This course is intended for previous Users of Process Simulator who have completed Basic Training but may not have used the software for a while.

Our hope is that this training will help these Users "brush up" on their skills so they can again use the software to benefit their business.

Process Simulator Basic Refresher Training Webinar

Process simulator | Professional

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7/2018 Version 9.3
PCS Refresher Training Webinar
For Software Version: 9.3

556 E Technology Way
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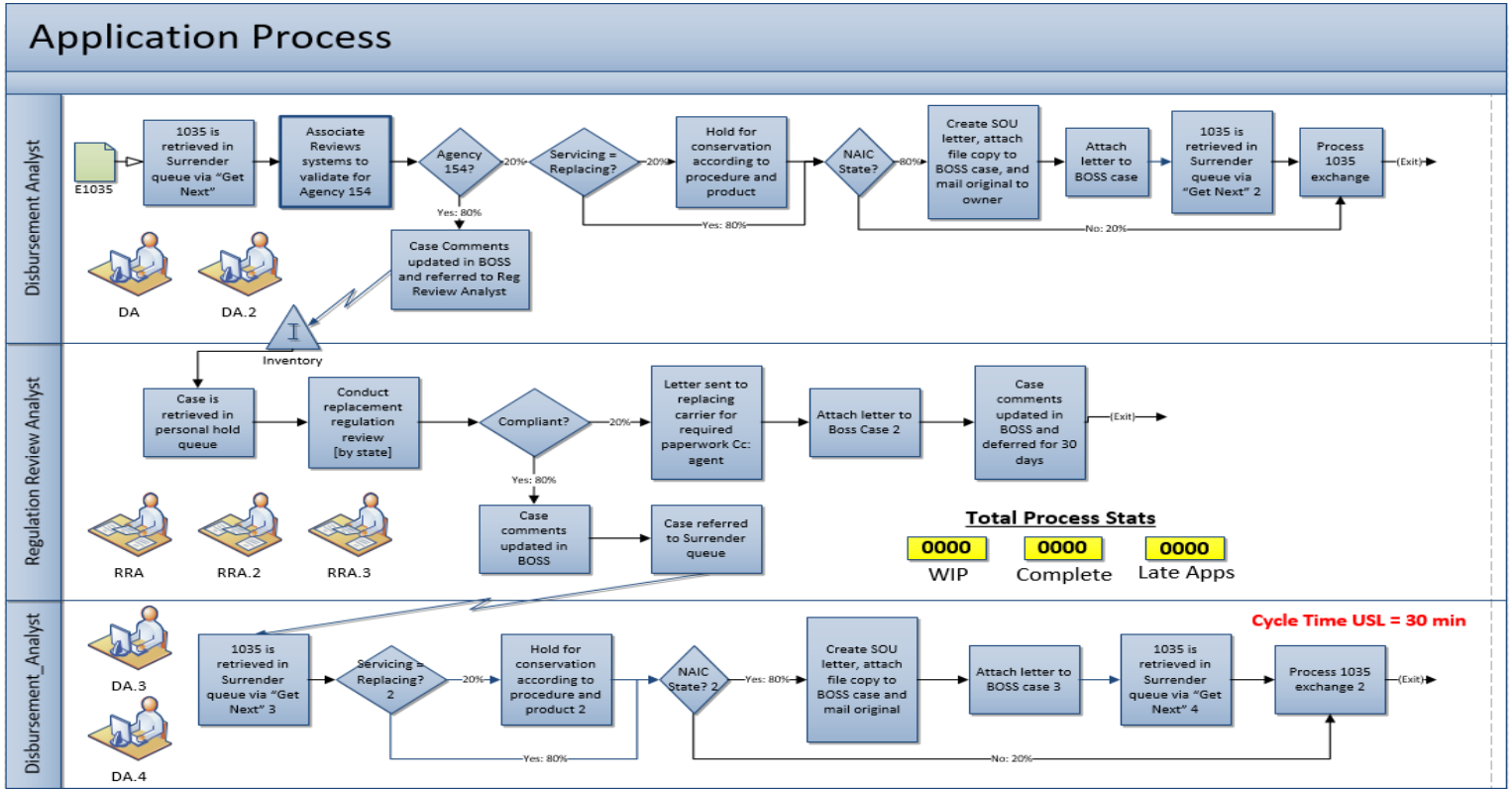
Course Objectives

1. Review the basic features of Process Simulator
2. Provide demonstrations of how to use PCS
3. Show model examples
4. Answer Attendees' questions (*as time allows*)

Poll #1

Business Process Model Example



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Agenda

Sections

1. How to use Process Simulator in Visio
2. Activities, Entities, & Arrivals
3. Routings
4. Resources & how to use them
5. User-Defined Expressions
6. Output Viewer
7. Scenarios

1. How to Use Process Simulator in Visio

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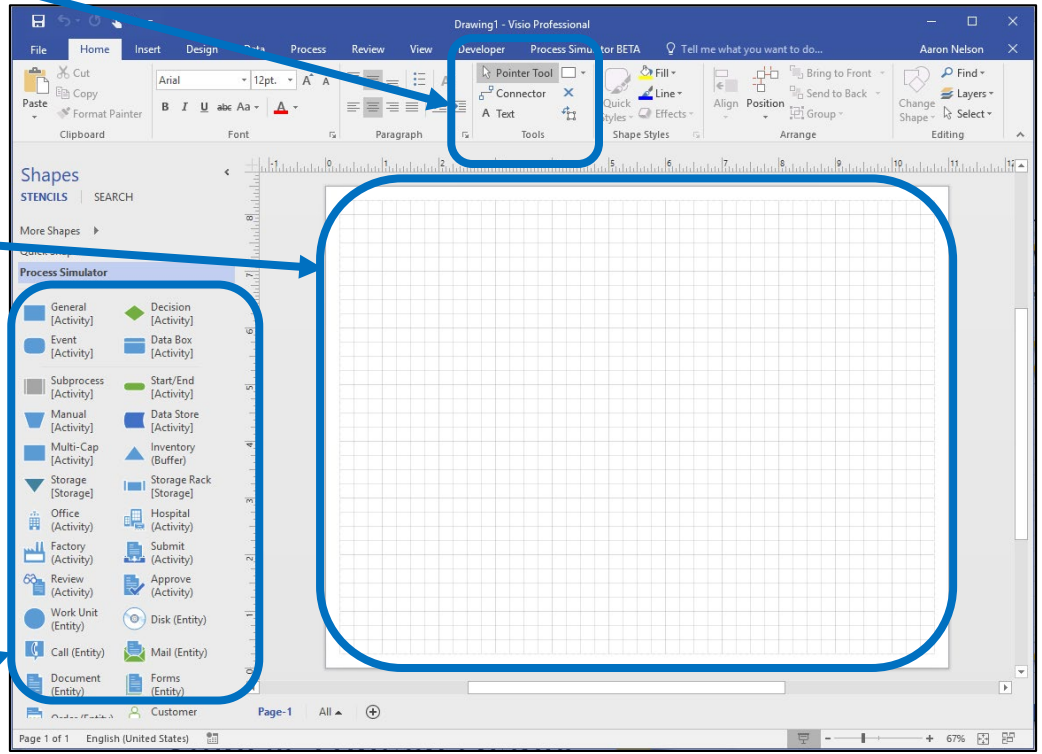
The Visio User Interface

Poll #2

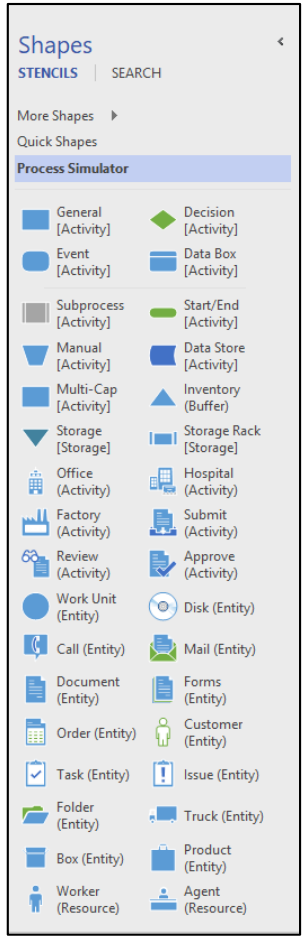
- The Home ribbon allows you to select Tools to point, add connectors, text, or custom shapes.
- The drawing page (or layout area) is where you draw your diagram using the shapes and tools available. You can add additional pages as needed.
- Stencils contain shapes



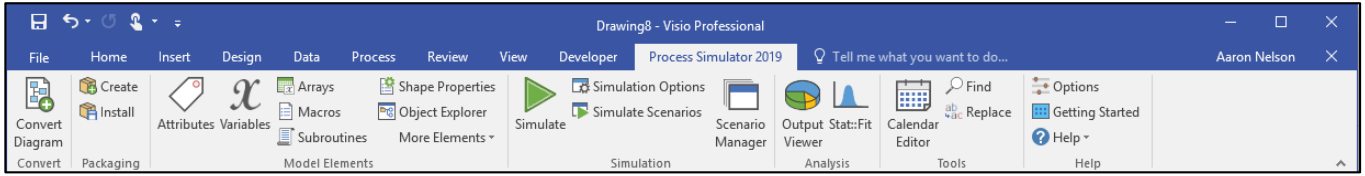
Process Simulator

- The Process Simulator Stencil and Ribbon Bar

Shape Stencil



Ribbon Bar



Typical Shapes

- Process Step or Activity

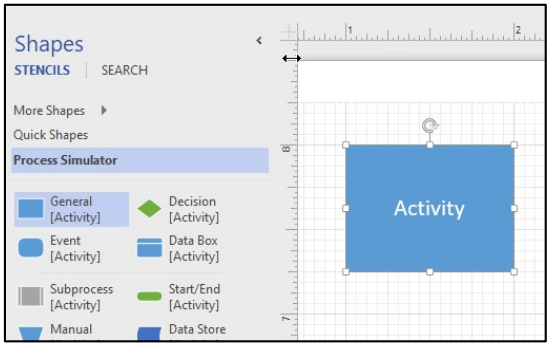
- Decision Diamond

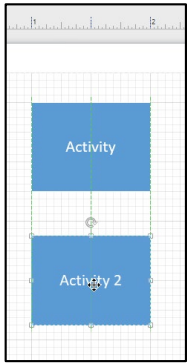
- Process Flow (Routing arrows)

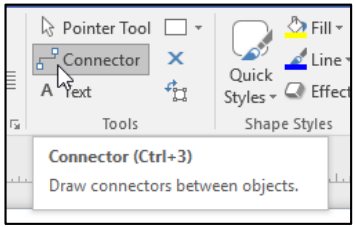
- You may also choose to use graphics to represent process steps or any element of your process map.

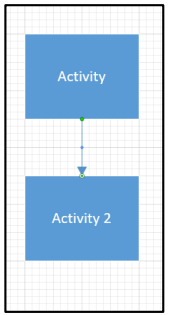
Basic Flowcharting in Visio

1. Select the Shape from the Process Simulator Stencil. While holding down the left mouse button, drag the shape to the layout and release the button, adding the shape.
2. Repeat this process to add an additional shape (or you may copy & paste the first shape).
3. Select the Connector Tool (from the Home Ribbon) to add connections between shapes.
4. Drag and drop the connection between shapes.



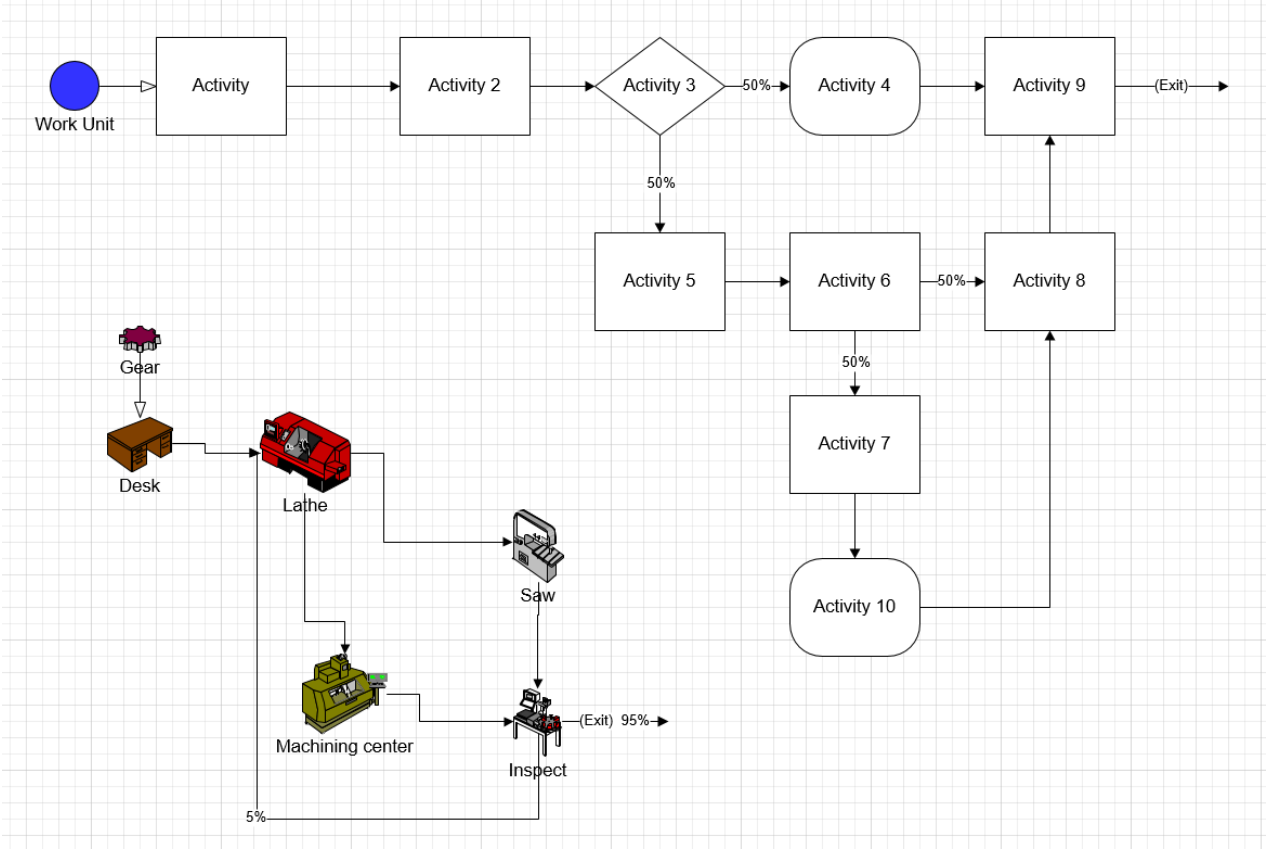






Visio also has an Auto Connect feature that your instructor can demonstrate

Demo 1: Build 1-2 Models Live



Poll #2

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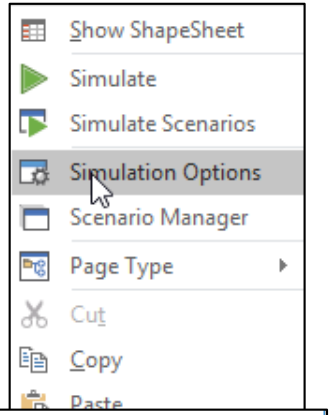
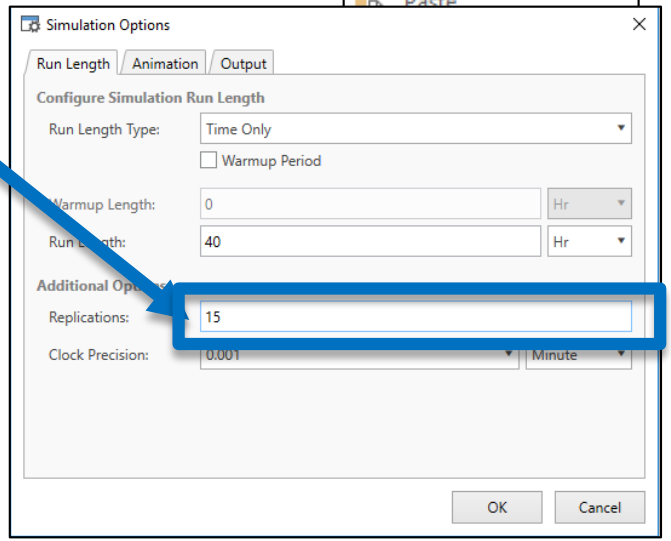
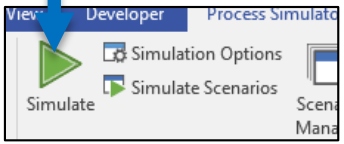
Run the Simulation

