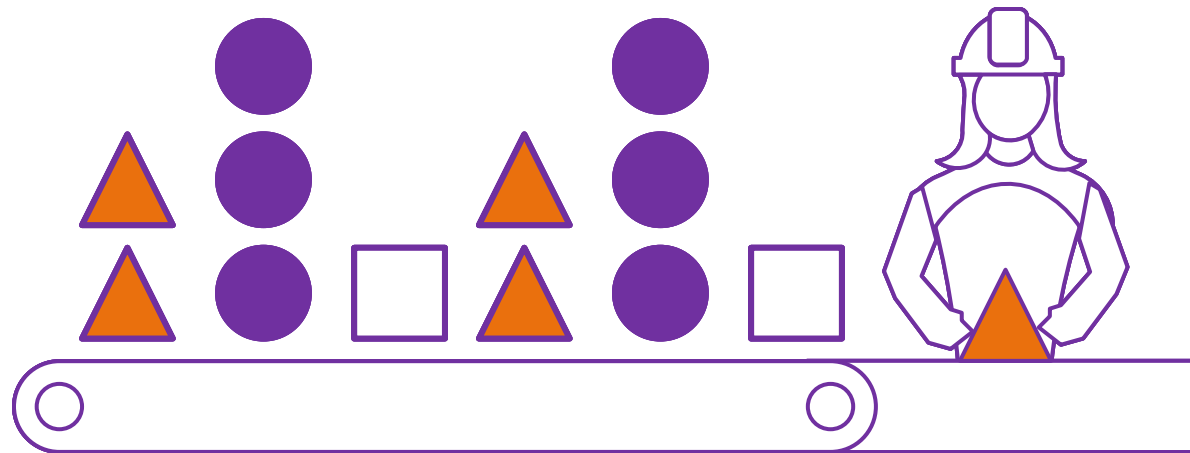


Mix Manufacturing VSM

Learn how to use eVSM for discrete manufacturing applications, allowing you to analyze capacity, lead time, and cost.



Course version: 051

Date Published: 11 January 2022

How to Use this File

This file contains the reading materials and the exercise pages from the course (title on previous page). While the course can only be taken on a computer, this booklet can be useful for note taking and later for refresher training.

This booklet is designed for on-screen and print use. For on-screen use, we recommend Acrobat Reader with the page display set to "Single Page View".

For hardcopy use, print the file on 8.5x11 or A4, and bind along the long edge.

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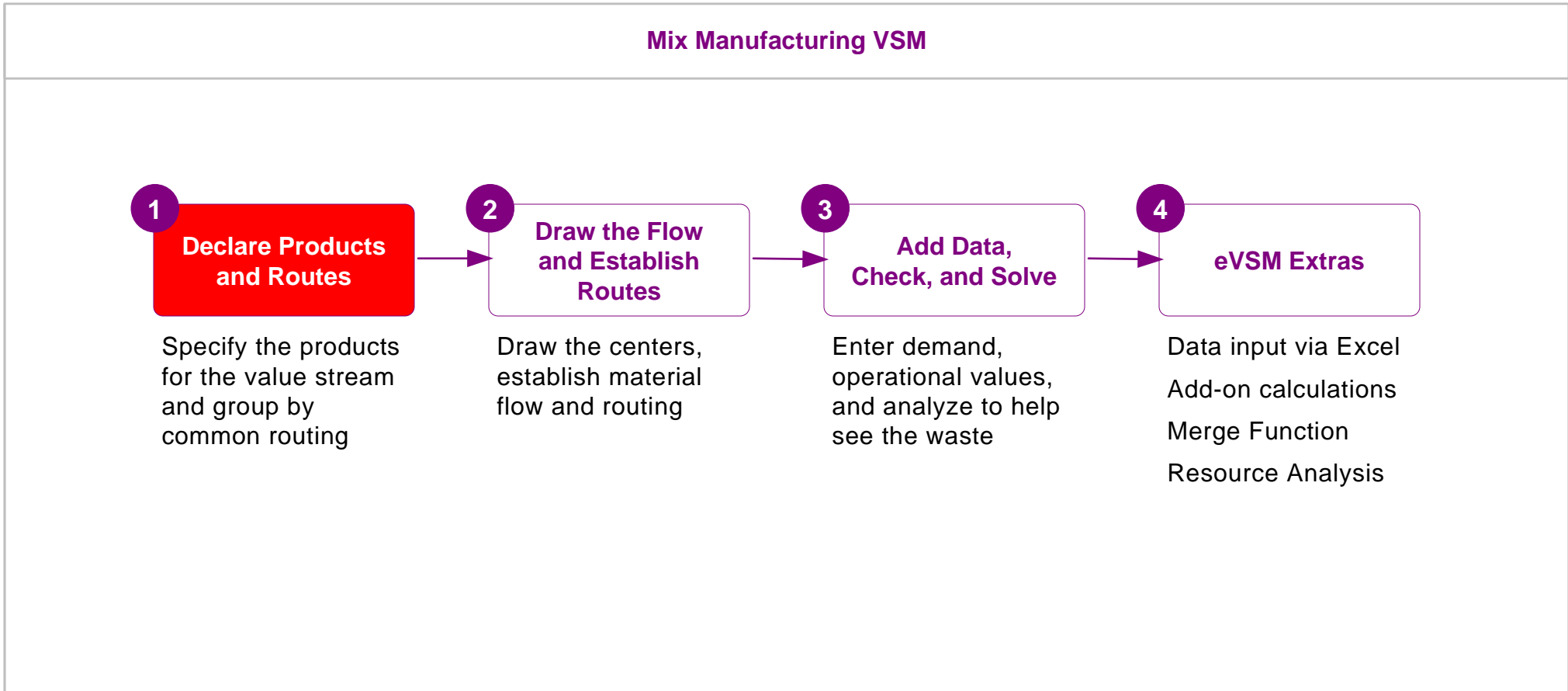
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Declare Products and Route Sets

The Mix Manufacturing VSM application focuses on plant value stream mapping for mixed model manufacturing of discrete parts and assemblies.

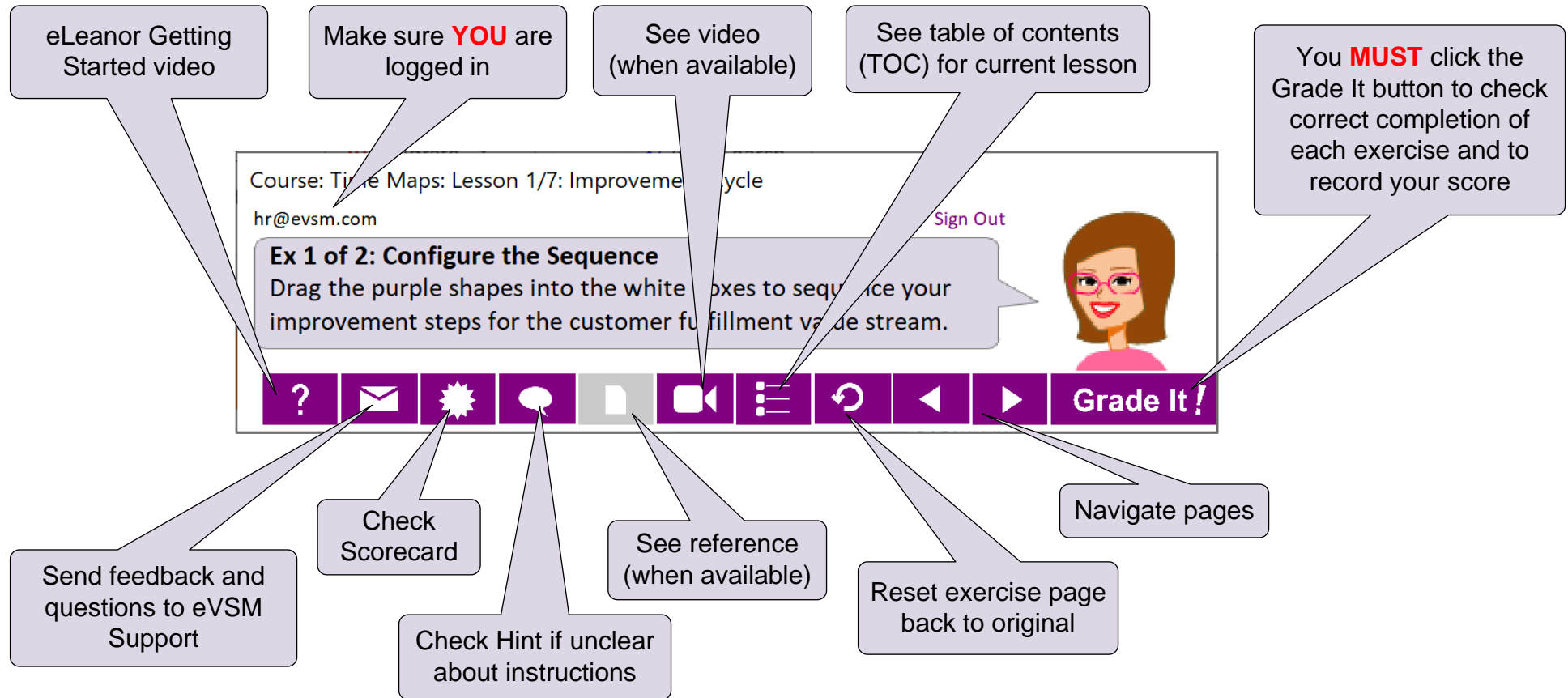
This lesson introduces the mapping process and covers the first step which is to specify the products in the value stream and to group them into unique route sets.



NOTE: You must have eVSM v11.62 or later to run this course. If you have an older version, please contact support@evsm.com for information on how to upgrade.

Declare Products and Route Sets

Working with the eLearner Control Panel



Important Notes

1. Make sure you have a good eLearner environment: large screen PC, 1280x720 resolution minimum, physical mouse with scroll wheel
2. When you complete an exercise, you **MUST** click the "Grade It" button
3. You **WILL** lose points if you get an exercise wrong the first time
4. If you are stuck on an exercise, check the Hint. If that does not help, go back and review the preceding Readme pages. If you are still unsure, click the Feedback button in the eLearner panel and ask your question.

