



Material Handling and Process Updates

Nathan Cole • Emulate3D Training and Support Lead

Thomas Templeton • Emulate3D Simulation Engineer

expanding **human possibility**[®]



PUBLIC

Agenda

1

AMR/Otto Motors

2

Black Box

3

End of line
packaging

4

Smart Conveyors

5

Baggage Handling

6

Flow Control

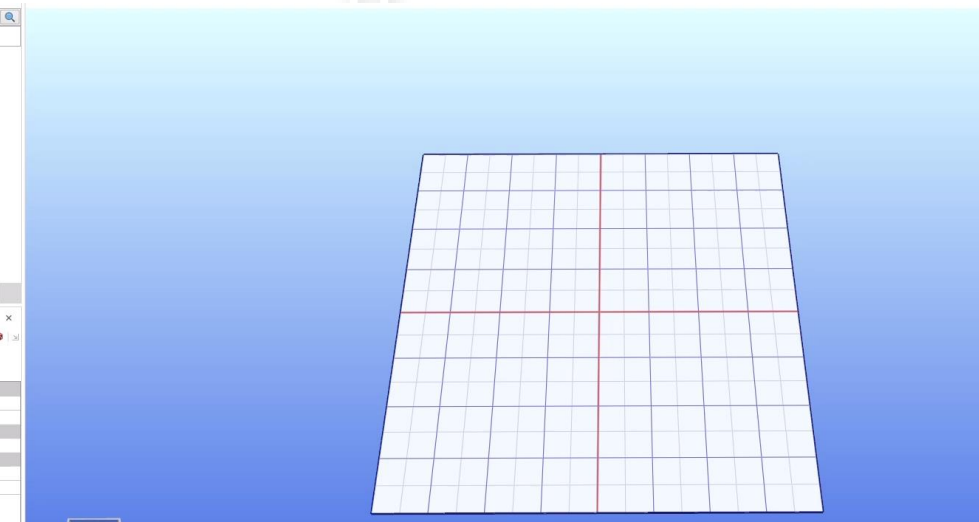
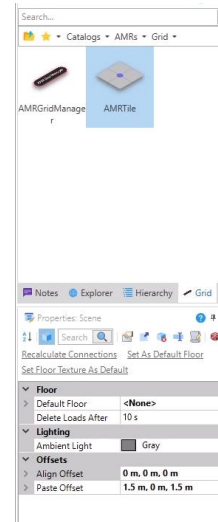
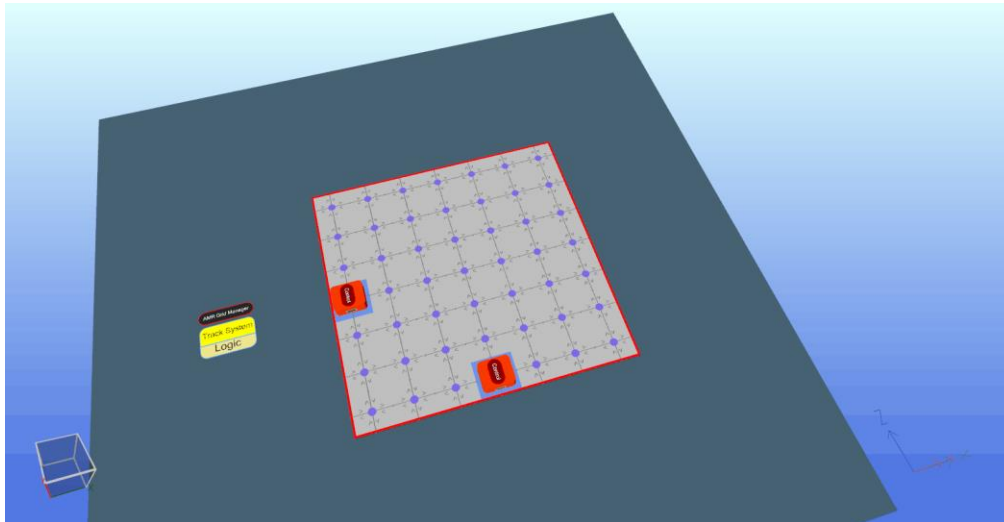
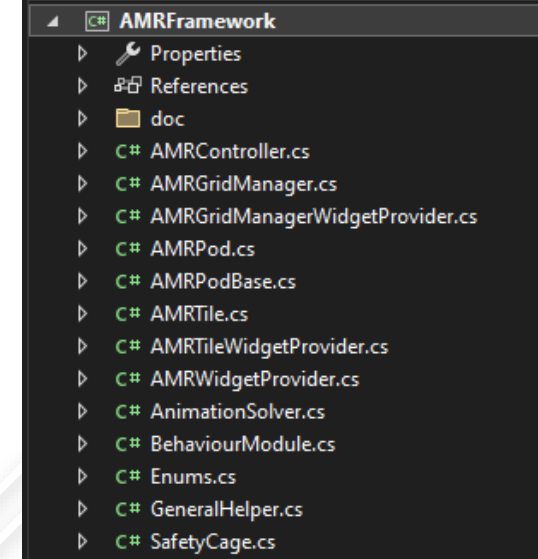
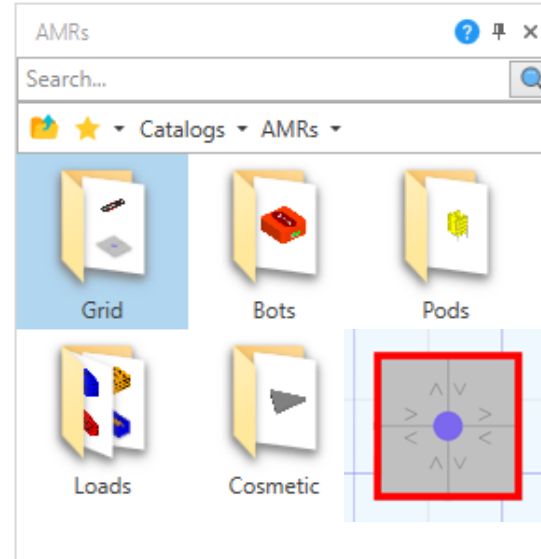
7

Process -
Tanks&Pipes V3



AMR Framework: Reminder

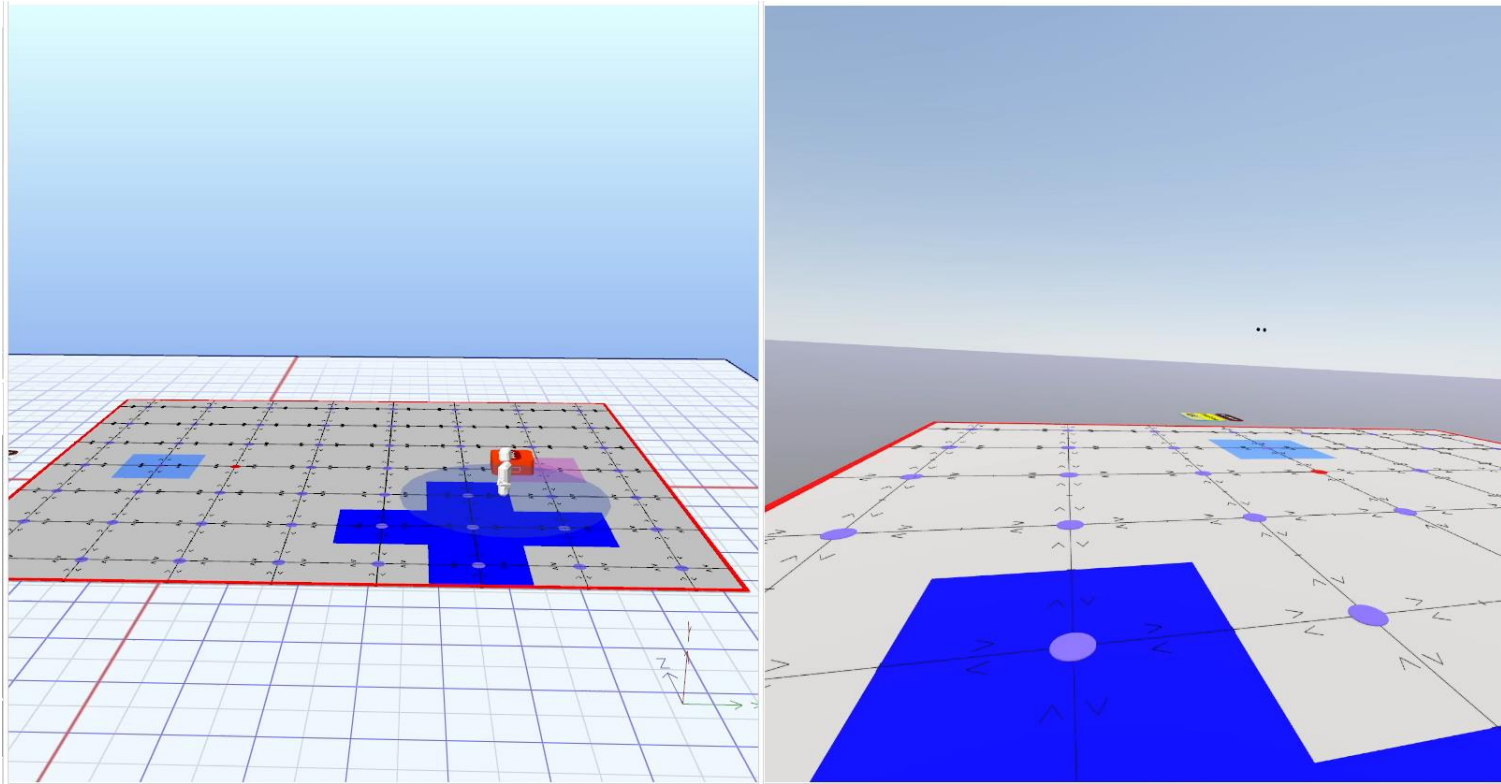
- The AMR Framework script includes smart path planning code capable of managing large fleets of bots (AMRs) without deadlocks occurring.
- Jobs are defined in QuickLogic.
- Emulate3D AMR systems are Transfer State compatible.
- AMR Tile components quickly build up a grid system.
- Adjust weighting/priority parameters on tiles to influence AMR pathing.
- Tile tracks can be unidirectional, bidirectional, and bidirectional with different directional priorities.
- Add/Remove pods to tiles. Supports custom user pod objects.
- AMR Grid Manager can be used to schedule jobs.
- Native collision avoidance and path planning. "Claiming tiles" and A-star algorithm for navigation.



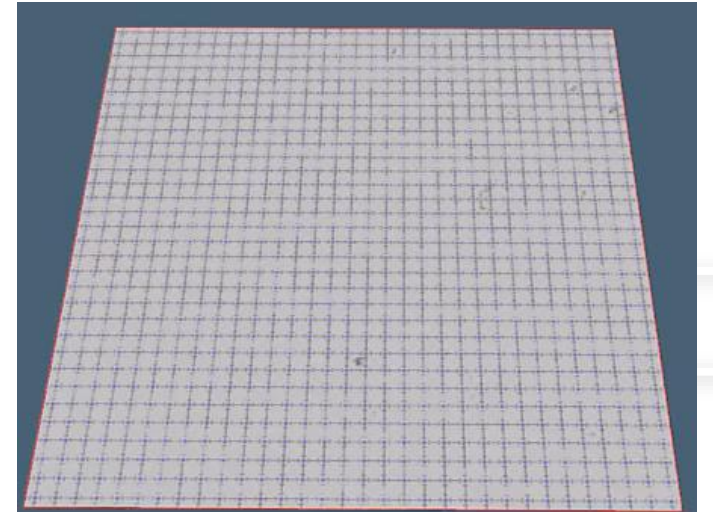
AMR Framework: New Additional Features

Additional features over the last year for the AMR Framework.

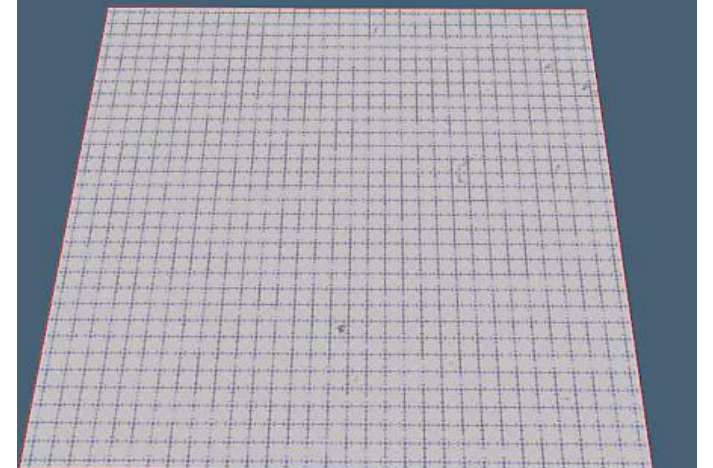
Safety Cage script that allows an external obstruction to be represented with a set radius.



