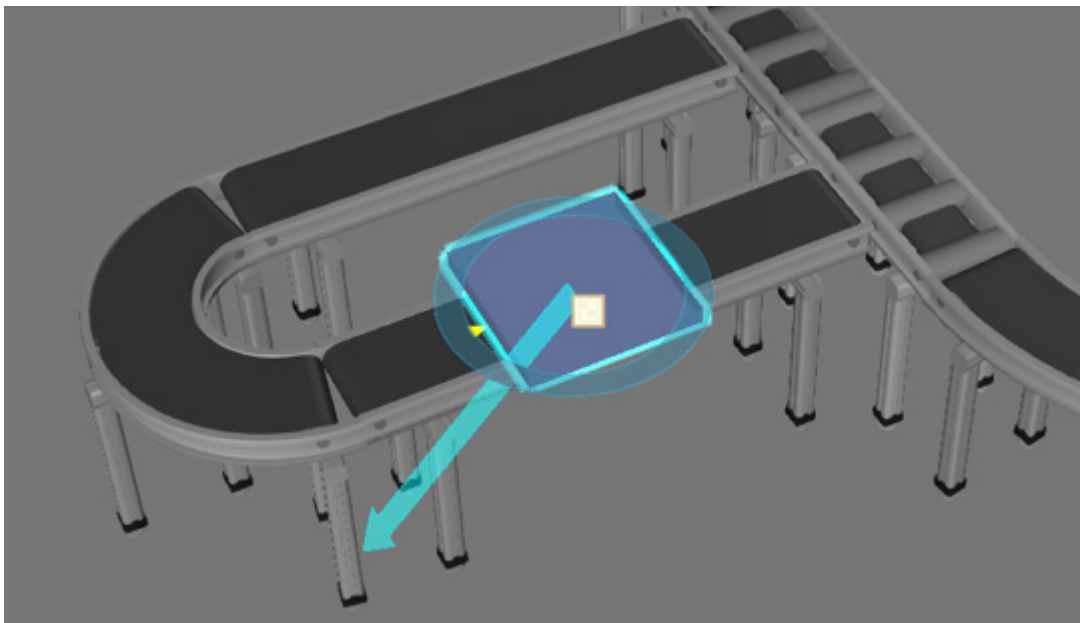
Create Loading Station

The Works library and its resources can be used to put parts on trays. For example, you can create one or more loading stations.

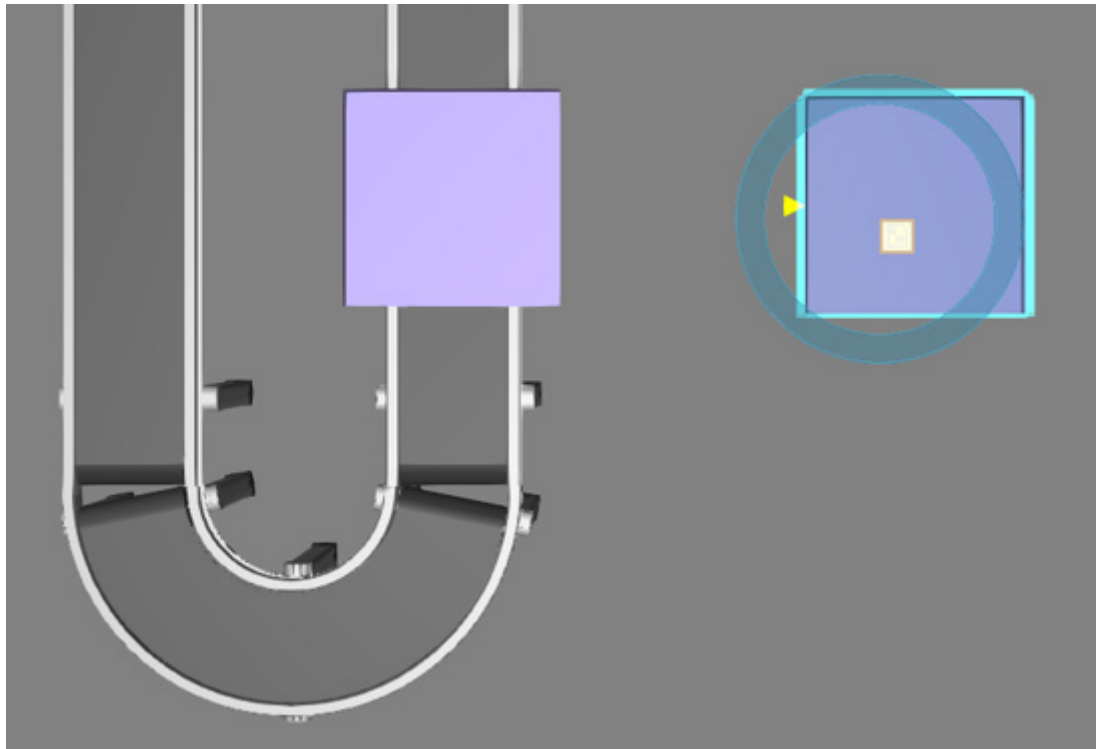
1. In the eCatalog panel, under Visual Components, click **Works**.



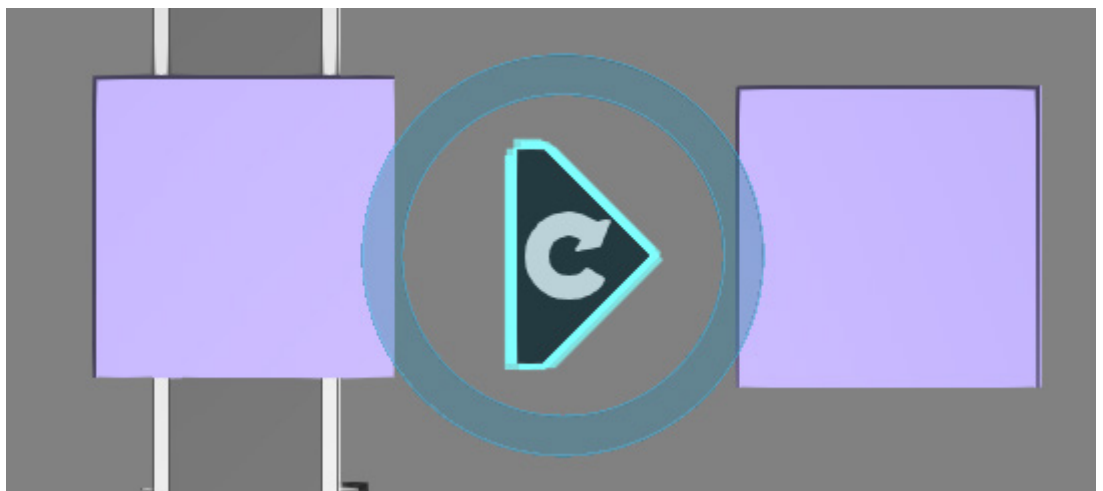
2. Add a **Works Task Controller** to the 3D world, and then make it invisible.
3. Add a **Works Process** to the 3D world, and then change its HeightOffset to **0**.
4. Connect the Works Process to the path of a conveyor in the branch. In this context, the Works Process component acts as a component path sensor, detecting the origin of a component traveling along its path. It will be used to stop a tray and request a human resource place a part on top of the tray.



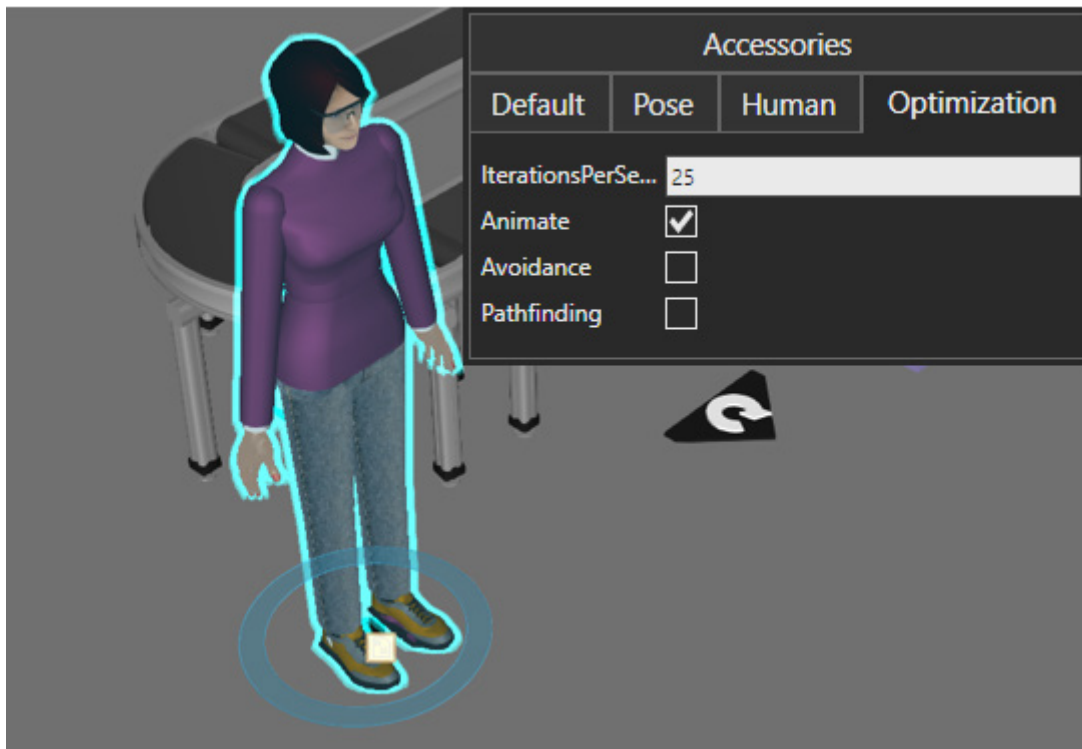
5. Add another **Works Process** to the 3D world and move it near the other one. This will be used to feed parts. That is, the parts a human resource will place on a tray.



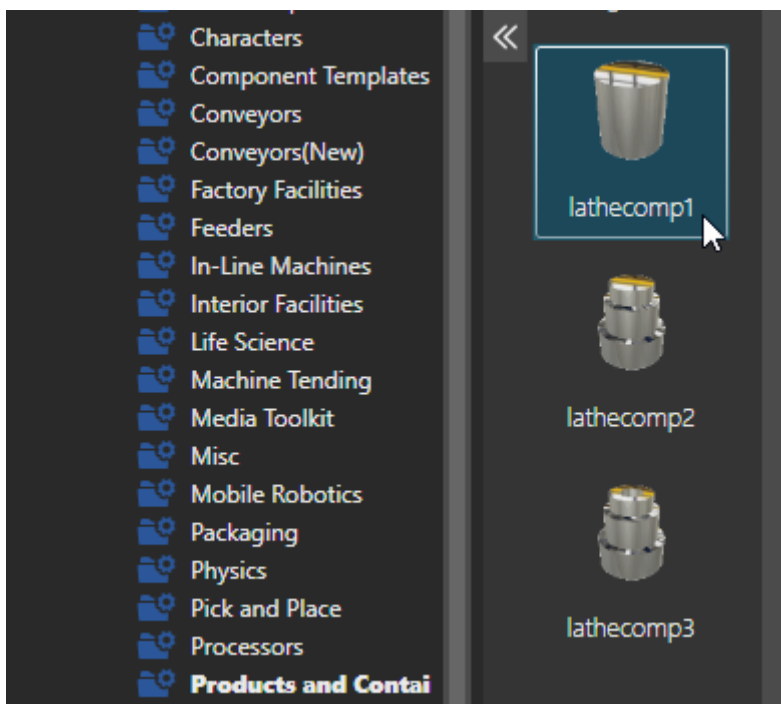
6. In the eCatalog panel, under Visual Components, click **Works Pathfinding**.
7. Add a **Labor Resource Location** to the 3D world, and then move it between the Works Process components. This location will be used by a human resource to pick and place parts.



8. In the eCatalog panel, under Visual Components, click **Works Resources**.
9. Add a **Works Human Resource** to the 3D world, and then disable its **Avoidance** and **Pathfinding** properties in the Optimization group.



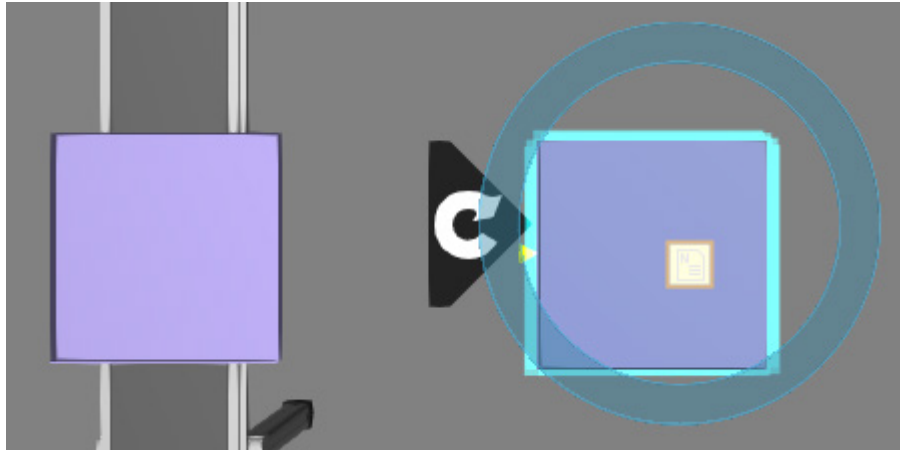
10. In the eCatalog panel, under Visual Component, click **Products and Containers**.
11. Add a **LatheComp1** component to the 3D world. You can make it invisible since it will be used as a template for making new parts.



Create Source

A preset can be used to quickly generate tasks in a process. For example, you can create a source of products that can be picked by a resource when they are needed in another process.

1. In the 3D world, select **Works Process #2**.



2. In the Component Properties panel, Presets tab, set Preset to **Source**, and then set PartName to **LatheComp1**, NewProdID to **111**, FeedTask to **pick111**, and then click **Set**. This makes a task for creating the part and another for feeding the part.

Component Properties

Works Process #2

Coordinates ☒ World ☐ Parent ☐ Object

X 5195.659 Y -1025.014 Z 0

Rx 0 Ry 0 Rz 0

Default Task Geometry UserVariables

Failure

Preset: Source

PartName: LatheComp1

NewProdID: 111

FeedTask: pick111

Interval:

Overwrite: ☒

Set

3. In the 3D world, select the **human resource**, and then set its Tasklist property to **pick111**. This means the human resource can perform a task named pick111.