Mix Manufacturing VSM Analysis

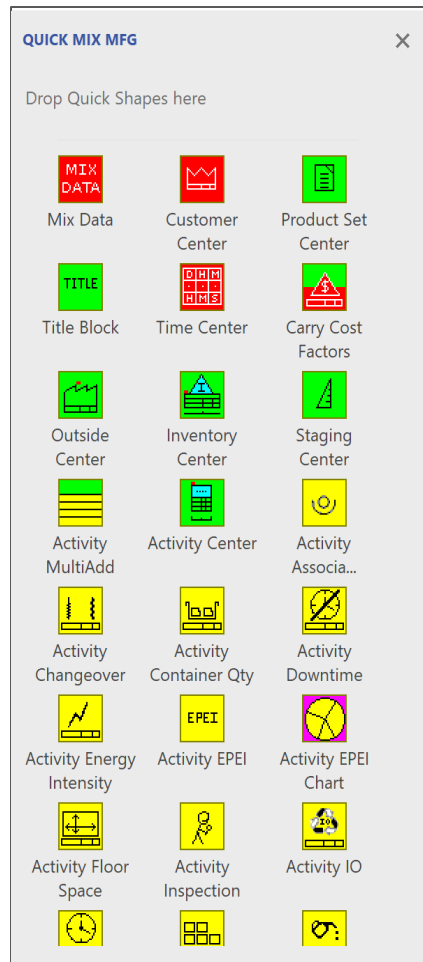
Mix Manufacturing VSM is part of the eVSM Mix edition and provides the tools needed to value stream map and improve mixed model production environments for discrete parts and assemblies. It supports all of the concepts and analyses shown below.



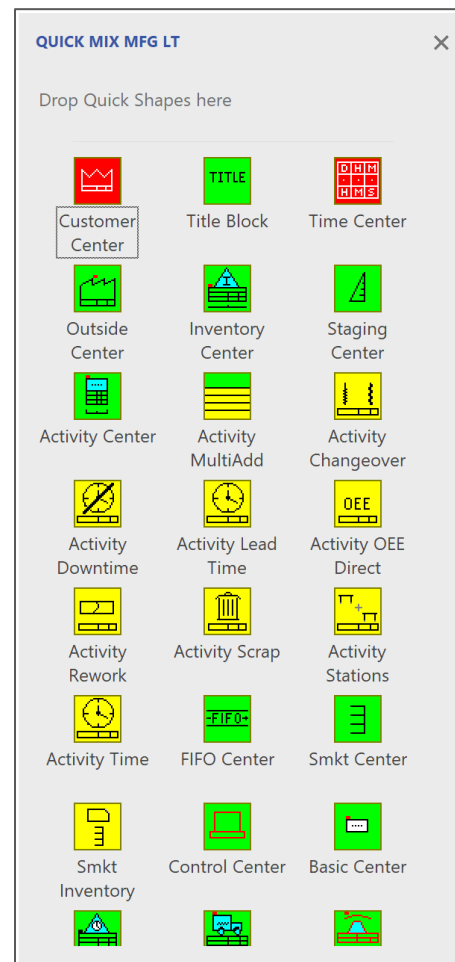
Note that eVSM has a separate stencil (Quick Processing) to support capture of plant processing maps for food and chemicals. This is not covered in this Course.

Mix Manufacturing VSM Application Stencils

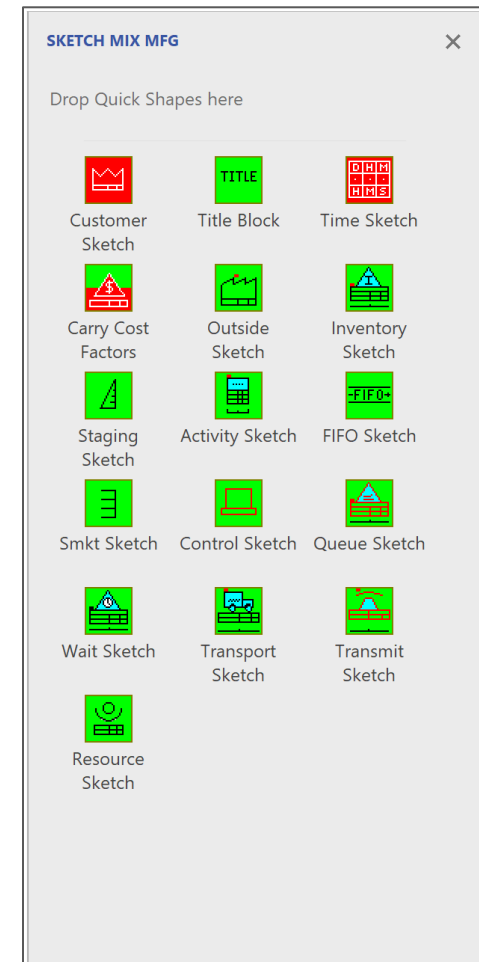
The application is accessed through three stencils. Each stencil is an instance of the same product. Icons may be interchanged between the stencils.



This is the main stencil and contains all icons for this application

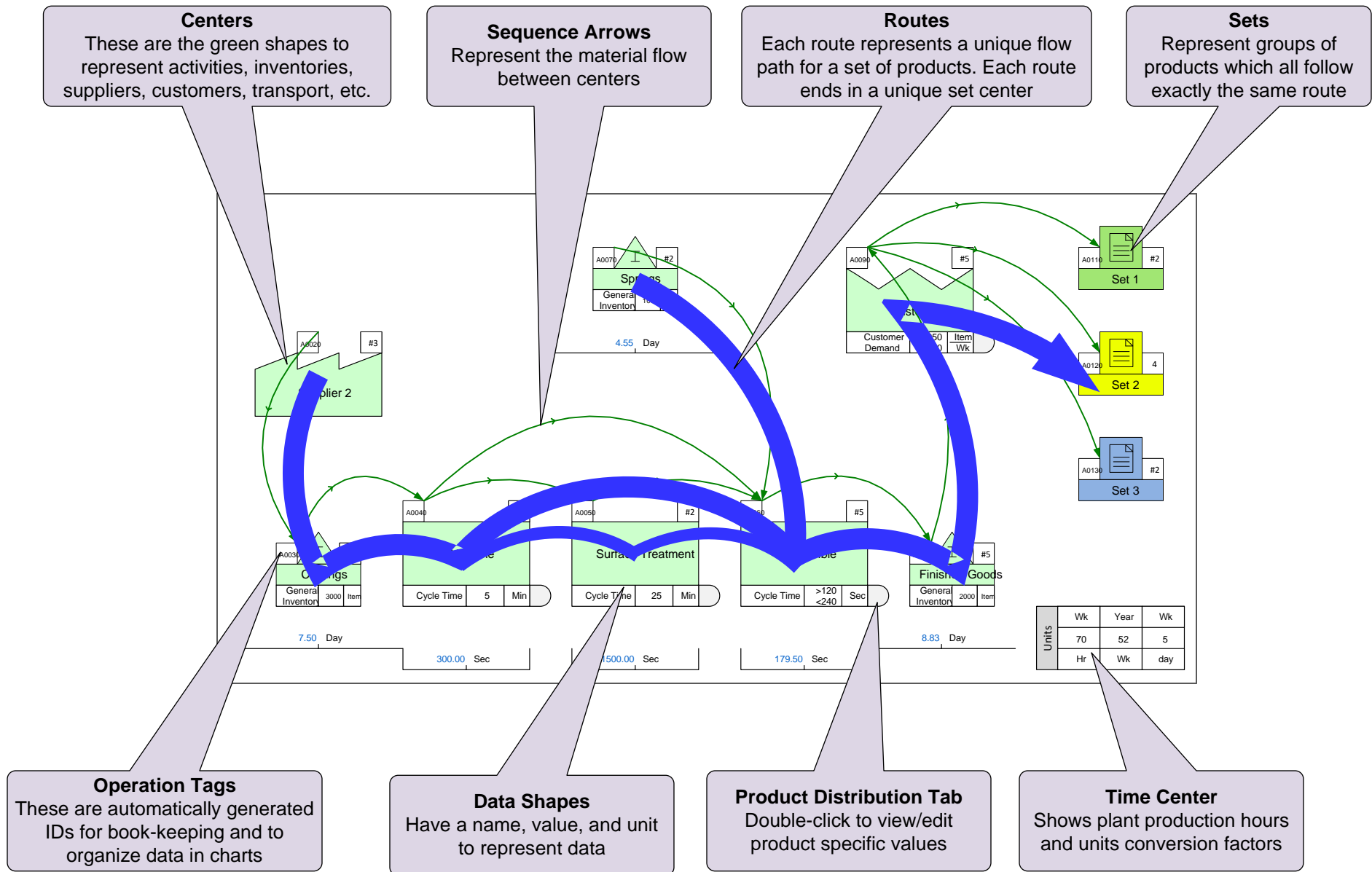


This is a subset of the main stencil. Useful for new users and for quicker access to the icons used most frequently



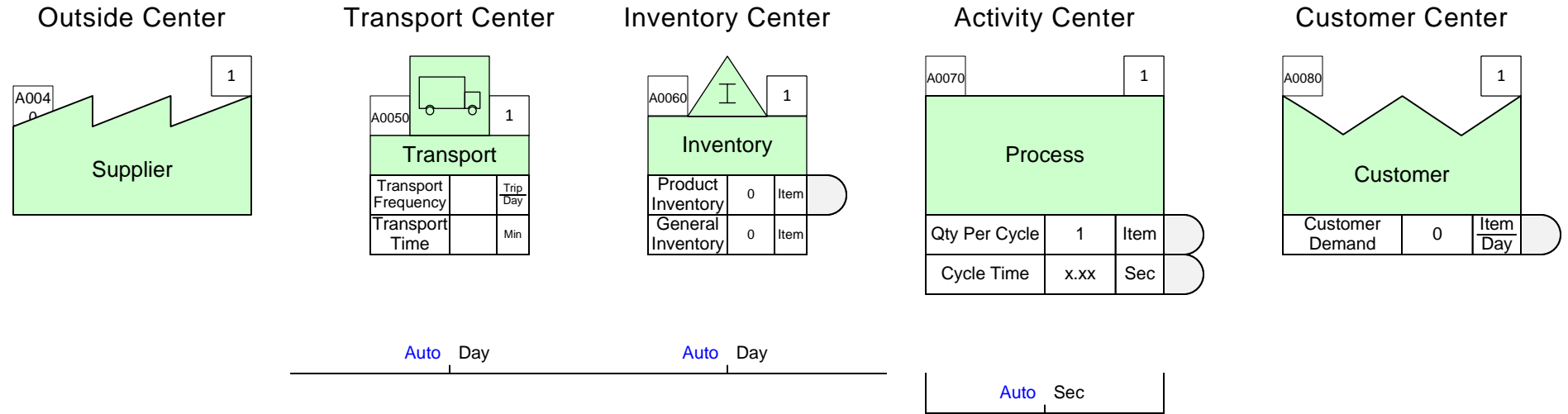
The sketch stencils contains only the shapes required to create a flowchart of the value stream. Very useful for capturing wall maps. The sketch shapes have a right-mouse click command to add data shapes if/when data needs to be added to the map

First some Essential Terminology...