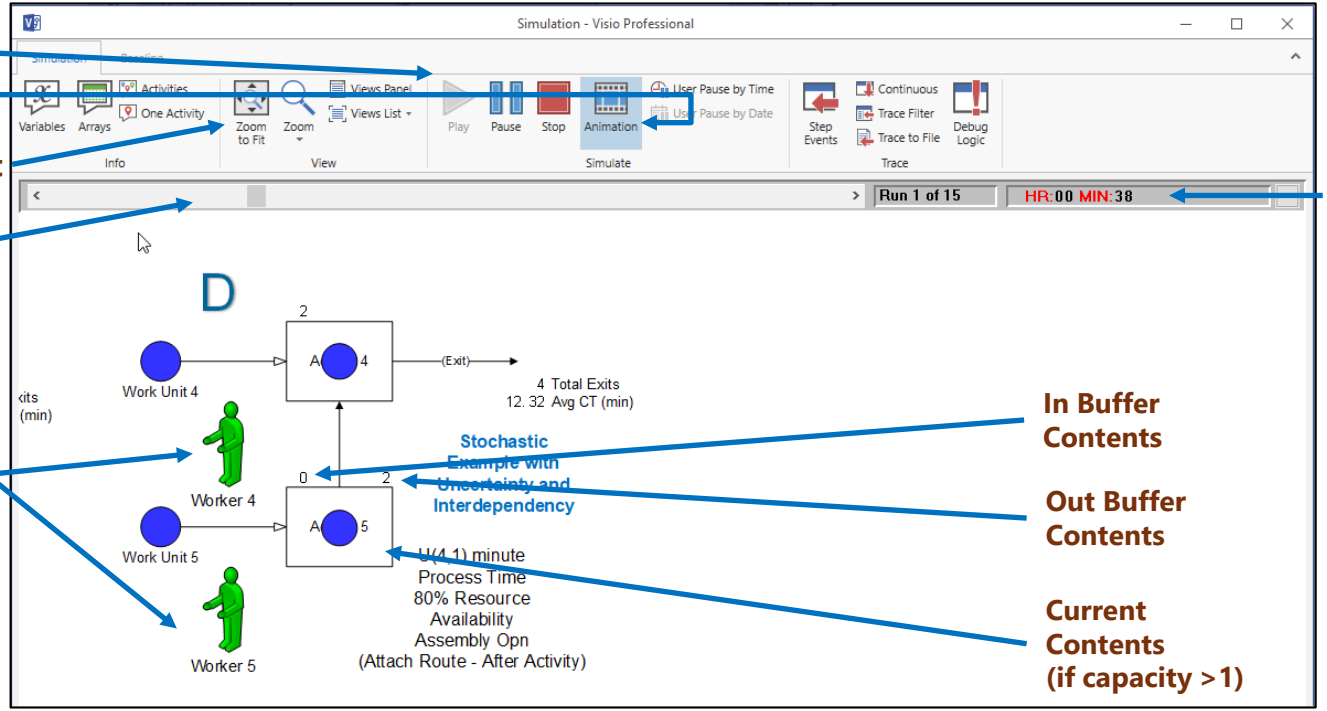
- Check your Simulation Properties by right-clicking on the Layout and selecting Simulation Properties.
- Enter 15 for the number of replications. Then click OK.
- Click on the Simulate button to start the simulation







Runtime Control



2. Activities, Entities, & Arrivals

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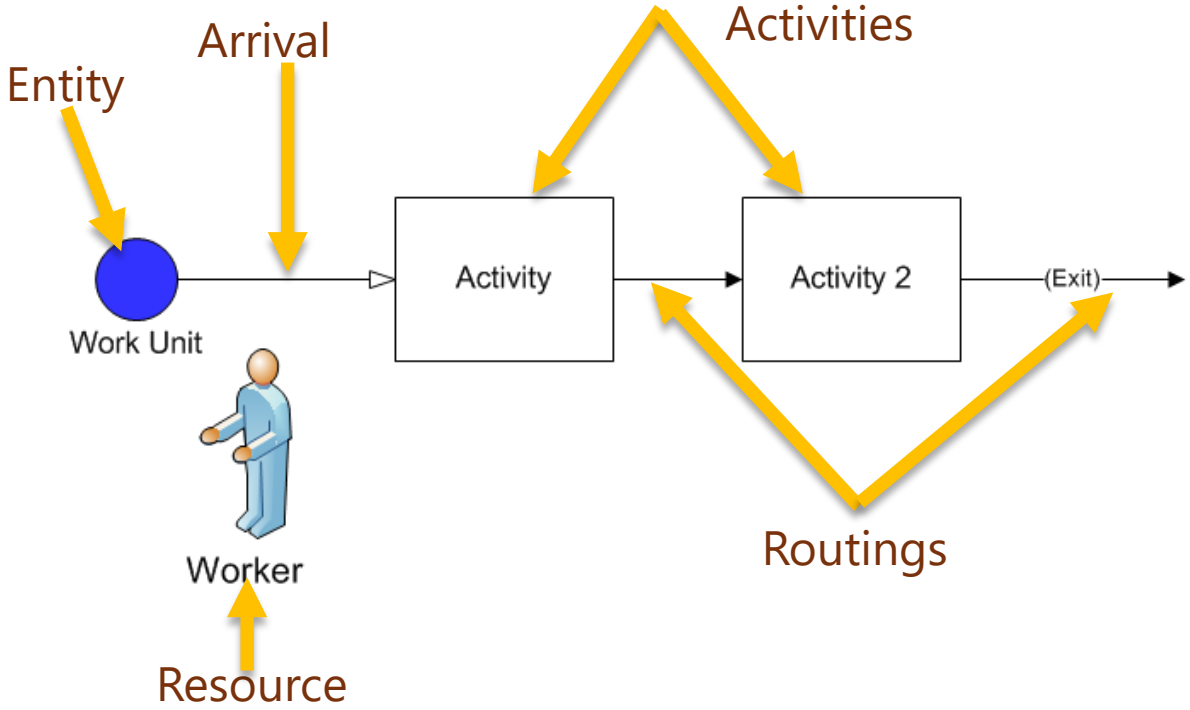
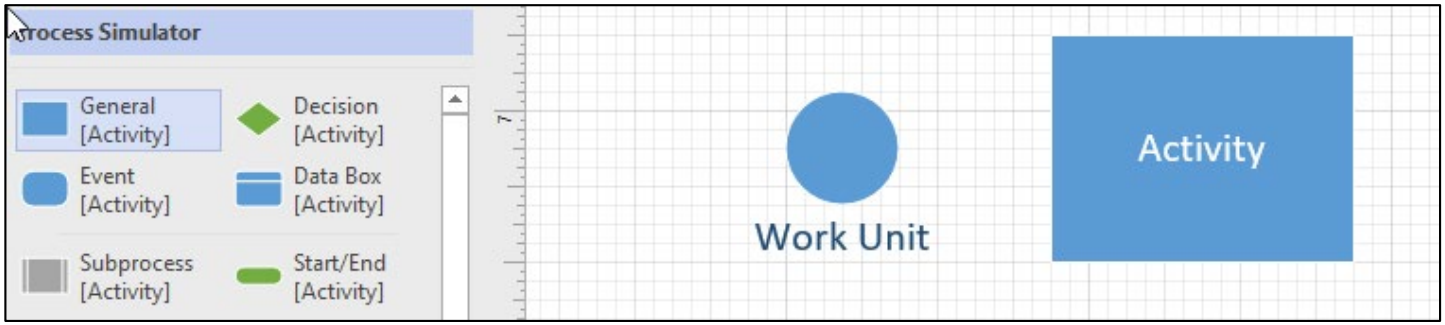
5 Basic Modeling Elements

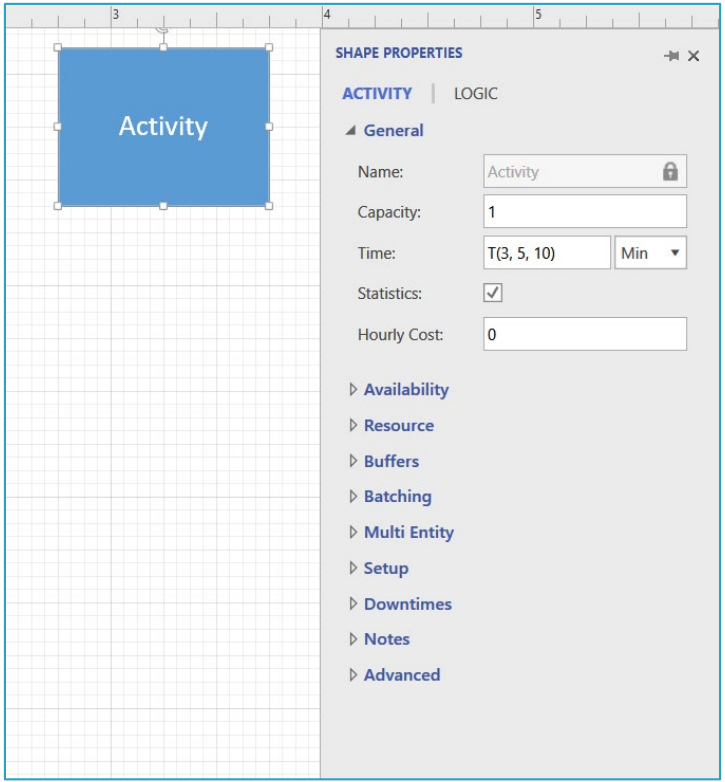


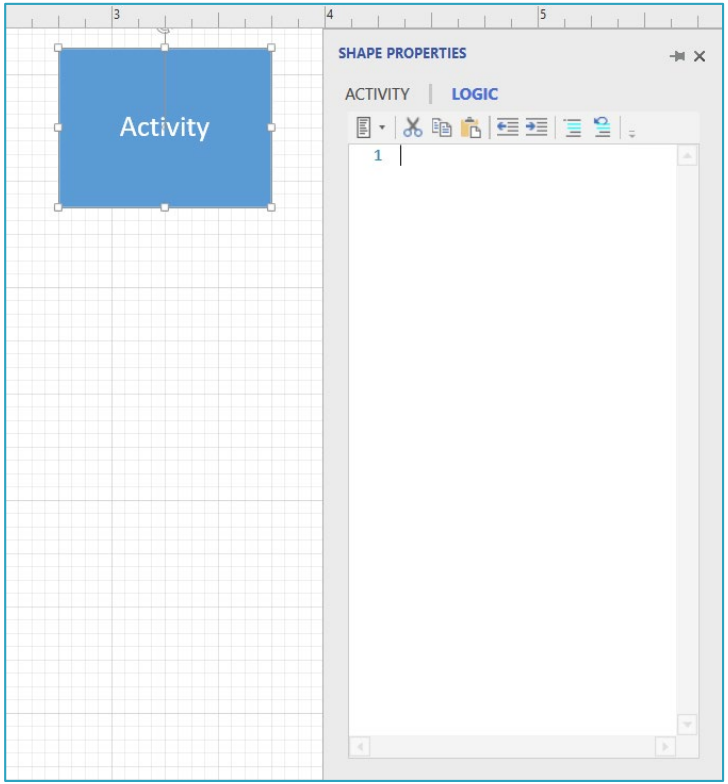
Create Activity

- Click and drag your Activity box from the Process Simulator stencil to your workspace.



Activity Properties & Logic

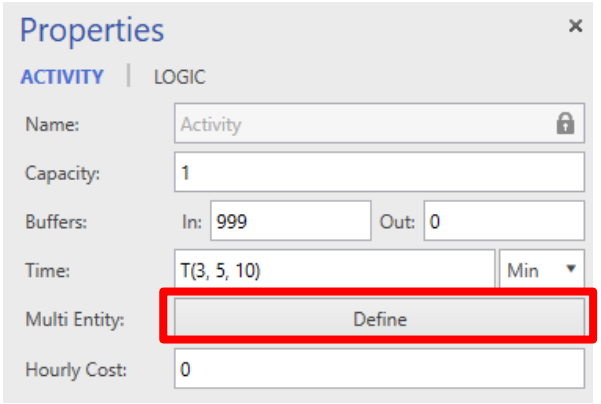


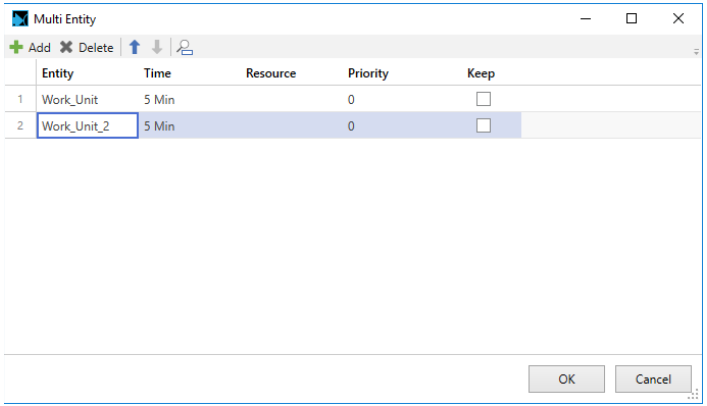


Once the Shape Properties are open you do not need to close them or reopen as you move on to other shapes.

Multi Entity

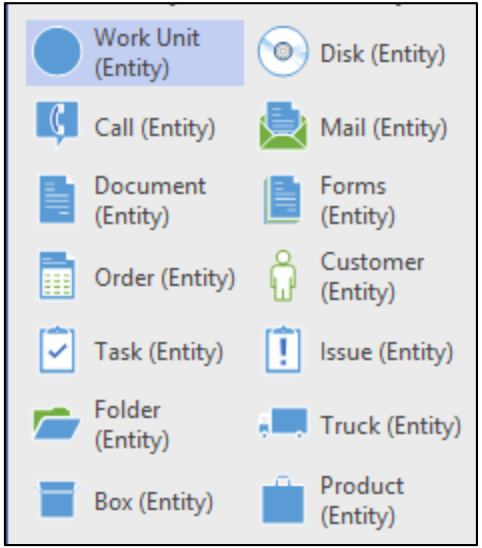
- When we have Entities with different names, all routing through the same process record, we can define different process times for each Entity, based on Entity name.



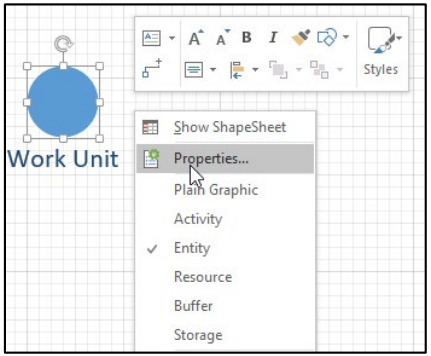


Create Entity

- Left-click and drag your Work Unit Entity from the Process Simulator stencil to your layout.



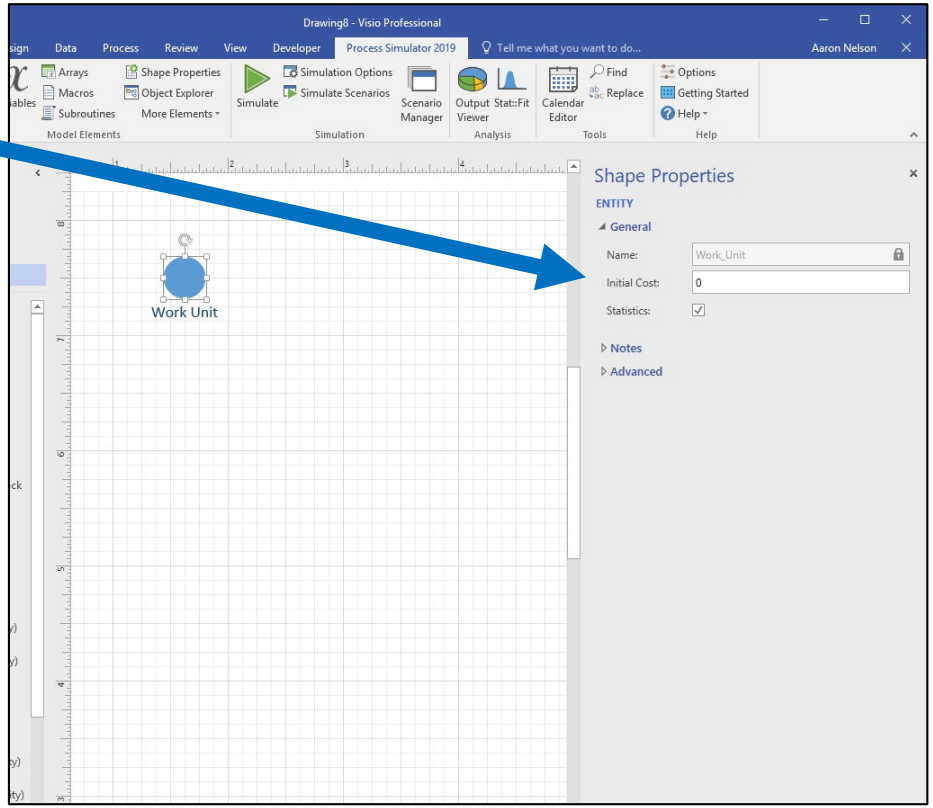
- After placing the entity on your layout, you can right-click on the entity to bring up the Properties dialog.



Entity Parameters

- The only data associated with an entity is an initial cost. You may also specify whether or not to collect statistics for each entity type.

- In order to use an entity in the model, you must place an entity shape on the screen. The shape does not need to be attached to anything, although it may be attached to an activity to represent an arrival.