IdlePositionFilter	IdlePosition
IdleTimeOut	10 s
Tasklist	pick111
reserver	

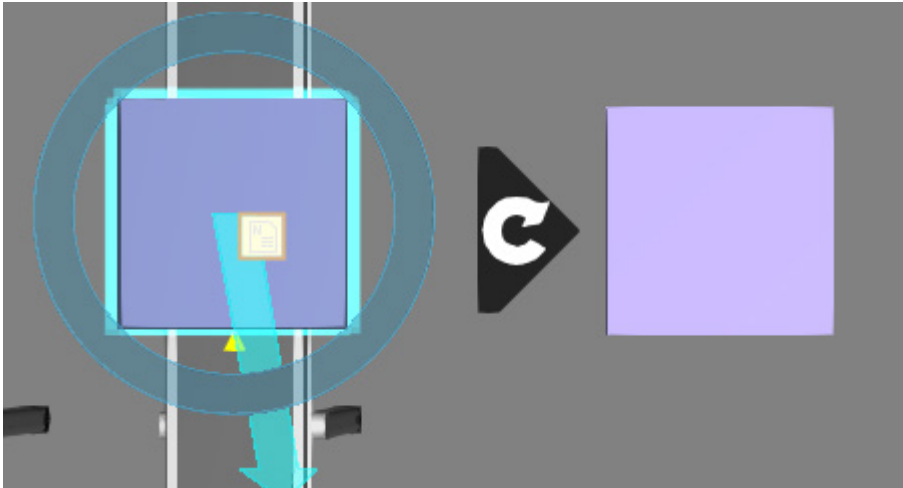
4. In the 3D world, select the **labor resource location**, and then set its PickTasks and PlaceTasks properties to **pick111**. This means a human resource assigned a task named pick111 will go to this location to pick and place parts associated with the task.

Backface Mode	Feature
PickTasks	pick111
PlaceTasks	pick111
ProcessTasks	

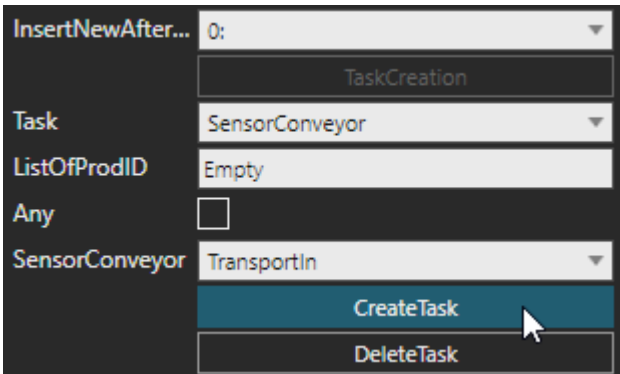
Place Parts on Trays

A Works Process component attached to a conveyor can be used to detect trays, and then request a need for parts to be placed on them.

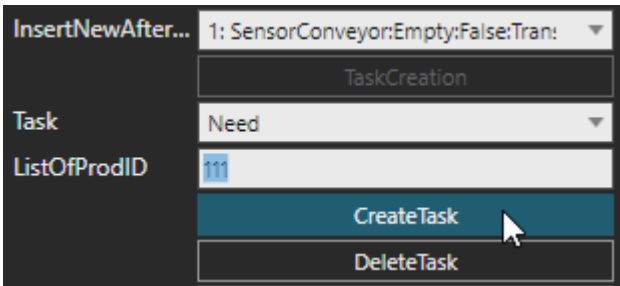
- 1. In the 3D world, select **Works Process**.



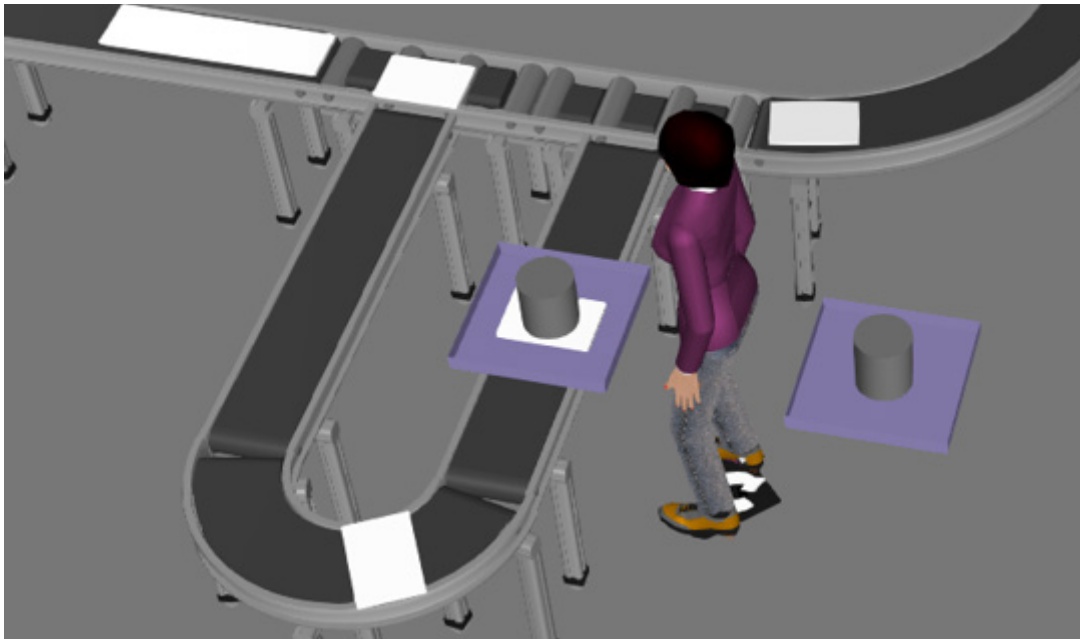
- 2. In the Component Properties panel, set Task to **SensorConveyor**, and then set ListOfProdID to **Empty**, clear the **Any** checkbox, set SensorConveyor to **TransportIn**, and then click **CreateTask**. This makes a task for detecting an empty tray and then stopping it.



- 3. Set Task to **Need**, and then set ListOfProdID to **111**, and then click **CreateTask**. This makes a task that requests a component with a ProdID of **111** that is in another process.

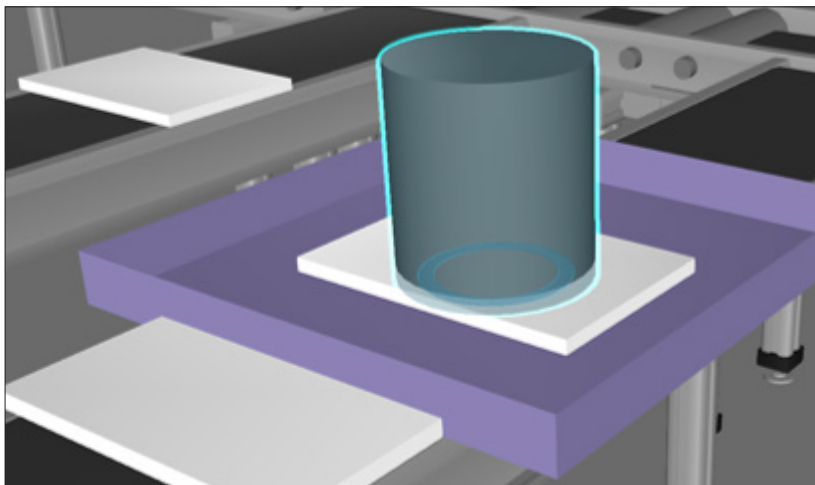


4. Run the simulation, verify the human resource picks and places a part, and then reset the simulation.

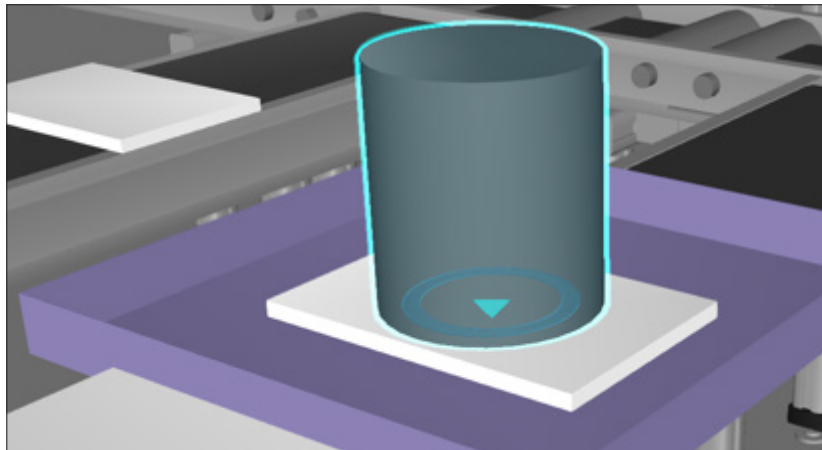


By default, the part is placed at the same location as the tray. This means the part is not on top of the tray. You can fix this by teaching a location of where to place the part.

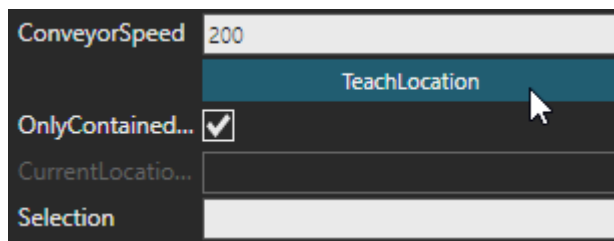
5. Run the simulation until the human places a part, and then stop the simulation.
6. In the 3D world, select the part intersecting the tray.



7. In the Component Properties panel, add **15mm** to its Z-axis coordinate. The part should now be on top of the tray.



8. In the 3D world, select **Works Process**, and then in the Component Properties panel, click **TeachLocation** to save the position of the part.

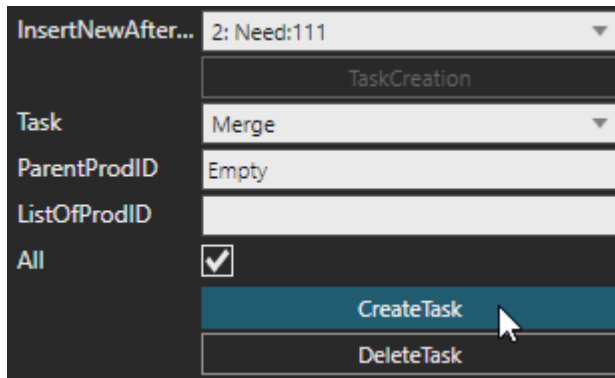


9. Run the simulation, verify the part is placed on top of the tray, and then reset the simulation.

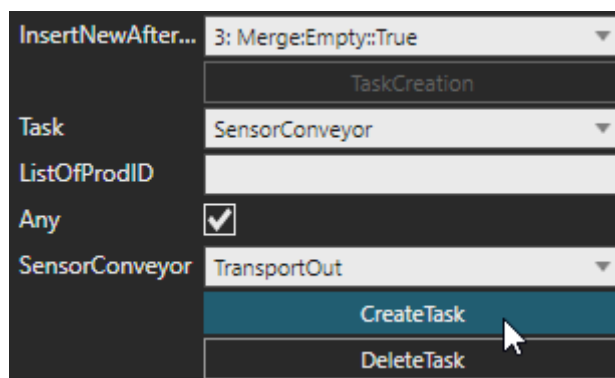
Merge and Transport Bundle

A part and tray can be merged together, so they move together.

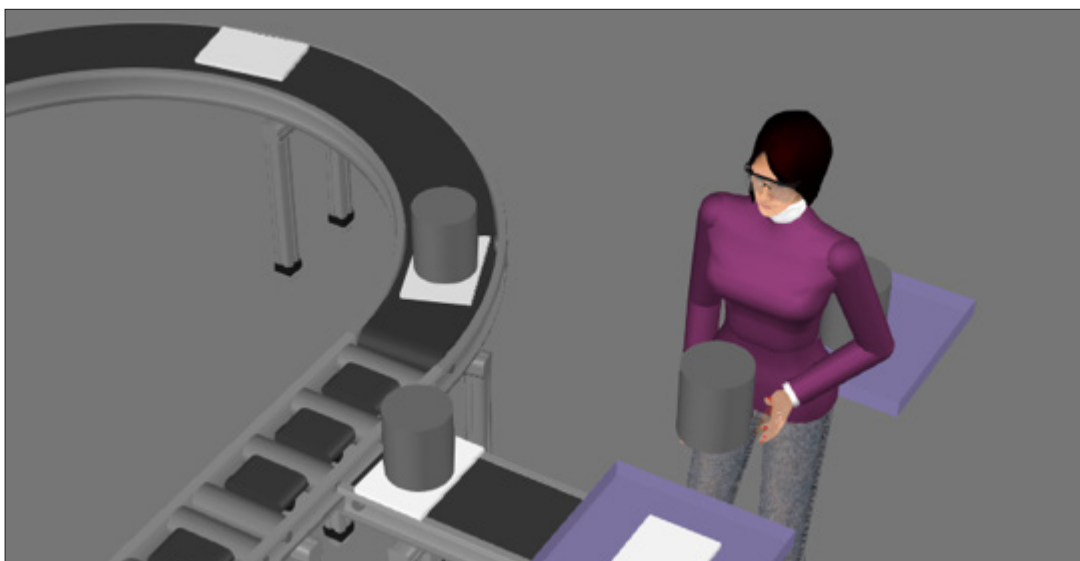
1. In the Component Properties panel, set Task to **Merge**, and then set ParentProdID to **Empty**, and then click **CreateTask**. This makes a task that attaches the part to the tray, which has a ProdID of Empty.



2. Set Task to **SensorConveyor**, and then click **CreateTask**. By default, this makes a task for moving any contained component out of the process, for example the tray and part.



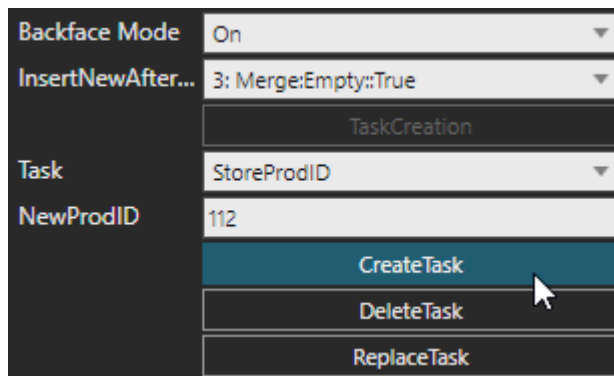
3. Run the simulation, verify a part and tray move together, and then reset the simulation.



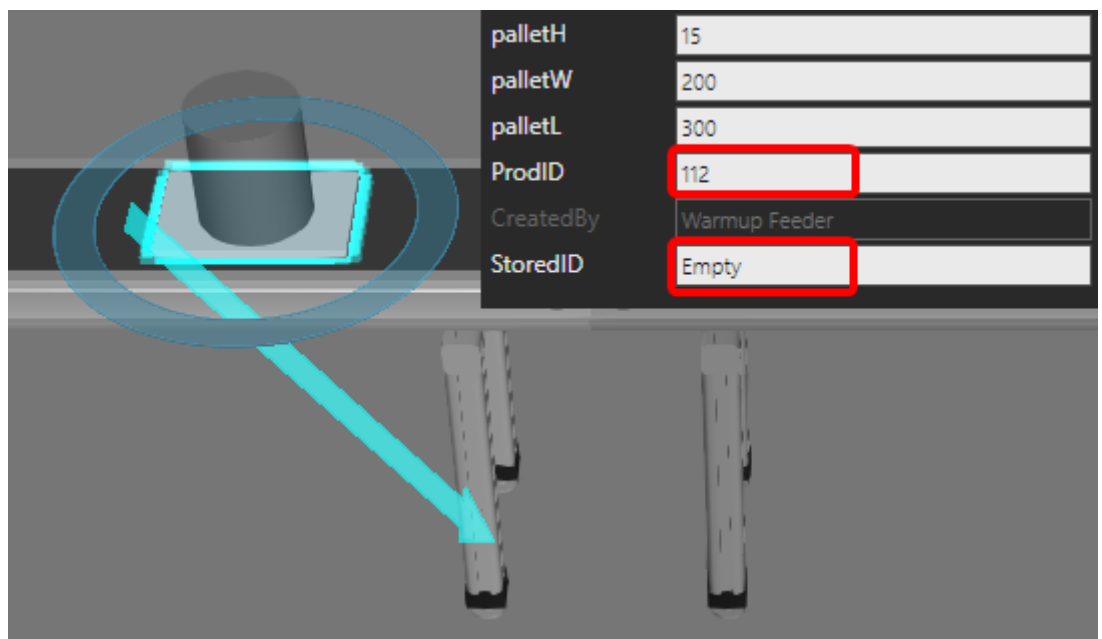
Store ProdID

A part on a tray needs to indicate its state. For example, you can use a ProdID value to indicate that a part on a tray needs to go to a machine.