Performance Optimizations



AMRFramework 0.8.4

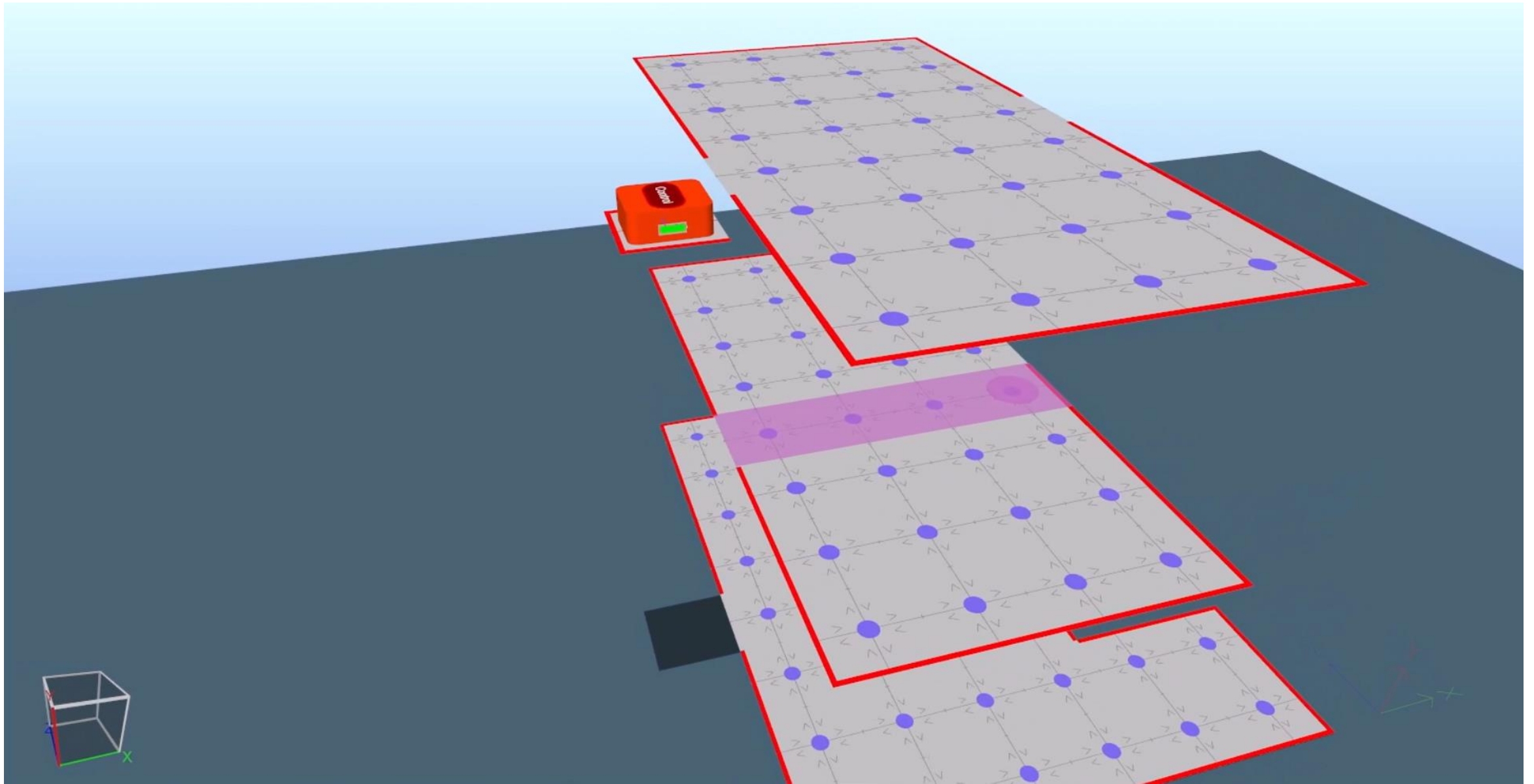


AMRFramework 0.9.2



PUBLIC

AMR Lifts



Clearpath Robotics - Otto Motors

Rockwell Automation's recent acquisition of Clearpath Robotics presents new and exciting opportunities

Modern enterprises need modern material handling.

Which OTTO AMR is right for you will depend on your material flow needs. Payload capacity, use case, and size of your facility will all impact the type and size of your fleet.

 AUTOMATE PUSH CART ROUTES

 AUTOMATE TUGGER/PUMP TRUCK ROUTES



OTTO 100

Small but powerful, with an integrated lift



OTTO 600

Toughest and most agile midsize AMR

  Catalogs ▾ Otto ▾



Otto100



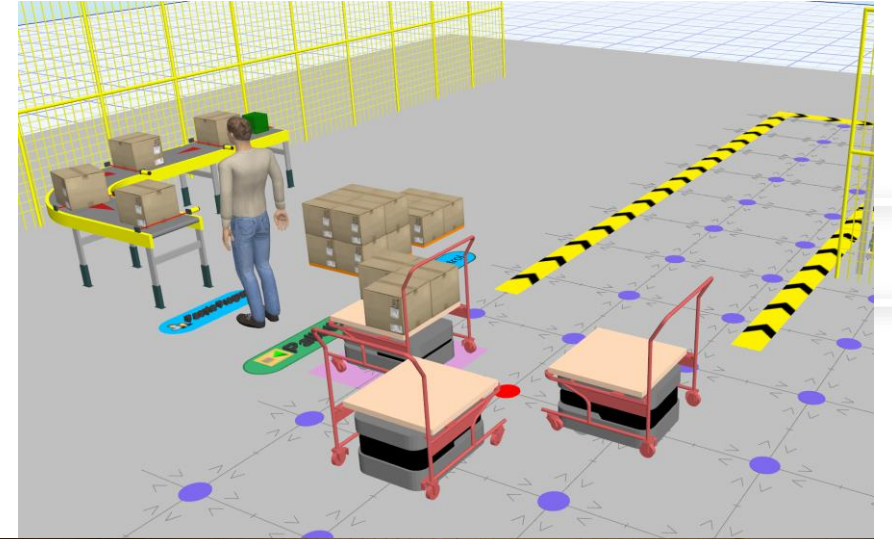
rzz_cart_v1



rzz_cart_v2



rzz_cart_v3



Black Box V3

Simple Transform

Parallel Transform

NextToTransform	4
Batch#1	8
Batch#3	8

Advanced Transform

Drink Can Blue	6
Drink Can Green	4
Drink Can Orange	6
Drink Can Red	6

Process which takes noncancelable time and rejects and then deletes or diverts x% of loads

Automatically creates custom properties for each outgoing connector. Add a weighting (% chance) of loads being diverted down that connector. Set unique divert times for each outgoing connector.

Automatically creates custom properties for each outgoing connector. These can be used to decide what type of load can be outputted there. Loads are randomly outputted to a destination which matches their type. Unsorted loads can be deleted or sent to another destination.

Use a table to look for matching properties on the visual. This can be a string, a color, or a number. Either outputs to the first match, or to a random matching row. Can choose to introduce x% of sort failures as well.

Picks a percentage of loads on a line. Cancels the pick if there is nowhere to put the load, or if a failure state.

Uses a custom bool expression to decide whether to pick loads from an incoming station. If the Black Box is busy, or the expression false, then the transfer is cancelled.

0/1

0/1

Total = 1/1

Animate with Speed

Total = 1/1

Animate over Time

0/1

0/1

1/1

Eject

1/1

0/1

0/1

Multi

Eject

Rate Throttle

Scheduled Throttle

Accumulation Transport

Non-Acc Transport

Block Buffer

Reskin

Prop

Color

Separation

Reparent

Process (Time)

Process (PPM)

Parallel Process

Multi Stage Process

Batched Process

Parallel Batched Process

FIFO Buffer

LIFO Buffer

Priority Buffer

Sorted FC Buffer

Dynamic Buffer

FC ASRS

ASRS

Try changing the InitialLoadCount, and Try changing the TotalCapacity before. Try comparing the ReleaseMode when

Note how the loads pass out of the Black Box. The first Blue Boxes to enter may never leave. Try changing the RowsPerCategory property

Note how loads are organized by color. Try adding Cardboard Box Yellow to the queue

Note how loads are organized into steps. The Flow Control currently orders one step at a time. Try editing the Flow Control to order them differently

Try changing the DynamicCapacity property. Note how the Black Box turns orange if it is full

Try changing the SimultaneousStores property. Note that this can be changed whilst the Black Box is busy. Try changing the InfeedTime, to represent a delay. Try editing the Flow Control to release loads. Try setting SortByLoad to true, to behave like a queue

Process (Variable Time)

Ramping Process (Time)

FIFO Buffer

Process (Variable PPM)

FIFO Buffer

Ramping Process (PPM)

Process (OEE)

Black Box V3 Performance Improvements

The screenshot displays the Black Box V3 software interface. The main window shows a 3D perspective view of a simulation flowchart on a dark blue plane. The flowchart consists of several nodes connected by red arrows: a green 'Storage' node on the left, followed by a 'Processing' node, which then branches into two parallel 'Processing' nodes. These two 'Processing' nodes converge into a single 'Storage' node, followed by a 'Transport' node, and finally a blue 'Storage' node on the right. A large red arrow points from the bottom left towards the 'Processing' nodes in the flowchart.

The interface includes a top toolbar with menus for File, Home, Arrange, Visualization, Construction, Package Tools, and CAD Is The Model. Below these are various tool icons for selection, navigation, text, find, edit, animate, tools, layers, view, physics, and emulation. A search bar is located in the top right corner.

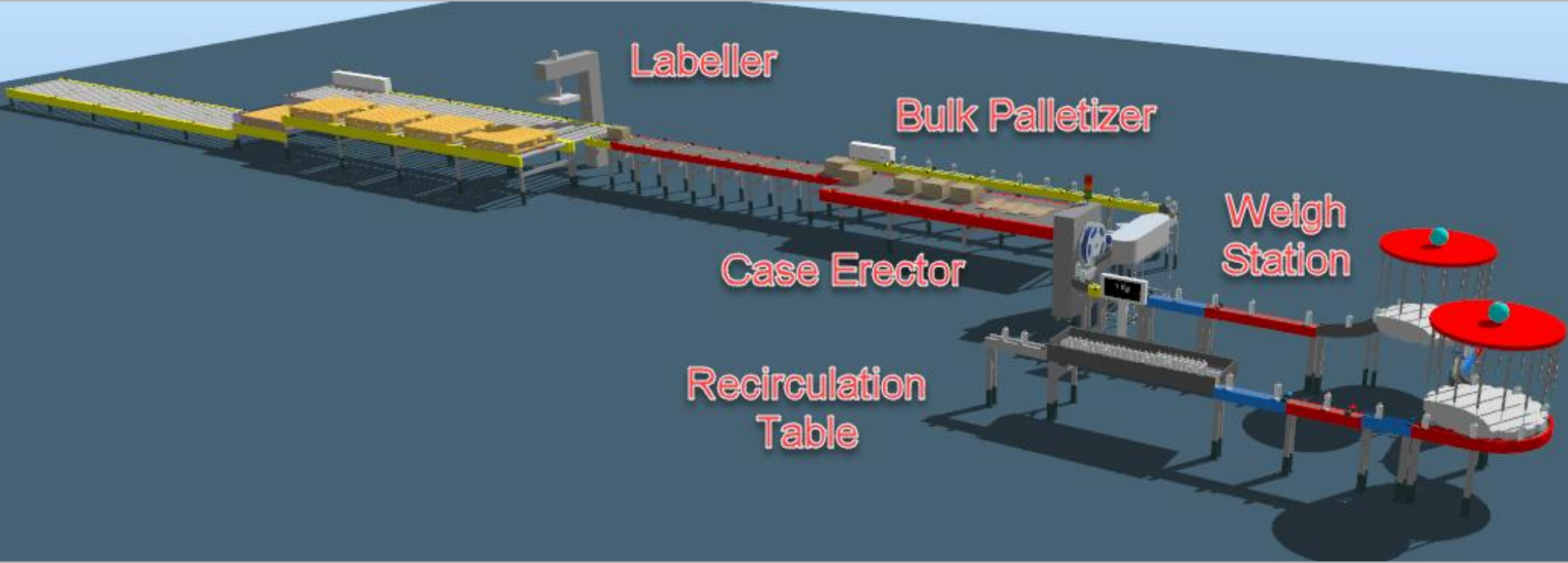
On the left side, there is a 'BlackBox' panel with a search bar and a 'Catalogs' dropdown. Below this is a 'Premade Configurations' section with icons for 'Black Box' and 'Black Box Station'. At the bottom left, there is a 'Properties: Scene' panel with expandable sections for 'Floor', 'Lighting', and 'Offsets'. The 'Offsets' section is currently expanded, showing the following values:

Property	Value
Align Offset	0 m, 0 m, 0 m
Paste Offset	1.5 m, 0 m, 1.5 m

At the bottom of the interface, there is a status bar with the following information: FPS: 25.05, Speed: 1.00 / 1.00, Size: 1608x831, Default Display, Reset Layout, Loads: 0, Time: 0:00:00:00.00.