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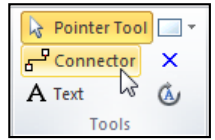
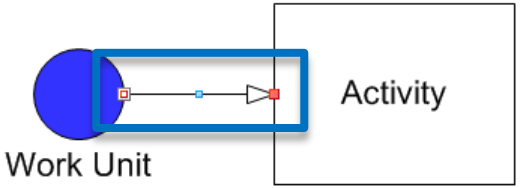
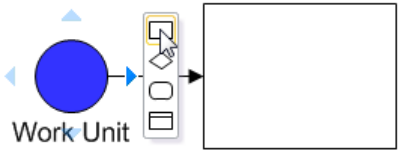
Entity Arrivals

- To Create an Arrival:
- From the Home Ribbon, select the Connector Tool and click between connection points from the Entity to the Activity.
- Or use the AutoConnect feature to create the Arrival connection arrow between the Entity and the Activity where it first arrives in the system.
- Hover over the Entity shape and then click on the blue arrow that appears closest to the Activity.
- Alternately, use AutoConnect to create a new Activity block (if it does not exist already) where the Entity first arrives.

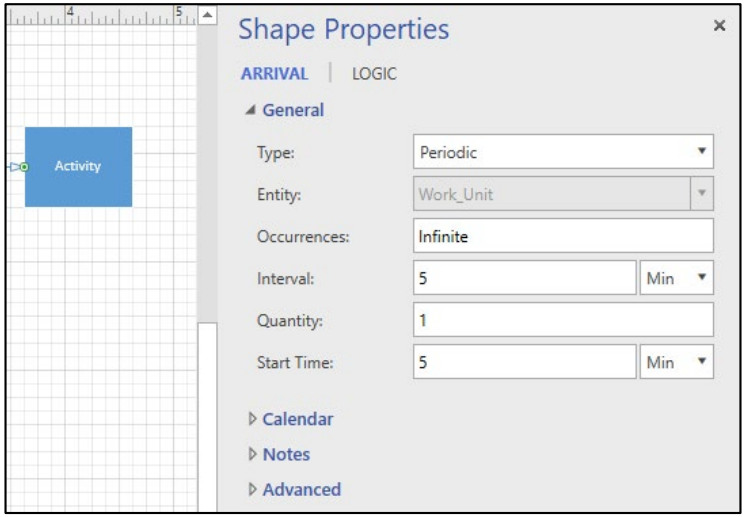


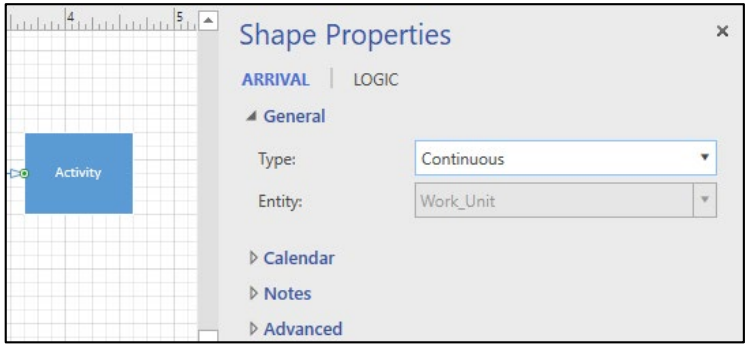




Arrival Types

- Periodic Arrivals specify the frequency of arrival, the quantity per arrival, and the time of the first Arrival. The Occurrences field allows you to define a finite number of arrivals.
- Continuous arrivals will create Entities as long as there is capacity at the input activity (or queue).

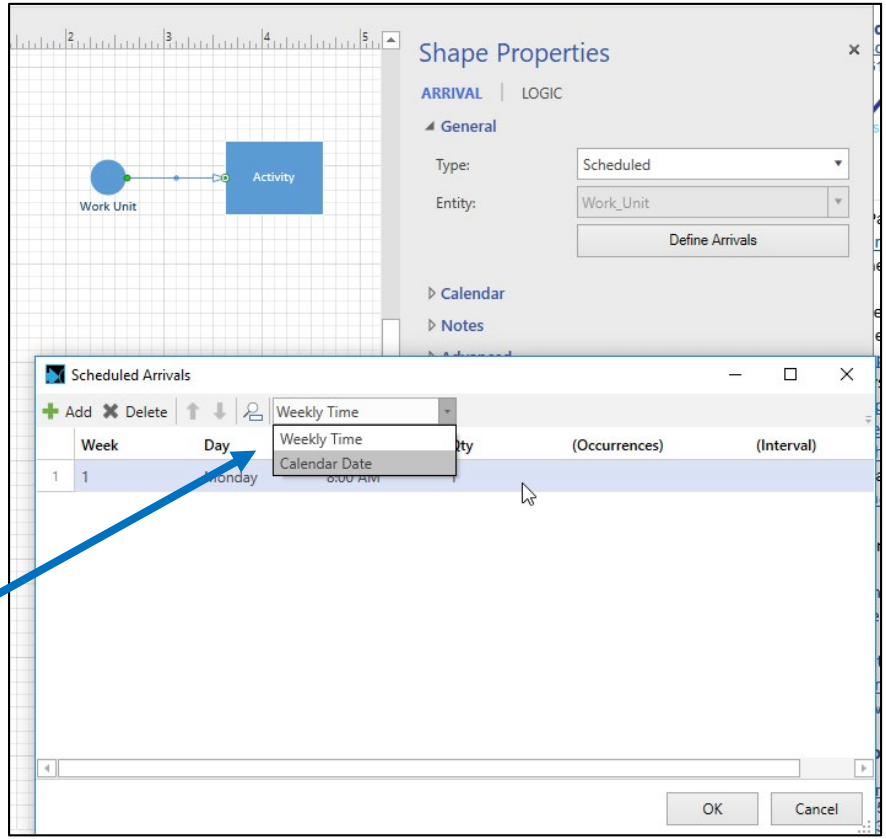




Scheduled Arrivals

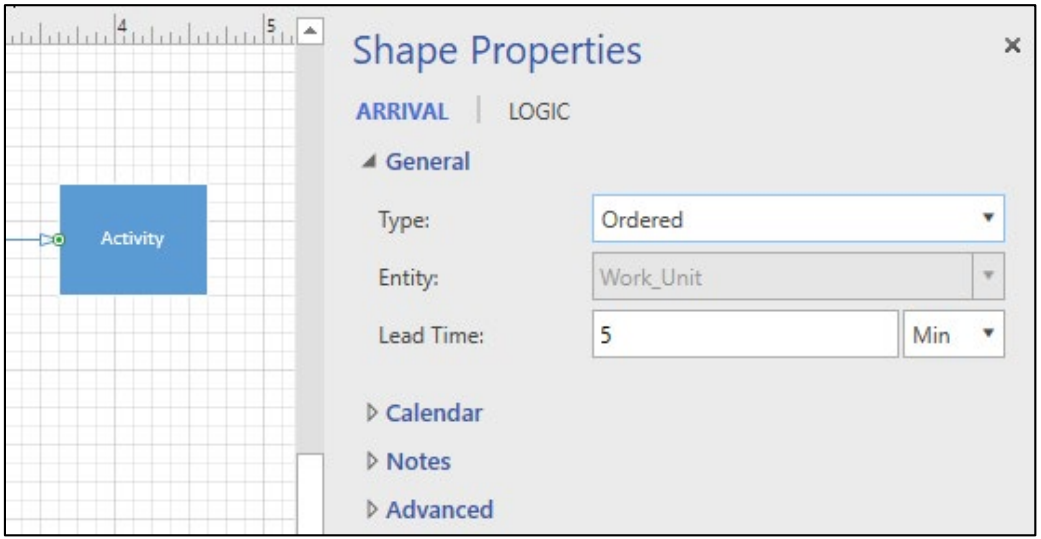
Multiple Scheduled Arrivals may be used for an Entity entering a Single Activity!

- Scheduled Arrivals allow you to specify the week, day, and time of the Arrival.
- Scheduled Arrivals may also be defined by calendar date and time



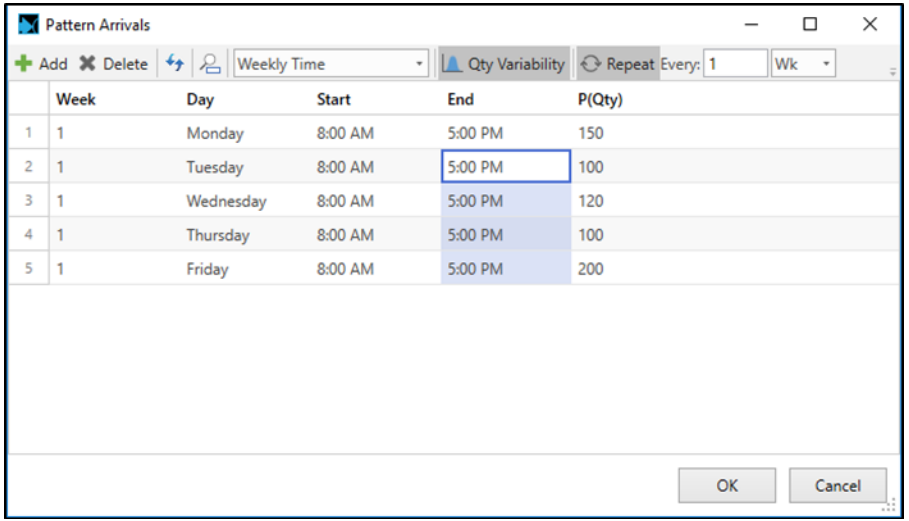
Ordered Arrivals

- Ordered Arrivals only occur when an associated input queue drops to a specified level. You may specify the Lead Time necessary to fulfill the Arrival.



Pattern Arrivals

- Pattern Arrivals are similar to Scheduled arrivals but Arrival quantity is randomly spread out over the time period given on each line.
- Variability of quantity can be toggled on or off via button.

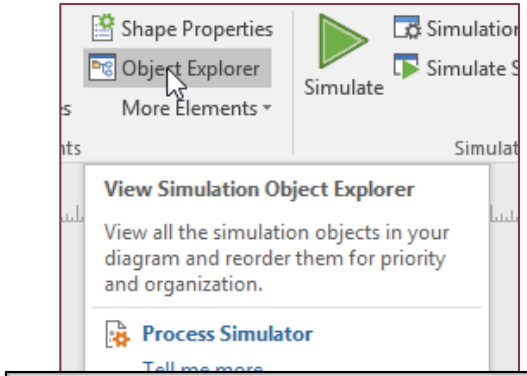


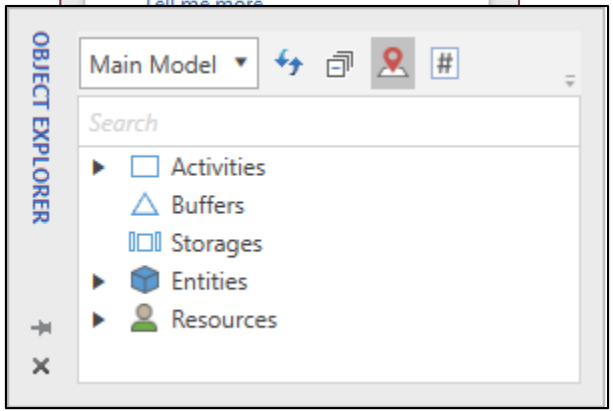
	Week	Day	Start	End	P(Qty)
1	1	Monday	8:00 AM	5:00 PM	150
2	1	Tuesday	8:00 AM	5:00 PM	100
3	1	Wednesday	8:00 AM	5:00 PM	120
4	1	Thursday	8:00 AM	5:00 PM	100
5	1	Friday	8:00 AM	5:00 PM	200

Simulation Object Explorer

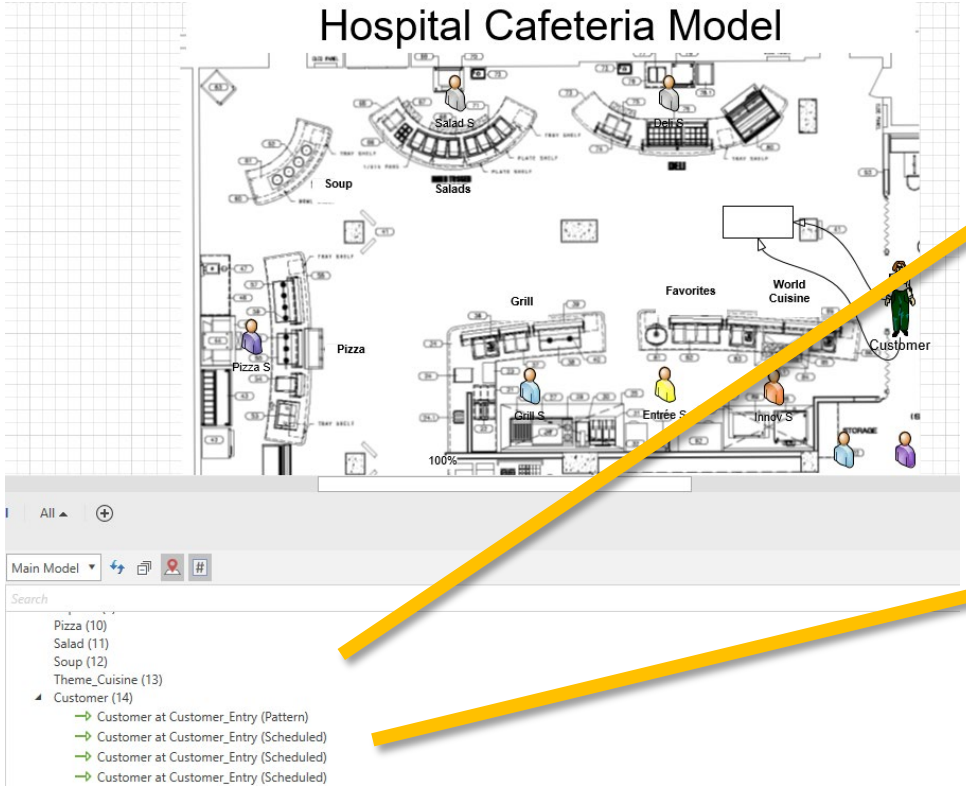
- Select Object Explorer from the Model Elements Section of the Process Simulator 2019 ribbon.

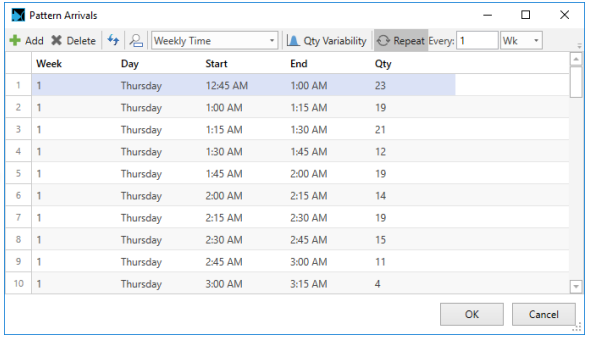
- Allows you to quickly and easily view and change parameters for all simulation objects

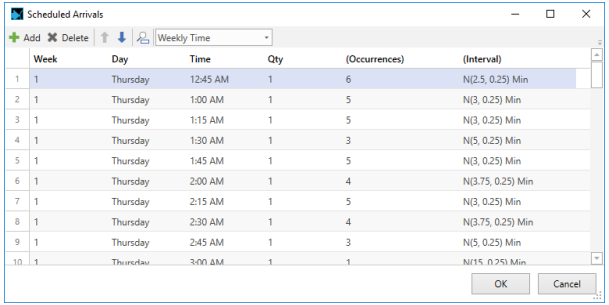




Demo 2: Cafeteria Model with Multiple Arrival Types







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3. Routings

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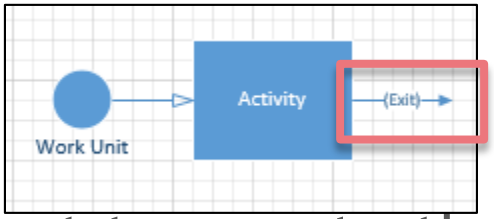
Entity Routings

- Routings define the process flow from activity to activity, and to “Exit” (where the entity leaves the system).



- Use the AutoConnect to create the routing from Activity to Exit (hover over the Activity and click and drag on a blue arrow that appears).

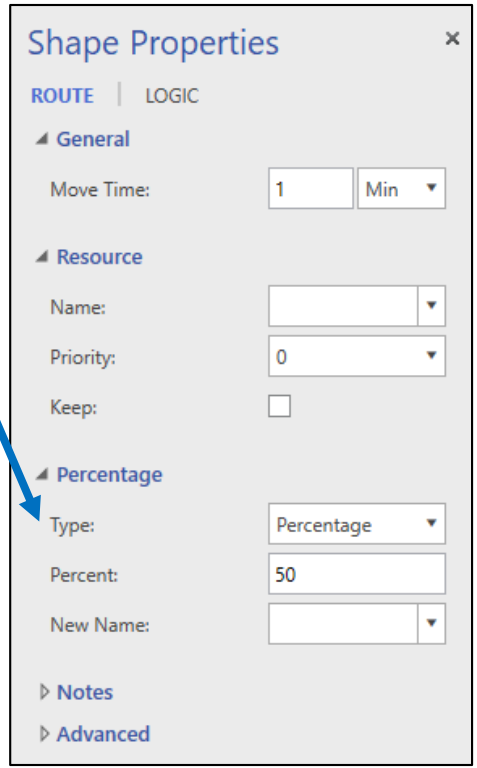
Routing Shape Properties & Types

- Routings specify how an entity gets from one activity to another. You can specify a simple time, or you can require the use of a resource. You can also specify complex logic to select multiple resources or any other condition that must be met before the routing occurs.