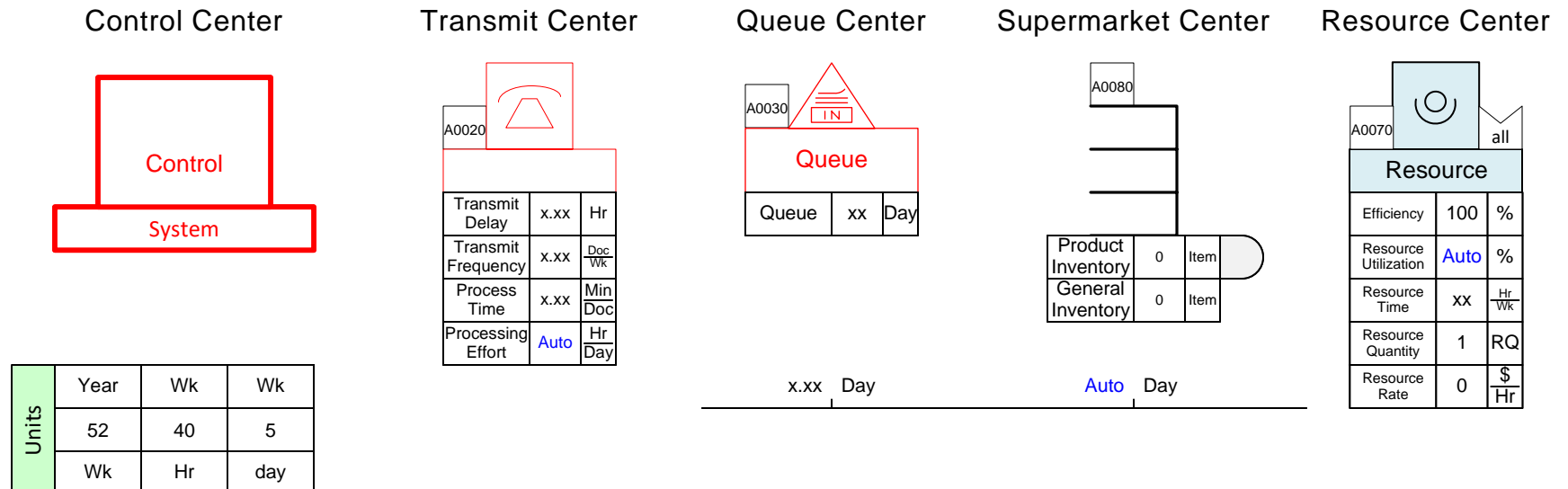


Mix Manufacturing VSM Main Centers

Material Flow

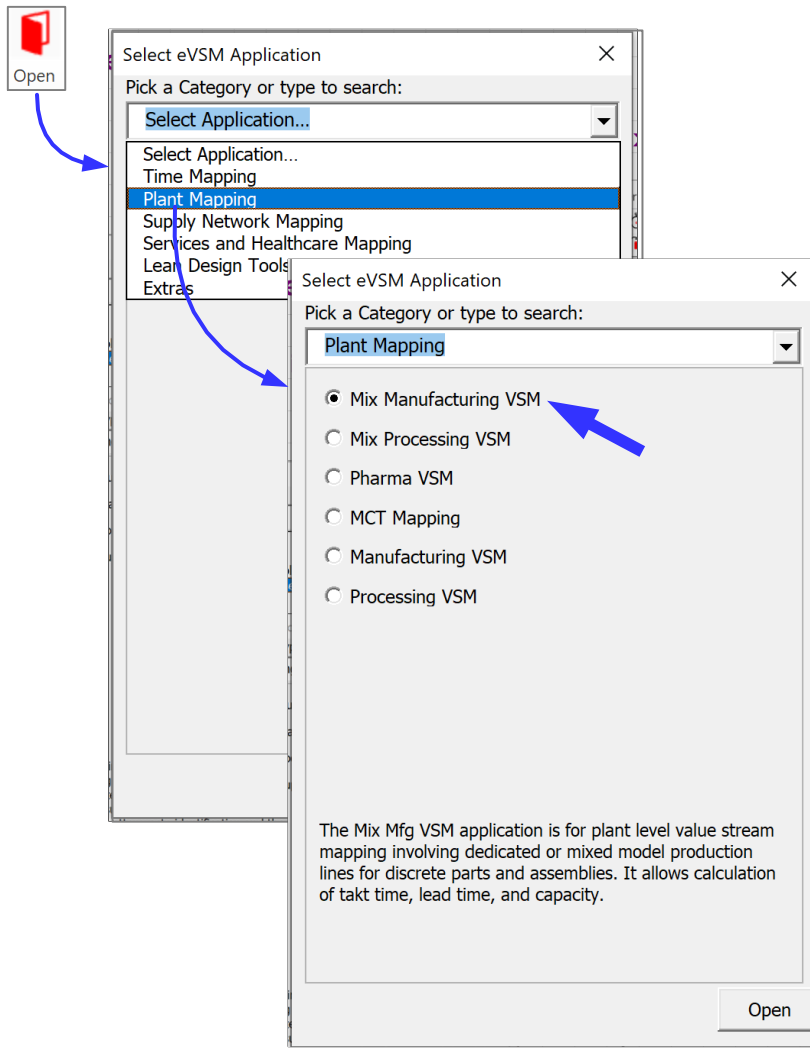


Information Flow

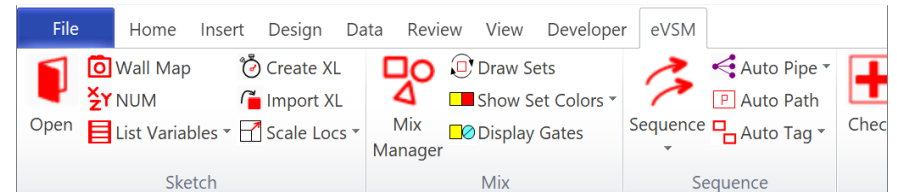


Start eVSM and Open the Mix Stencils

Opening the Mix Manufacturing VSM Stencils



Quick Mix Toolbar Functions



The Mix toolbar functions are only available when Mix stencils are open.

Note: eVSM Mix and eVSM Standard are two different editions of eVSM. eVSM Standard is a sub-set of eVSM Mix. The Mix functionality is only in the eVSM Mix edition.

The free 30-Day eVSM trial includes eVSM Mix.

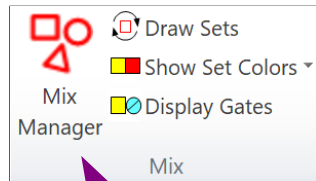
Q. What does a “Set” in eVSM Mix mean?

- ☐ All products which have similar cycle times
- ☐ All products which go through exactly the same sequence of steps
- ☐ All products which are pulled by the customer through similar steps downstream
- ☐ All products which get packaged together

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Define Products and Route Sets

The Mix Manager form shows the current products and sets. New products and sets can be added, and existing ones edited.



Open Mix
Manager form

Mix Manager - Define Products and Sets

Products:						
ID	Name	Set	Can Merge?	Must Merge?	Is Merged?	Description
P5	Product 5	S1	Y	N	N	
P6	Product 6	S1	Y	N	N	
P1	Product 1	S2	Y	N	N	
P4	Product 4	S2	Y	N	N	
P2	Product 2	S3	Y	N	N	
P3	Product 3	S3	Y	N	N	

Sets:			
ID	Name	Description	Tag
S1	Set 1		
S2	Set 2		
S3	Set 3		

Add/Edit/Delete
Products and Sets

Import Products and Sets
through the Excel product
matrix template

What are some of the functions of the Mix Manager Products and Sets dialog? Select ALL that are true.

- ☐ It shows all the products for the current page
- ☐ It allows adding/removing Products from Sets
- ☐ It shows the customer demand
- ☐ It allows importing of Products, Sets, and Centers from Excel

Mix Manager - Define Products and Sets

Products:						
ID	Name	Set	Can Merge?	Must Merge?	Is Merged?	Description
P5	Product 5	S1	Y	N	N	
P6	Product 6	S1	Y	N	N	
P1	Product 1	S2	Y	N	N	
P4	Product 4	S2	Y	N	N	
P2	Product 2	S3	Y	N	N	
P3	Product 3	S3	Y	N	N	

Sets:			
ID	Name	Description	Tag
S1	Set 1		
S2	Set 2		
S3	Set 3		

The Product Matrix

eVSM Mix includes a product matrix template (in Excel format) which provides a quick way to enter a large number of products and group them into route Sets. Instructions for using the template are below and also included in the front worksheet of the automatically created Excel file.

When the matrix is imported into Visio, the software will establish the Products and route Sets for the map. It will also draw the process centers below the drawing page and the Set centers to the right of the drawing page.