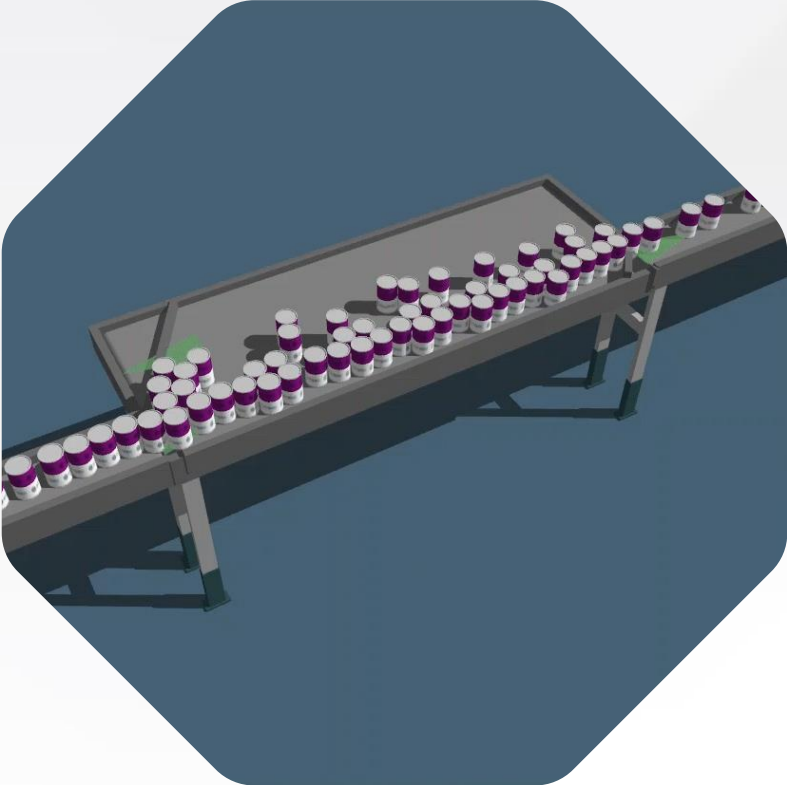
End of Line Packaging Components

Coming soon to the Package Manager

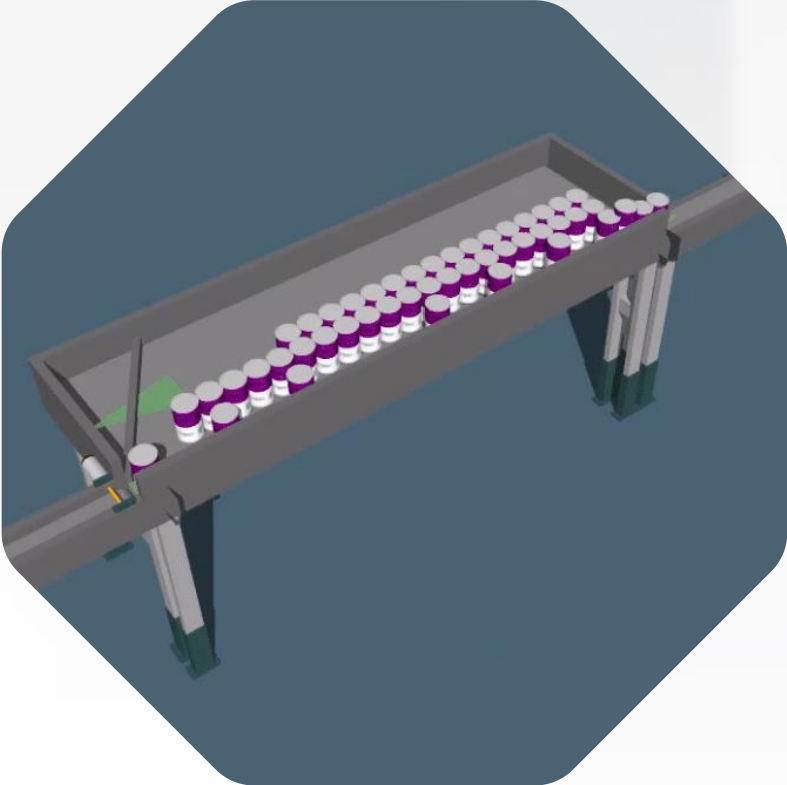


Recirculation Table

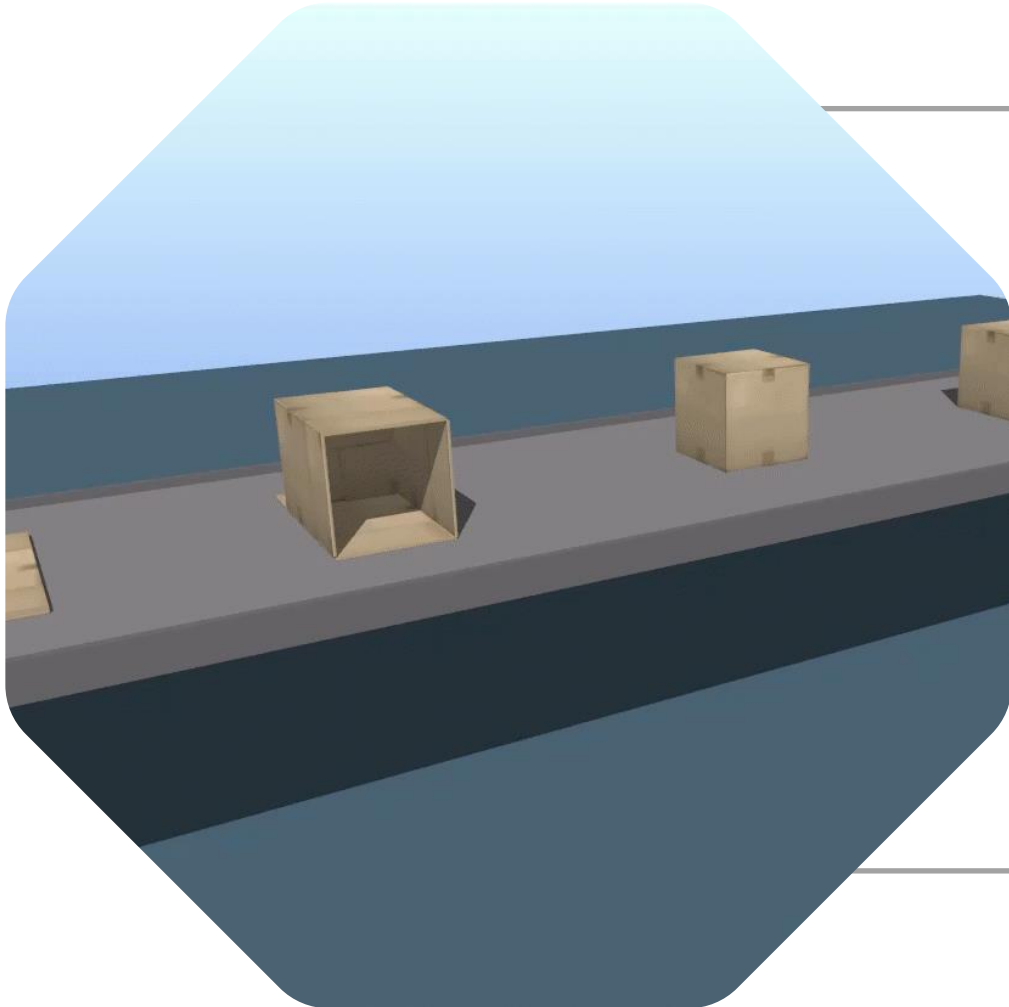
Volumetric Physics



Linear Physics

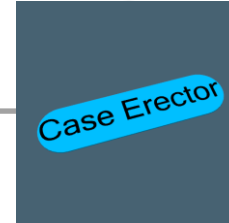


Case Erector



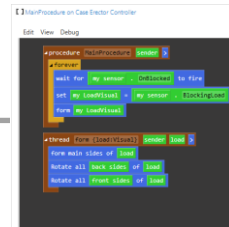
Case designer

Specify the size and texture of the flattened box



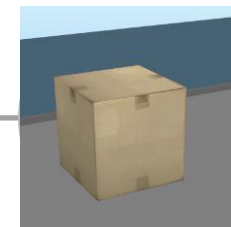
Case Erector

Similar to Flow Controller. Set when the sides should form, i.e after blocking a sensor.



QuickScript

New widgets for folding sides at certain times.



Convert to container and box visuals

Allow partially and completed boxes to have physics interactions.



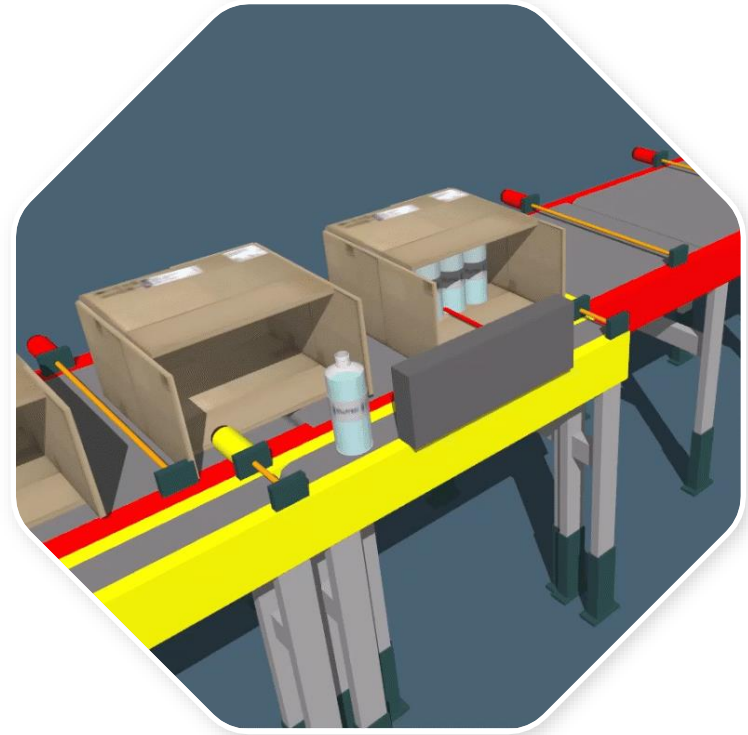
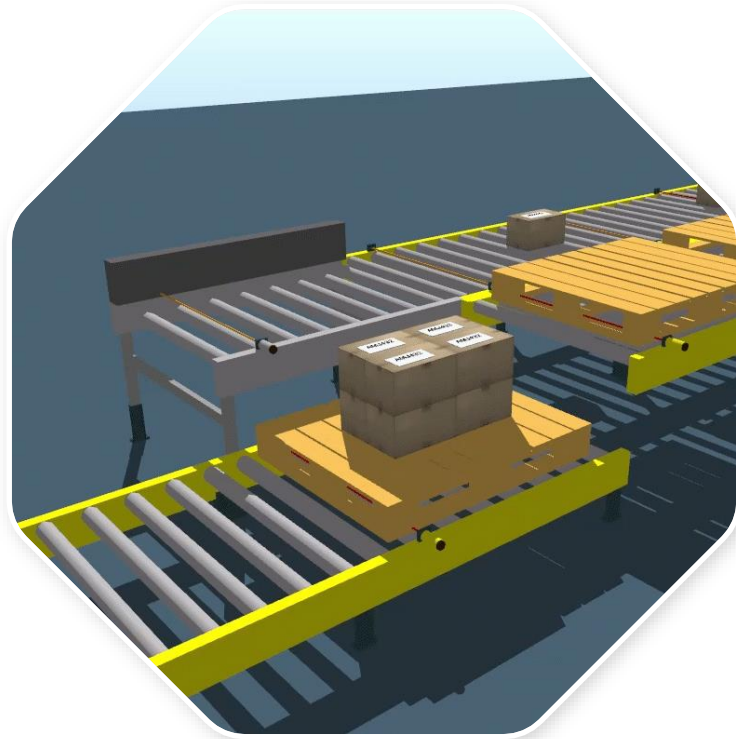
Bulk Palletizer