- Each Routing type has its own parameters.

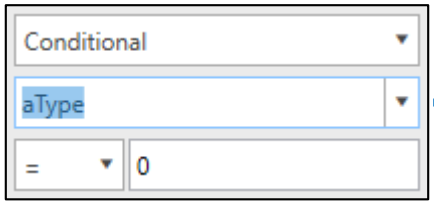
Routing Types:

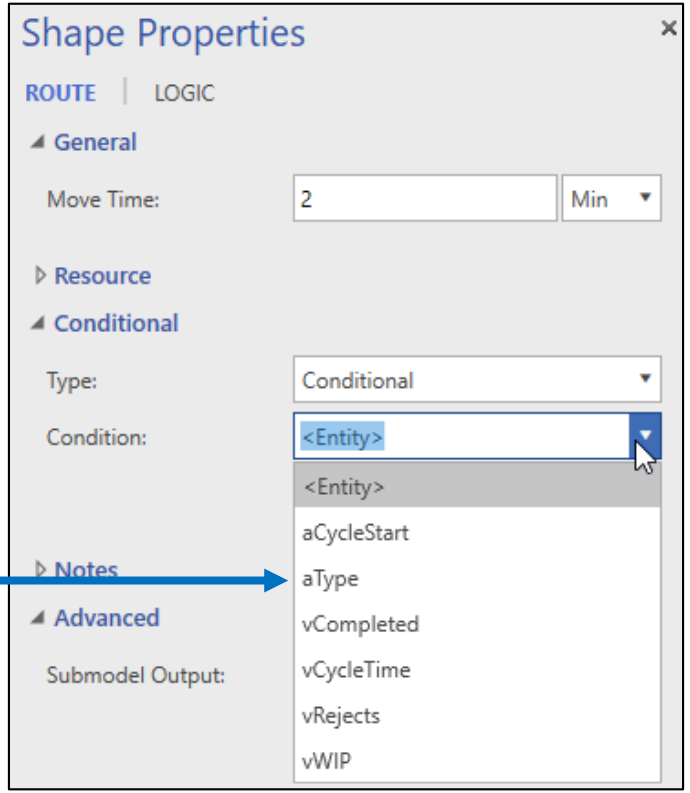
-Percentage
- Conditional
- Attach
- Detach
- Create
- Send
- Outlet
- Flexible



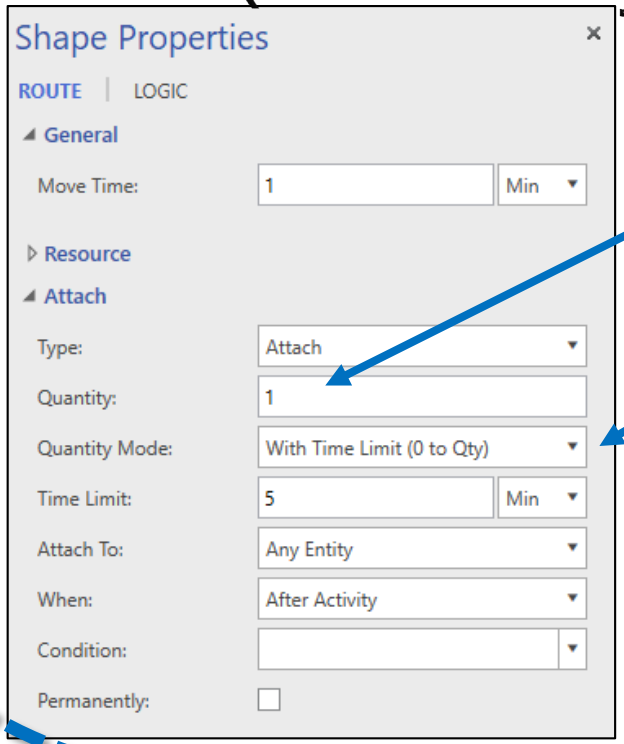
Conditional Routing

- The Conditional Route type allows for routing based on some condition being true:

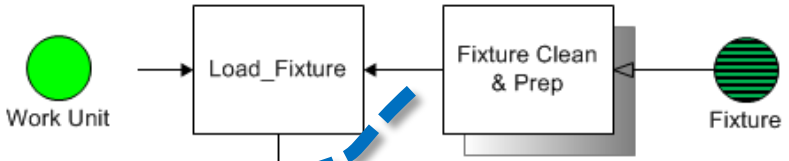




Attach (an Entity)

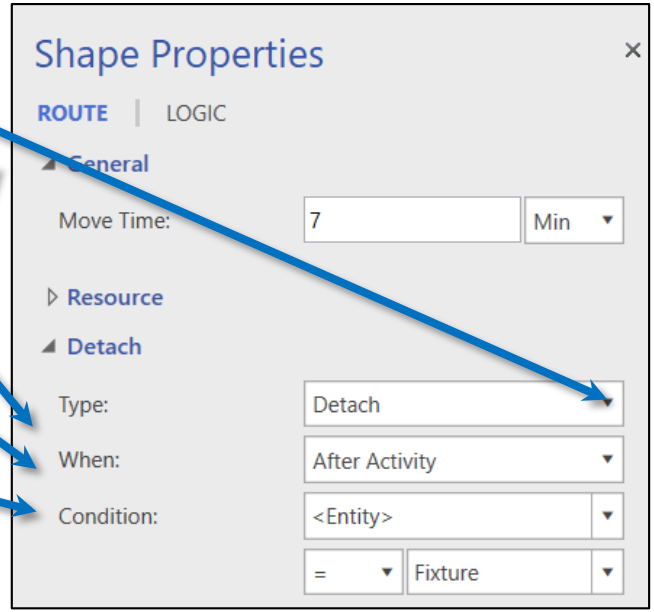


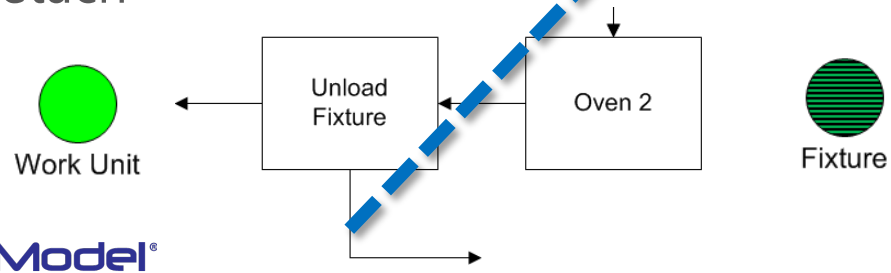
- The number of entities (Fixtures) to be attached to each entity waiting at the connecting activity (Work Unit @ Load Fixture)
- After the Load Fixture Activity time is complete, the base entity will attach the total number of entities defined in Quantity field and wait if all entities are not available to be attached.



Detach (an Entity)

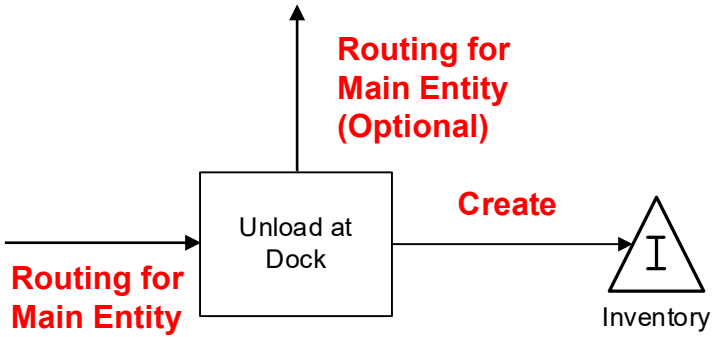
- Select from the dropdown list
- Detach entities (Fixtures) after the activity (Unload Fixture)
- The condition by which an entity will be detached (i.e. Entity Name, attribute, or variable)
- The condition that must be satisfied for the entities to detach

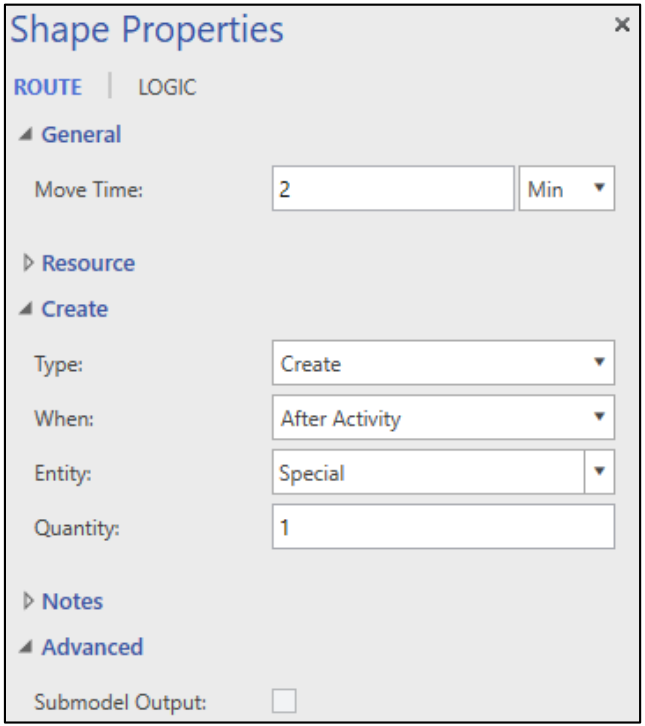




Create Routing

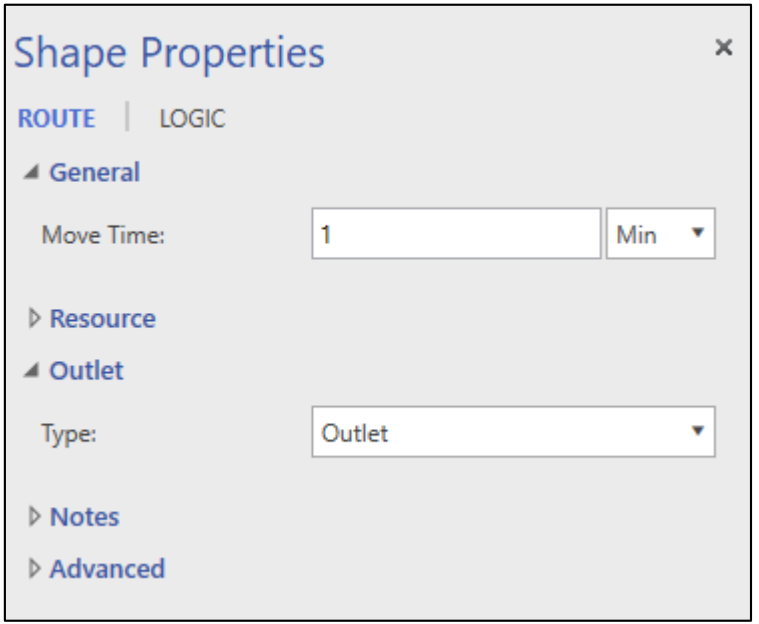
- Creates one or more new Entities before or after the Creator Entity completes its time and logic.
- You must select the name of the Entity as well as the quantity to be created.
- Note that all new created Entities have the same Attribute values as the Creator Entity. This can be useful to reunite Entities later in a model if needed.



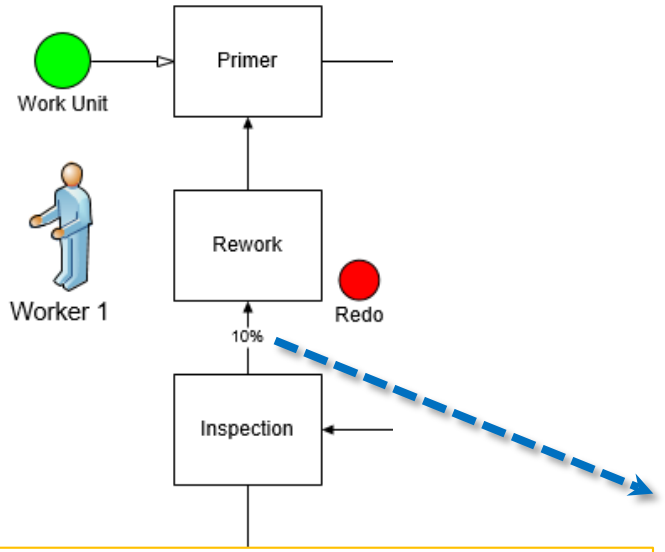


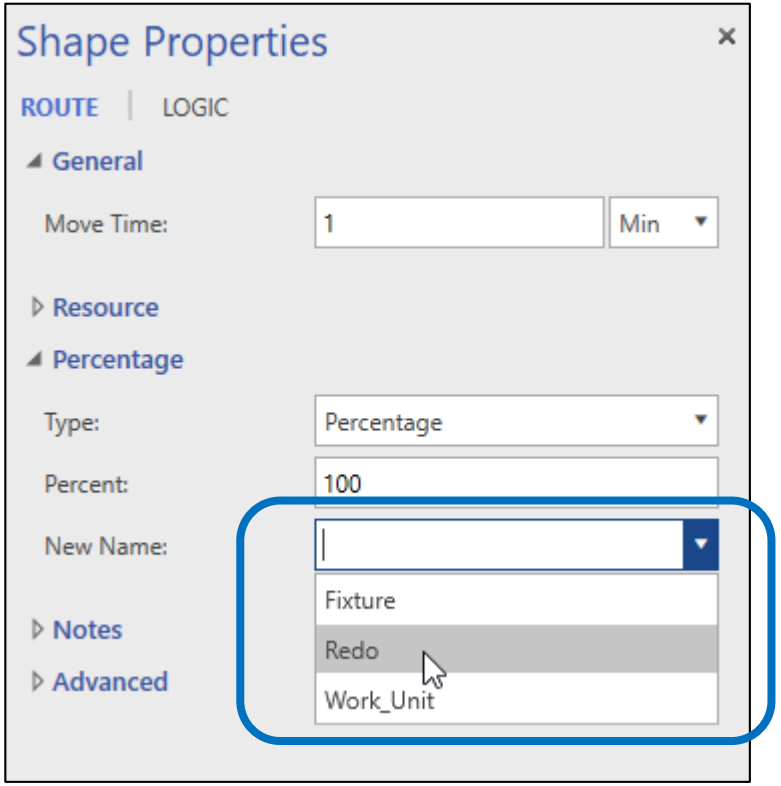
Outlet Routings

- When an Outlet Routing is defined, the entity will select this route if all other connections lead to activities that are unavailable, because they are off-shift or have no available capacity.



New Entity Name with Routing



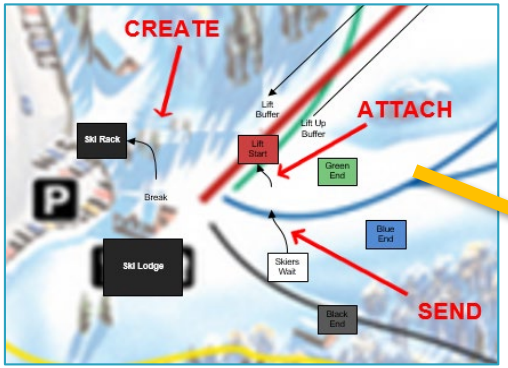


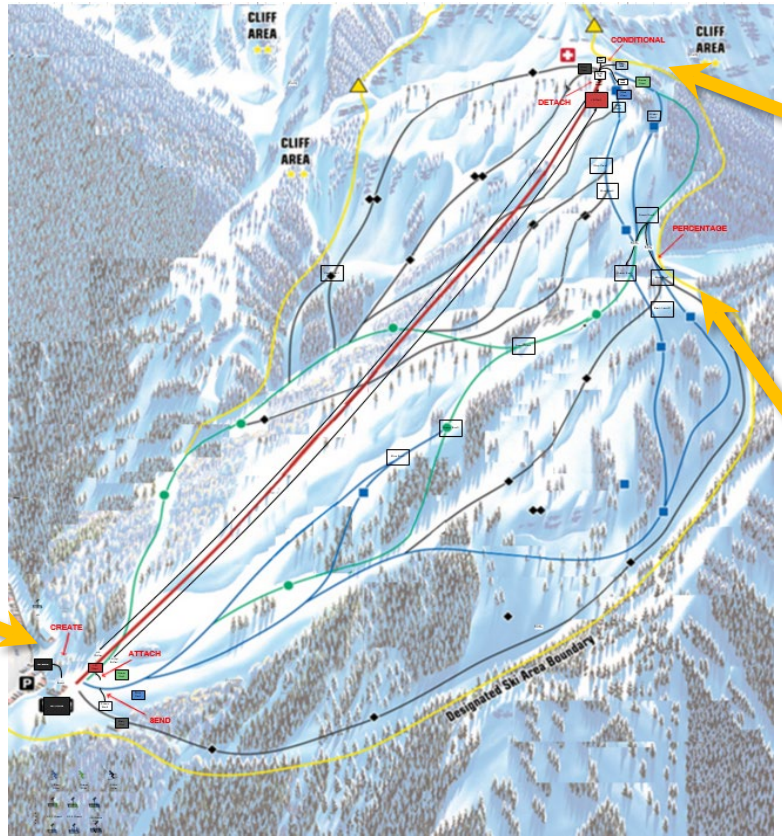
Note: The Only way to give an Entity a new name is in Percentage & certain Conditional Routings! -- Conditions based on Attribute & Variable values allow Entity name changes but the Entity Name condition does not.