1. In the Component Properties panel, set InsertNewAfterLine to the **Merge** task. You need to change the ProdID value before transporting out the tray and part.
2. Next, set Task to **StoreProdID**, and then set NewProdID to **112**, and then click **CreateTask**. This makes a task that records the current ProdID of the tray, which is Empty, and assigns it a ProdID value of 112. This does not change the ProdID of the part because it will already be attached to the tray.



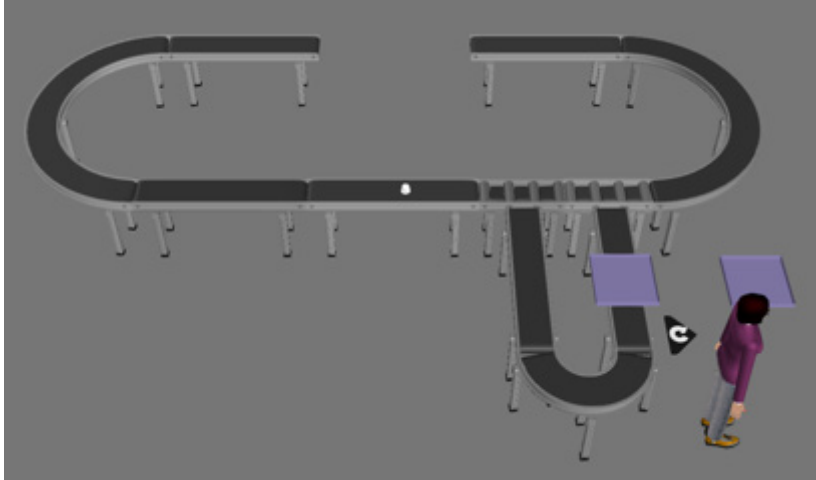
3. Run the simulation, verify the tray has a ProdID of 112, and then reset the simulation.



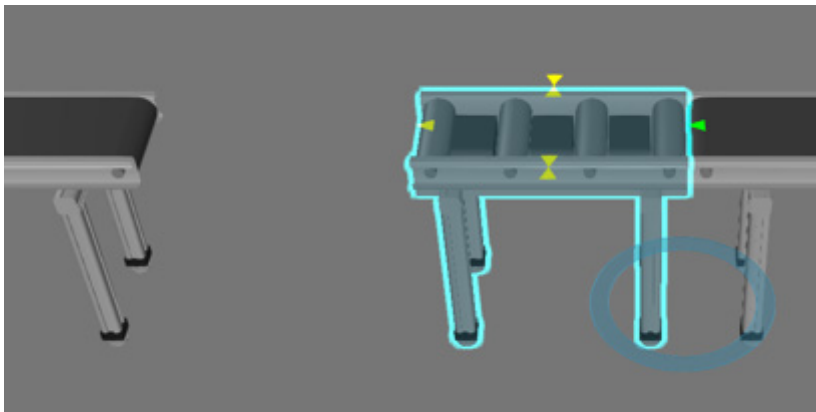
Add Another Branch

Another branch can be added to the loop for machine tending parts on trays.

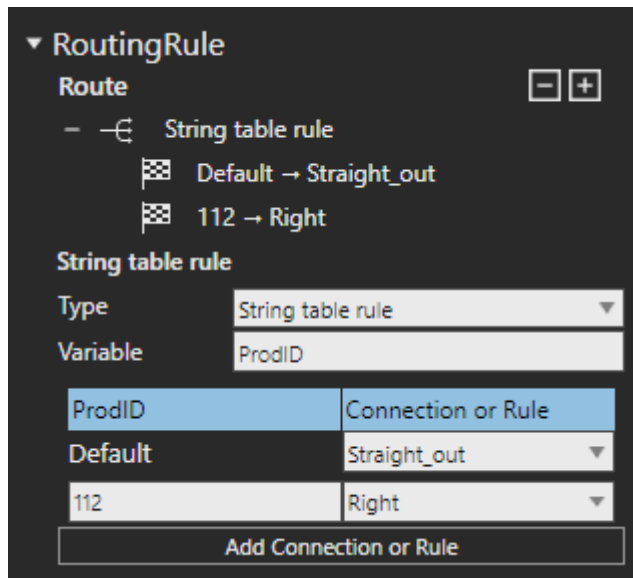
1. In the 3D world, delete a **conveyor** on the main loop to form a gap.



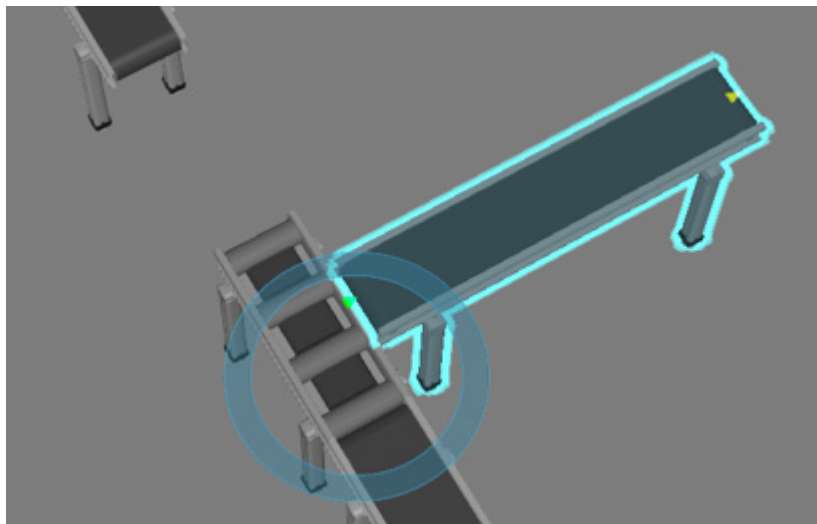
2. Add a **Crossing Conveyor** to the 3D world, and then change its ConveyorLength to **750** and LiftOffset to **0**.
3. Use the PnP command to rotate the crossing conveyor **180** degrees and connect its straight in port to the beginning end of the gap.



4. In the Component Properties panel, RoutingRule section, use a **String table rule** that routes components with a ProdID of **112** to the **right**. That is, 112 will be used to indicate a part on a tray needs to go to a machine.



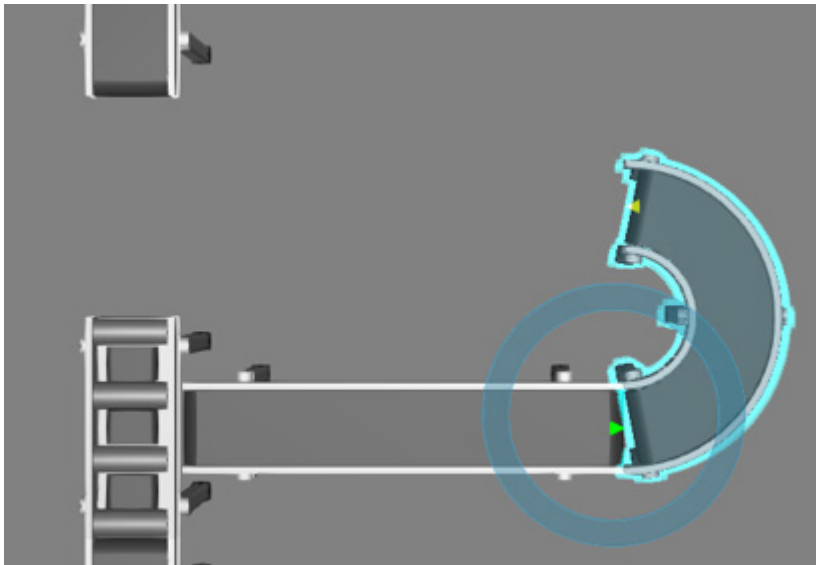
5. Add and connect a **Conveyor** to the right side of that crossing conveyor.



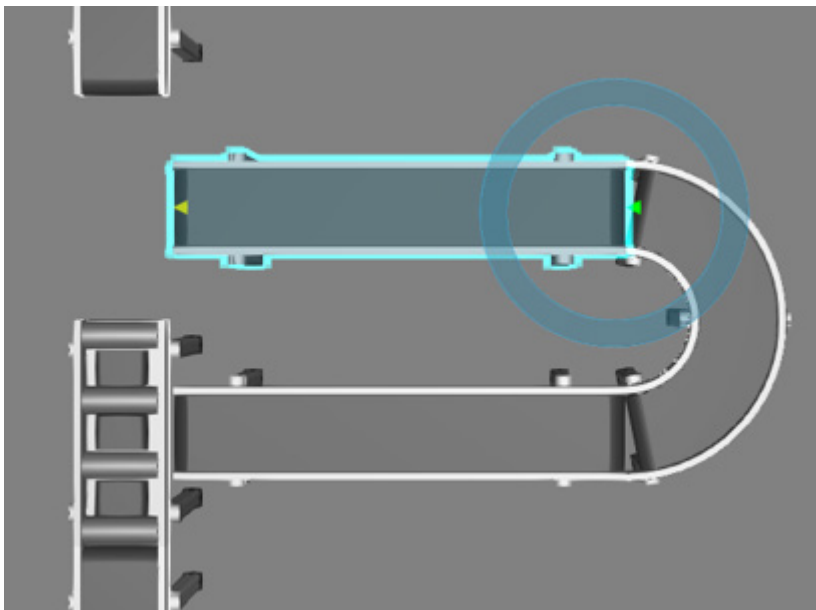
6. Add a **Curve Conveyor** to the 3D world, and then change its ConveyorRadius to **375**, ConveyorAngle to **180**, and Direction to **Left**.

Backface Mode	Feature	
ConveyorRadius	375	mm
ConveyorAngle	180	°
Direction	Left	
ConveyorWidth	500	mm
ConveyorHeight	700	mm

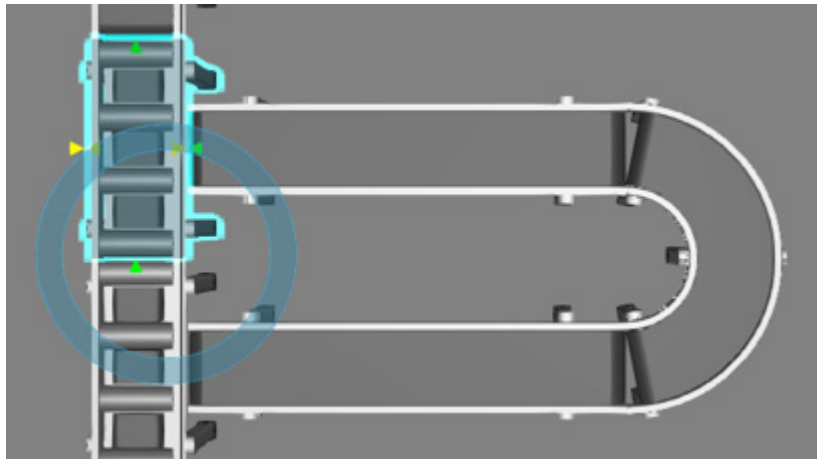
7. Connect the curve conveyor to the end of the conveyor in the branch.



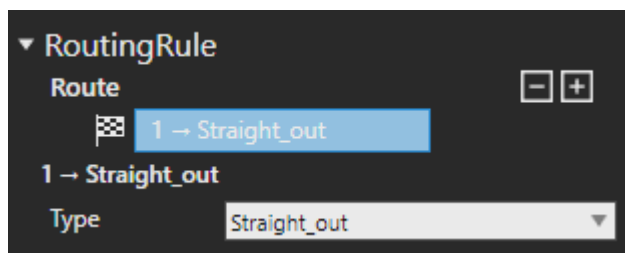
8. Add a **Conveyor** to the 3D world, and then connect it to the end of the curve conveyor in the branch.



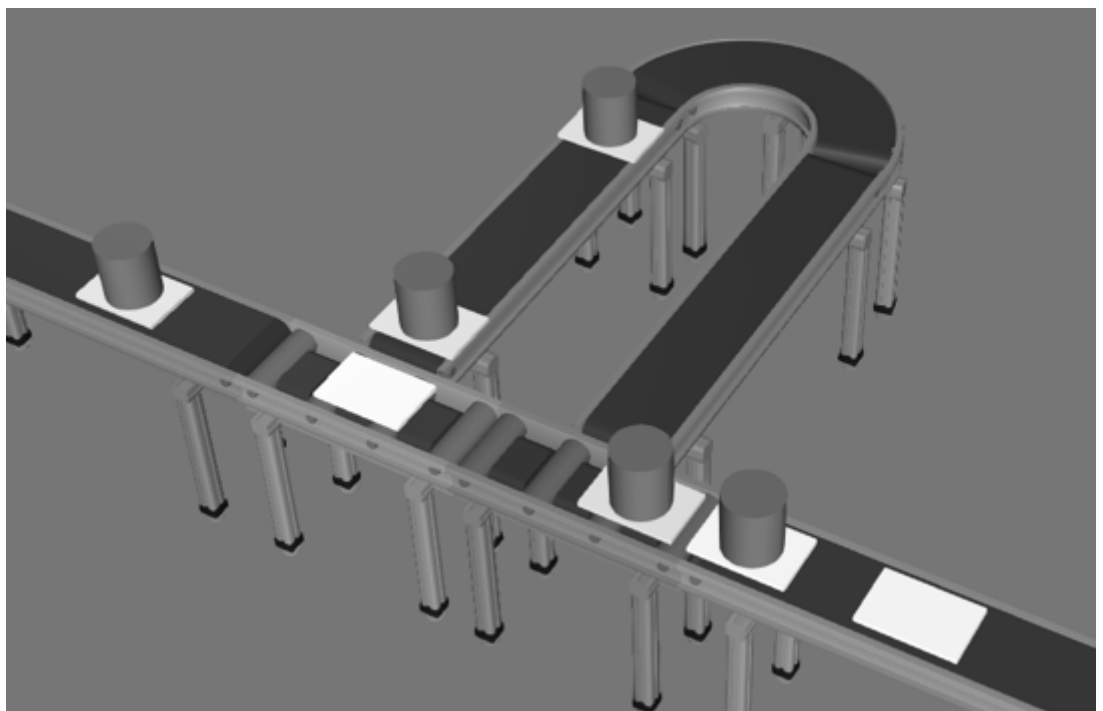
9. Clone the crossing conveyor, and then connect it to fill the gap and connect the end of the branch to the main loop.



10. In the Component Properties panel, expand **RoutingRule**, and then replace the Cyclic Rule with **Straight_out**. This means any arriving part will be sent straight out of this conveyor.