Palletize

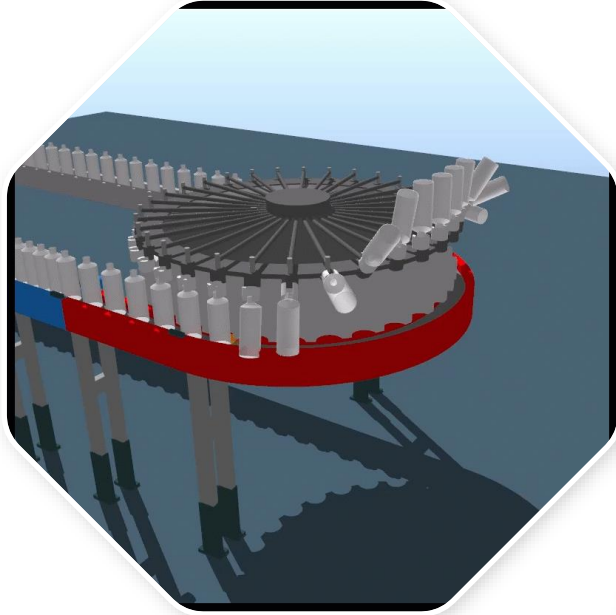
Push

Integration
with existing
Palletizer

Pallet Patterns



Other components



Bottle Rinser

Label
Applicator



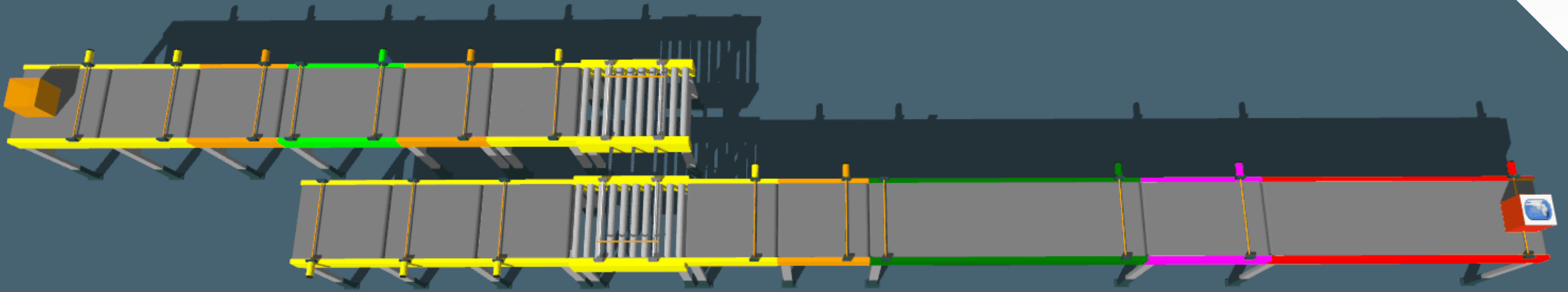
ASRS Crane

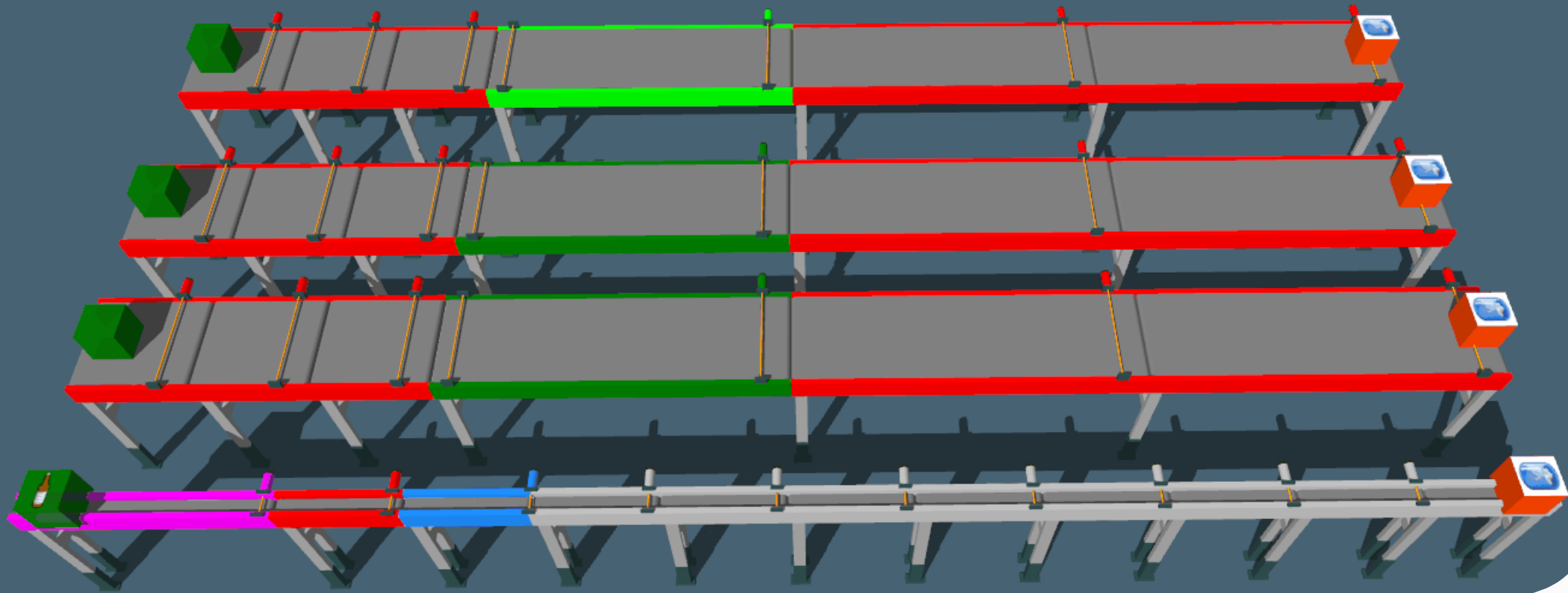
Weigh Station



Smart Conveyors - A reminder

- New Protocols
- New Properties
- New Catalog Organisation





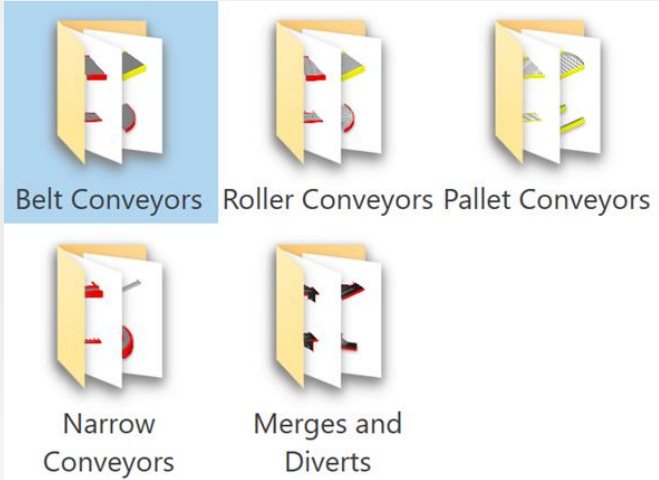
Slug Creation and Indexing

Control slug creation and indexing using zones, or through using stop blades and brakes

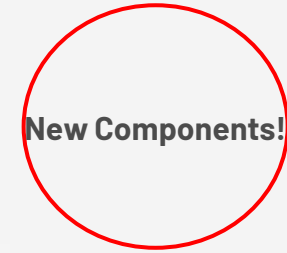
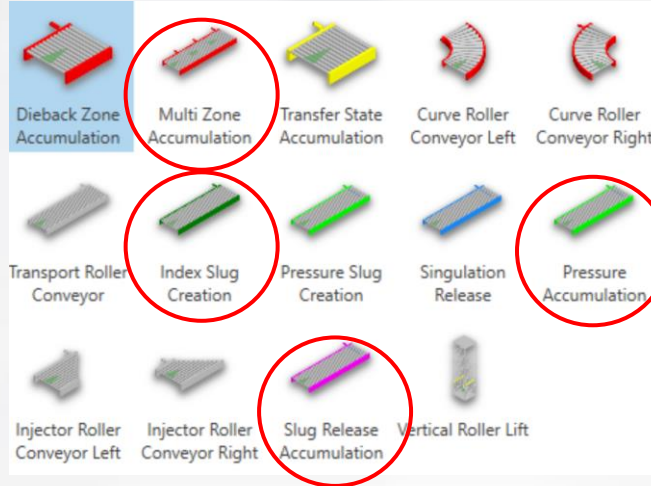
New Smart Conveyors Catalog Organisation