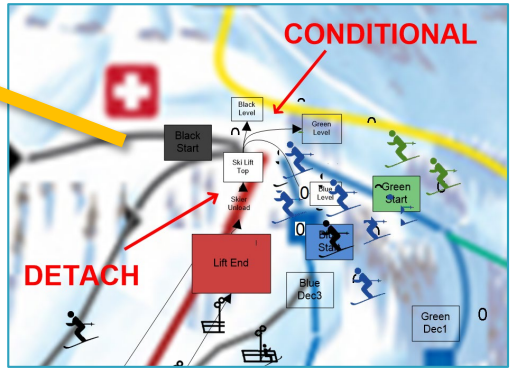
Demo 3: Ski Resort Model with Multiple Routing Types

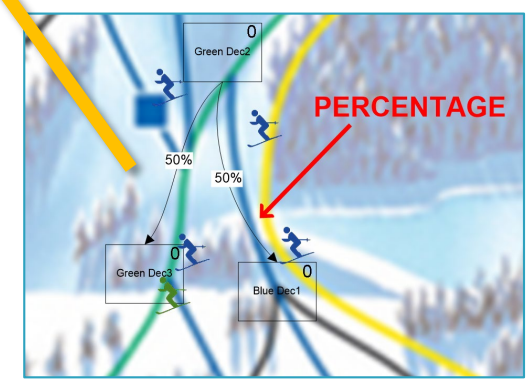
This model uses these Routings:

- Percentage
- Conditional
- Attach
- Detach
- Create
- Send









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4. Resources & How to Use Them

Poll #3

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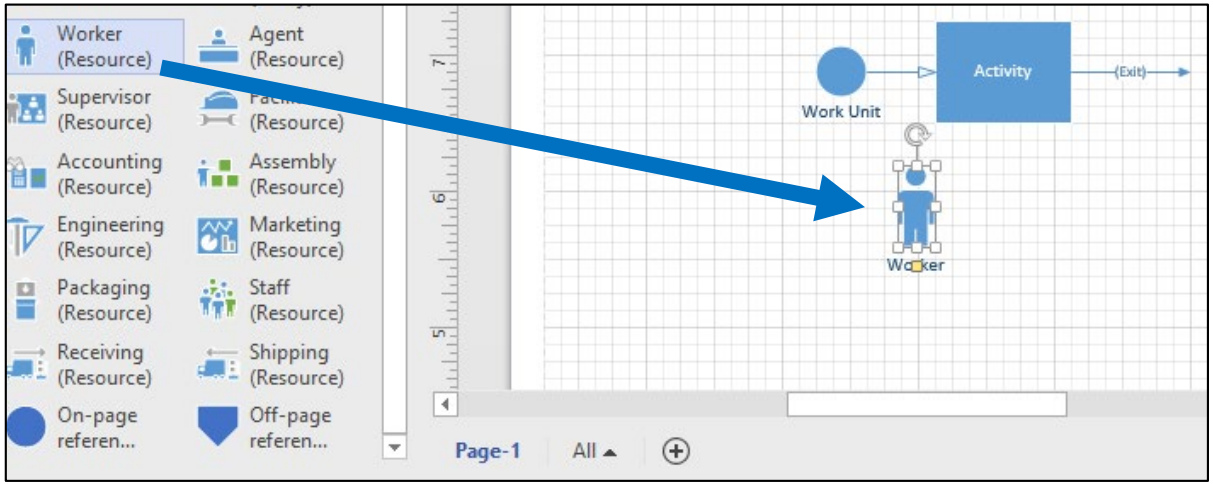
Resources

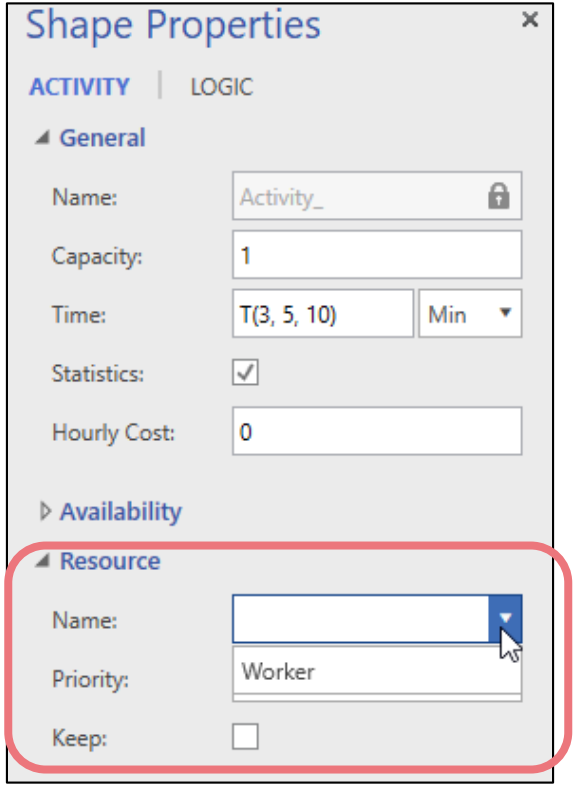
- Left-click and drag your Worker Resource object from the Process Simulator stencil to your layout.



Use the Resource in an Activity

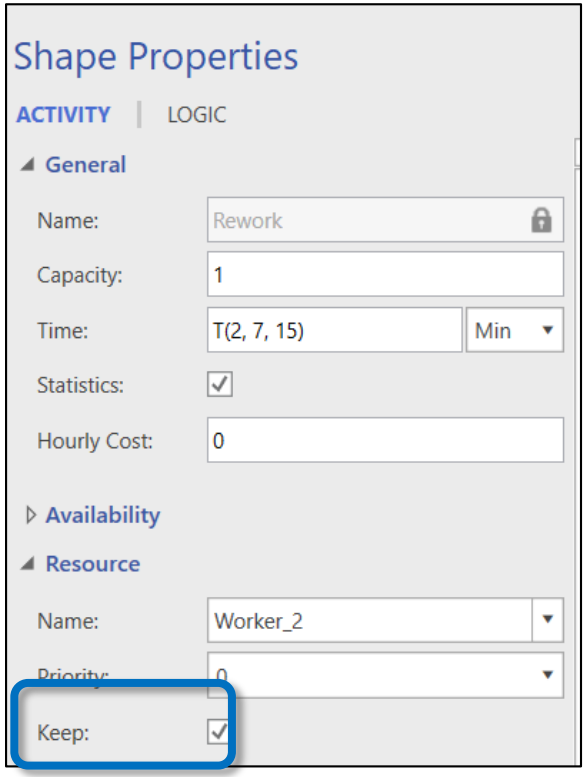
- To Use a Resource for an Activity: -
  - Enter the Shape Properties for that Activity
  - Select the desired resource from the drop-down list.
- Resources can also be captured during routings from one activity to another and can be held for several activities in a row (more on this later).

- *<u>Note</u> that you must have first placed a resource on the screen in order for it to appear as an option in the drop-down list.*



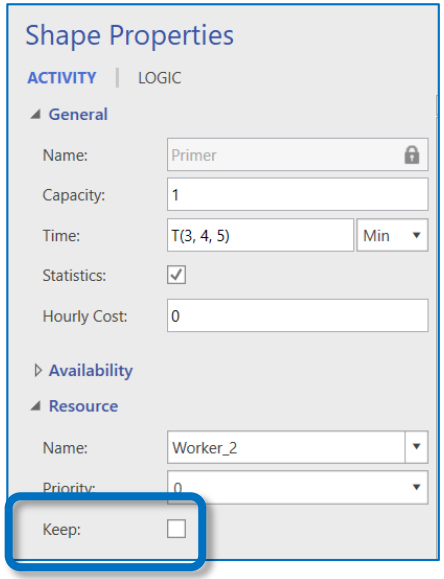
Controlling Resources

- When we need a Resource, we have been specifying it by name in the Resource drop-down list.
- If we need a Resource for multiple steps there are additional ways we can more precisely control when we *capture* and *release* Resources:
  - Keep (checkbox)
  - Get (in Logic)
  - Free (in Logic)



Freeing a Kept Resource

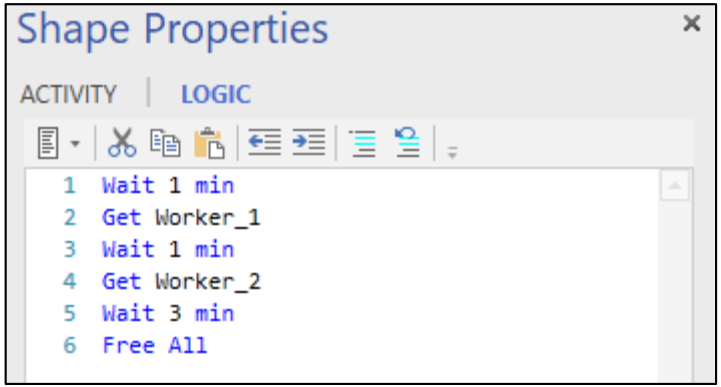
- If we select the Keep checkbox in an Activity or Routing dialog, the selected Resource will stay with the Entity for subsequent process steps.
- At some downstream step, the Entity MUST release the Resource, by one of two methods:
  1. Select again the name of the resource in the drop down but without checking the "Keep" option.
  2. Use a Free statement in Activity or Routing Logic.



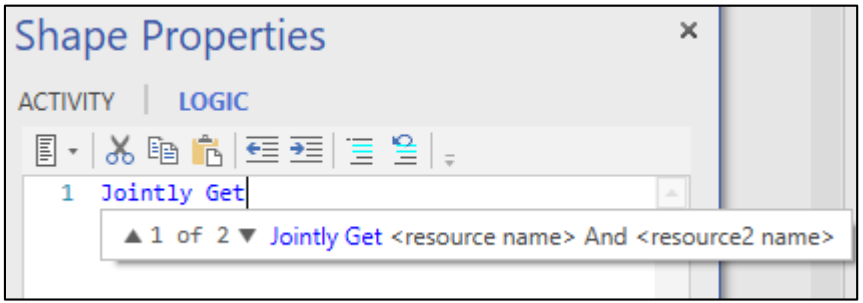
For example (in the Paint Line model) If I used the Keep option for Worker 2 at the Rework Activity, the Entity could subsequently use Worker 2 at Primer *without* the Keep option and this would use Worker 2 for the Primer time and Free the Resource when the Primer processing was complete.

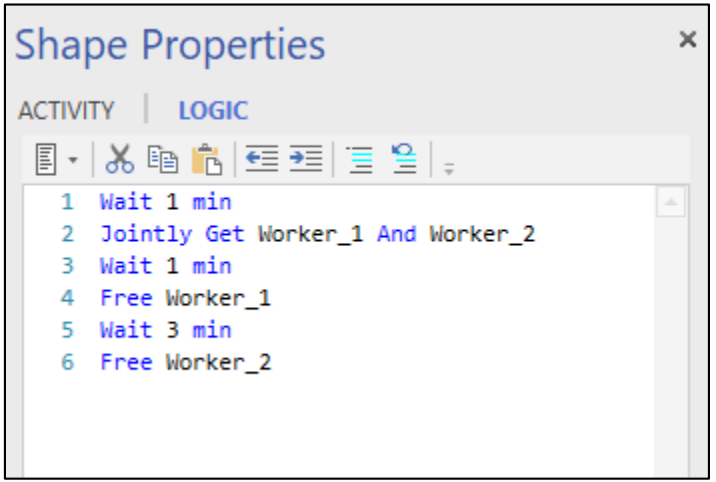
Get and Free Statements

- If we need more precise control over when we capture and release Resources within an Activity, we can use the Get and Free statements.
- Get issues a request to capture the Resource (there may be delays based on Resource availability). Once the Get statement is satisfied (the Resource is captured), the Entity will proceed to the next line of logic.
- Free will immediately free the listed Resource
- For example:



Jointly Get

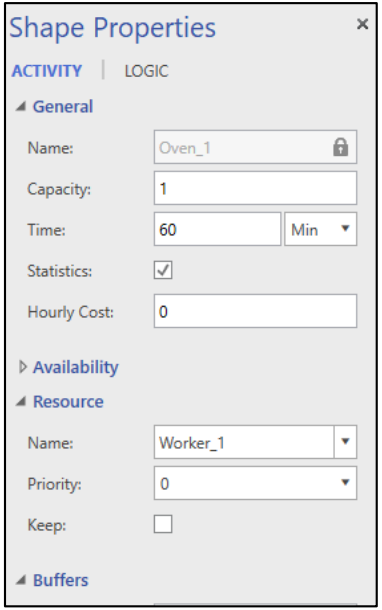

Shape Properties
ACTIVITY
LOGIC
1 Jointly Get
▲ 1 of 2 ▼ Jointly Get <resource name> And <resource2 name>

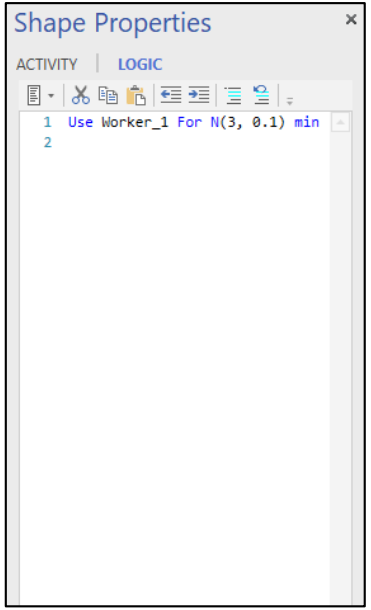

Shape Properties
ACTIVITY
LOGIC
1 Wait 1 min
2 Jointly Get Worker_1 And Worker_2
3 Wait 1 min
4 Free Worker_1
5 Wait 3 min
6 Free Worker_2

Use Statement

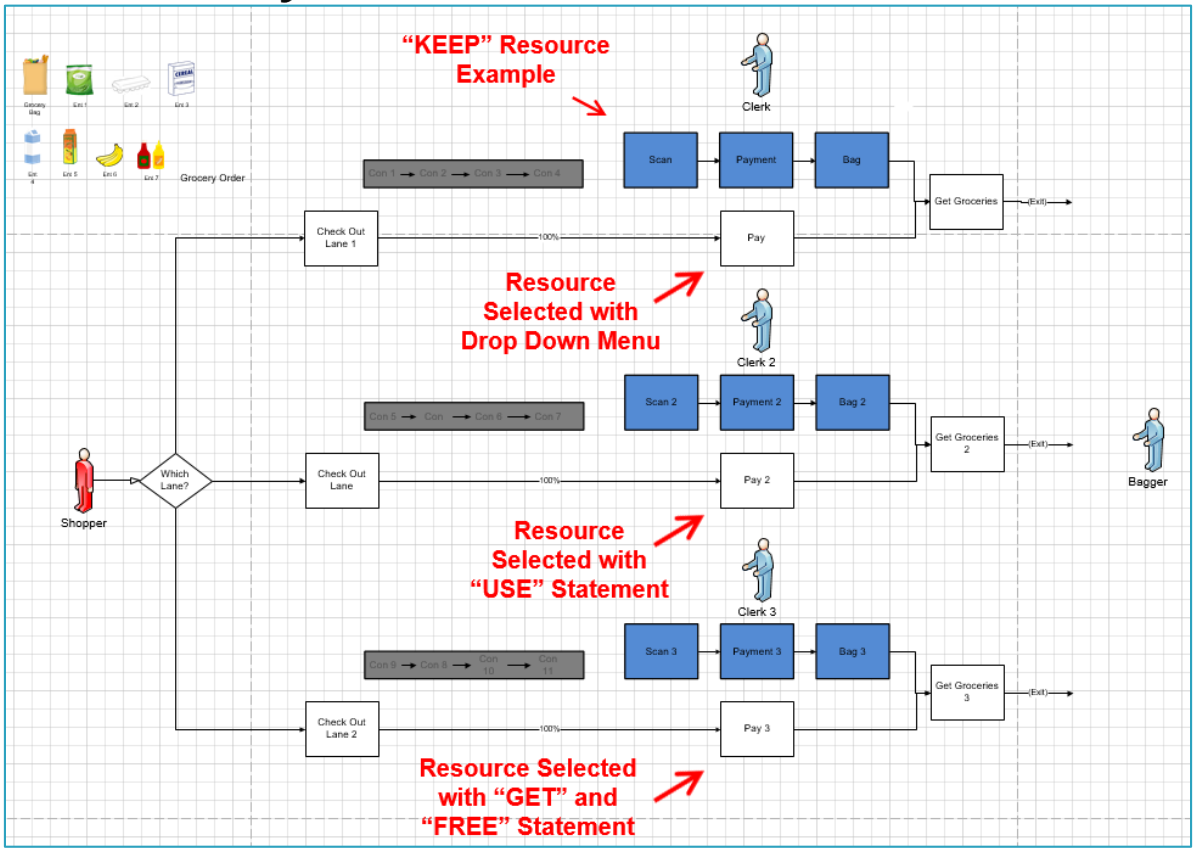
- The Use statement is a method to capture a Resource in the logic, Use it for a defined length of time, then Free the Resource. This works the same as separate Get, Wait, & Free statements.
- Syntax:

  Use <Resource Name> For <duration><units>
- If there are multiple process steps taking place within one Activity, this is a more detailed way to control the sequence Resources are actually captured and freed.