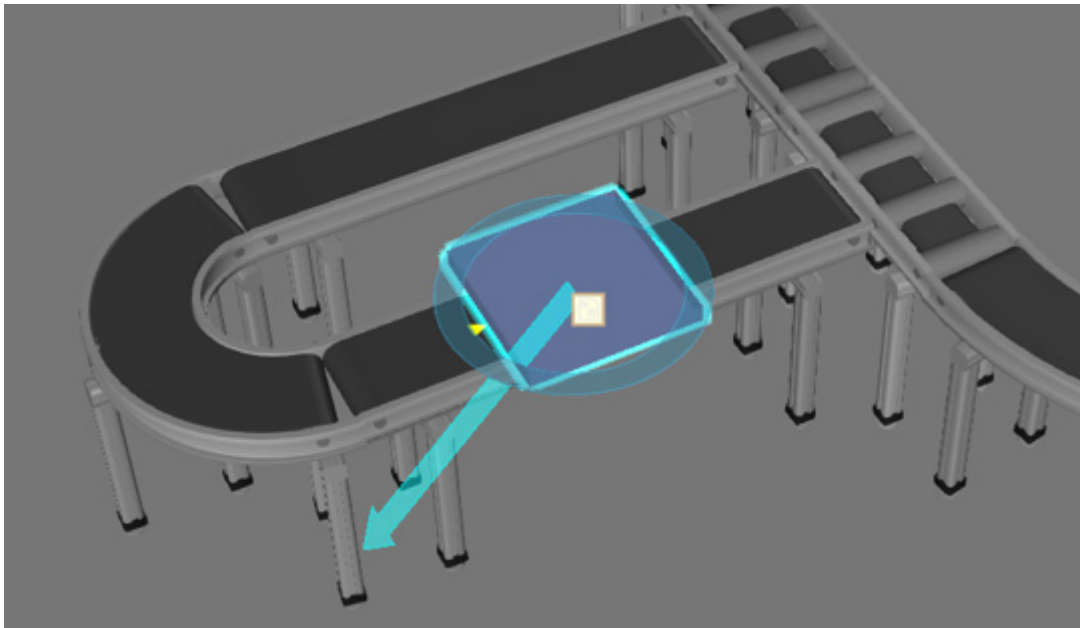
11. Run the simulation, verify trays with parts flow in and out of the second branch, and then reset the simulation.



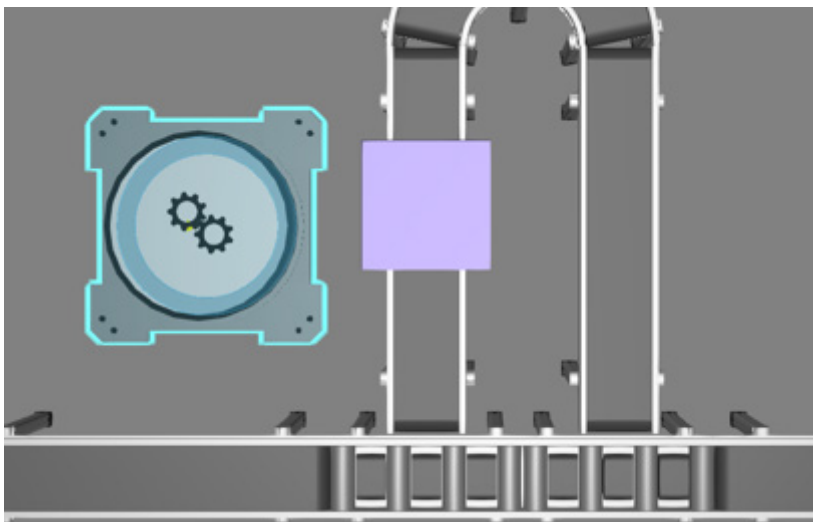
Create Machine Station

The Works library can be used with machines that support the library. For example, Feeler machines allow you to connect a Works Process component to their workplace. This makes it easy to create a machine station that can process parts, remove them, and feed new ones. That is, simulating the different stages of a part in a machine tending process.

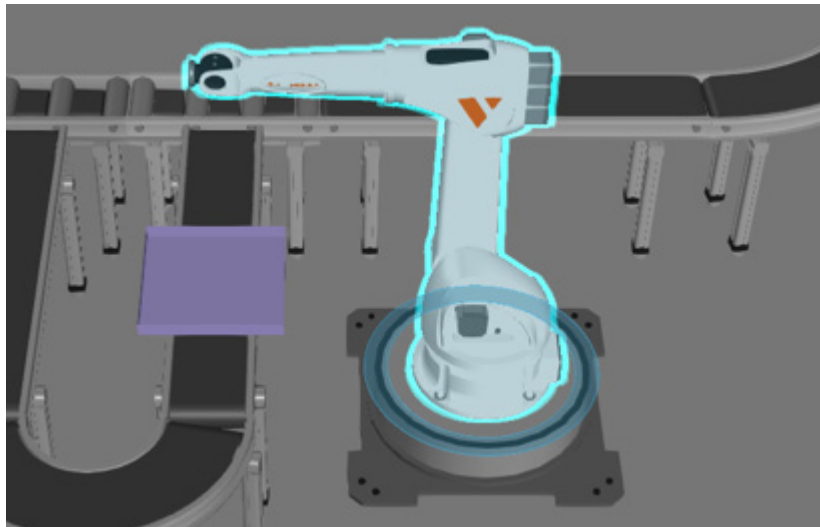
1. Add a **Works Process** to the 3D world, and then change its HeightOffset to **0**.
2. Connect the works process to the path of a conveyor in the second branch. It will be used to stop a tray and request a robot resource pick and place its part in a machine.



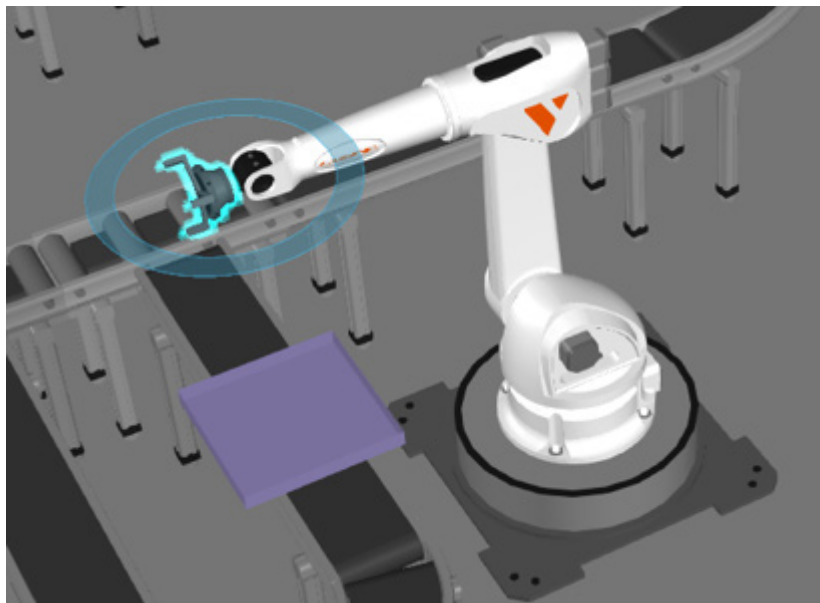
3. In the eCatalog panel, under Visual Components, click **Works Resources**, and then add a **Works Robot Controller** to the 3D world.
4. Move the controller to the side of the second branch and within reach of its Works Process component.



5. In the eCatalog panel, under Visual Components, click **Robots**, and then add and connect a **Generic Articulated Robot** to the controller in the 3D world.



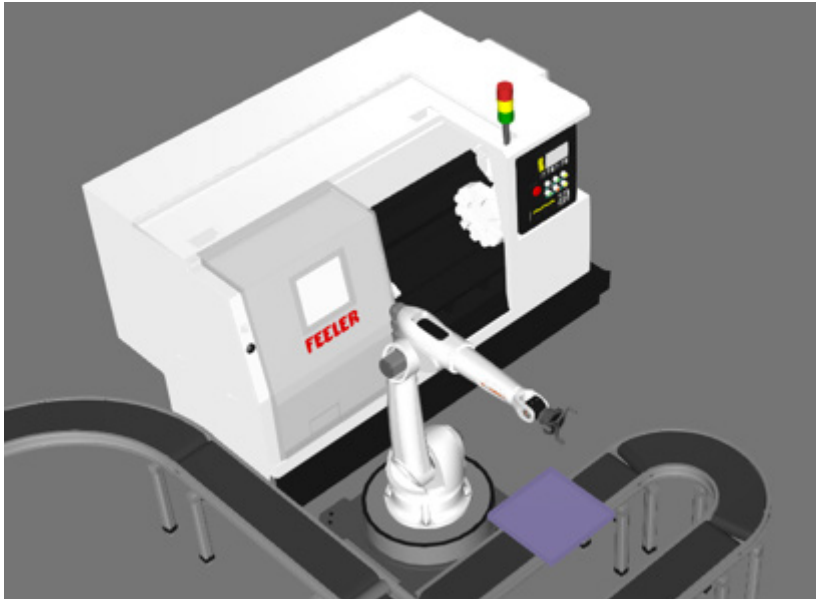
6. In the eCatalog panel, under Visual Components, click Tools, and then add and connect a **Simple Gripper** to the end of the robot's arm.



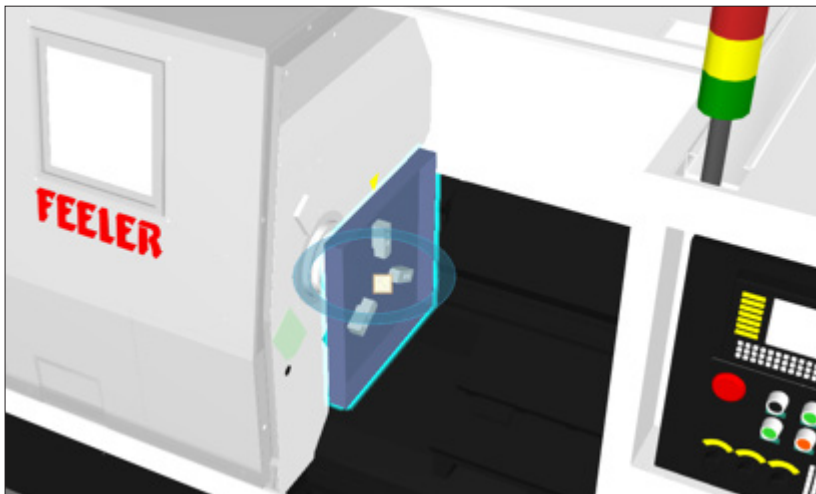
7. In the Component Properties panel, set GripperDia to **180**.

J1	198	
J2	0	
GrippingDia	180	mm
BodyDia	150	mm
BodyHeight	70	

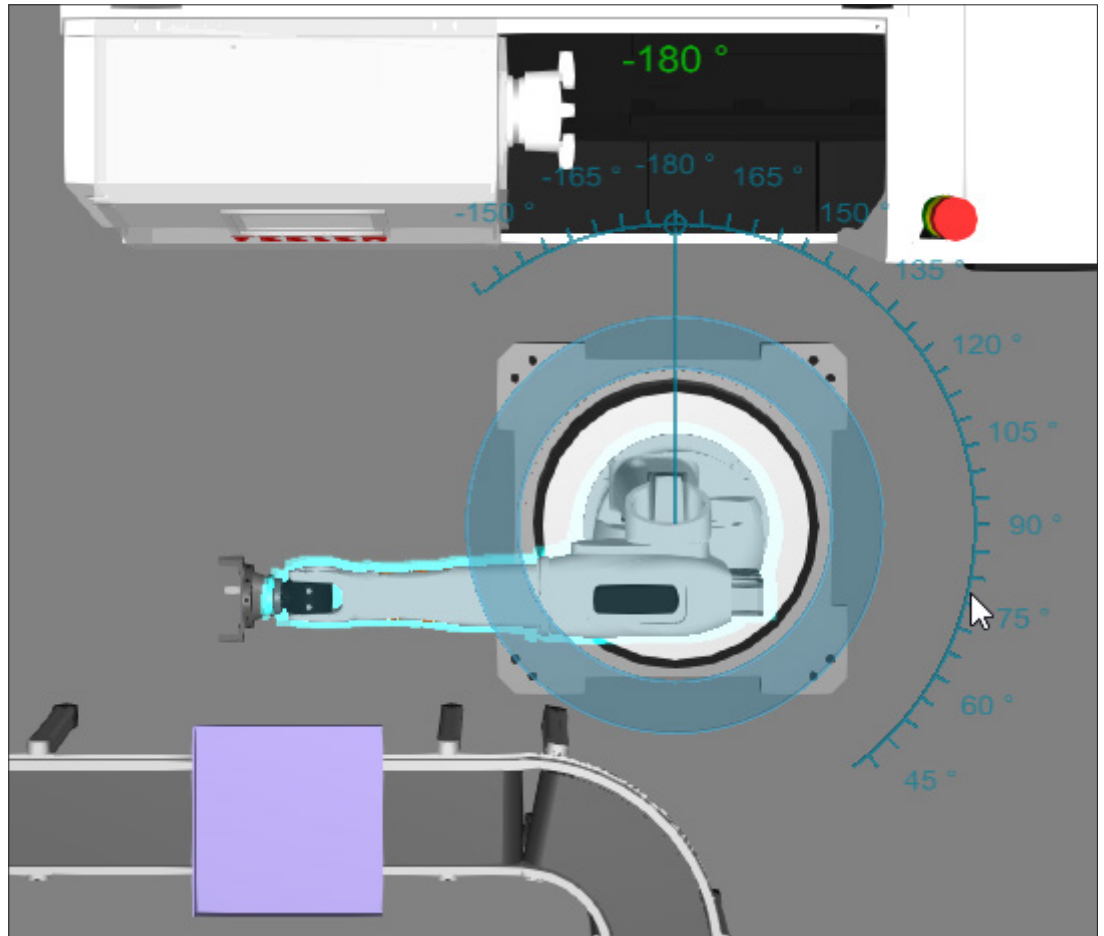
8. In the eCatalog panel, under Models by Manufacturer, click **Feeler**, and then add a **FTC350** machine to the 3D world.
9. Use the PnP command to rotate the machine **90** degrees so that its door faces the robot.



10. Add a **Works Process** to the 3D world, and then change its HeightOffset to **0**.
11. Use the PnP command to connect that works process to the chuck of the machine.



12. In the 3D world, select the **robot controller**, and then use the PnP command to rotate it **180** degrees.
13. Reposition the robot controller and machine so that the robot can reach both the chuck of the machine and the works process on the conveyor line.

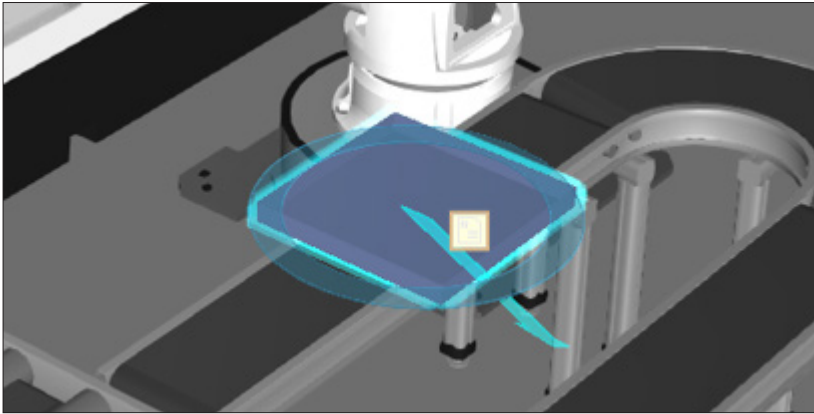


Tip: You can use the WorkSpace::Envelope property of the robot to visualize its area of reachability.