Broken down into conveyor types, each containing multiple protocols

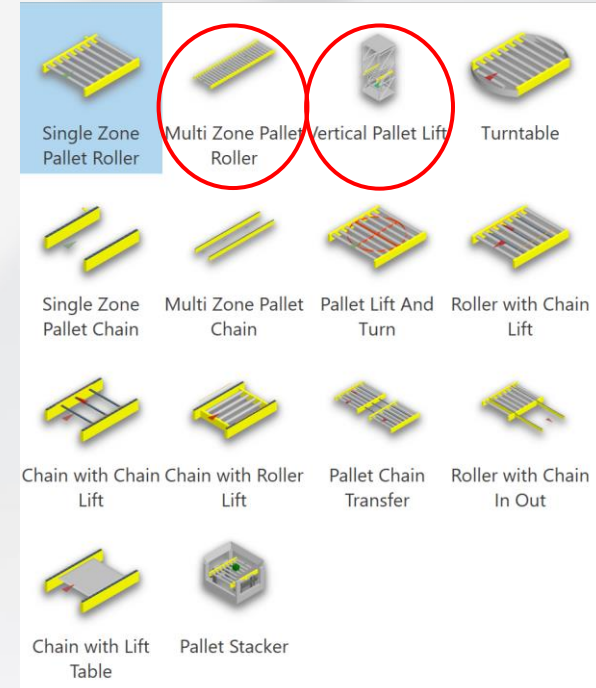
Smart Conveyors Catalog



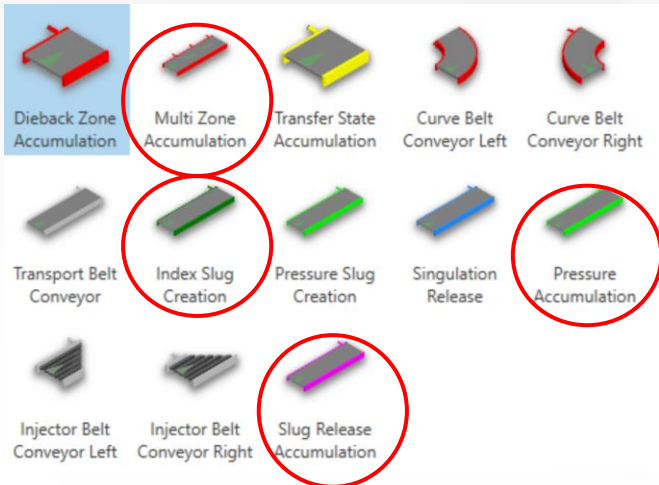
Roller Conveyors



Pallet Conveyors



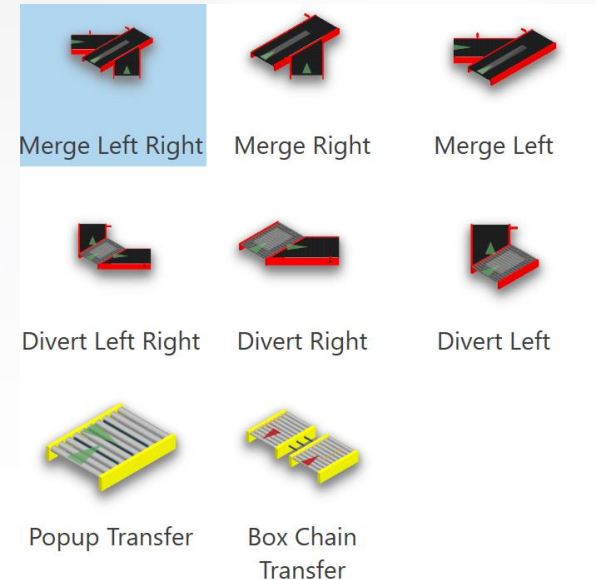
Belt Conveyors



Narrow Conveyors



Merges and Diverts

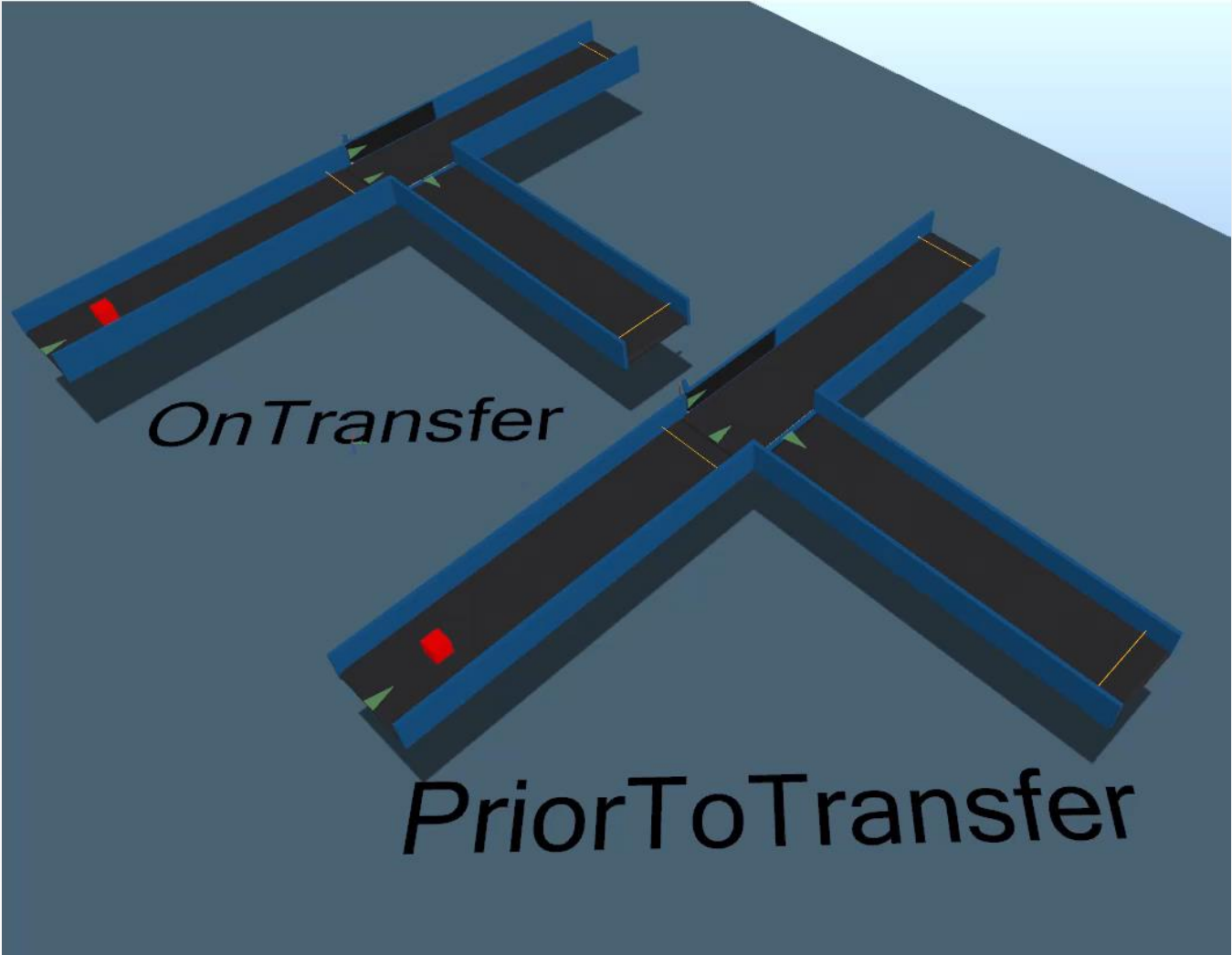


Baggage Handling Updates

**Single Plough Diverter -
HaltLoadPosition**

**Tilt Tray - Vertical
CrossBelts**

**Managed Merge
Controller -
IsStrictMerge**



**Sorter Content Tracker -
UseDisabledTrayFunc**

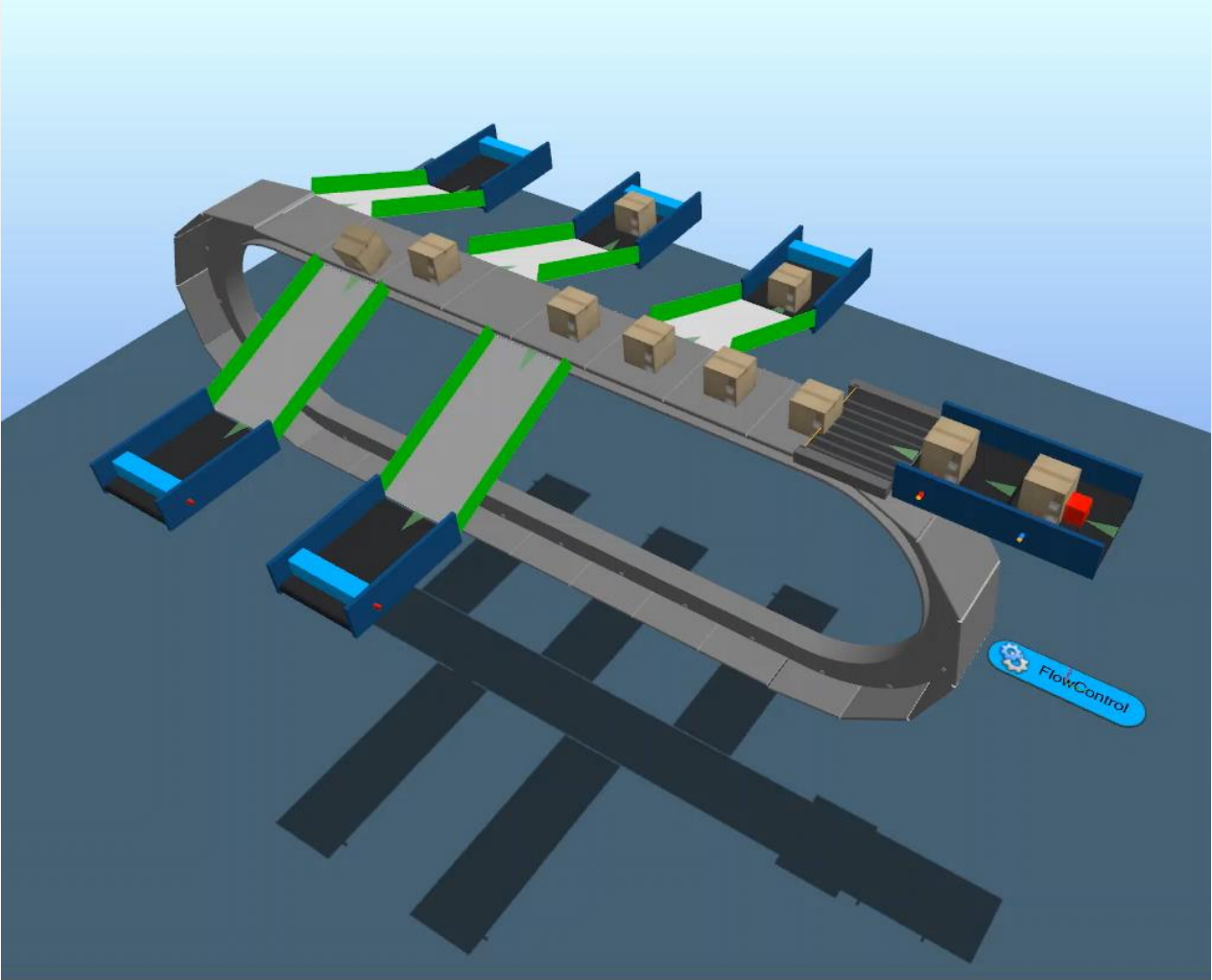
**Tilt Tray Outfeeds -
InhibitTimeoutDelay**

Baggage Handling Updates

Single Plough Diverter -
HaltLoadPosition

Tilt Tray - Vertical
CrossBelts

Managed Merge
Controller -
IsStrictMerge



Sorter Content Tracker
- UseDisabledTrayFunc

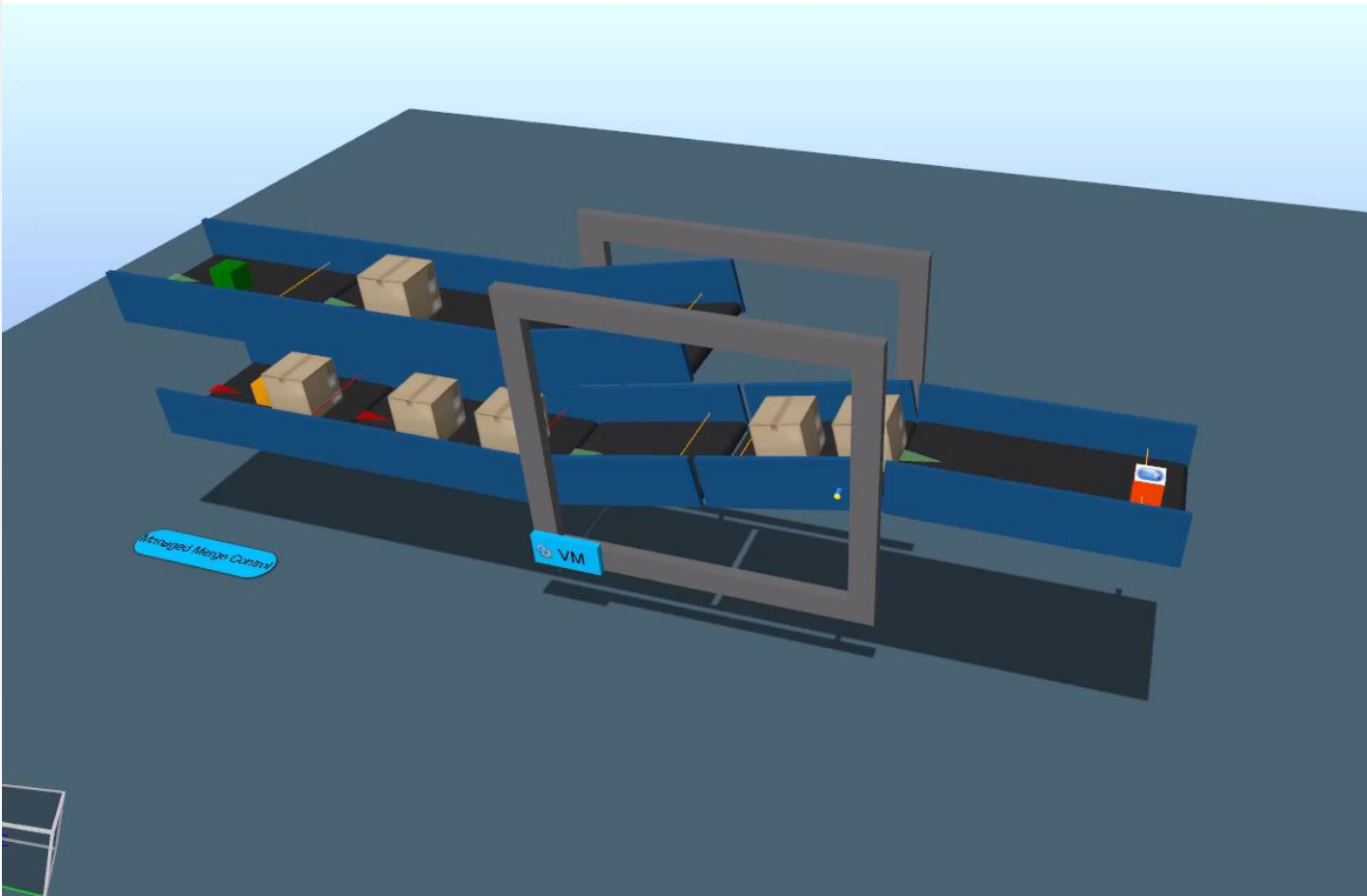
Tilt Tray Outfeeds -
InhibitTimeoutDelay