Demo 4: Grocery Store with Resources in Use



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10 Minute Break

Webinar will resume at 3:05 pm ET

5. User-Defined Expressions

Poll #4

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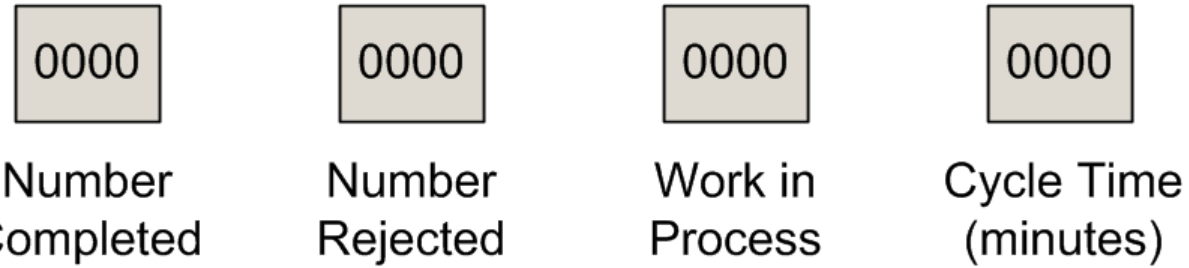
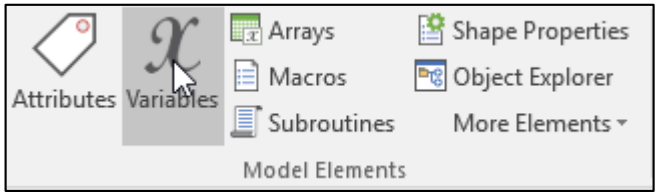
Variables

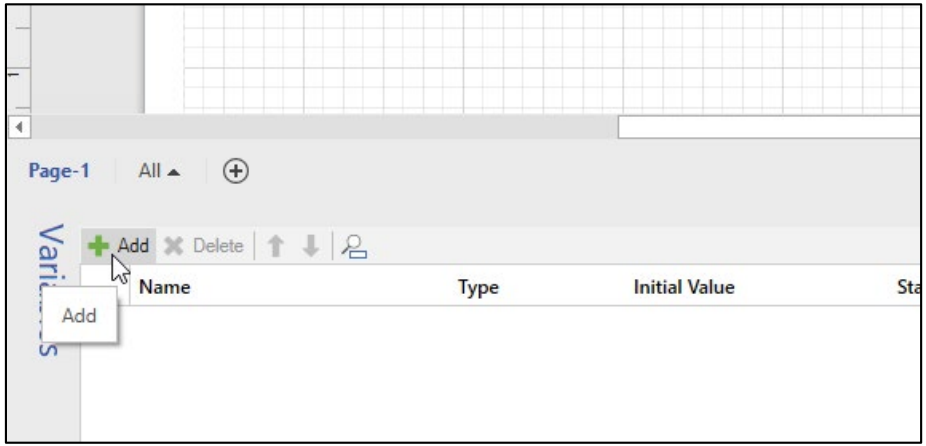
- Hold a numeric value
- Integer or Real
- May be displayed on the screen
- Initial value specified in the Variables and Attributes window (see next slide)



Variables

1. Select the Variables Button from the Ribbon in the Model Elements section to open the Variable Grid
2. Click on the Add + button create a new variable
3. Edit Variable name
4. Type may be Integer or Real
5. Specify Initial Value



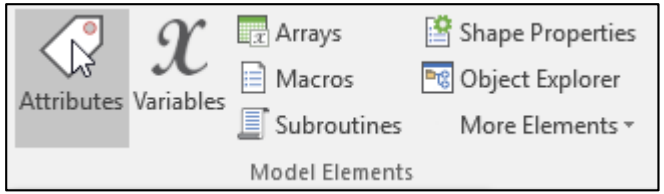


Attributes

- Used for identifying entities during processing or for tracking certain statistics.
- Not global—value is held by each entity independently.
- Initial value assigned to all entities as they enter the system.
- May be Real or Integer.

Attributes

1. Click on the Attribute Button to open the Attribute Grid. Like Variables, you can click on the Add + button to add a new Attribute
2. Edit attribute name
3. Type may be Integer or Real
4. Specify Initial Value

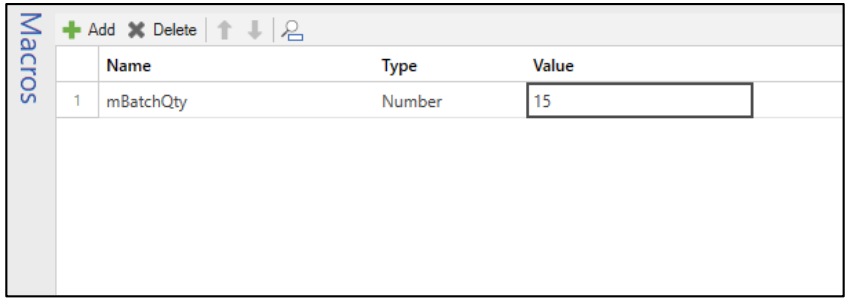


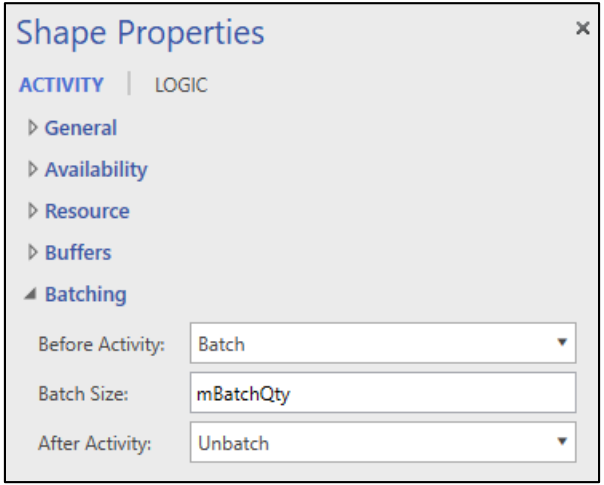
Macros

- A Macro is an element which can represent a number or a distribution that might be used repetitively throughout your model.
- Macros can be used as parameters in the Scenario Manager for scenario analysis.
- The Macros table can be found in the Model Elements window, along with Variables and Attributes.
- Define the Macro (in the Macros table) and then enter the Macro in Activity Properties or logic, for example.
- When you want to change a Macro value, do so in the Macros table or, if it's a temporary change, you can modify it in the Scenario Manager.

Macros Examples

- Here a Macro expression has been created representing the number of parts to be Batched at Oven1.
- The Macro is then used in the Entity Batching dialog at Oven1.
- And as a Scenario Parameter within Scenario Manager.





Which Expression to Use?

Expression	Definition	Use When	Notes
Attribute	Integer or Real number	• Entity characteristic determines action or route • Needed along with a Variable to track items	• Not Global; they are independent to each Entity • No Output Viewer Stats! • Exist only during model run
Macro	Number or Distribution	• Value is repeated multiple places in model • Needed for Scenario parameter • Want a single table to edit many expressions used in logic	• Global to entire model • No Output Viewer Stats! • Exist only during model run • Value cannot be changed after model run begins!
Variable	Integer or Real number	• Counting items • Needed to trigger action • Value needs to change during model run	• Global to entire model • Yes, Output Viewer Stats! • Can be displayed onscreen

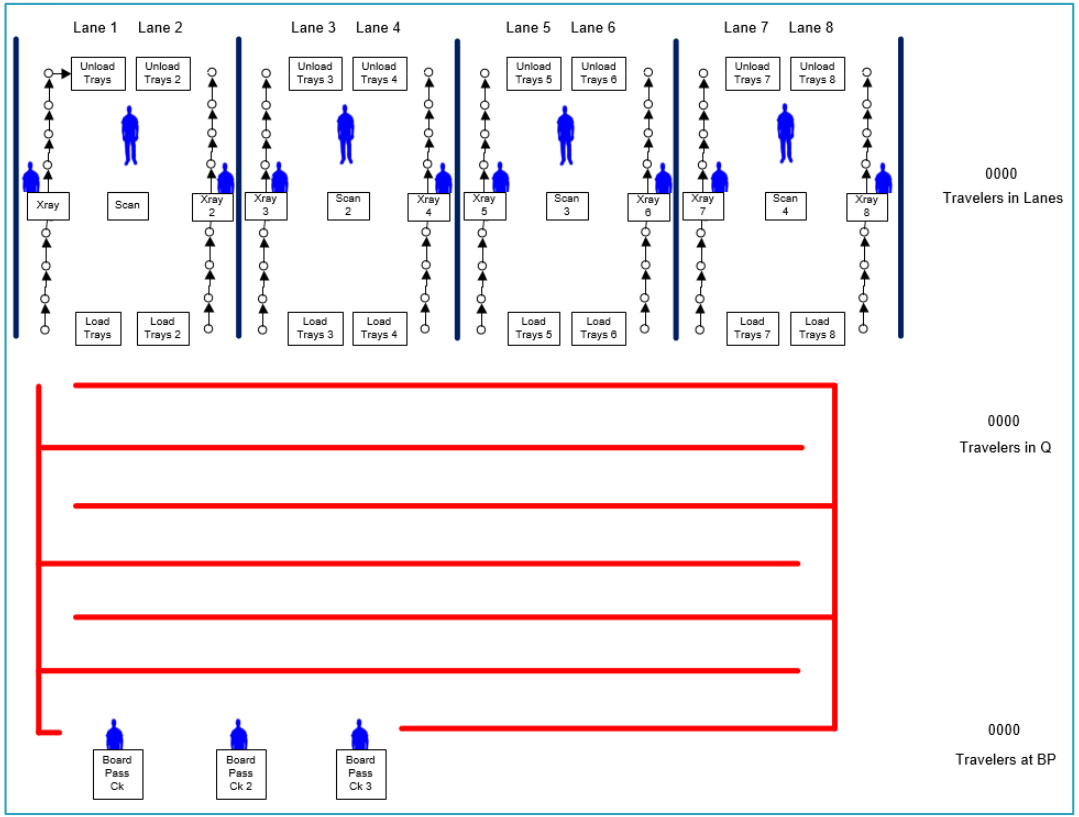
Demo 5: Airport Security Model with User Defined Expressions

Variables

Add | Delete

	Name	Type	Initial Value	Statistics	Graphic
1	vCount_thru_Ln1	Integer	0	Time Weighted	☑
2	vCount_thru_Ln2	Integer	0	Time Weighted	☑
3	vCount_thru_Ln3	Integer	0	Time Weighted	☑
4	vCount_thru_Ln4	Integer	0	Time Weighted	☑
5	vCount_thru_Ln5	Integer	0	Time Weighted	☑
6	vCount_thru_Ln6	Integer	0	Time Weighted	☑

Variables | Resource Groups | Macros | Attributes



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6. Output Viewer

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Poll #5

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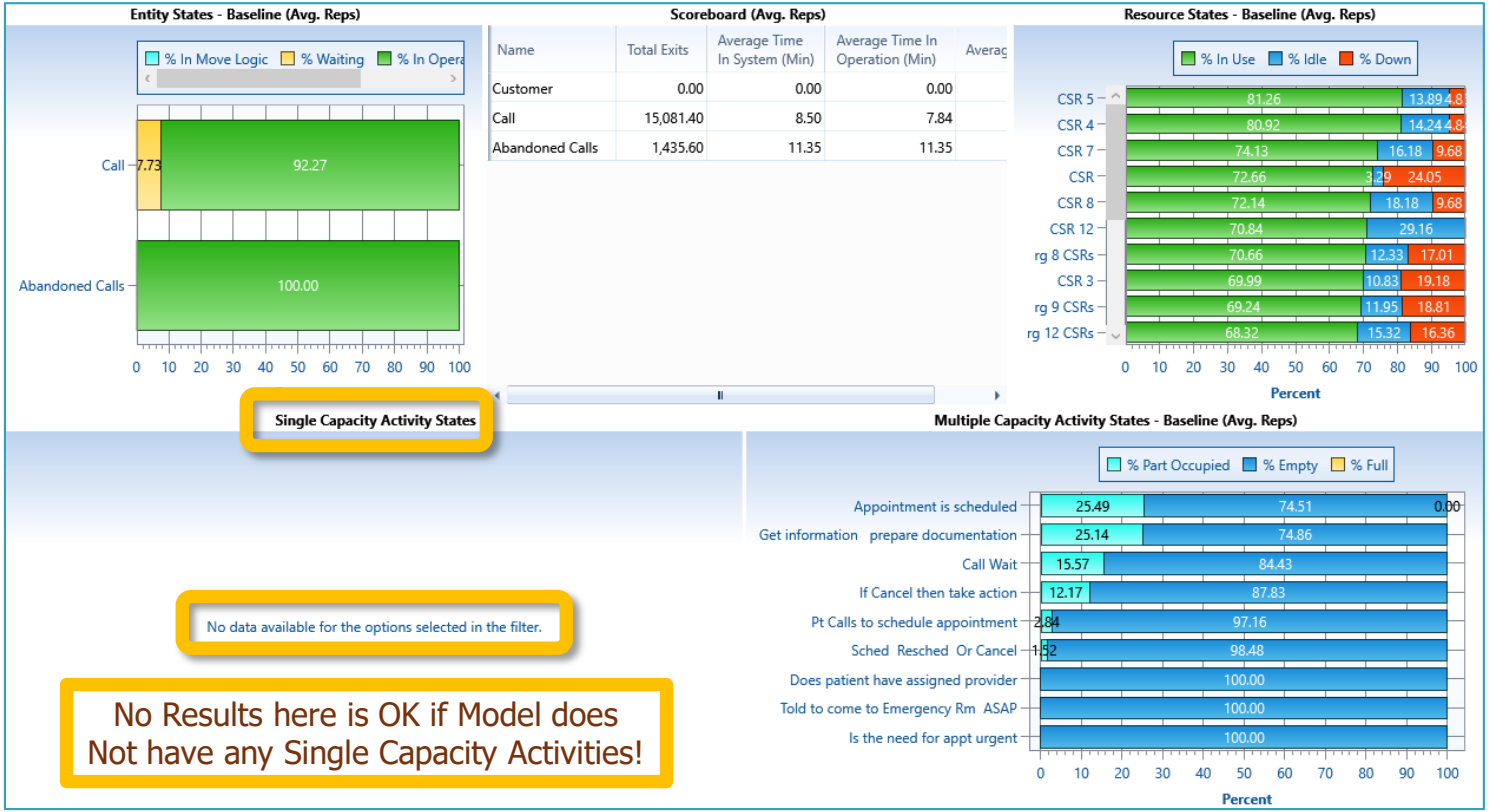
About the Output Viewer

- A data file is generated every time a model runs
- The OV links to that file allowing data mining
- Use the OV to view different slices of data and examine the process model in detail
- Custom charts & tables can be built and saved so they populate with new data after each run
- TIP: Always determine some key process metrics early in a model project so you can compare output results later from different Scenarios

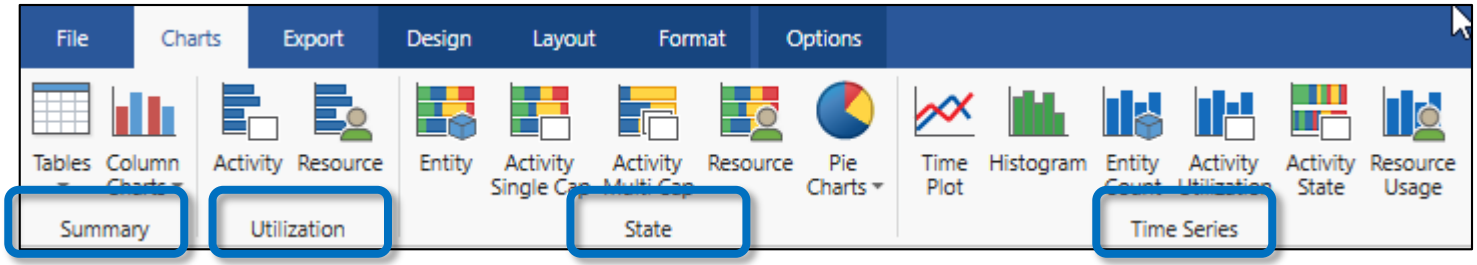
Results – Default View



No Results here is OK if Model does Not have any Single Capacity Activities!