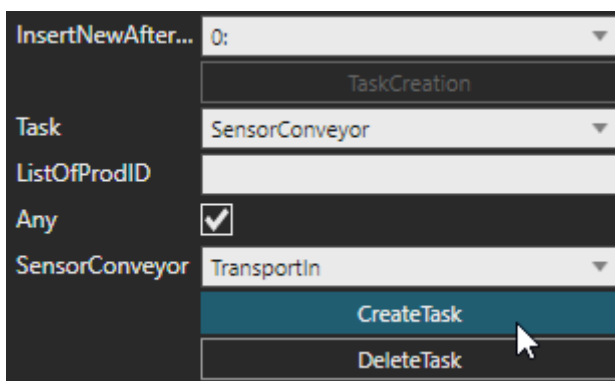
Load Machine

The robot controller can tell the robot pick a part on a tray, and then place the part in the machine.

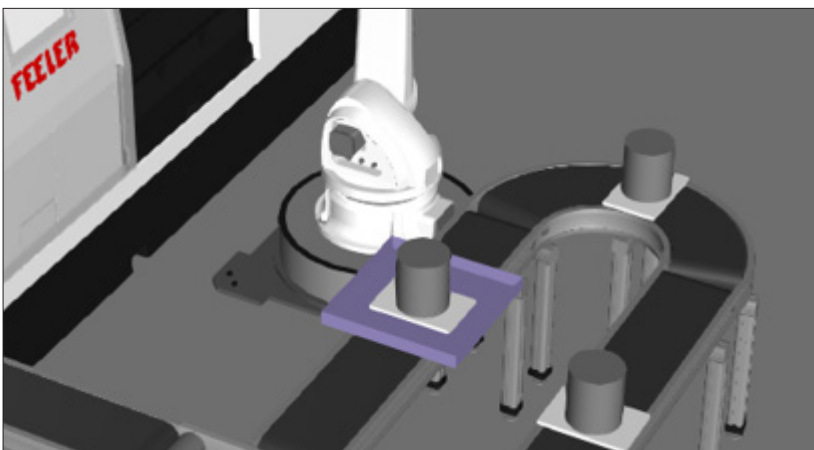
1. In the 3D world, select **Works Process #3**. It should be the one connected to a conveyor in the second branch.



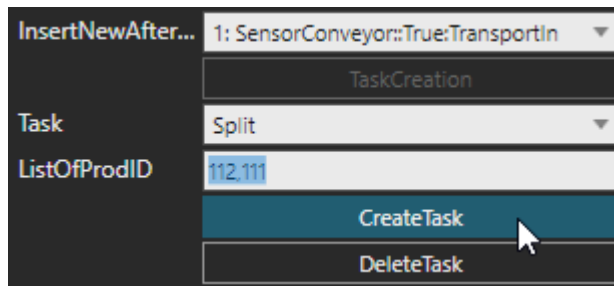
2. In the Component Properties panel, set Task to **SensorConveyor**, and then set SensorConveyor to **TransportIn**, and then click **CreateTask**. The crossing conveyor is responsible for routing trays with parts into the branch, so it is safe to assume a detected component is a tray with a part.



3. Run the simulation, verify a tray with a part stops at the process, and then reset the simulation.



4. In the Component Properties panel, set Task to **Split**, and then set ListOfProdID to **112,111** and then click **CreateTask**. This makes a task for detaching the part from the tray, so the part can be picked by the robot.



InsertNewAfter... 1: SensorConveyor::True:TransportIn ▼

TaskCreation

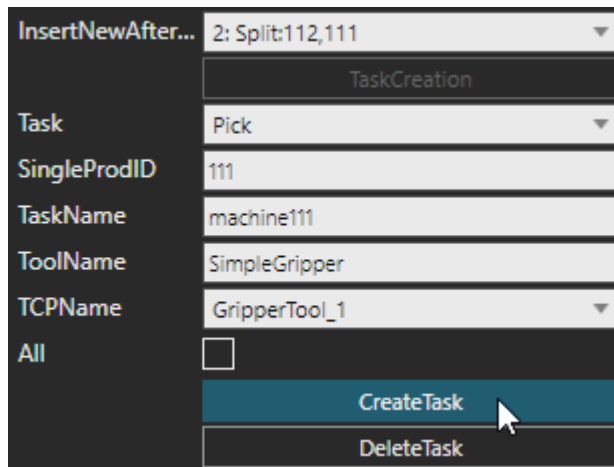
Task Split ▼

ListOfProdID 112,111

CreateTask

DeleteTask

5. In the Component Properties panel, set Task to **Pick**, and then set SingleProdID to **111**, TaskName to **machine111**, ToolName to **SimpleGripper**, TCPName to **GripperTool_1**, clear the **All** checkbox, and then click **CreateTask**. This makes a task for using a robot to pick the part.



InsertNewAfter... 2: Split:112,111 ▼

TaskCreation

Task Pick ▼

SingleProdID 111

TaskName machine111

ToolName SimpleGripper

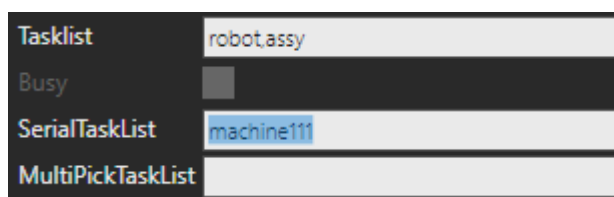
TCPName GripperTool_1 ▼

All ☐

CreateTask

DeleteTask

6. In the 3D world, select the **robot controller**, and then add **machine111** to its SerialTaskList property.



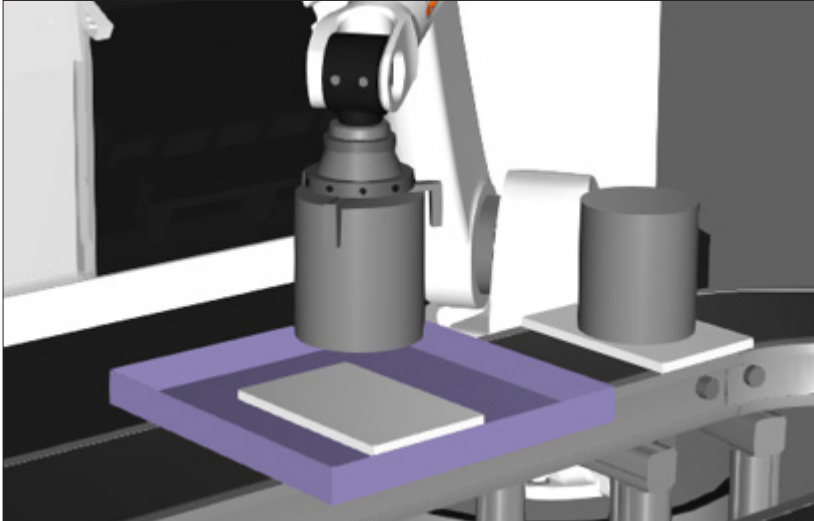
Tasklist robot.assy

Busy

SerialTaskList machine111

MultiPickTaskList

7. Run the simulation, verify the robot picks a part, and then reset the simulation.



8. In the 3D world, select the **Works Process #4**. It should be the one inside the machine.

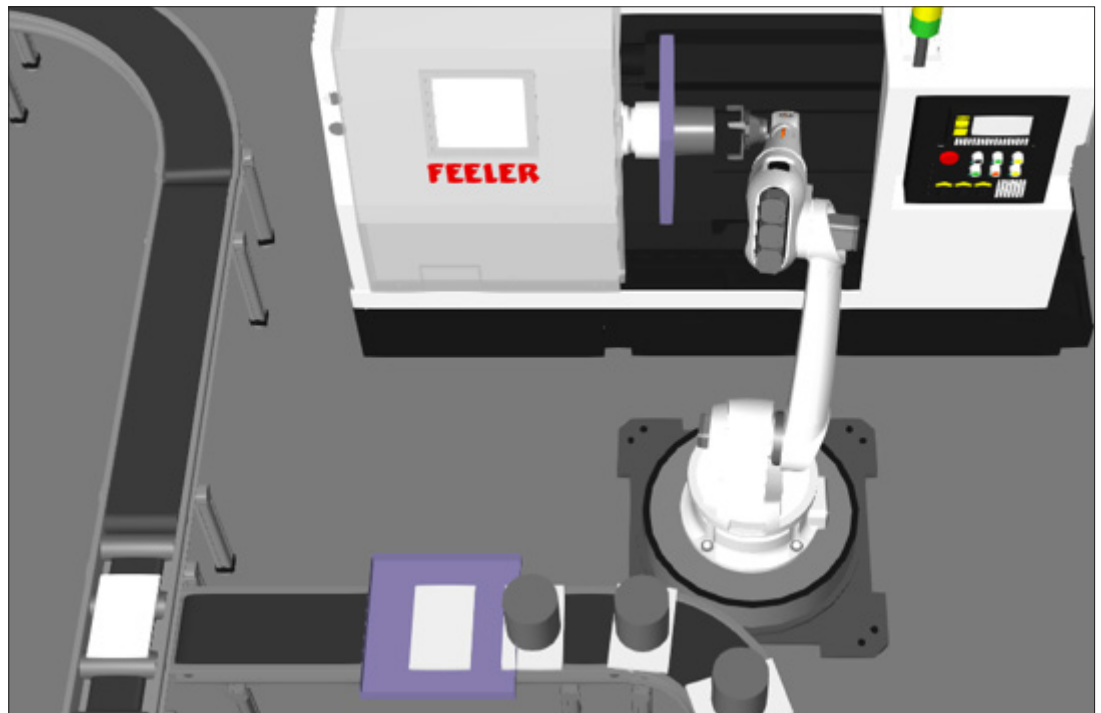


9. In the Component Properties panel, set Task to **Place**, and then set SingleProdID to **111**, TaskName to **machine111**, ToolName to **SimpleGripper**, TCPName to **GripperTool_1**, and then click **CreateTask**. This makes a task for using a robot to place a part.

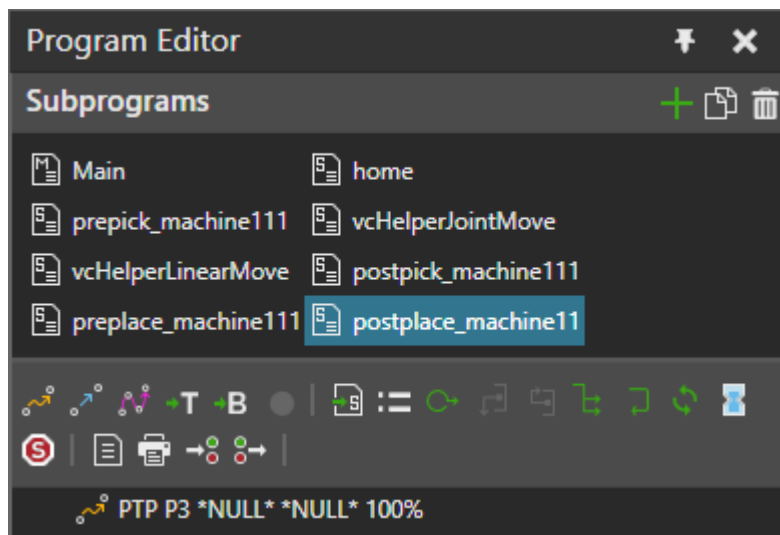
	TaskCreation
Task	Place
SingleProdID	111
TaskName	machine111
ToolName	SimpleGripper
TCPName	GripperTool_1
	CreateTask
	DeleteTask

In this context, the same TaskName for the Pick and Place tasks can be used because the job of the robot is simple and the logic of both processes ensures they work together/depend on one another.

10. Run the simulation, verify the robot loads a part in the machine, and then reset the simulation.



11. Click the **Program** tab, and then use the **Jog** command to select the **robot**.
12. In the Program Editor panel, select the **postplace_machine111** sequence, and then add a **Point-to-Point** motion statement. This means the robot will move to its initial joint position after loading the machine.

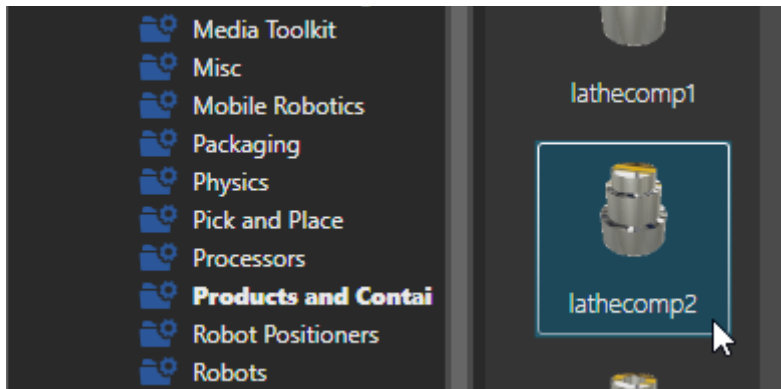


13. Run the simulation, verify the robot moves away from the machine after loading a part, and then reset the simulation.

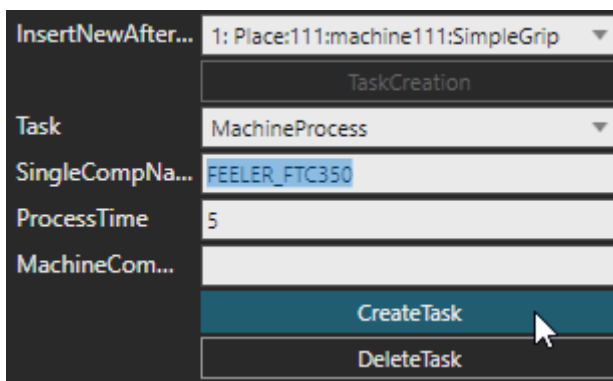
Machine the Part

You cannot simulate material removal, but you can remove and replace a part.

1. Click the **Home** tab.
2. In the eCatalog panel, under Visual Components, click **Products and Containers**, and then add a **LatheComp2** to the 3D world. You can make it invisible since it will be used as a template for making a new part in the machine.

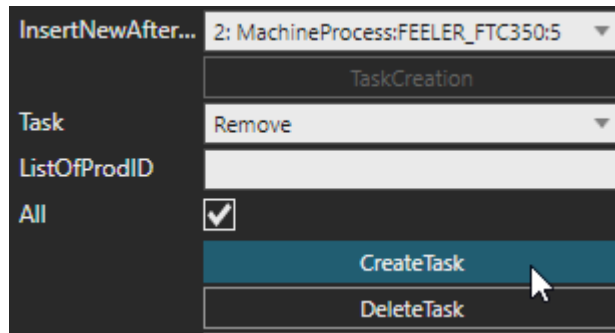


3. In the 3D world, select the **works process** inside the machine.
4. In the Component Properties panel, set Task to **MachineProcess**, and then set SingleCompName to **FEELER_FTC350** and then click **CreateTask**. This makes a task that signals the machine to execute its own process for a specific amount of time. By default, the machine process will last five seconds.