Baggage Handling Updates

Single Plough Diverter
HaltLoadPosition

Tilt Tray - Vertical
CrossBelts

Managed Merge
Controller -
IsStrictMerge



Sorter Content Tracker
- UseDisabledTrayFunc

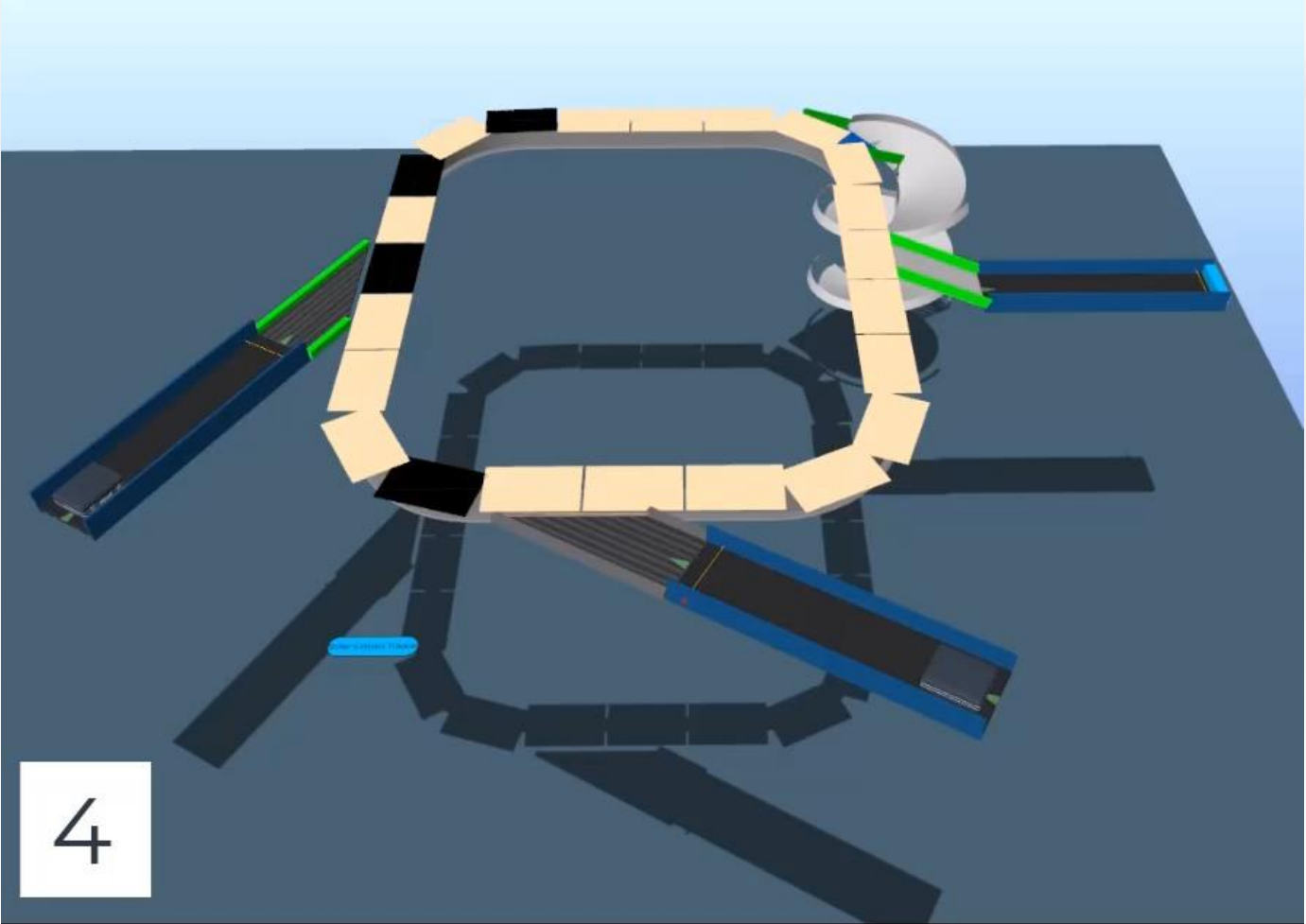
Tilt Tray Outfeeds -
InhibitTimeoutDelay

Baggage Handling Updates

Single Plough Diverter -
HaltLoadPosition

Tilt Tray - Vertical
CrossBelts

Managed Merge
Controller -
IsStrictMerge



Sorter Content Tracker -
UseDisabledTrayFunc

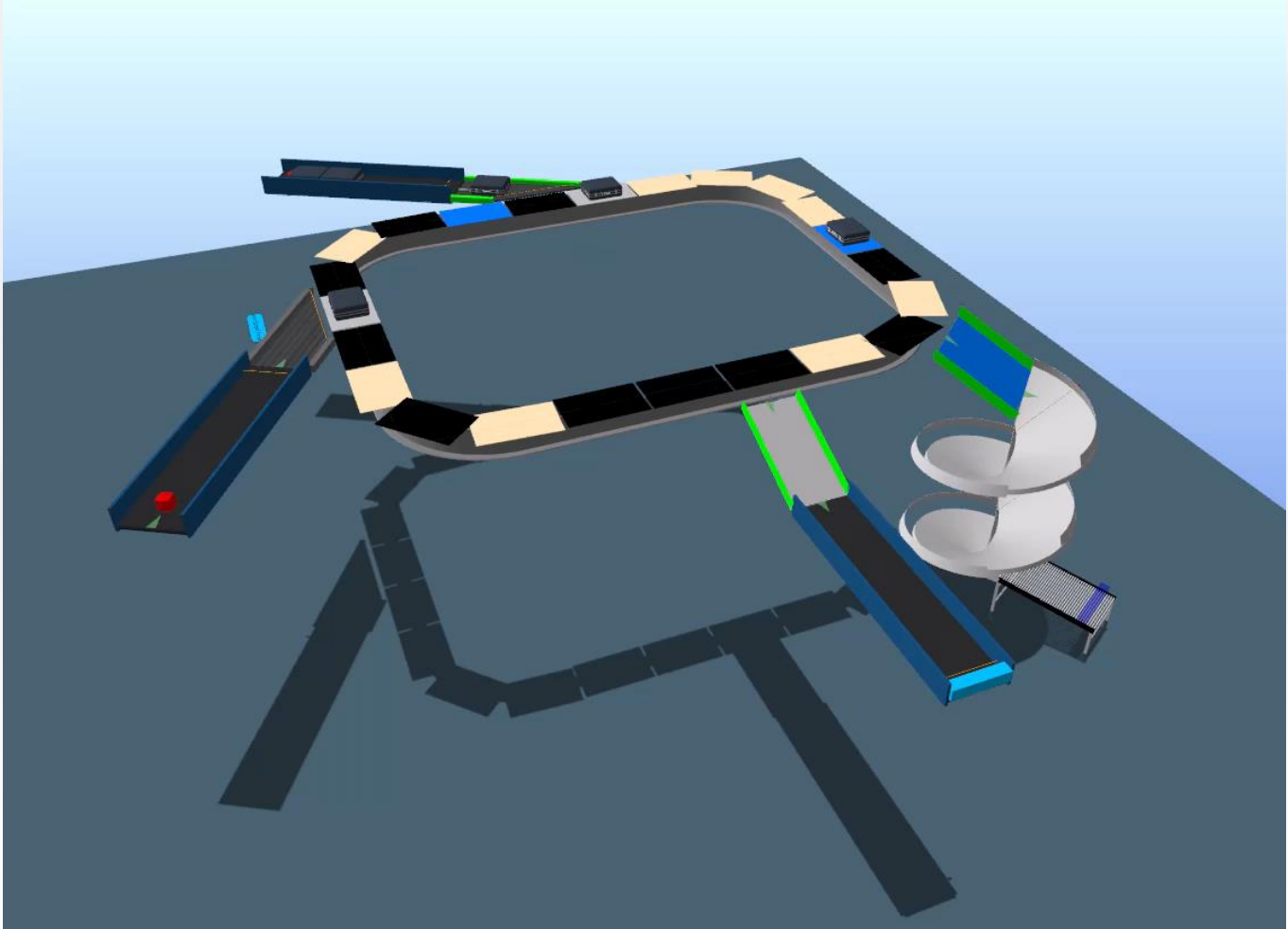
Tilt Tray Outfeeds -
InhibitTimeoutDelay

Baggage Handling Updates

Single Plough Diverter -
HaltLoadPosition

Tilt Tray - Vertical
CrossBelts

Managed Merge
Controller -
IsStrictMerge



Sorter Content Tracker
- UseDisabledTrayFunc

Tilt Tray Outfeeds -
InhibitTimeoutDelay

Flow Control Variants

Pre-made common configurations example

Multi-flow:

Multiple sources/targets either sequential or random order

Percentage:

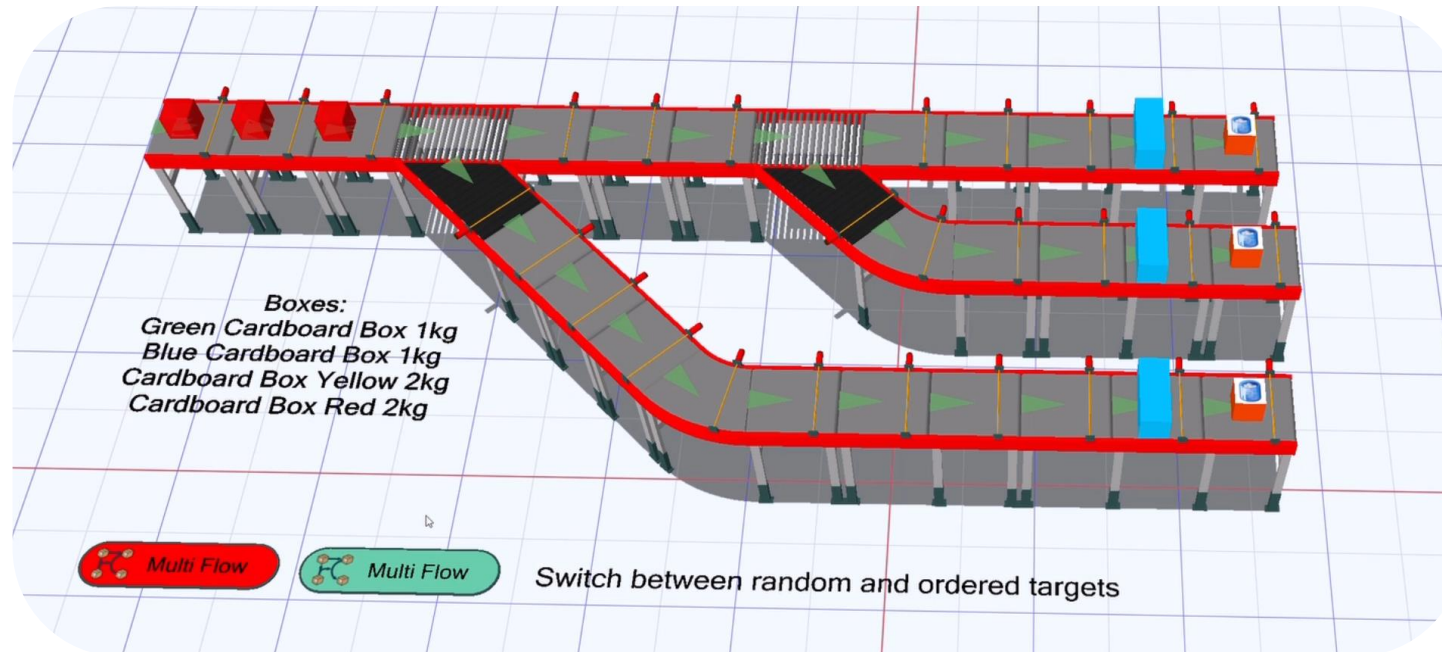
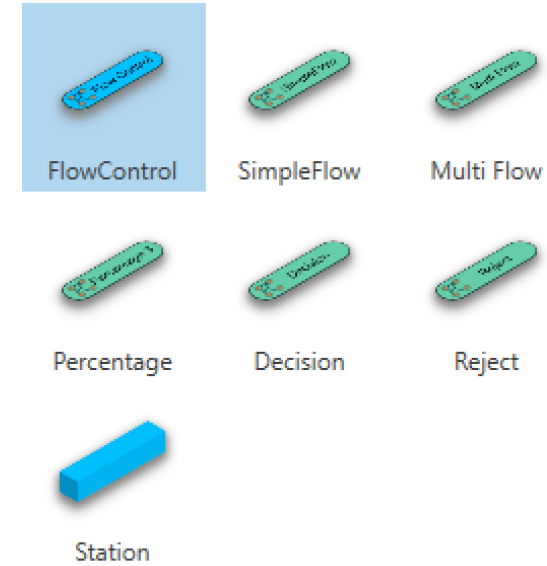
Sorted based on percentages