The screenshot shows an Excel spreadsheet titled 'Product Matrix' with columns A through L. The data is organized into rows for sets and products. Callouts provide instructions on how to use the template:

- Assign a short ID in column C and a longer product name in column D for each product.** (Points to columns C and D)
- Enter name of process in row 1 and select the process type in row 2.** (Points to row 1, columns F through J)
- Important: You must select the process Type from the pull-down list in row 2.** (Points to row 2, column J)
- Click the "Auto Name" button to do the same, but also to automatically apply a default ID and name to each set.** (Points to the 'Auto Name' button in row 2, column B)
- Click the "Sort Product" button to re-arrange the order of the rows so that the like products are together.** (Points to the 'Sort Products' button in row 2, column D)
- Enter an "X" if the product goes through the process.** (Points to the 'X' in row 3, column F)

	A	B	C	D	F	G	H	I	J	K	L
1	Set ID	Set Name	Product ID	Product Name	Stamp	Drill	Assemble	Thread	Customer		
2	Auto Name		Sort Products		Activity	Activity	Activity	Activity	Customer	Select..	Select..
3	S1	Set 1	1	Product 1	X	X	X	X	X		
4	S1	Set 1	5	Product 5	X	X	X	X	X		
5	S2	Set 2	2	Product 2			X	X	X		
6	S3	Set 3	3	Product 3			X		X		
7	S3	Set 3	4	Product 4	X		X		X		
8											

When the matrix is later imported into Visio, the software will establish the Products and route Sets for the map. It will also draw the process centers below the drawing page and the Set centers to the right of the drawing page.

Note: The purpose of the product matrix is to enter products, and sort them into route sets. The matrix is intended for one-time use. You can later add additional products (and sets) directly into the Mix Manager, or by importing a second matrix.

What are the uses of the eVSM Product Matrix? Select All of the following that are true.

- ☐ Provides an easy way to input products for the value stream
- ☐ Imports product specific customer demand to the map
- ☐ Allow sorting to identify low volume products
- ☐ Groups products together which follow exactly the same route
- ☐ Automatically draws centers on the map on Import

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Steps to create the Product Matrix



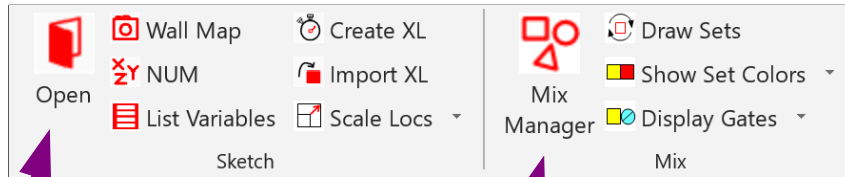
Watch the Movie

Click the Video button in the eLearner panel to start the video

Reference Notes

- 1 Select the map type with  **Open**
- 2 Initiate the map by dropping the Time Center from the Quick stencil on the page.
- 3 Open the  **Mix Manager** form. Then click “Create Template” to open the product matrix template in Excel.
- 4 Fill out the Excel template (for help, see the “Instructions” worksheet in Excel).
- 5 Sort products into Route Sets and name the Sets.

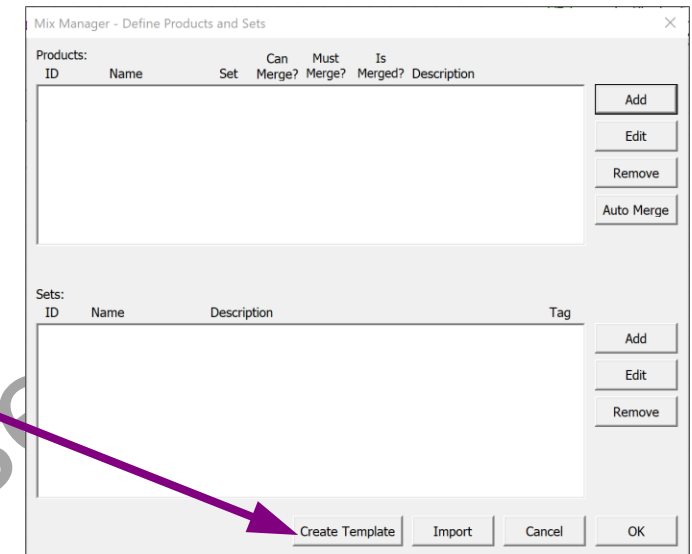
Complete all 6 steps on this page and then click Grade It!



1
Open the
“Mix Manufacturing VSM”
stencils

2
Open the Mix
Manager form

3
Create Template.
This will open an
Excel template file



4
Populate the Excel
template as shown here

	A	B	C	D	F	G	H	I	J
1	Set ID	Set Name	Product ID	Product Name	Sheet Metal	Stamp	Drill	Assemble	ABC Corp
2	Auto Name			Sort Products	Inventory	Activity	Activity	Activity	Customer
3			P1	Product 1	X	X	X	X	X
4			P2	Product 2	X	X		X	X
5			P3	Product 3	X	X		X	X
6			P4	Product 4	X	X	X	X	X
7			P5	Product 5	X	X	X	X	X

Row 2 is important

5
Click the Auto Name
button.

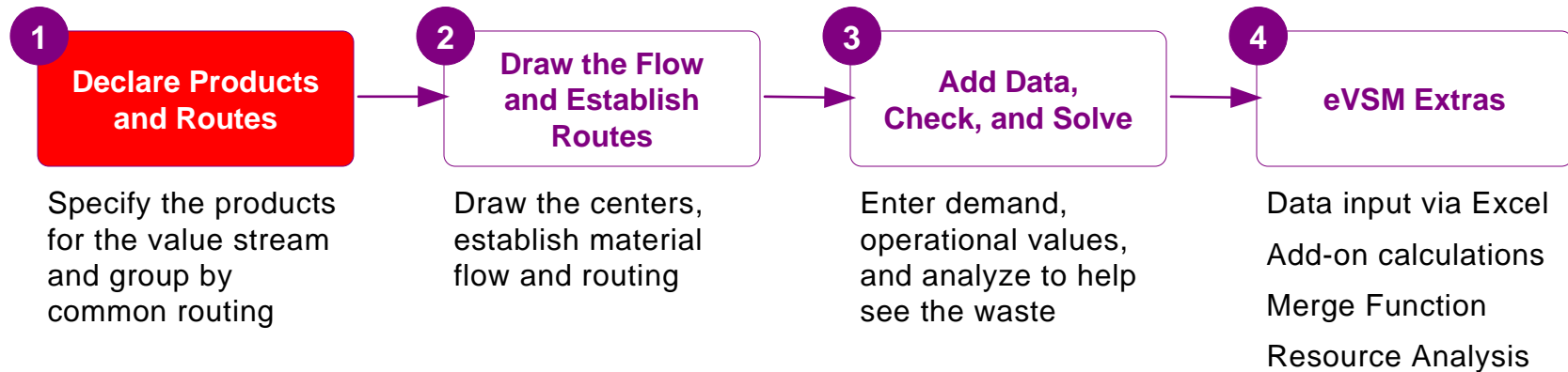
	A	B	C	D	F	G	H	I	J
1	Set ID	Set Name	Product ID	Product Name	Sheet Metal	Stamp	Drill	Assemble	ABC Corp
2	Auto Name			Sort Products	Inventory	Activity	Activity	Activity	Customer
3	S1	Set 1	P1	Product 1	X	X	X	X	X
4	S1	Set 1	P4	Product 4	X	X	X	X	X
5	S1	Set 1	P5	Product 5	X	X	X	X	X
6	S2	Set 2	P2	Product 2	X	X		X	X
7	S2	Set 2	P3	Product 3	X	X		X	X

Notice how the rows got
sorted and colored, and
how the sets got named.

6
Close the Mix Manager form
and click Grade It.

- You learned:**
- How to declare products for the value stream
 - How to represent process centers in the product matrix
 - How to sort the products into route Sets and name the Sets

Summary:



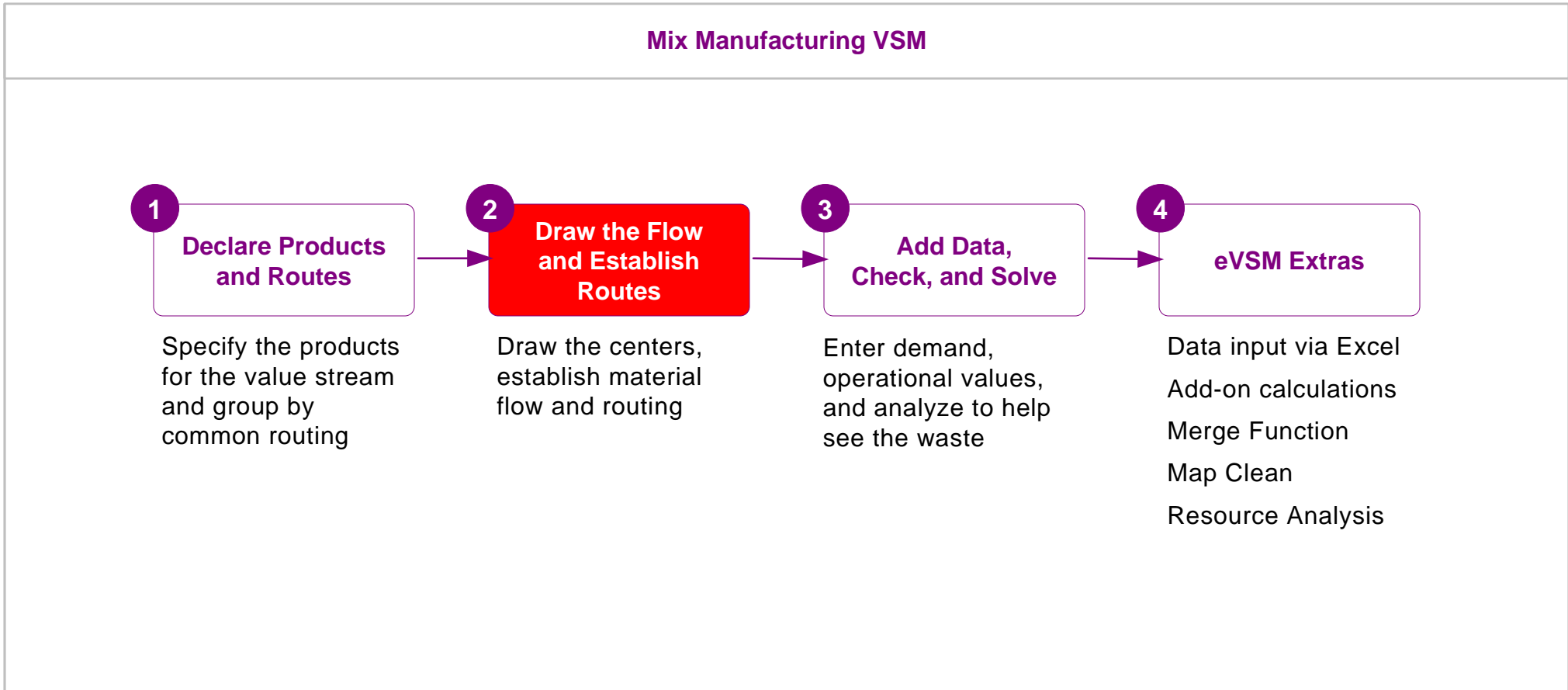
What's next:

You will learn how to import the product matrix on to your drawing page, arrange the flow, and establish the routes.