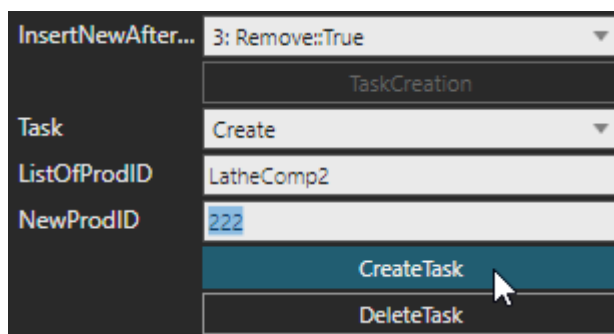


5. Run the simulation, verify the machine spins the part, and then reset the simulation. The part spins because the works process component is attached to the machine.

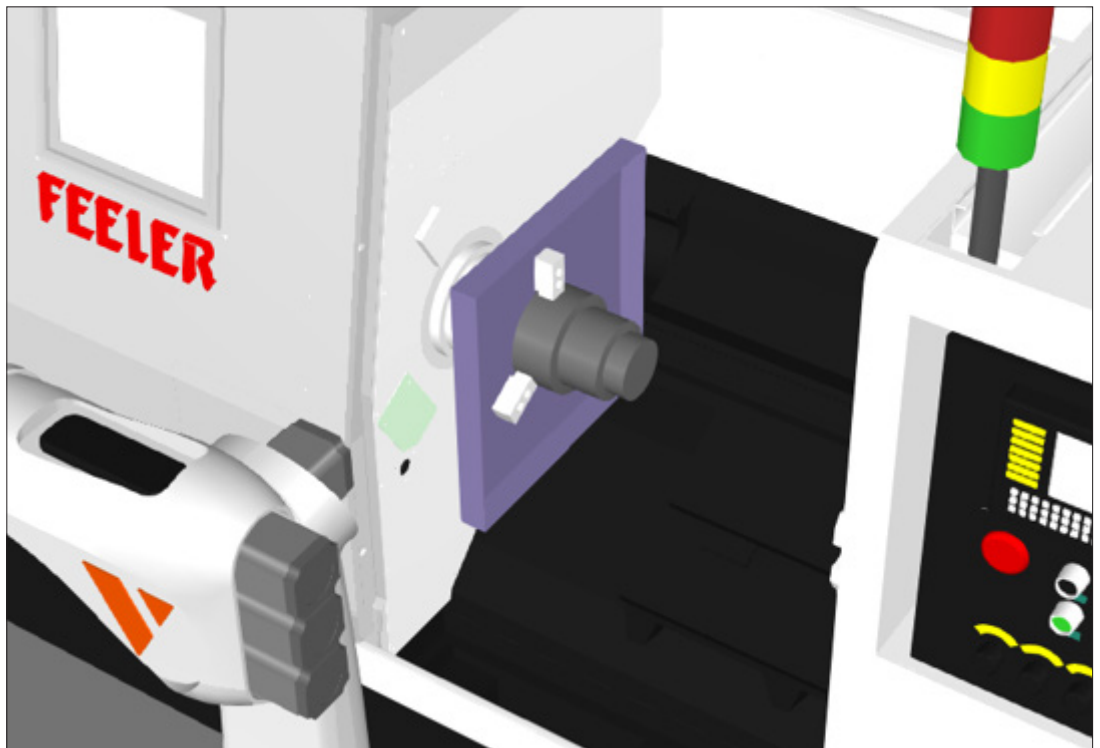
- Set Task to **Remove**, and then click **CreateTask**. By default, this will remove all components from the process.



- Set Task to **Create**, and then set ListOfProdID to **LatheComp2**, NewProdID to **222**, and then click **CreateTask**.



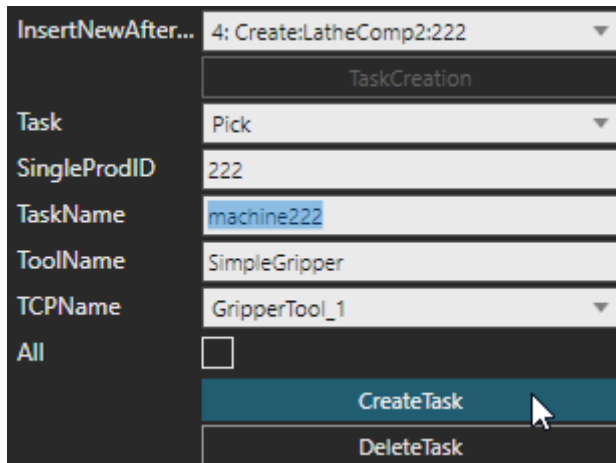
- Run the simulation, verify a new part appears in the machine after its process, and then reset the simulation.



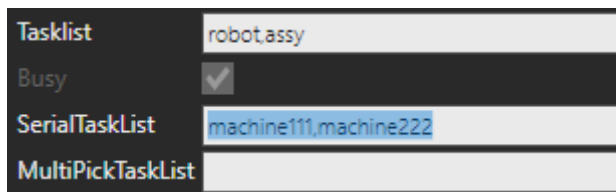
Unload Machine

You can use a new set of Pick and Place tasks to have the robot pick a part from the machine, and then place it on a tray.

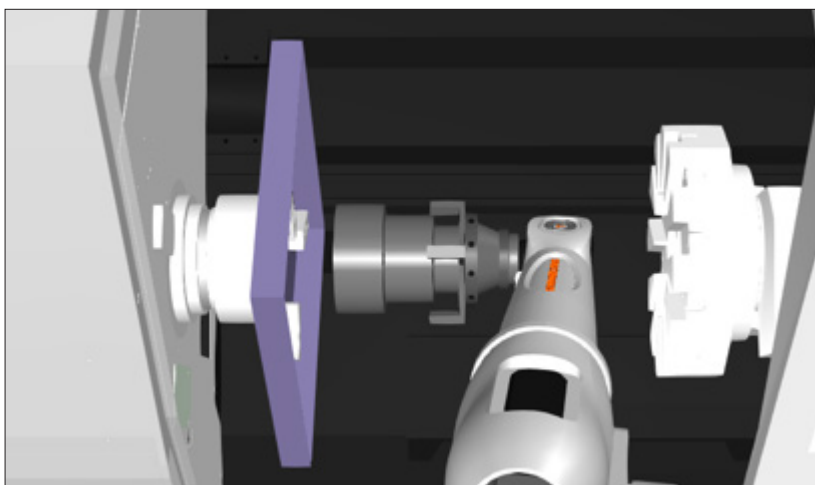
1. In the 3D world, select the **works process** in the machine.
2. In the Component Properties panel, set Task to Pick, and then set SingleProdID to **222**, TaskName to **machine222**, ToolName to **SimpleGripper**, TCPName to **GripperTool_1**, clear the **All** checkbox, and then click **CreateTask**.



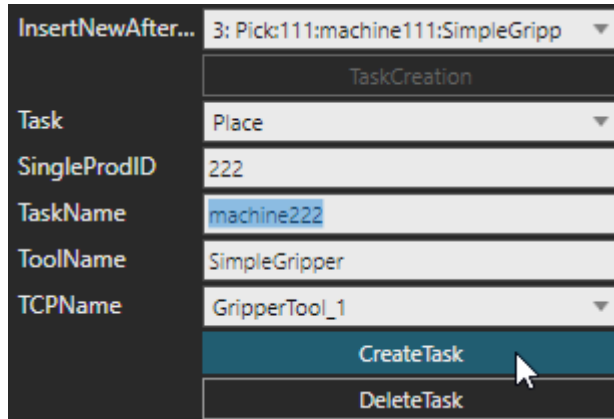
3. In the 3D world, select the **robot controller**, and then append **machine222** to its SerialTaskList property.



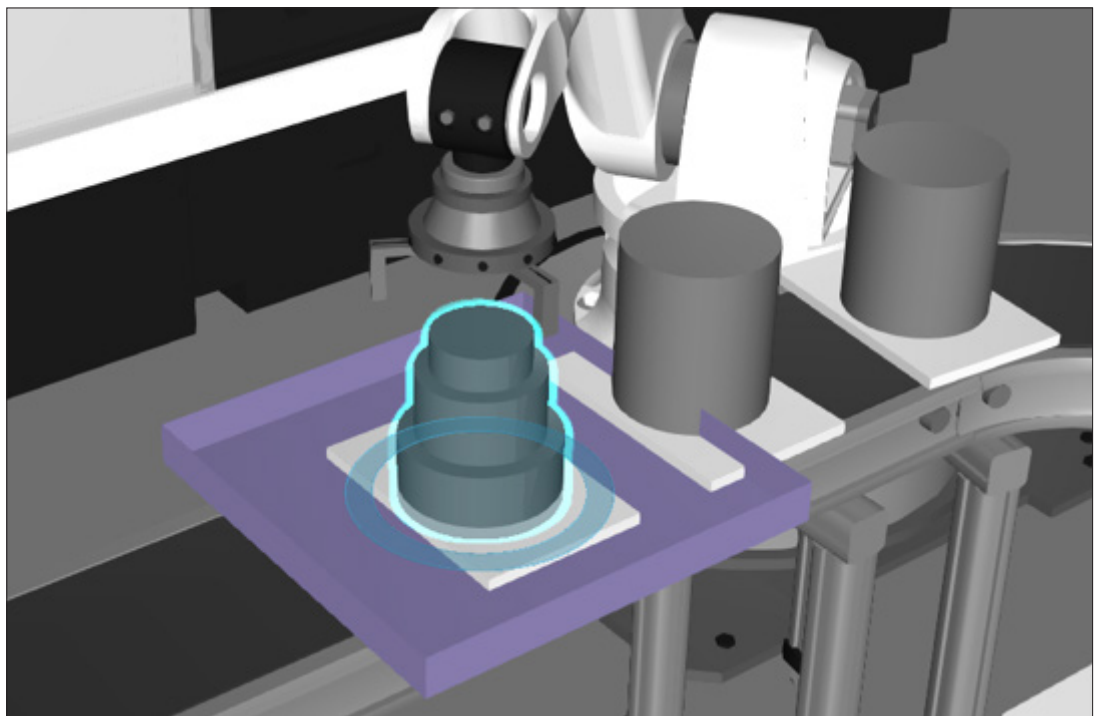
4. Run the simulation, verify the robot picks a part from the machine, and then reset the simulation.



5. In the 3D world, select the **works process** connected to the conveyor in the second branch.
6. In the Component Properties panel, set Task to **Place**, SingleProdID to **222**, TaskName to **machine222**, ToolName to **SimpleGripper**, TCPName to **GripperTool_1**, and then click **CreateTask**.



7. Run the simulation, verify the robot picks and places a part from the machine, and then STOP the simulation.



8. Same issue as before: you need to move the part up 15mm, and then teach its location to the works process component.
9. Reset the simulation and run it again to verify the part is placed on top of the tray, and then reset the simulation.

10. In the Component Properties panel, set Task to **ChangeProdID**, and then set SingleProdID to **112**, NewProdID to **113**, and then click **CreateTask**. This makes a task for changing the ProdID of the tray to indicate its new state. That is, a different part is now on the tray.

The screenshot shows the 'Component Properties' panel for a task. The 'InsertNewAfter...' dropdown is set to '4: Place:222:machine222:SimpleGrip'. The 'Task' dropdown is set to 'ChangeID'. The 'SingleProdID' text field contains '112'. The 'NewProdID' text field contains '113'. At the bottom, there are two buttons: 'CreateTask' (highlighted in blue) and 'DeleteTask'. A mouse cursor is pointing at the 'CreateTask' button.

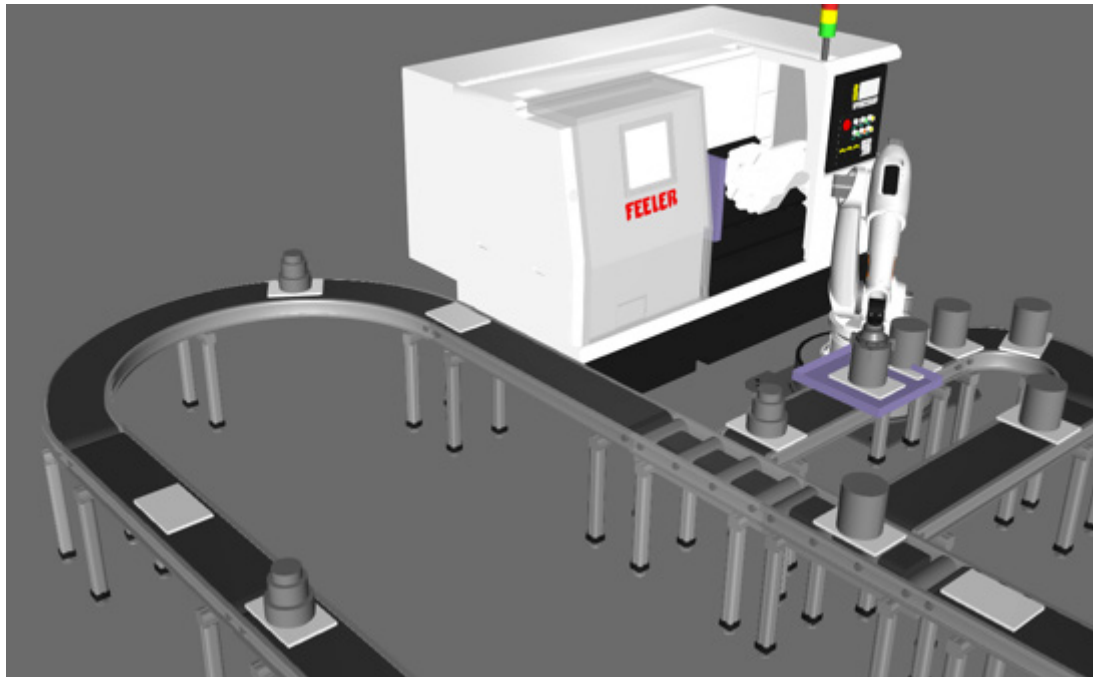
11. Set Task to **Merge**, and then set ParentProdID to **113**, and then click **CreateTask**. This makes a task that attaches the new part to the tray, so they can move together.

The screenshot shows the 'Component Properties' panel for a task. The 'InsertNewAfter...' dropdown is set to '6: Merge:113:222:False'. The 'Task' dropdown is set to 'Merge'. The 'ParentProdID' text field contains '113'. The 'ListOfProdID' text field is empty. The 'All' checkbox is checked. At the bottom, there are two buttons: 'CreateTask' (highlighted in blue) and 'DeleteTask'. A mouse cursor is pointing at the 'CreateTask' button.

12. Set Task to **SensorConveyor**, and then set SensorConveyor to **TransportOut**, and then click **CreateTask**.

The screenshot shows the 'Component Properties' panel for a task. The 'InsertNewAfter...' dropdown is set to '6: Merge:113::True'. The 'Task' dropdown is set to 'SensorConveyor'. The 'ListOfProdID' text field is empty. The 'Any' checkbox is checked. The 'SensorConveyor' dropdown is set to 'TransportOut'. At the bottom, there are two buttons: 'CreateTask' (highlighted in blue) and 'DeleteTask'. A mouse cursor is pointing at the 'CreateTask' button.