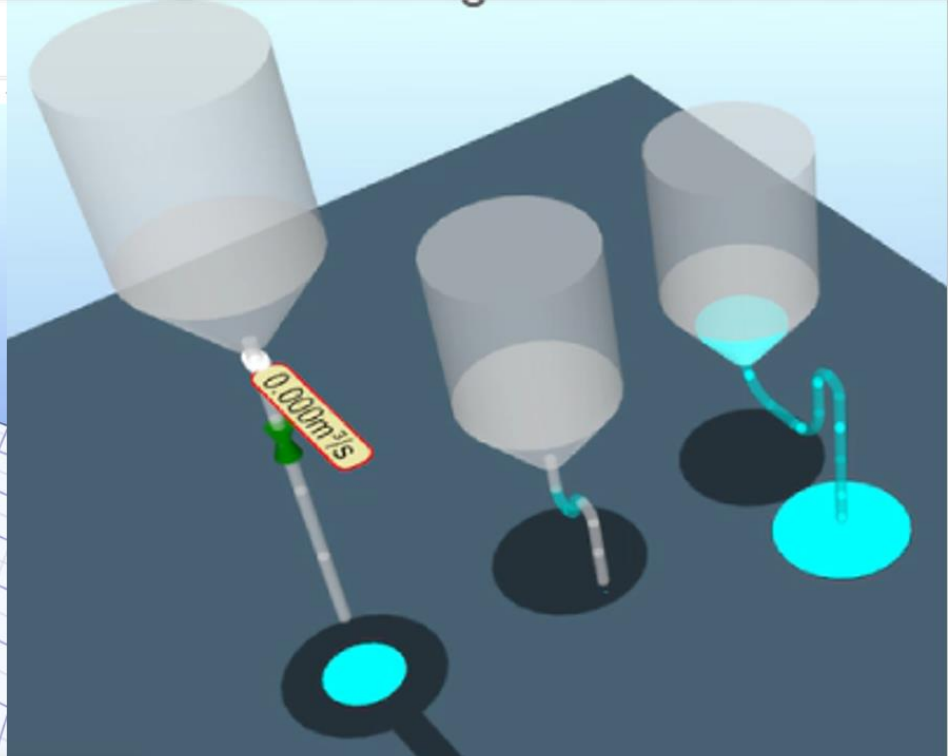
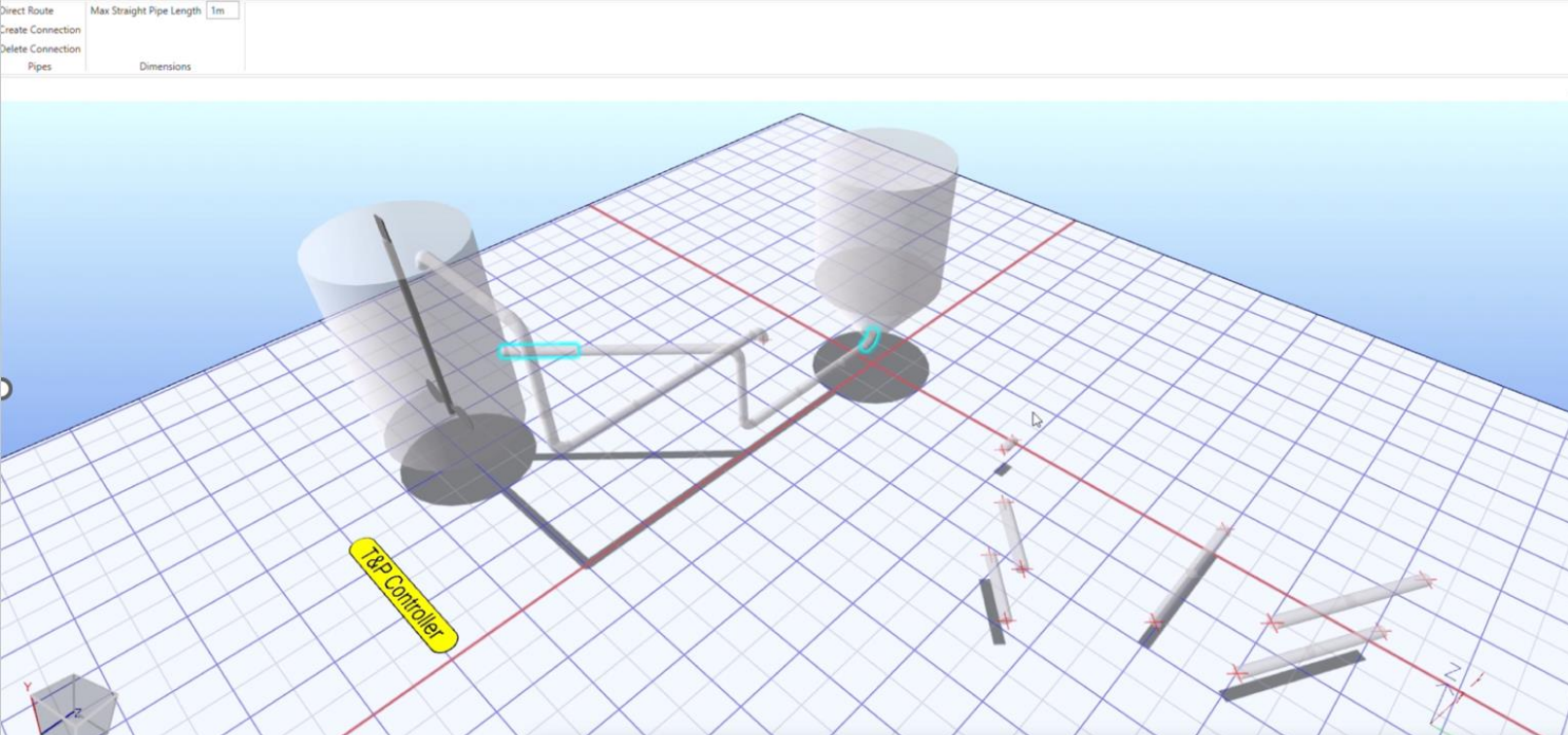
Decision:

Target decision based on expression being true or false

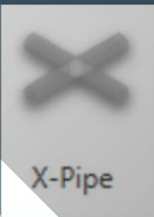
Reject:

Reject and recolour proportion of loads



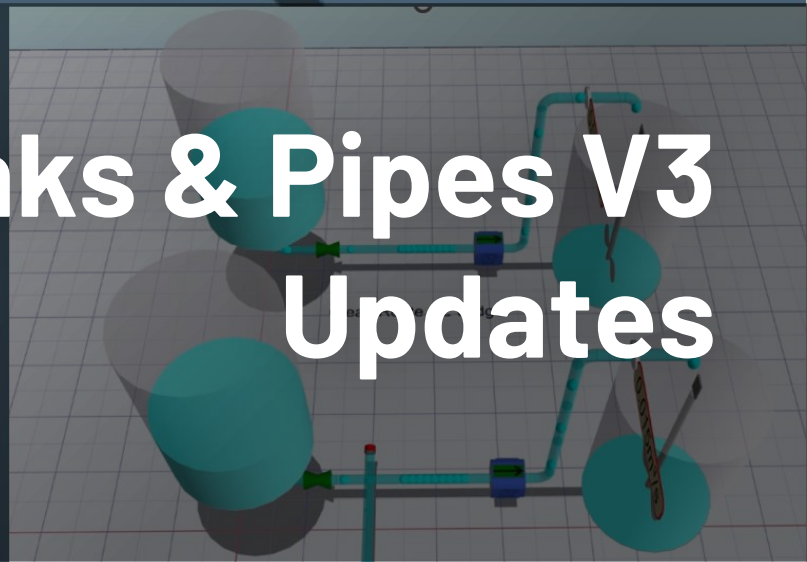


expanding human possibility®



Configuration	
AllowSpill	True
CurrentLiquid	Empty
SplitLength	0 m
Dimensions	
DiscontinuousLength	0 m
PipeDiameter	0.15 m
PipeLength	1 m
General	
Name	SP2
Position	
World Location	0.5966 m, 0.5 m, -2.4887 m