Draw the Flow and Establish Routes

In the previous (first) lesson of this course, you learnt how to specify the products for the value stream in Excel and how to organize them into Set groups of similar routes.

In this lesson, you will learn to import the product matrix into Visio, draw the flow, and establish the routes.



Draw the Flow and Establish Routes




Steps to Draw the Flow and Establish Routes




Watch the Movie

Click the Video button in the eLearner panel to start the video

Reference Notes

1. Click “Mix Manager > Import” to import the products/sets from Excel. This will populate the Mix Manager, draw the center at the bottom of the page, and Set centers to the right.
2. Arrange centers on the page and add any missing centers from the Quick Mix Mfg stencils.
3. Indicate all material flow with  **Sequence** arrows.
4. Click  **Display Gates** to make the gates visible. By default all gates will be open (square).
5. Change the gate status with the “Set Gate Open” command in the right-mouse menu of the color shape indicators (square = open gate, circle = closed gate).
6. Click  **Display Gates** to refresh the Set gates view.

Import the Product Matrix and Draw Sets

1. Initiate the current page for a Mix Manufacturing VSM map then create the product matrix shown here. 
2. Sort the products into route sets with “Auto Name” and then **Import** the matrix.
3. Move the process centers onto the page in the space below then submit your work with the **Grade It!** button in the eLearner panel.

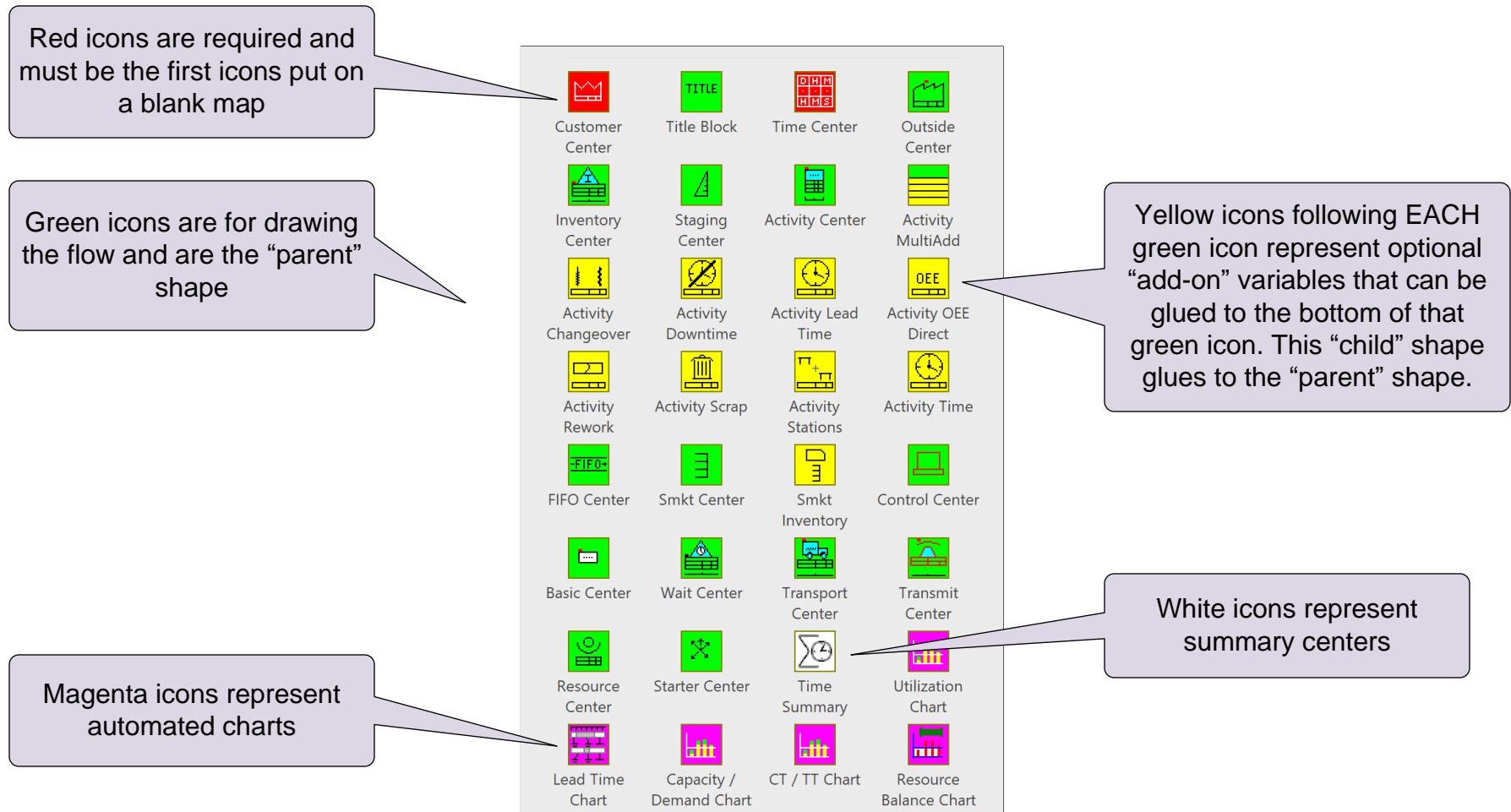
If you mess up, click the  Reset button and start again.

	A	B	C	D	F	G	H	I	J	K
1	Set ID	Set Name	Product ID	Product Name	Supplier	Stamp	Drill	Assemble	FG	ABC Corp
2	Auto Name			Sort Products	Supplier	Activity	Activity	Activity	Inventory	Customer
3			P1	Product 1	X	X	X	X	X	X
4			P2	Product 2	X	X	X	X	X	X
5			P3	Product 3	X	X		X	X	X
6			P4	Product 4	X	X		X	X	X
7			P5	Product 5	X	X	X	X	X	X

	A	B	C	D	F	G	H	I	J	K
1	Set ID	Set Name	Product ID	Product Name	Supplier	Stamp	Drill	Assemble	FG	ABC Corp
2	Auto Name			Sort Products	Supplier	Activity	Activity	Activity	Inventory	Customer
3	S1	Set 1	P1	Product 1	X	X	X	X	X	X
4	S1	Set 1	P2	Product 2	X	X	X	X	X	X
5	S1	Set 1	P5	Product 5	X	X	X	X	X	X
6	S2	Set 2	P3	Product 3	X	X		X	X	X
7	S2	Set 2	P4	Product 4	X	X		X	X	X

Icon Color Codes in Quick Stencils

The Quick stencils on the left contain macro shapes with pre-built variable names, units, equations, and default values. The icon color coding works as shown here.



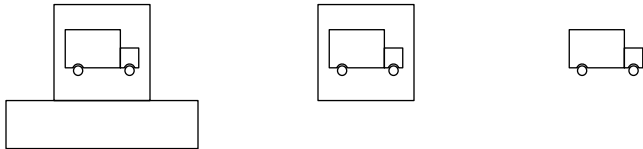
How are the eVSM Base Stencils Organized?

The eVSM Base Stencils are on the right of the screen and contain individual eVSM drawing shapes. The Quick Stencils on the left of the screen are actually macro combinations of base shapes.

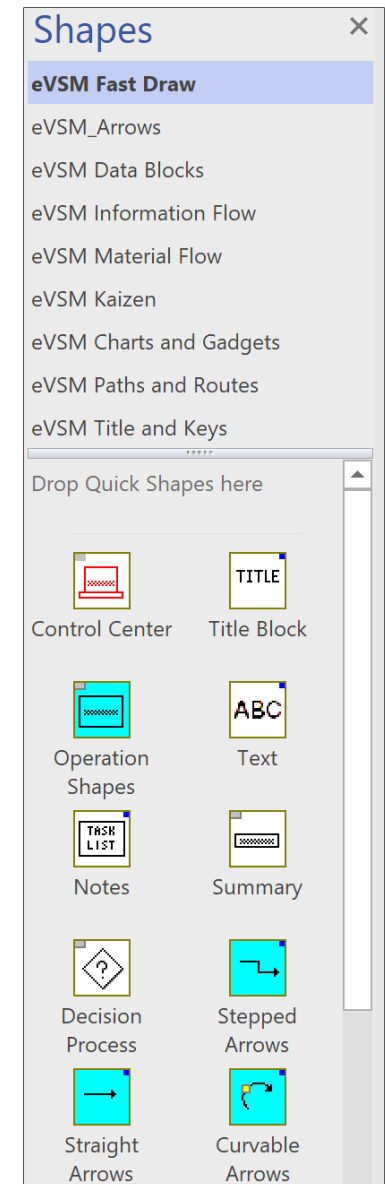
Base stencils have blue and white icons. The blue icons are actually FAMILIES of shapes. To access members of the family, you:

- Drag out the icon
- Right-click the shape on the page
- Use “Change Shape” to select a different member

There are also right-click options to change the framing around the shape.

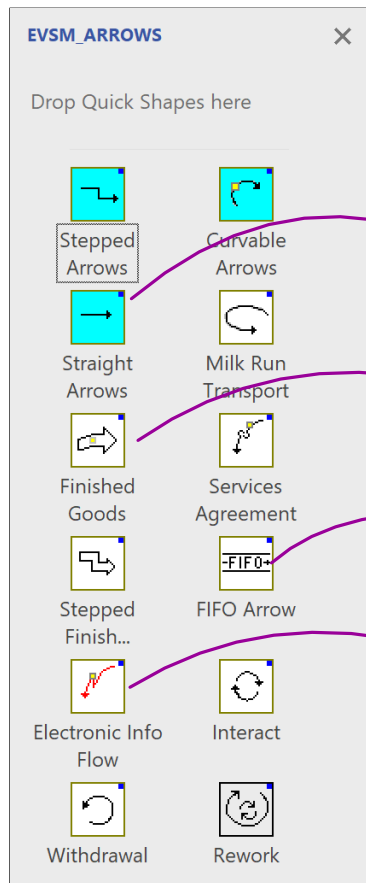


Base stencils are organized by categories like eVSM Arrows, eVSM Data, etc.