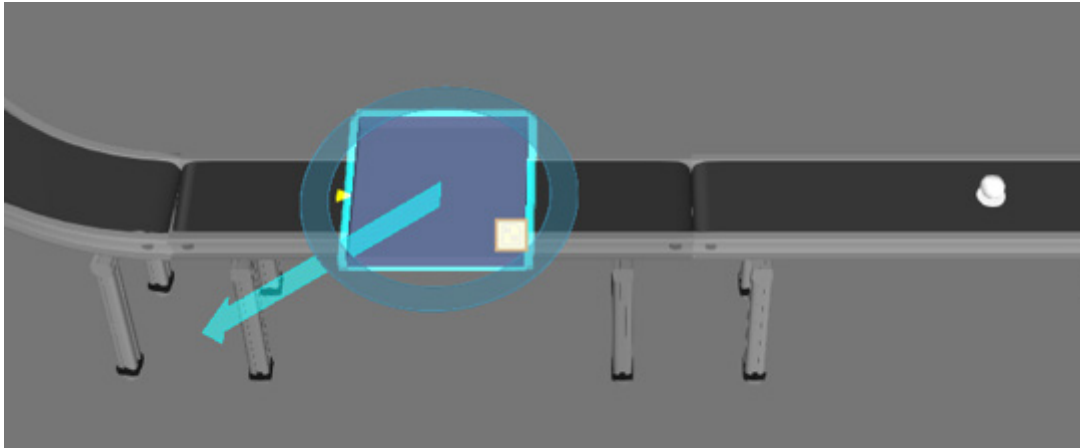
13. Run the simulation, verify the machine station is correctly processing parts, and then reset the simulation.



Create Unloading Station

After machining a part, a resource can pick the part from the conveyor line and leave the tray. In this case, you will unload a part from the main loop not a branch.

1. Add a **Works Process** to the 3D world, and then change its HeightOffset to **0**.
2. Use the PnP command to connect the works process to the path of a conveyor on the main loop that comes after the machine station.



3. In the Component Properties panel, set Task to **SensorConveyor**, and then set ListOfProdID to **113**, clear the **Any** checkbox, set SensorConveyor to **TransportIn**, and then click **CreateTask**. This makes a task for stopping a tray with a machined part NOT empty trays NOR trays with a part that has not been through a machine process.

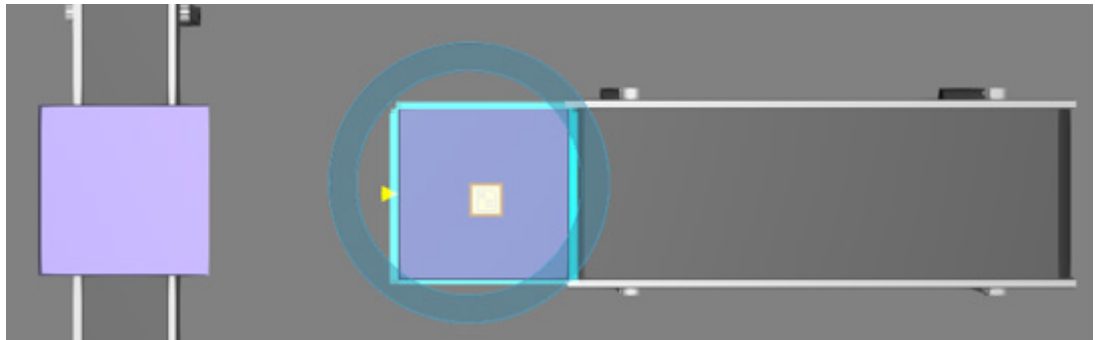
InsertNewAfter...	0:	▼
	TaskCreation	
Task	SensorConveyor ▼	
ListOfProdID	113	
Any	<input type="checkbox"/>	
SensorConveyor	TransportIn ▼	
	CreateTask	
	DeleteTask	

4. Add a **Split** task the detaches the tray from its part.

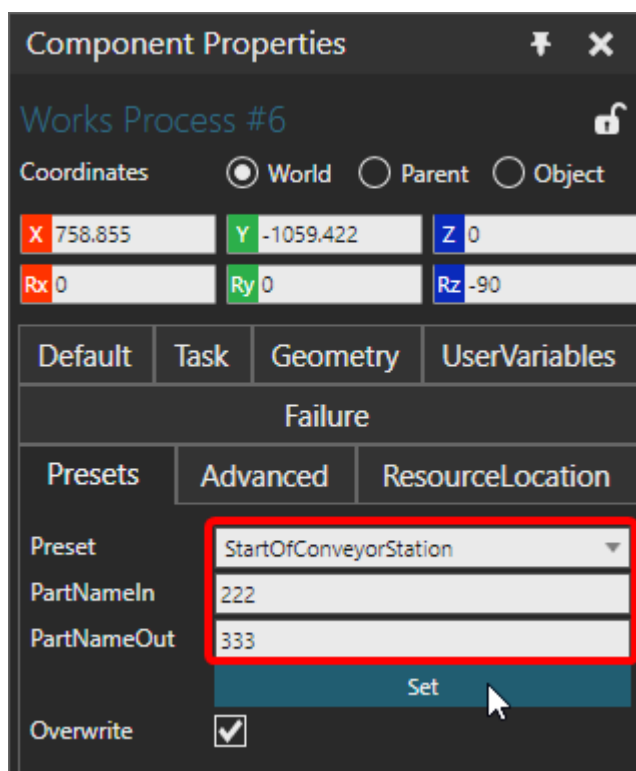
InsertNewAfter...	1: SensorConveyor:113:False:Transpc ▼	
	TaskCreation	
Task	Split ▼	
ListOfProdID	113.222	
	CreateTask	
	DeleteTask	

Create Outlet

1. Add a **Works Process** to the 3D world, and then move it to the side of the unloading station.
2. Rotate the works process **90** degrees so that its path moves away from the unloading station.
3. Add a **Conveyor** to the 3D world, and then connect it to the end of that works process.



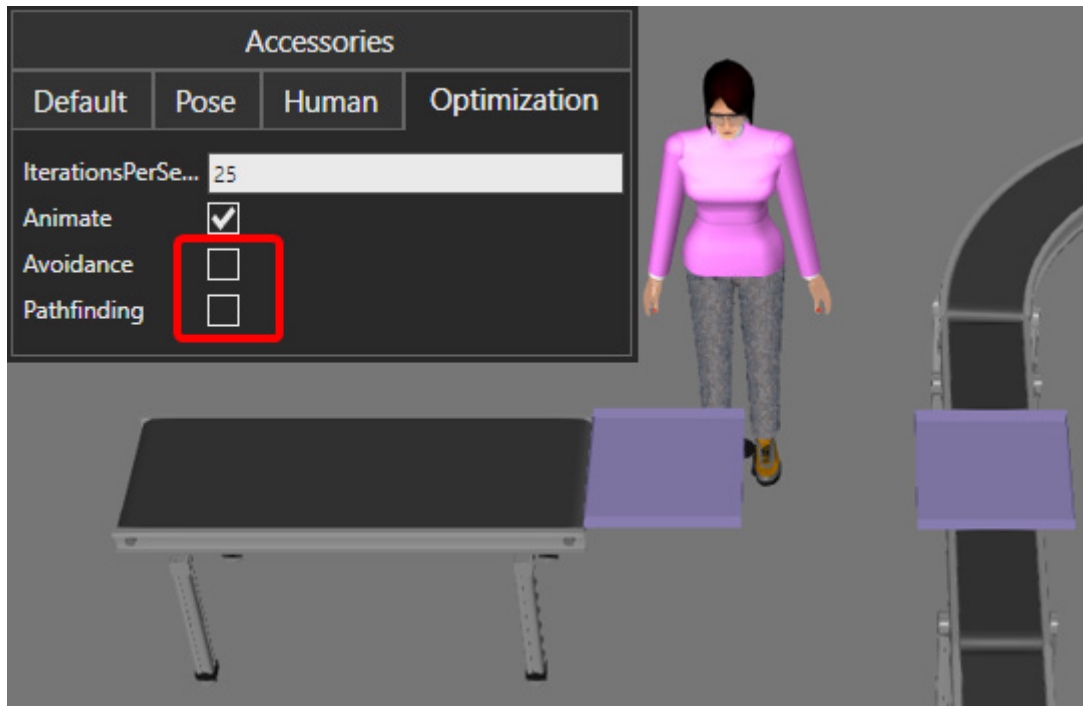
4. In the 3D world, select **Works Process #6**. It should be the works process you added in this section which is connected to the conveyor.
5. In the Component Properties panel, click the **Presets** tab.
6. Set Preset to **StartOfConveyorStation**, and then set PartNameIn to **222**, PartNameOut to **333**, and then click **Set**. This generates a set of tasks in the process for requesting a machined part, changing its id after delivery, and then transporting it to the connected conveyor.



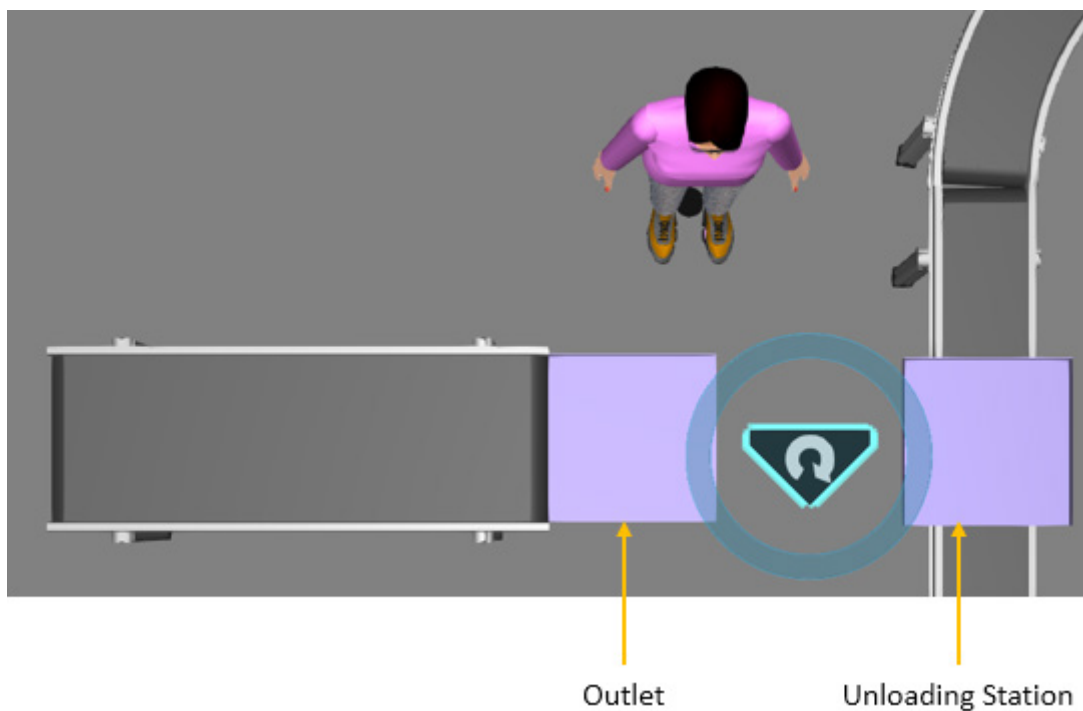
Add Another Resource

Another worker can be used to unload parts.

1. Add a **Works Human Resource** to the 3D world, and then change its Material to **pink_matte**, and then disable its **Avoidance** and **Pathfinding** properties in the Optimization group.



2. Add a **Labor Resource Location** to the 3D world, and then move it between the unloading station and outlet.



3. Select the **works process** acting as the unloading station.
4. In the Component Properties panel, set Task to **Feed**, and then set ListOfProdID to **222**, TaskName to **pick222**, clear the **All** checkbox, and then click **CreateTask**. This makes a task for feeding only the part not the tray.

The screenshot shows the 'Component Properties' panel. The 'InsertNewAfter...' dropdown is set to '2: Split:113,222'. The 'Task' dropdown is set to 'Feed'. The 'ListOfProdID' text field contains '222'. The 'TaskName' text field contains 'pick222'. The 'ToolName' and 'TCPName' fields are empty. The 'All' checkbox is unchecked and is highlighted with a red square. The 'Simultaneous' checkbox is also unchecked. At the bottom, there are two buttons: 'CreateTask' (highlighted in blue) and 'DeleteTask'.

5. Set Task to **RestoreProdID**, and then click **CreateTask**. This makes a task that automatically sets the ProdID value of a component to its StoreID value. For example, the tray will have a ProdID of Empty not 113.

The screenshot shows the 'Component Properties' panel. The 'InsertNewAfter...' dropdown is set to '3: Feed:222:pick222::False:False'. The 'Task' dropdown is set to 'RestoreProdID'. The 'CreateTask' button is highlighted in blue and has a mouse cursor over it.

6. Add a **SensorConveyor** task that transports out any component.

The screenshot shows the 'Component Properties' panel. The 'InsertNewAfter...' dropdown is set to '4: RestoreProdID:'. The 'Task' dropdown is set to 'SensorConveyor'. The 'ListOfProdID' field is empty. The 'Any' checkbox is checked and is highlighted with a red square. The 'SensorConveyor' dropdown is set to 'TransportOut'. At the bottom, there are two buttons: 'CreateTask' (highlighted in blue) and 'DeleteTask'.

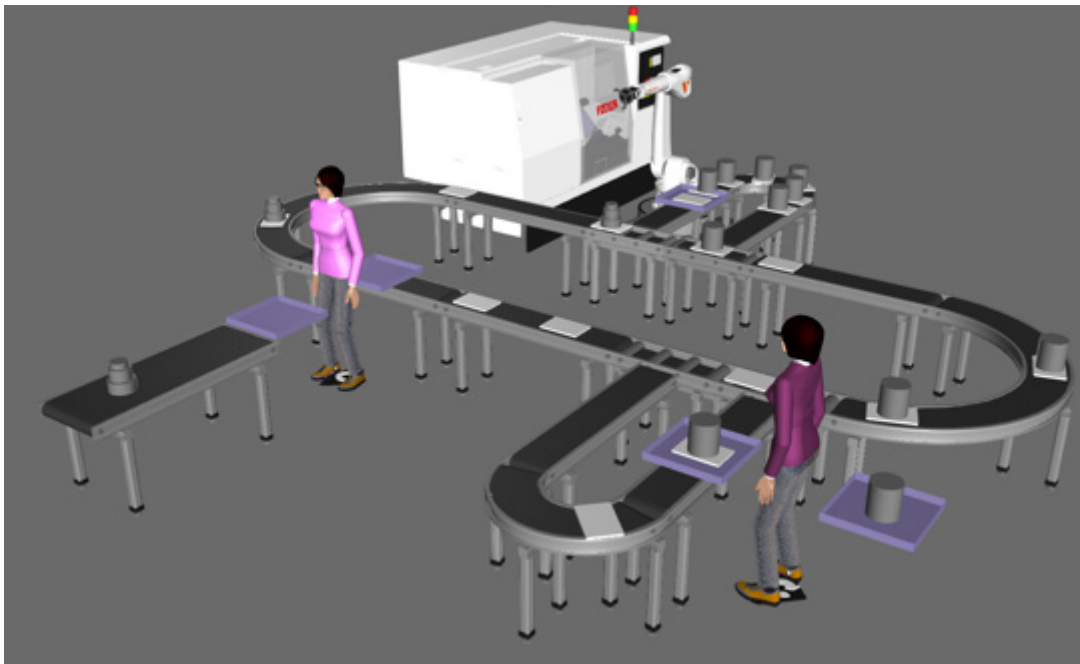
7. Assign the **pick222** task to the human with the pink shirt.