Process - Tanks & Pipes V3 Updates



PUBLIC

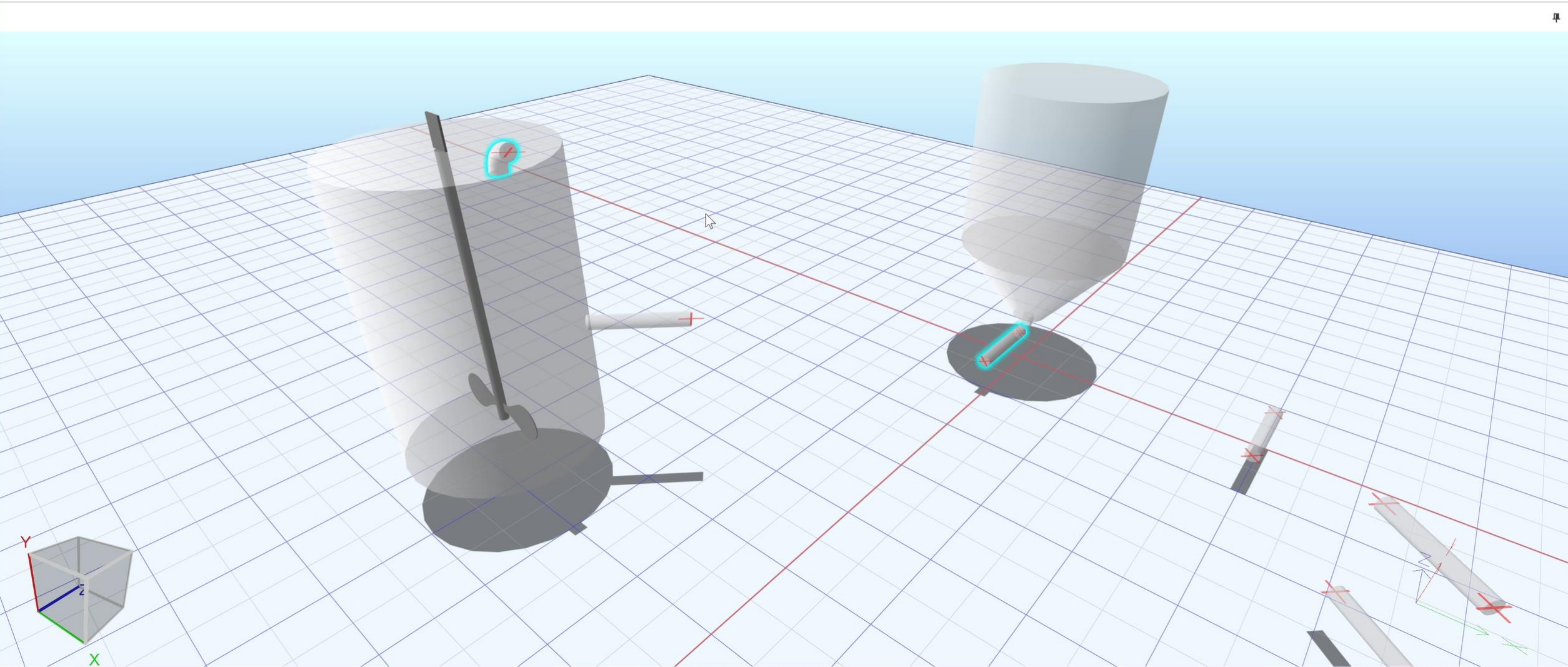
Pipe Connecting Toolbar

Direct Route Max Straight Pipe Length

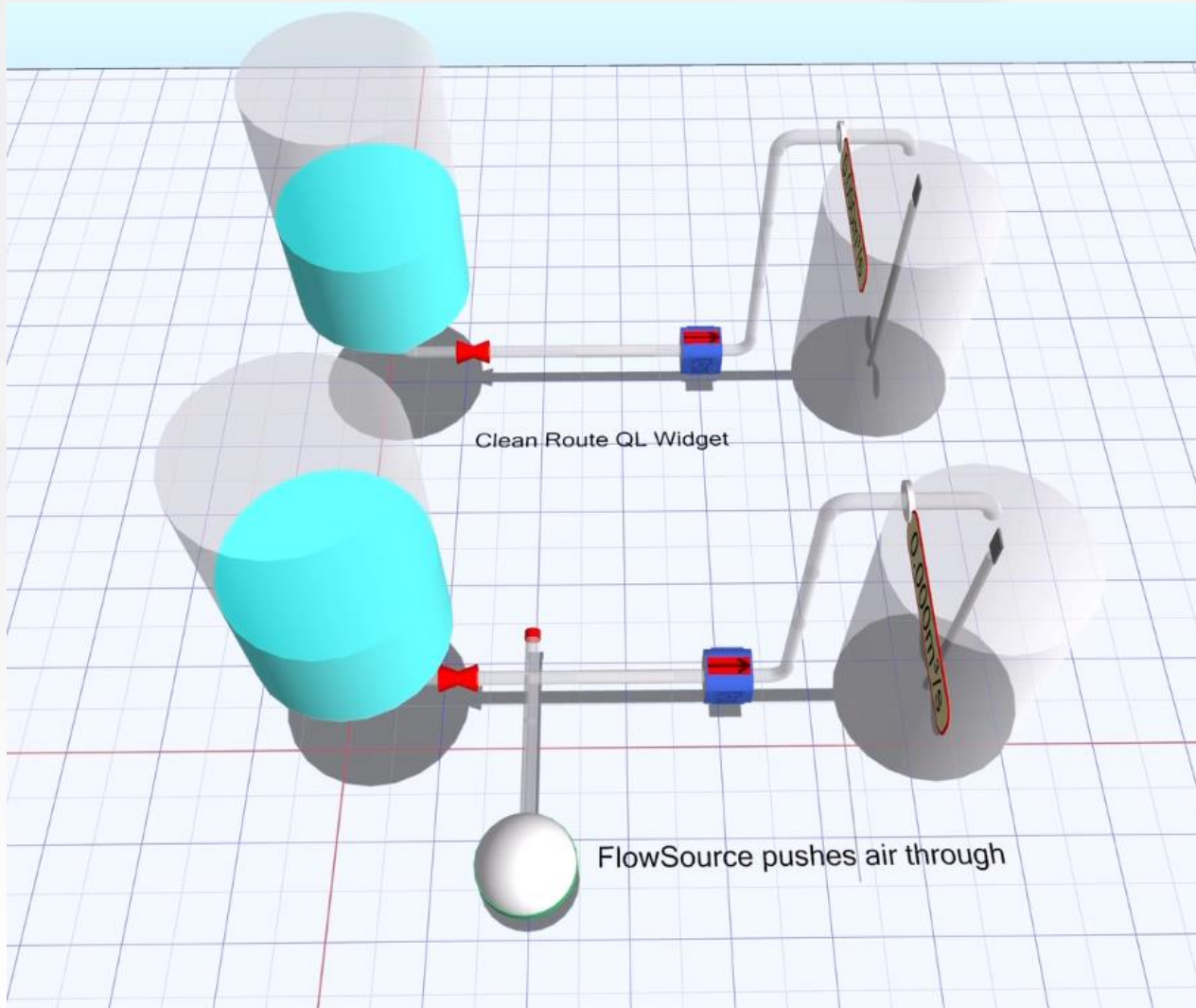
Create Connection

Delete Connection

Pipes Dimensions



Cleaning – Pigging and clearing pipes



Manual pipe cleaning QuickLogic Widgets

`clean route from [start] to [end]`

Manually clean the route from the given start to end point.

`clean route from [start] to [end] via [pipe]`

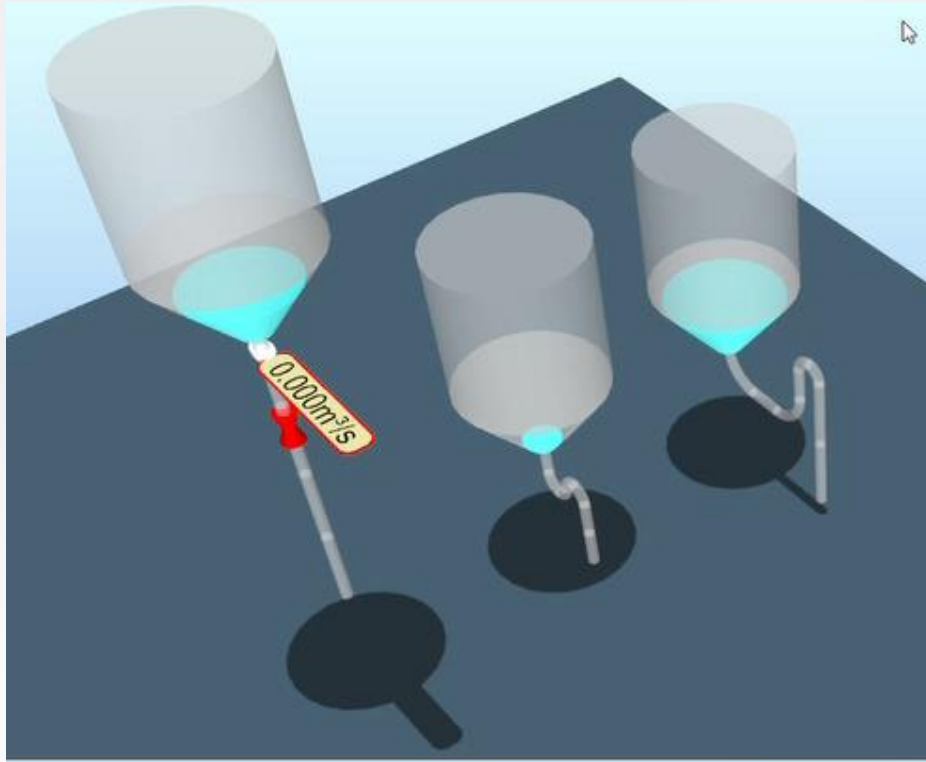
Manually clean the route from the given start to end point, via an alternate pipe.

Pigging: FlowSource can push air through pipes

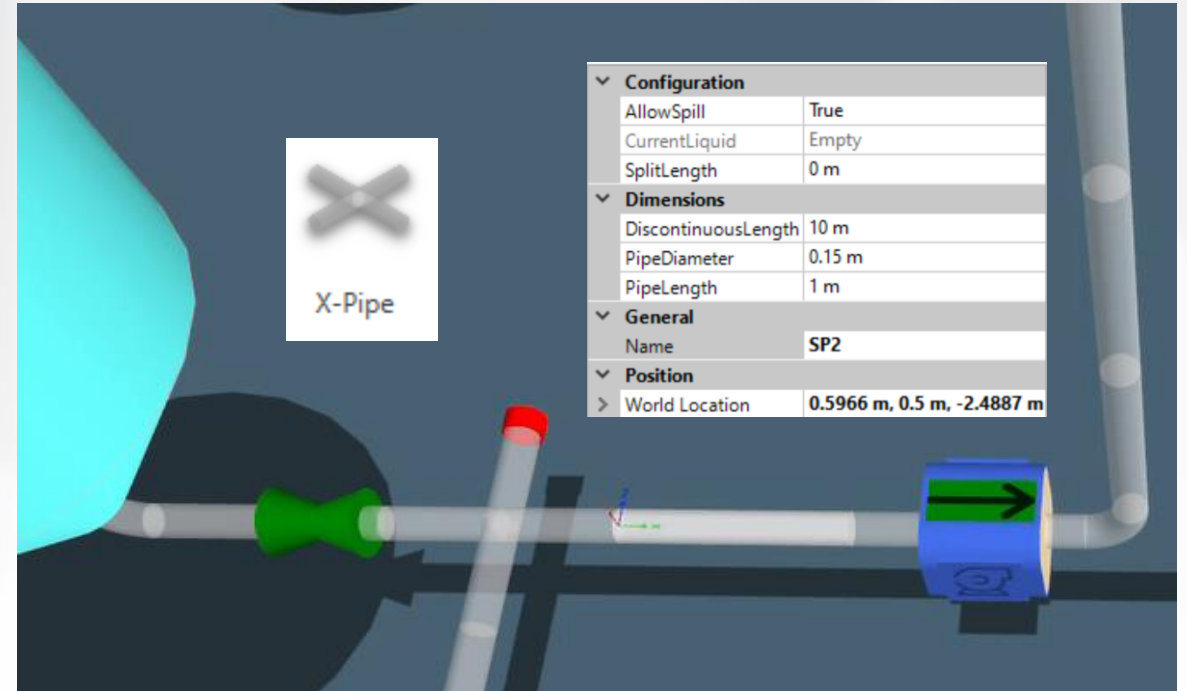
✓ Configuration	
AddToScenario	False
➤ Destinations	Tank1,EndCap1
Flow	0.5 m ³ /s
PositiveDisplacement	True
✓ Control	
Active	False
CurrentLiquid	Empty
IsFlowing	False
Pressure	100.4634 Pa

Further Tanks&Pipes V3 Updates:

Draining/Siphoning Pipes



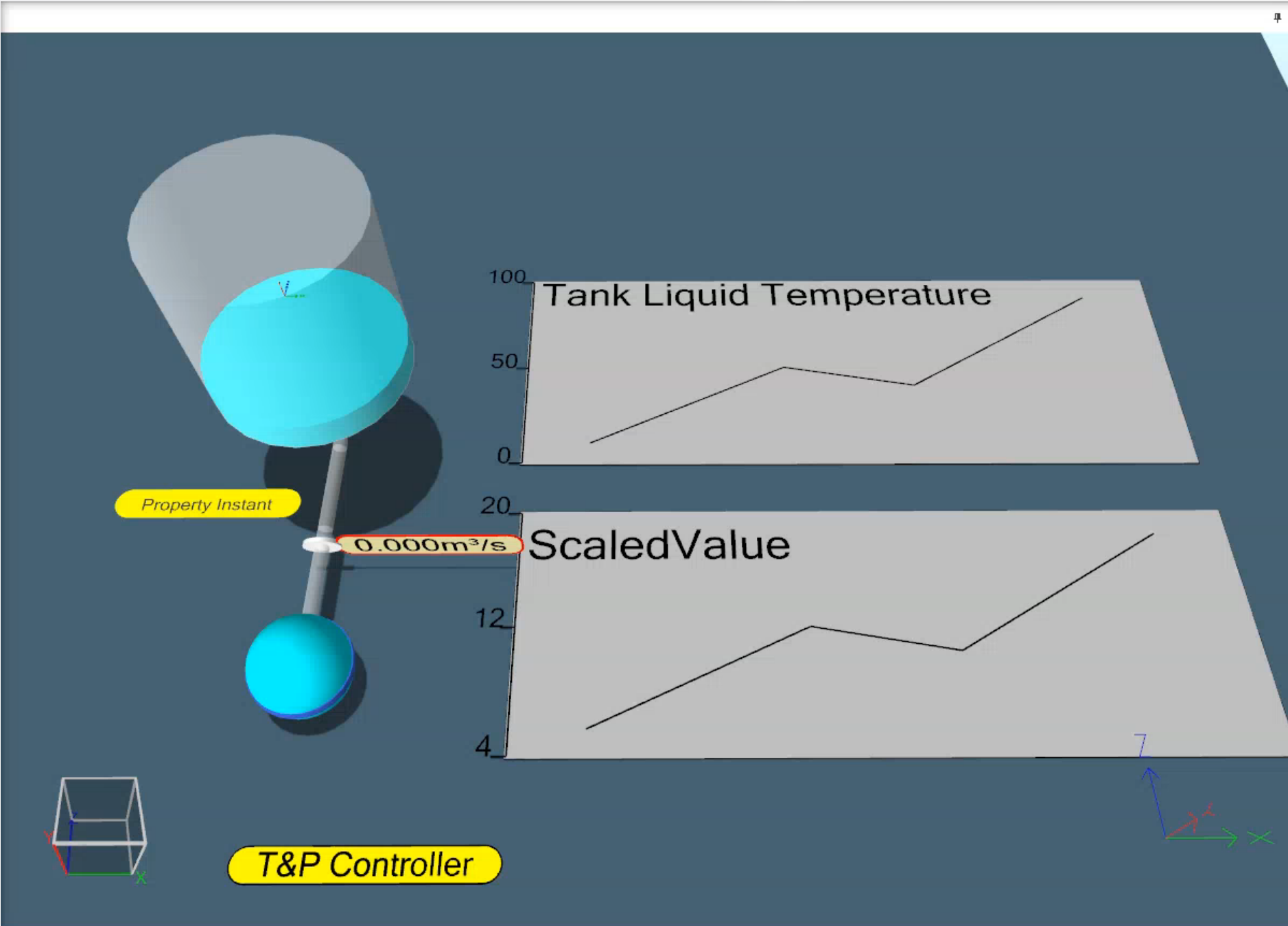
X-Pipe and Discontinuous straight pipe



Other Updates:

- Scenarios now allow for multiple tables
- Optional Sensor Fluctuation
- Improved pump noise to show on CurrentPressure/Flow

New Signal Scaling Aspect



Aspect Viewer: Tank1

Filter...

Add Aspect...

- Visual Info
- Load State
- Visual Events
- Connectors
- Bill Of Materials
- Plant P Ax_Liquid Property Sensor
- Liquid Property Sensor
 - Property: Temperature
 - Sensor Level: 0 m
 - Value: 20
- Signal Scaling
 - Min Input: 20
 - Max Input: 80
 - Min Output: 4
 - Max Output: 20
- Signal Scaling
 - Property Name: LiquidTemperature
 - Scaled Value: 4

THANK YOU!
Any Question?



**Rockwell
Automation**

expanding **human possibility**[®]



www.rockwellautomation.com