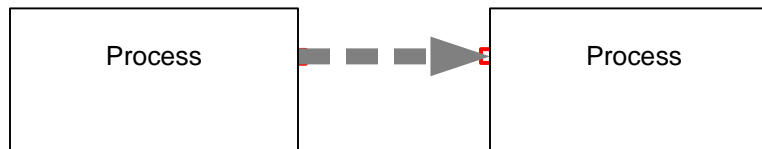
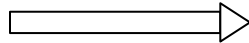


Arrows on Value Stream Maps

You remember that the arrows between the VSM shapes have specific meaning on a map. For example, push arrow, information arrow, etc. You review the different arrow types before you add the arrows to the captured model.



The blue stacks of arrows found in the eVSM Arrows stencil have a variety of arrows in the right-mouse menu after dragging out the shape. The "Straight Arrows" stack below has been dragged out and changed to Information and Push arrows.



Make sure to glue each end of the arrow (by making sure a glue connection appears) to the center it is associated with so that if the center is moved, the arrow will move with it.

Sequence and Pipe Arrows

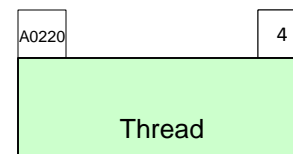
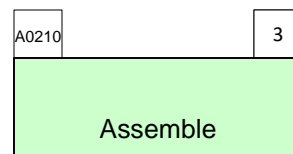
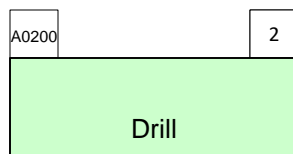
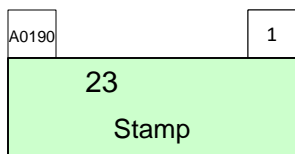
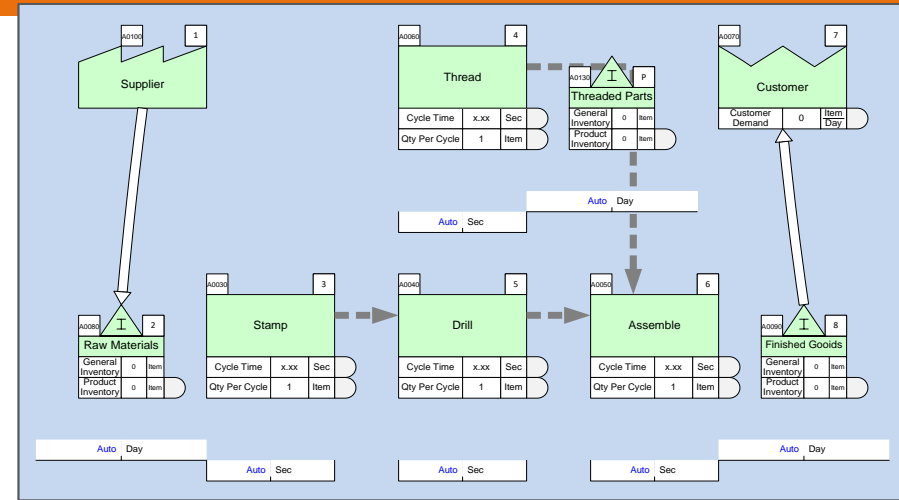
These are not included in the above stencil. Sequence arrows are used to indicate material flow and are automatically generated through buttons in the toolbar. Similarly, Pipe arrows are used to transfer other data (cost, resources, time) and are also automatically created with buttons in the toolbar.

Arrange the centers as shown in the blue thumbnail image.

A product matrix was just imported to this page. This added new centers below the bottom of this page.

Arrange the centers as laid out in the thumbnail. Any missing centers can be added from the Quick Mix Mfg stencil. The arrows are available in the eVSM Arrows stencil on the right.

No need to enter any data or sequence arrows.



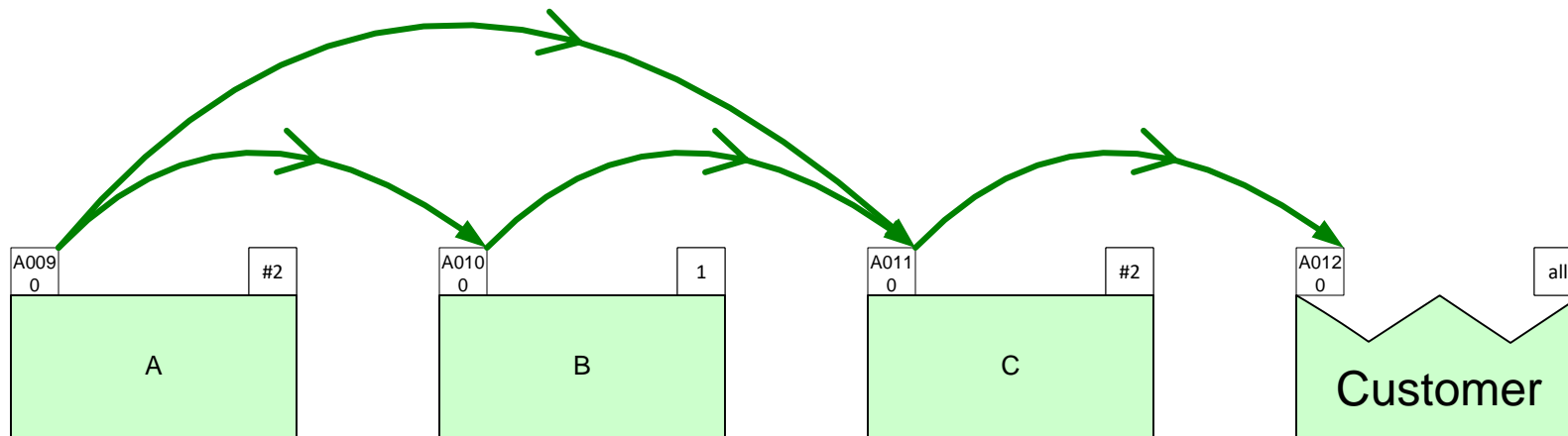
Specifying material flow sequence on the map

The need to specify material flow sequence using eVSM's Sequence arrows is mandatory. Sequence arrows are used to:

1. Calculate demand at any point working back from customer demand
2. Establish unique product routings
3. Label activities from upstream to downstream (useful for charting)

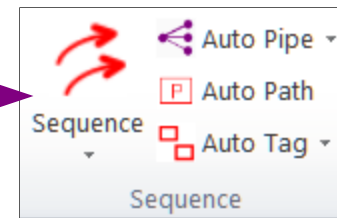
How do you specify material flow sequence ?

Lets say material is moving from stations A to B to C (diagram below). Some material is also moving directly from A directly to C. We would specify the sequence as shown by the green sequence arrows in the diagram. Note that arrows are directional.



How do you create the sequence arrows ?

Pick two or more stations in the correct sequence (holding down the shift key). Then click the "Sequence" button in the eVSM toolbar



Sequence the flow as shown in the thumbnail image

No need to enter data values. Zoom in to the thumbnail to check arrow directions.



A0030			1
Thread			
Qty Per Cycle	1	Item	
Cycle Time	x.xx	Sec	

Auto	Sec
------	-----

A0010			2
Stamp			
Qty Per Cycle	1	Item	
Cycle Time	x.xx	Sec	

Auto	25	Sec
------	----	-----

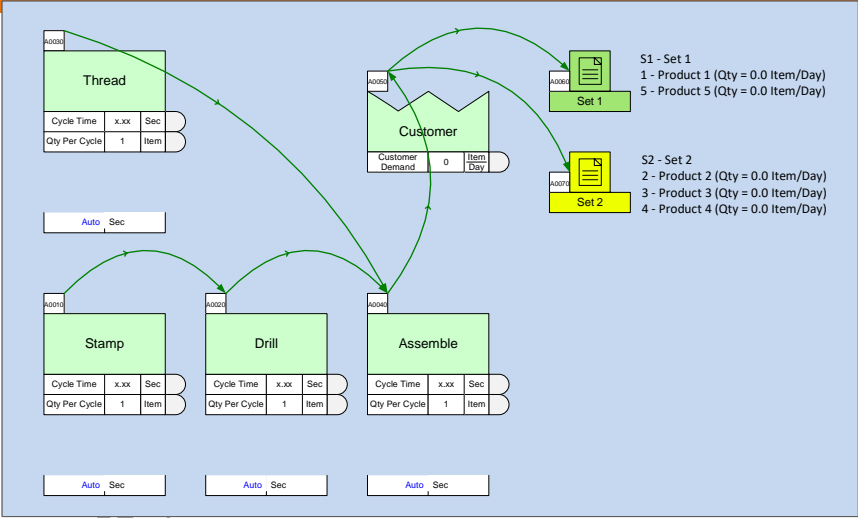
A0020			3
Drill			
Qty Per Cycle	1	Item	
Cycle Time	x.xx	Sec	

Auto	Sec
------	-----

A0050			5
Customer			
Customer Demand	0	Item Day	

A0040			4
Assemble			
Qty Per Cycle	1	Item	
Cycle Time	x.xx	Sec	

Auto	Sec
------	-----



A0070			7
Set 2			

Add Sequence arrows to show all three sequences

Sequence 1:

A > B > C > D > E

Sequence 2:

A > B > E

Sequence 3:

A > C > D > E



A0610			1
A			
Qty Per Cycle	1	Item	
Cycle Time	x.xx	Sec	

A0620			2
B			
Qty Per Cycle	1	Item	
Cycle Time	x.xx	Sec	

A0630			3
C			
Qty Per Cycle	1	Item	
Cycle Time	x.xx	Sec	

A0640			4
D			
Qty Per Cycle	1	Item	
Cycle Time	x.xx	Sec	

A0650			5
E			
Qty Per Cycle	1	Item	
Cycle Time	x.xx	Sec	

Auto

Sec

Auto

Sec

Auto

Sec

Auto





Sec

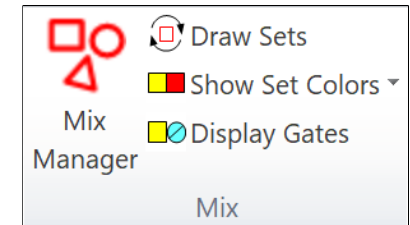
Auto

Sec

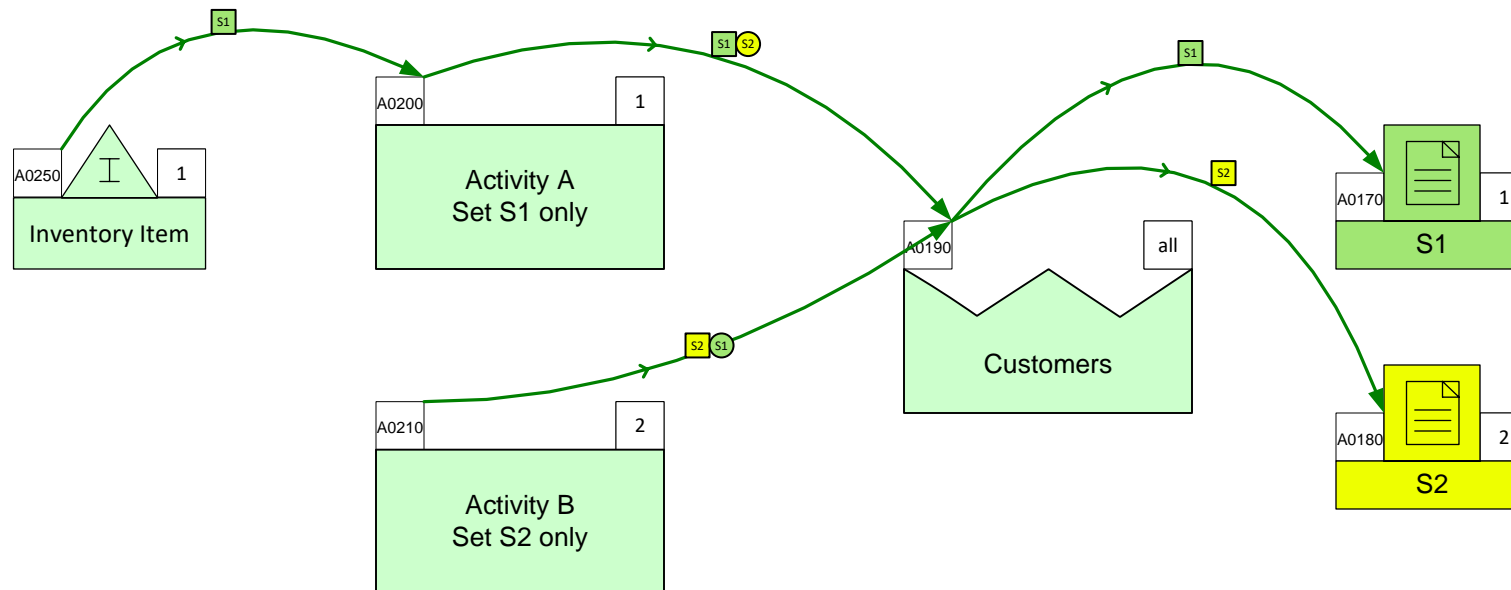
Using Set gates to establish Set Routes

A simple visual way to establish routes

1. Make sure sequence arrows are created to support each of the routes.
2. Click the  Display Gates button in the eVSM toolbar to show the gates (small squares and circles) on the sequence arrows. These Set Gates can be closed/opened with a right-mouse menu "Set Gate Open" command on gate indicators. Round indicators  represent a closed gates. Square indicators  represent open gate. The indicator color matches the Product Set centers.
3. Once you have adjusted the status of the gates, use the  Show Set Colors button to clearly show which product set goes through which sequence arrow.



Mix section of eVSM Toolbar



Note:

The gate status rolls to all upstream arrows and activities. In the above example S2 is closed after Activity A so it does not show upstream between the inventory and Activity A.

Routing Example Problem 1

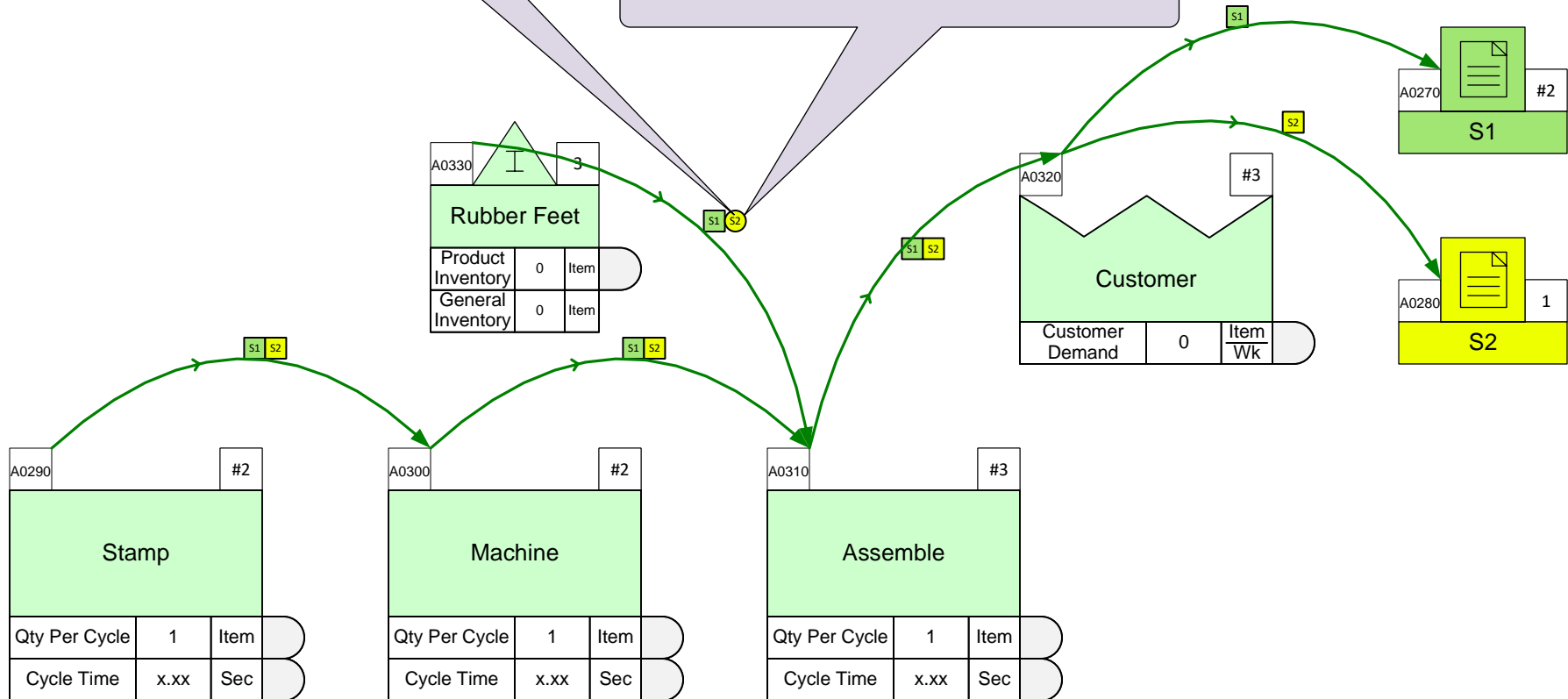
Products in set S1 need rubber feet. Products in set S2 do not.

Solution:

Close the set gate for S2 here

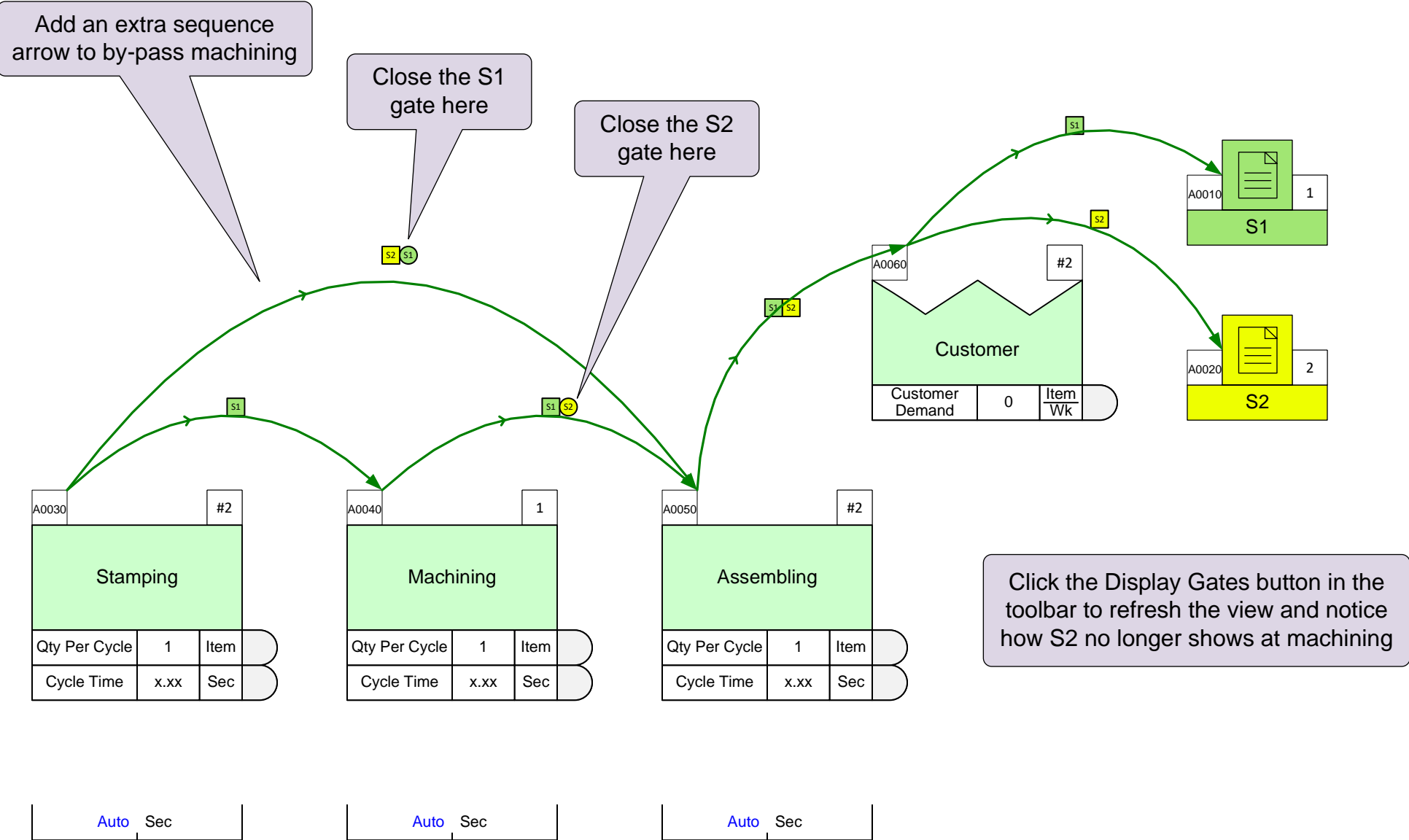
How?