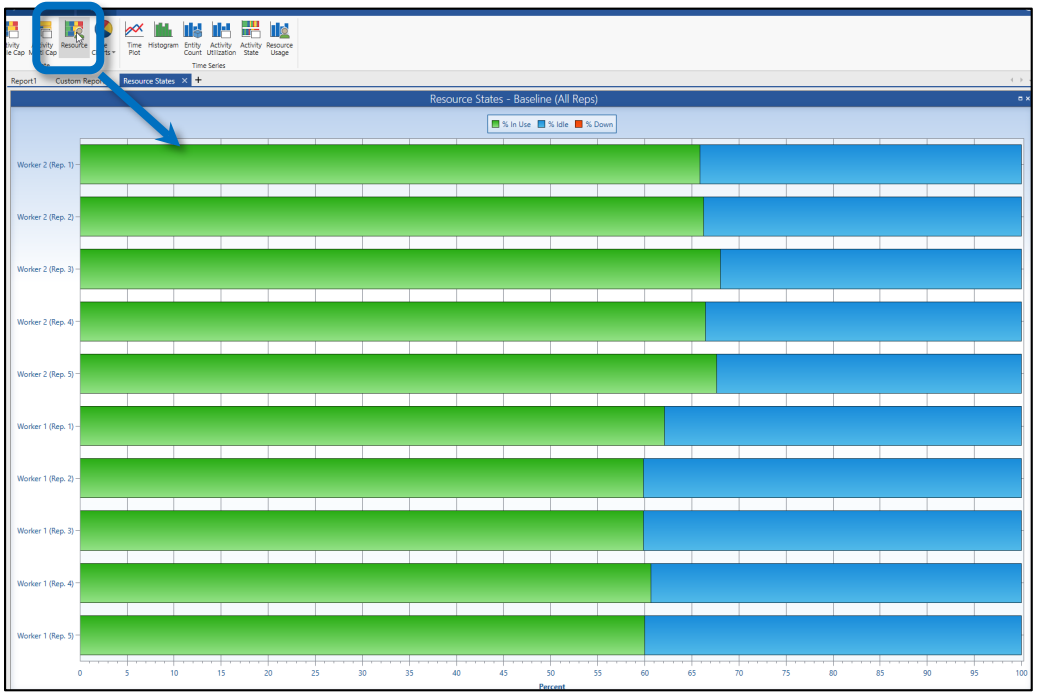
OV Chart Menu

- Summary – Tables & Column Charts
- Utilization – Activities & Resources
- State – Entities, Activities, & Resources
- Time Series – Data over the model run

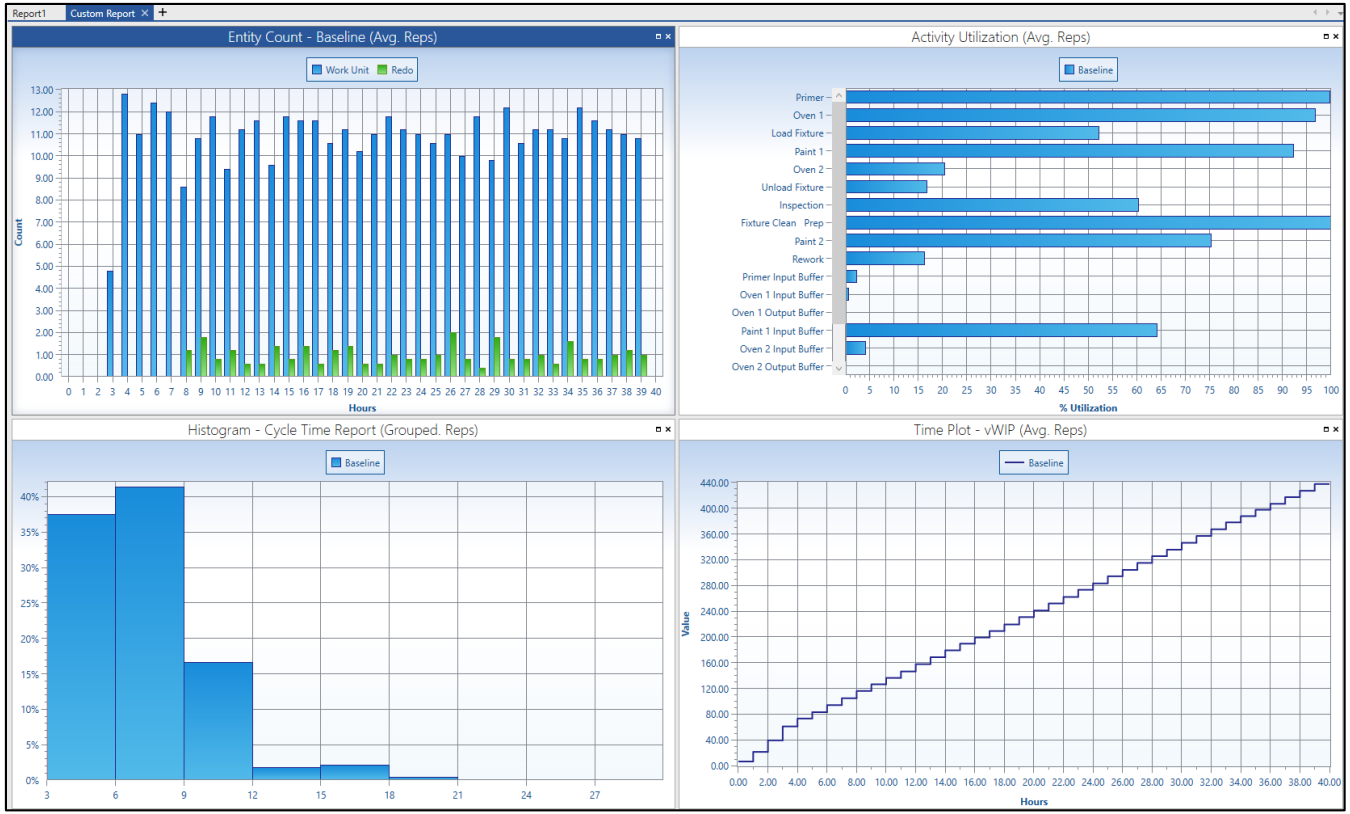


Create a Chart

- Click on a button to create a new chart



Output Views—User-Defined



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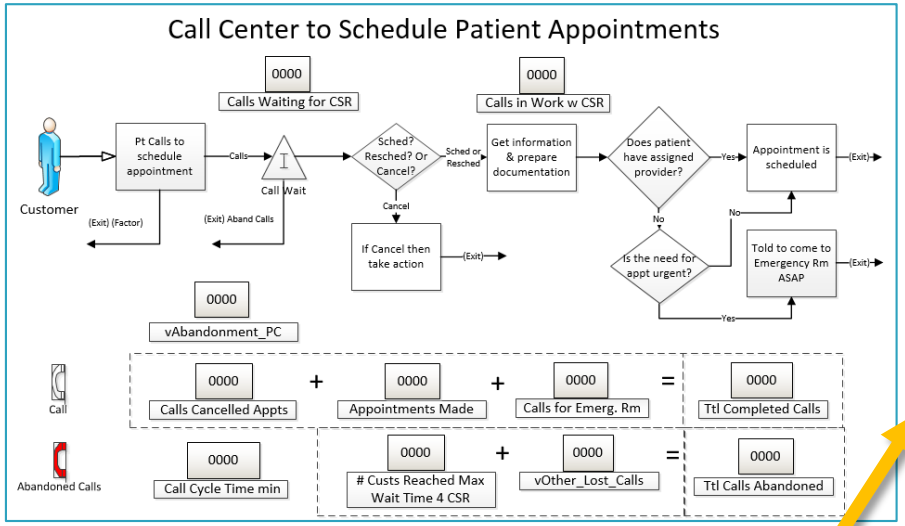
Demo 6: Call Center Results in Output Viewer



Activity Summary (Avg. Reps)

Name	Total Entries	Average Time Per Entry (Min)	Average Contents	Maximum Contents	Current Contents	% Utilization
Call Wait	16,517.00	2.67	1.0	27.00	0.00	0.00
Appointment is scheduled	13,418.60	3.86	1.22	13.00	0.00	9.42
Get information prepare documentation	13,557.20	2.88	0.92	11.60	0.00	7.09
Pt Calls to schedule appointment	16,517.00	0.08	0.03	6.40	0.00	0.00
If Cancel then take action	1,524.20	4.54	0.16	6.00	0.00	1.26
Sched Resched Or Cancel	15,081.40	0.07	0.03	5.20	0.00	0.20
Does patient have assigned provider	13,557.20	0.00	0.00	3.00	0.00	0.00
Is the need for appt urgent	1,345.60	0.00	0.00	1.20	0.00	0.00
Told to come to Emergency Rm ASAP	138.60	0.00	0.00	1.00	0.00	0.00

Resource Summary (Avg. Reps)

Scenario	Name	Units	Scheduled Time (Hr)	Work Time (Hr)	Number Times Used	Average Time Per Usage (Hr)	% Utilization
Baseline	CSR 5	1.00	164.68	133.82	1,363.60	0.1	81.26
Baseline	CSR 4	1.00	185.75	150.31	1,528.00	0.10	80.92
Baseline	CSR 7	1.00	165.04	122.35	1,242.40	0.10	74.13
Baseline	CSR	1.00	145.32	105.59	1,072.00	0.10	72.66
Baseline	CSR 8	1.00	165.12	119.12	1,209.80	0.10	72.14
Baseline	CSR 12	1.00	185.17	131.17	1,335.40	0.10	70.84

*Key Output Results you should Always analyze include:

- Throughput (i.e., Entity Exits)
- Cycle/Lead Time (process beginning to end)
- Work in Process (WIP)
- Activity & Resource Utilization

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7. Scenarios

Poll #6

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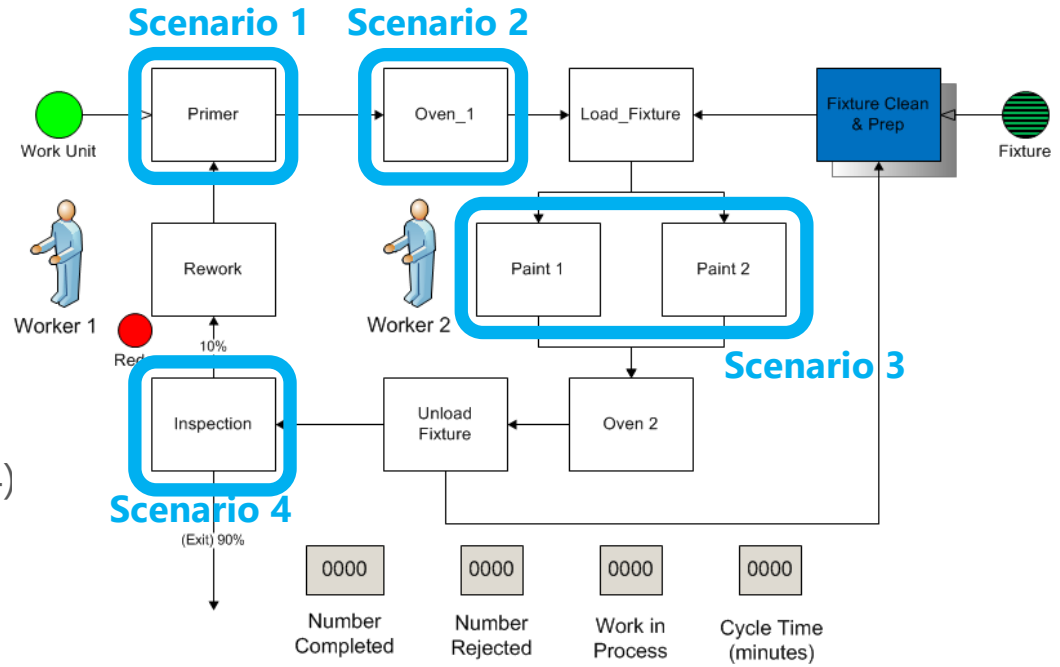
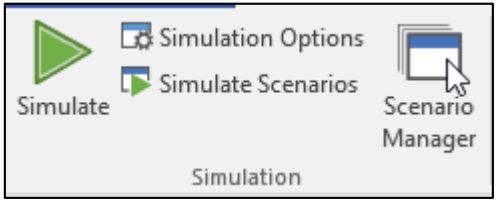
Scenarios

1. Reduce Primer Time
2. Alter Batch Size for Oven
3. Reduce Paint Booth Time
4. Reduce Rework Rate
5. All Improvements (Scen. 1 thru 4)

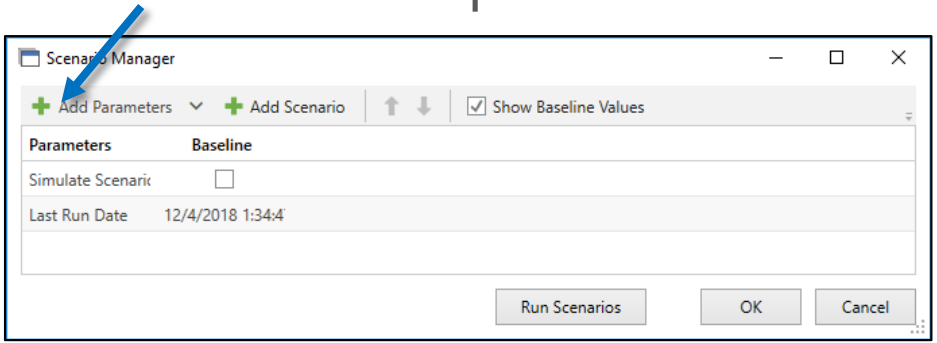


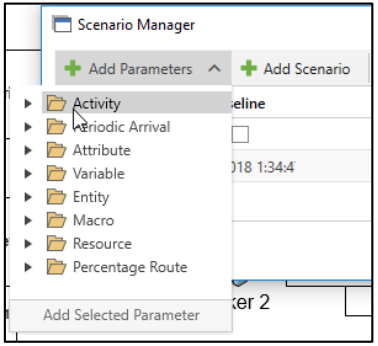
Scenario Manager

- Scenario Manager allows you to define the parameters that can be changed, then create Scenarios from those Parameters.



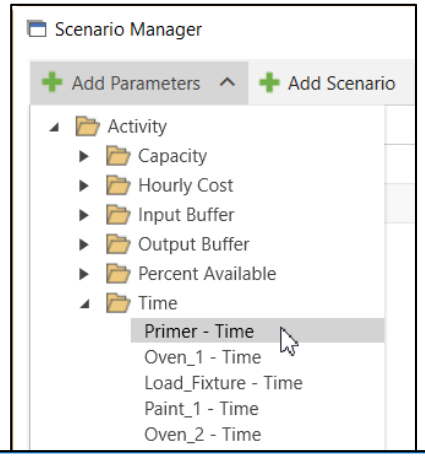
- Step 1. Click “Add Parameter” to create the list of parameters for experimentation.