IdlePositionFilter	IdlePosition
IdleTimeOut	10 s
Tasklist	pick222
reserver	

8. In the 3D world, select the **labor resource location** between the unloading station and outlet, and then set its PickTasks and PlaceTasks properties to **pick222**.

Backface Mode	Feature
PickTasks	pick222
PlaceTasks	pick222
ProcessTasks	

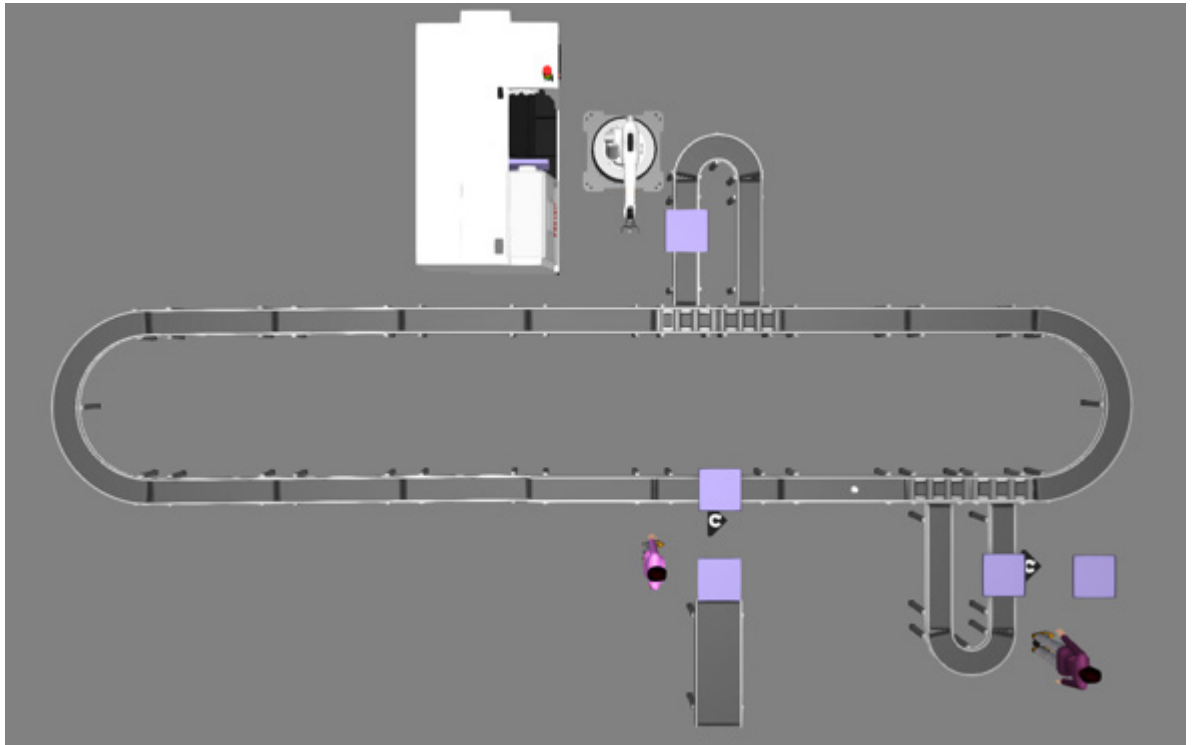
9. Run the simulation, verify the unloading station is working properly as well as the entire assembly line, and then reset the simulation.



Exercises

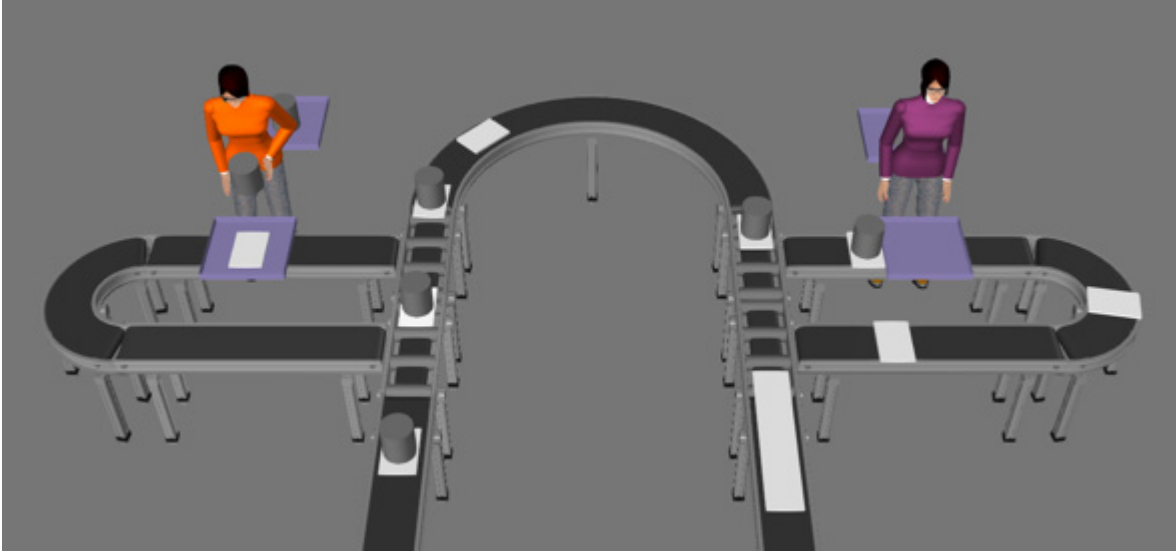
Refer to the lesson files, Help file, and other Academy lessons as needed to complete these exercises.

Extend Conveyor Line



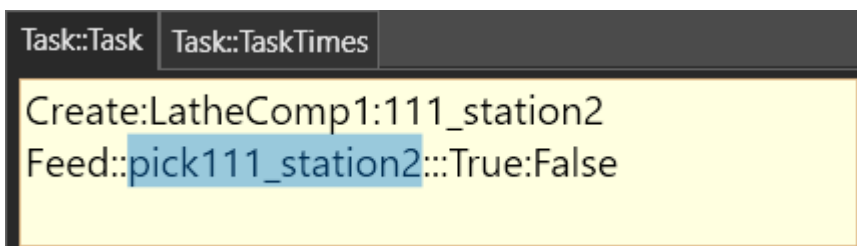
This exercise is optional. Add more conveyors to extend the line and make room for more stations. This is a simple matter of using the Select and PnP modes of manipulation.

Add Another Loading Station

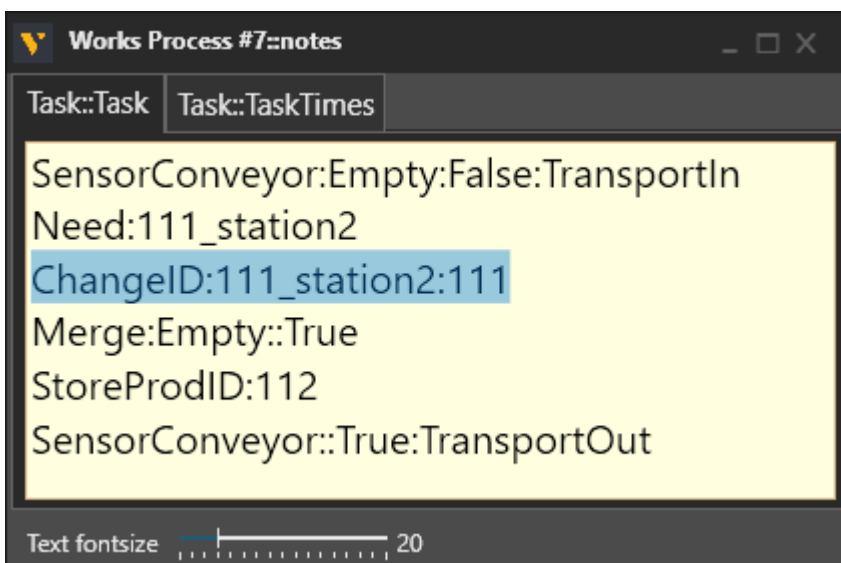


This exercise is optional. Add another loading station that uses a human resource to place parts on trays. Empty trays should visit the station not trays with parts. We recommend you do not copy and paste components from the existing station. Instead, add and configure the components to practice your skills. One tip is to use a String Table routing rule.

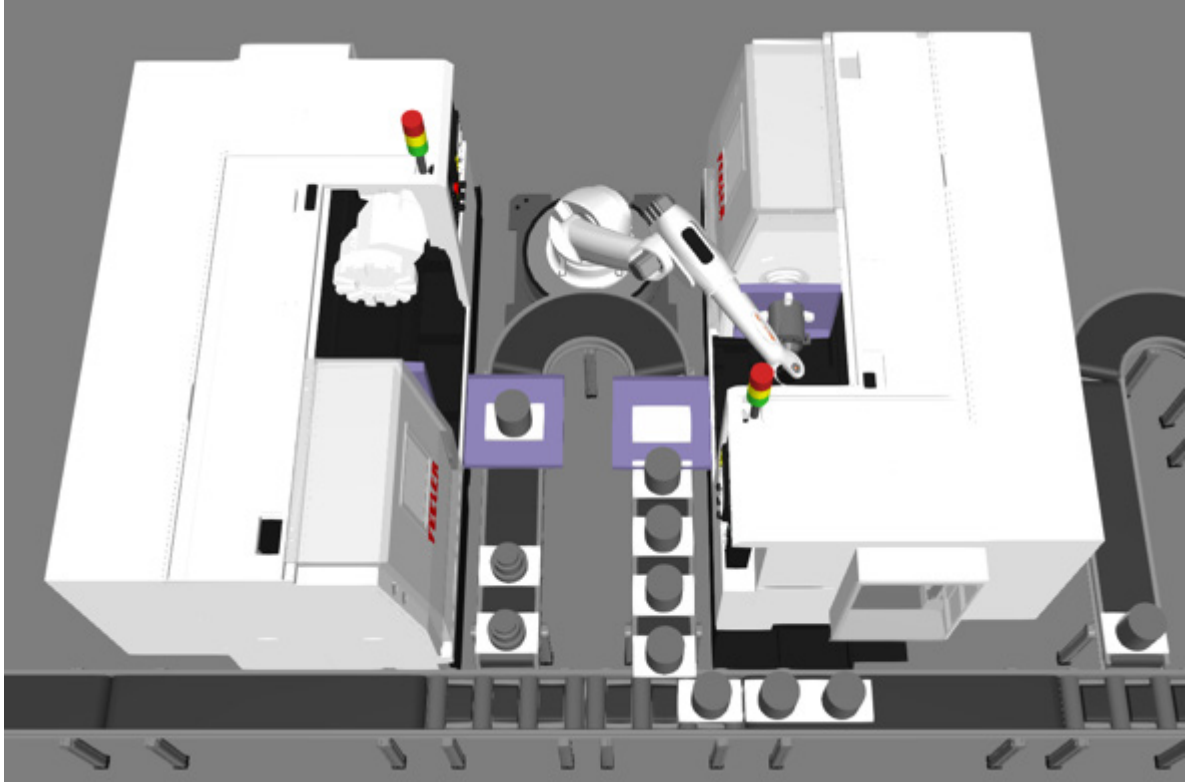
To avoid conflicts with Feed and Need tasks, use a different ProdID value and TaskName to load the parts.



Afterward, change the ProdID of the part so it can be placed in the machine.



Reorganize Machine Station



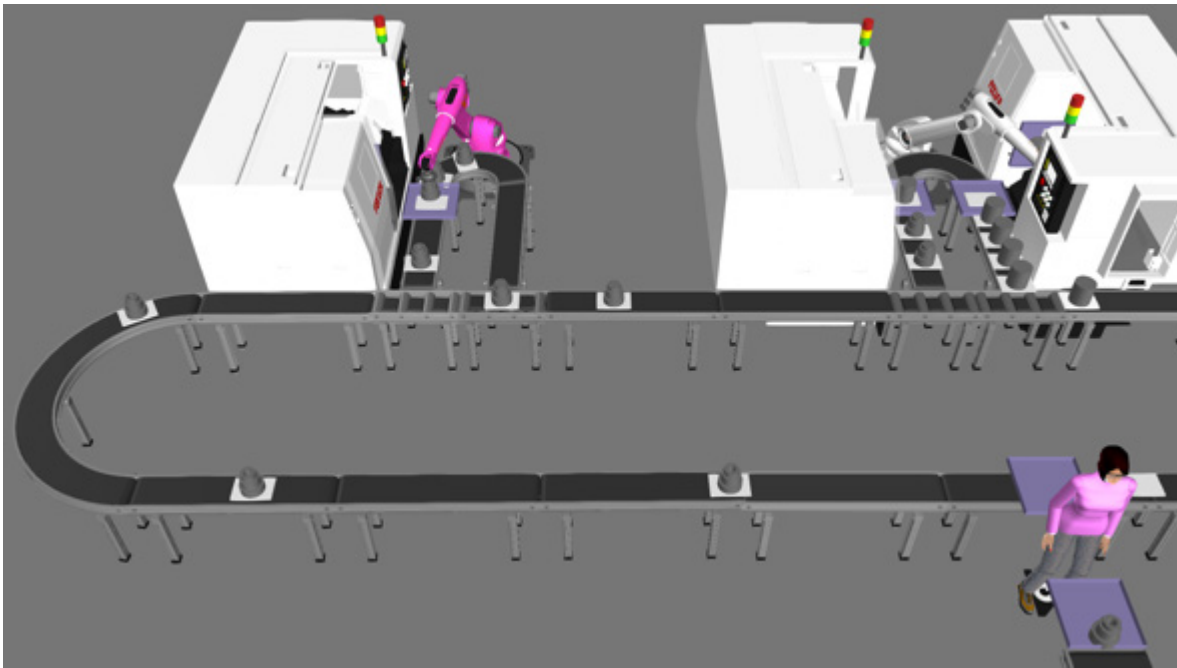
This exercise is optional. Add and edit the components at the machine station to maximize its workspace and incorporate another machine. We recommend you do not copy and paste the components. One tip is to use a different ProdID values for picking and placing parts to and from the second machine. Another tip is to use TransportIn and TransportOut tasks to distribute the workload.

```
Works Process #10::notes
Task::Task Task::TaskTimes
#let first tray with part pass
SensorConveyor::True:TransportIn
SensorConveyor::True:TransportOut
#
SensorConveyor:112:False:TransportIn
Split:112,111
ChangeID:111:111_station2
Pick:111_station2:machine111:SimpleGripper:GripperTool_1:False
Place:222_station2:machine222:SimpleGripper:GripperTool_1
```

Note: This exercise can be challenging, so refer to the lesson files as needed and try to optimize your solution as much as possible.

Add Another Machine Station

This exercise is optional. Add another machine station that removes more material from the part. For example, you can remove LatheComp2 and create LatheComp3. Note that you also need to update the unloading station to pick the new part from the tray.



Modify Unloading Station

This exercise is optional. At the unloading station, place parts into a box. That means you will need to create a box and teach a location for part in the box, and then use a NeedPattern or NeedCustomPattern task to place more than one part.



Review

In this tutorial you learned how to configure a machine tending layout using components from different libraries. You know how to connect conveyors, make loops and branches, and define simple rules for routing products. You know how to use the Works library and resources to pick and place parts and add more logic to control workflows.

If you completed the exercises, you know how to extend and modify an assembly line to test different outcomes and optimize solutions. For example, you know how to add more machines, resources and products.