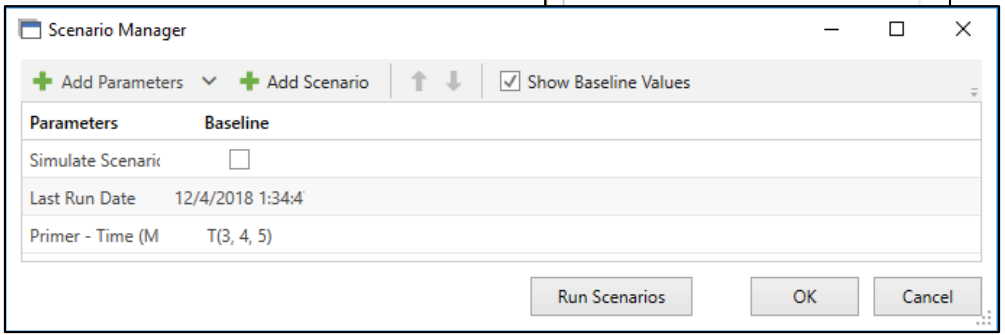




Adding Scenario Parameters

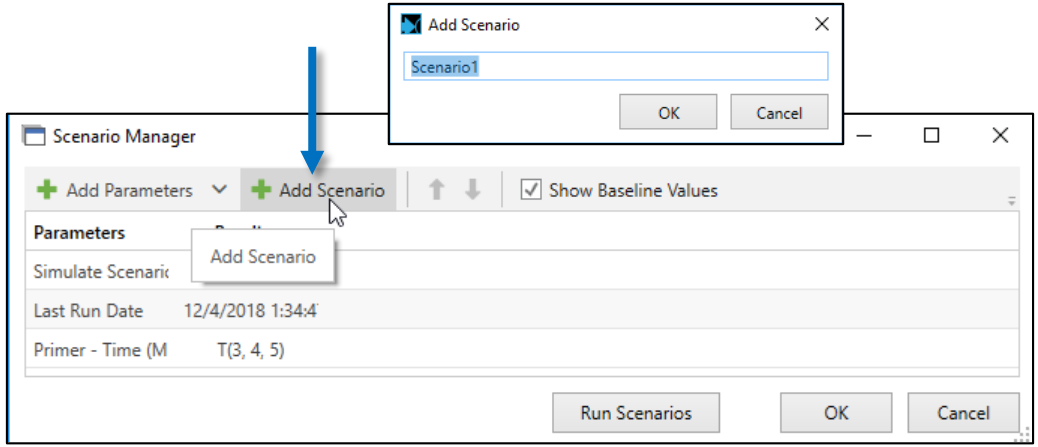
- Select each factor that you will be varying for experimentation.
- As the parameter is added, it appears in the Parameters column and default values appear in the Baseline scenario in Scenario Manager

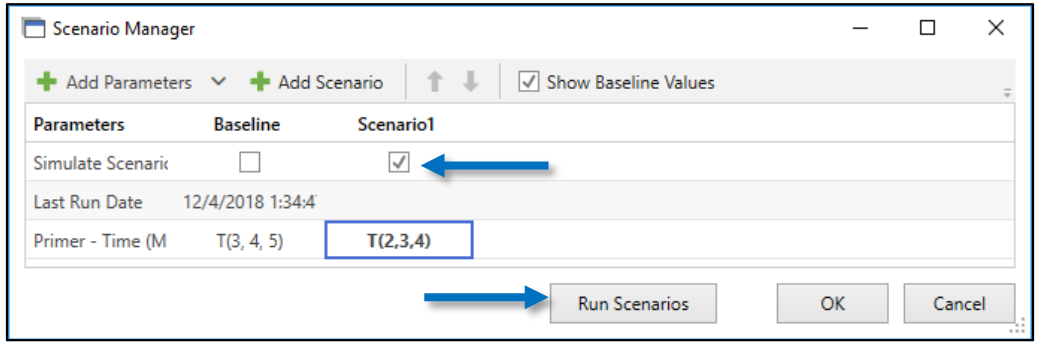




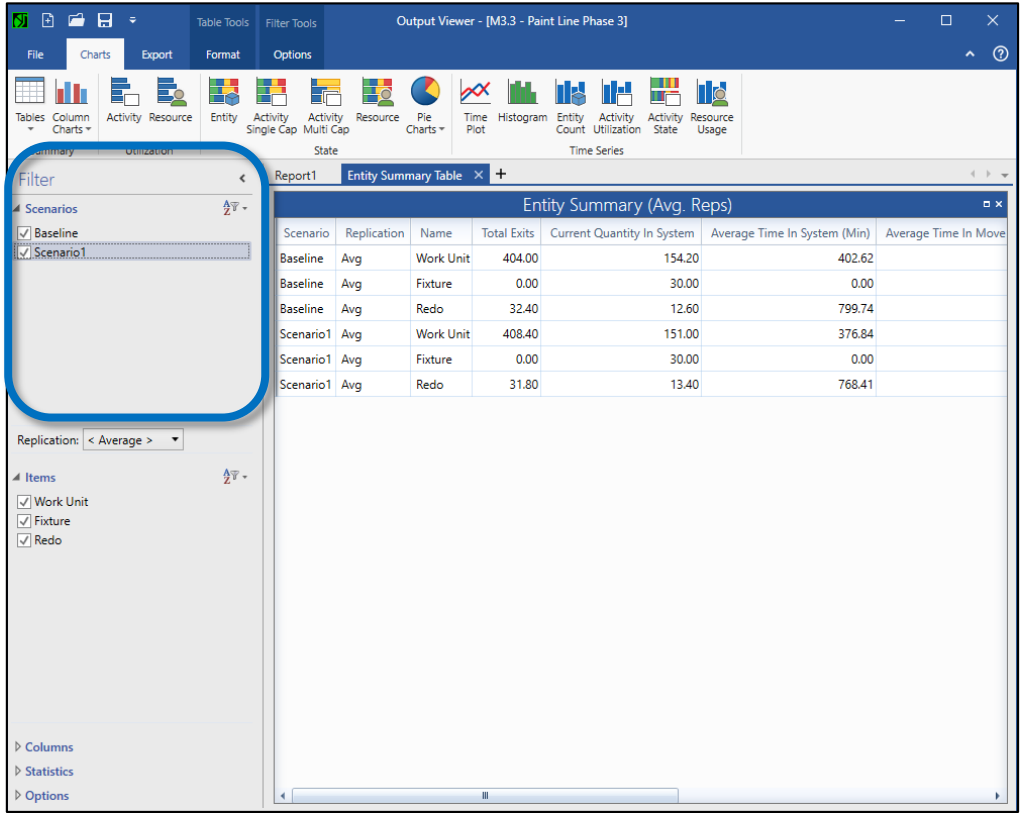
Simulate Scenarios

- Step 2. Click “Add Scenario” to create a scenario and define values for each parameter.
- You can enable or disable each scenario for comparison.
- Run the enabled Scenarios by clicking the Run Scenarios button





Scenario Analysis - Tables



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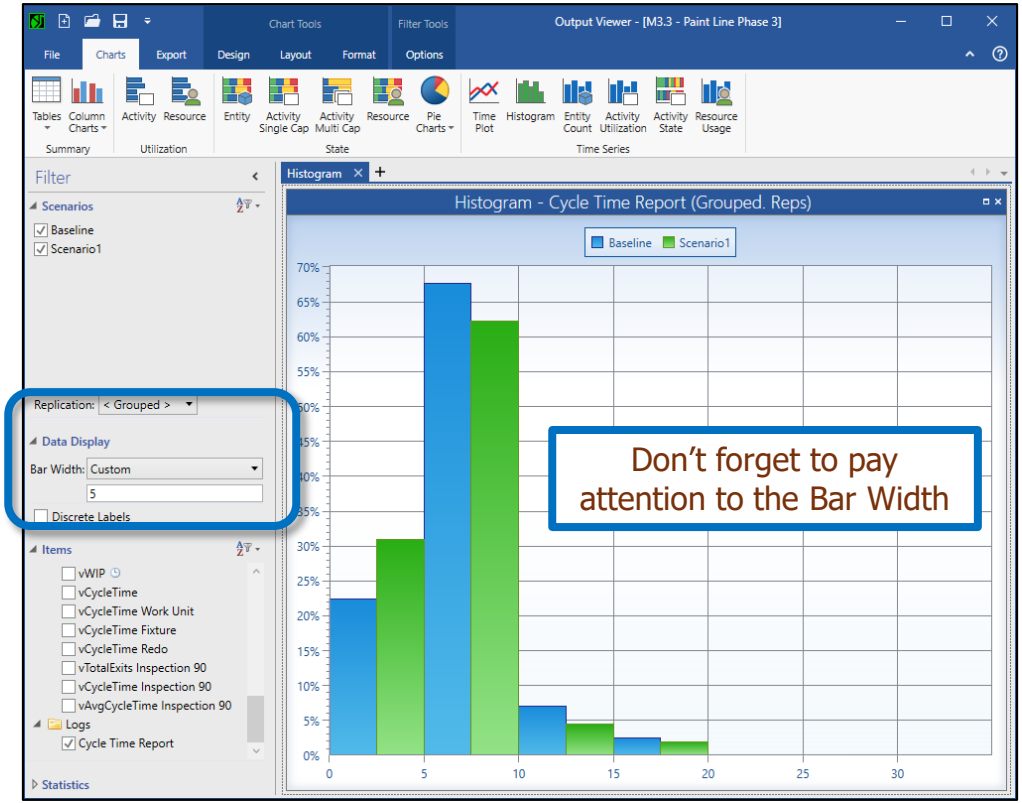
Scenario Analysis - Charts

- Histograms (Cycle Time)



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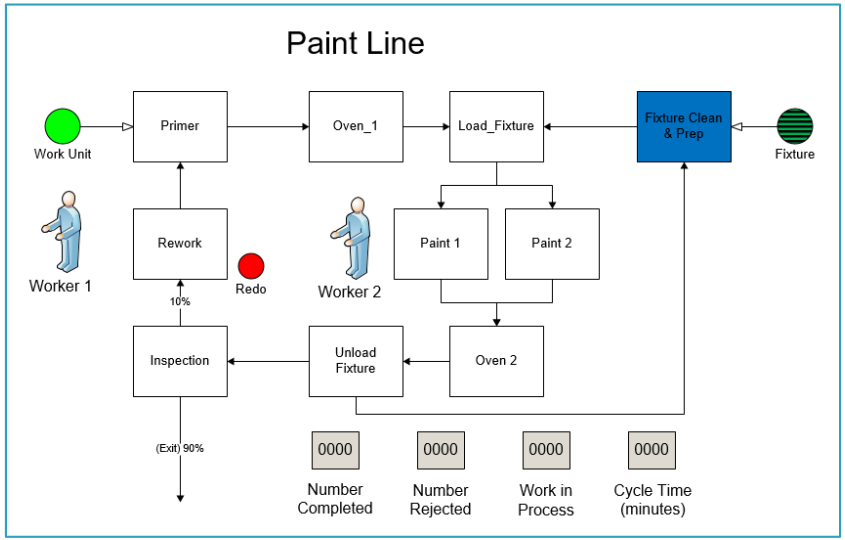
Demo 7: Paint Line Mfg with Multiple Scenarios

Scenario Manager

Add Parameters | Add Scenario | Show Baseline Values

Parameters	Baseline	Primer Improve	Paint Improvem	Batch Size 20	Rework 5 Pct	All Improvemen
Simulate Scenari	☑	☑	☑	☑	☑	☑
Last Run Date						
Primer - Time	T(3, 4, 5)	**T(2, 3, 4)**	**T(3, 4, 5)**	**T(3, 4, 5)**	**T(3, 4, 5)**	**T(2, 3, 4)**
Paint 1 - Time	N(8, 1)	**N(8, 1)**	**N(7, 1)**	**N(8, 1)**	**N(8, 1)**	**N(7, 1)**
Paint 2 - Time	N(8, 1)	**N(8, 1)**	**N(7, 1)**	**N(8, 1)**	**N(8, 1)**	**N(7, 1)**
mBatchQty - Valu	15	**15**	**15**	**20**	**15**	**20**
Inspection TO EX	90	**90**	**90**	**90**	**95**	**95**
Inspection TO Re	10	**10**	**10**	**10**	**5**	**5**

Run Scenarios | OK | Cancel



ProModel®
Better Decisions—Faster

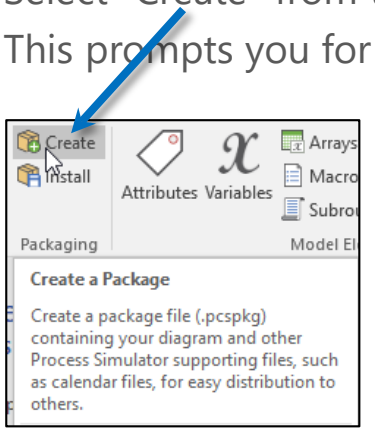
Wrap Up

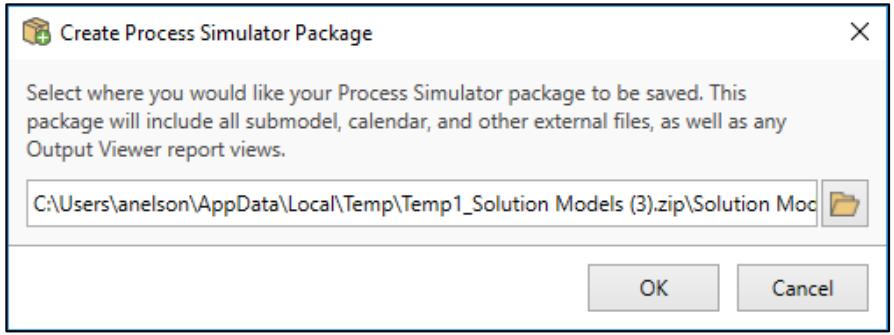
7/2018 Version 9.3
PCS Refresher Training Webinar
For Software Version: 9.3

556 E Technology Way
Orem, UT 84097
801-223-4600

Creating Model Packages

- Sharing or archiving models is easy.
- Select “Create” from the Packaging area of the Process Simulator Ribbon bar.
- This prompts you for a name for your model “Package.”





- A model package is saved with a .pcspkg extension and combines: the .vsd file, .pmcal files, and any other associated files.
- This .pcspkg file can then be copied or emailed to others. They can run the model by double clicking on the file name or “Install Package.”

Arrays

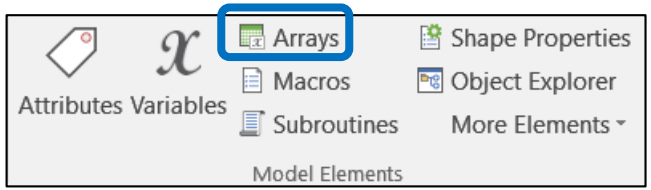
- An array is a matrix of values
- Each cell works like a variable
- A reference to a cell in an array can be used anywhere a variable can be used
- Refer to an array value by specifying the value's row & column cell address, for example, the value 18 above in row 2 and column 3 has a cell address of [2,3]

10	**15**	**15**	**20**
12	15	18	25
15	15	10	10

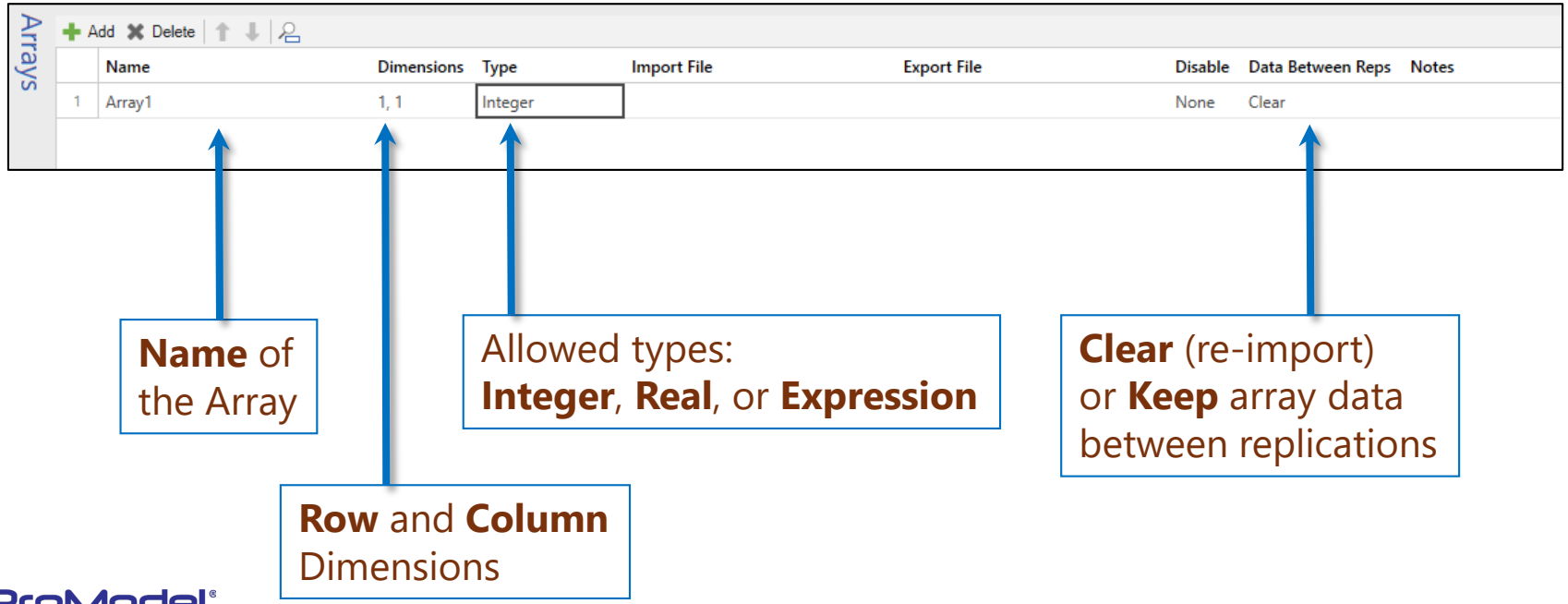
Cell [1,1]	**Cell [1,2]**	**Cell [1,3]**	**Cell [1,4]**
Cell [2,1]	Cell [2,2]	Cell [2,3]	Cell [2,4]
Cell [3,1]	Cell [3,2]	Cell [3,3]	Cell [3,4]

Note: Arrays are not available in the Standard version of PCS; Arrays are only available in PCS PRO.

Arrays



- Name and define in the Arrays Tab



FINISHED

- Thanks for attending this PCS Refresher simulation course! We hope it was helpful.
- An online, self-paced, step-by-step PCS training course is also available. For more information, contact the ProModel Sales Director that works with your company.
- Remember, help is only an email or phone call away.
- Good luck and happy modeling!

Technical Support
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