Right-click on the S2 gate, switch off the "Set Gate Open" command. Then click "Display Gates" button in the toolbar to refresh the set color indicators

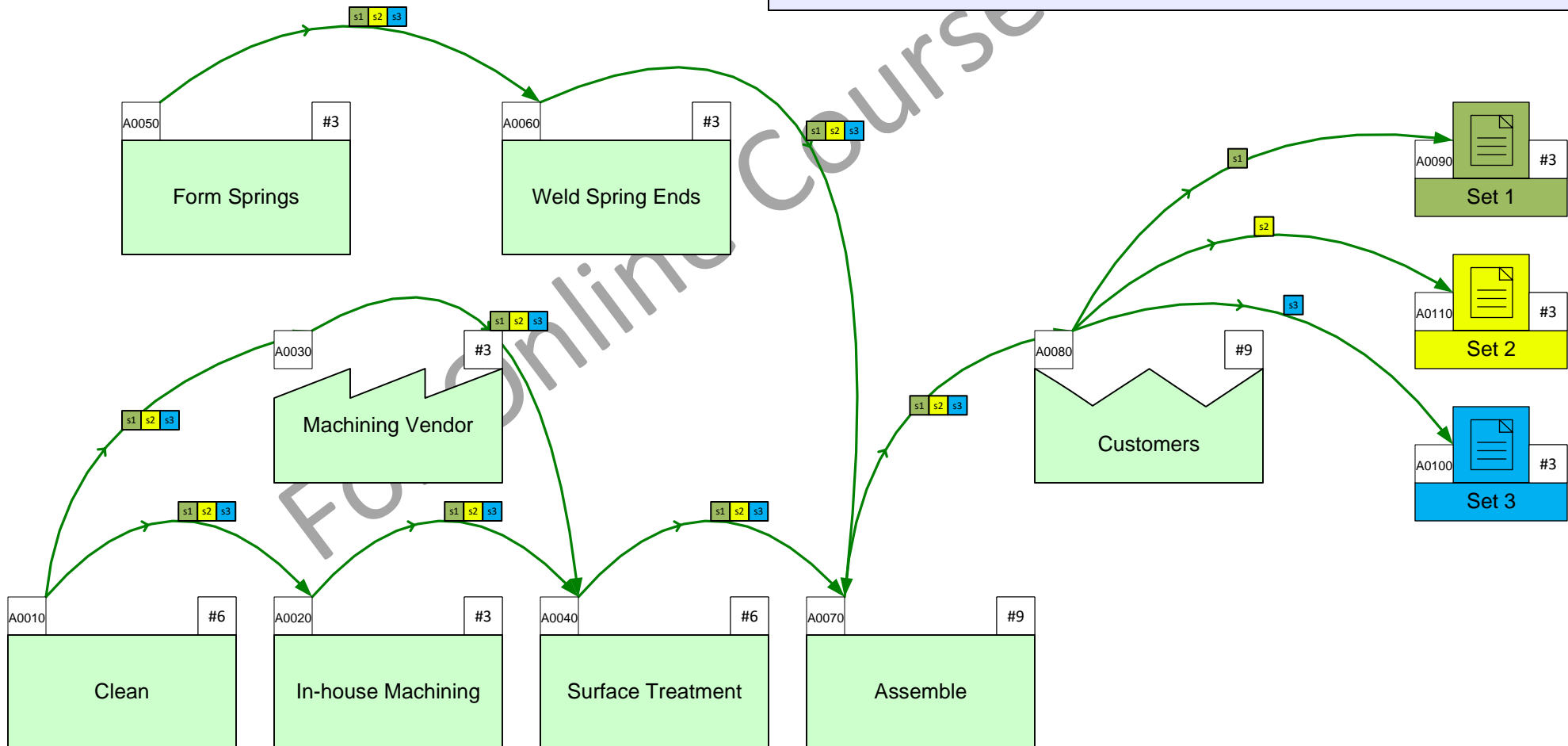
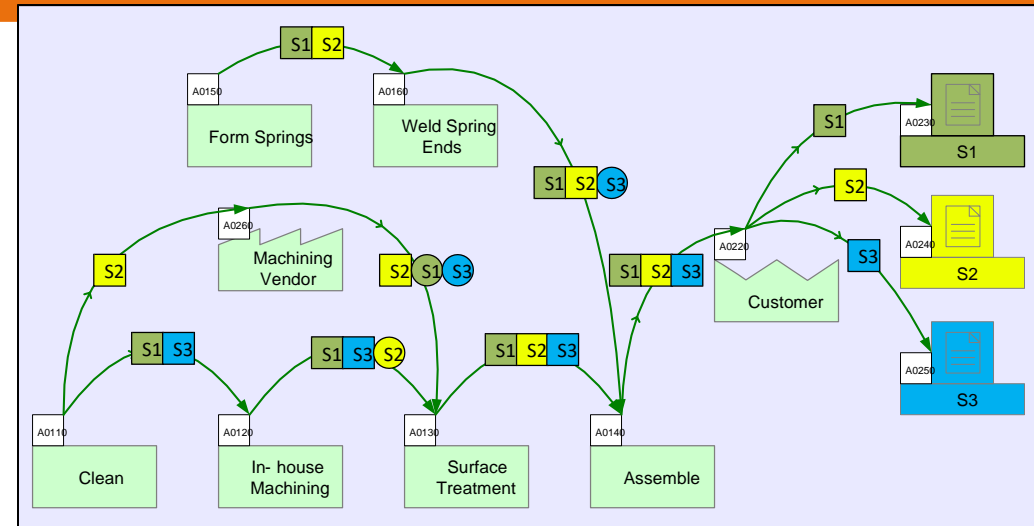


Routing Example 2

S1 requires machining, S2 does not.

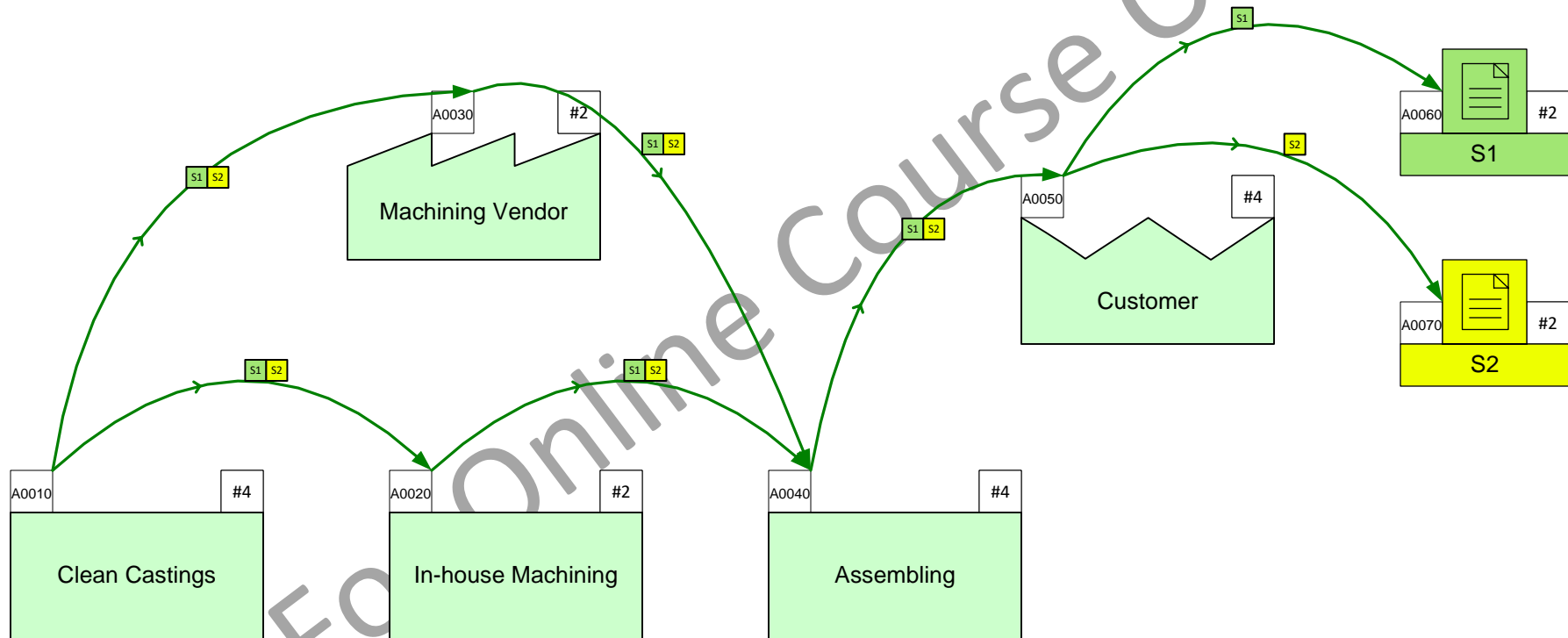


Adjust the Set gates in the map below to match the thumbnail image.



Adjust the Set Gates to meet the following requirement

S1 will be machined in-house, while S2 has to go through the machining vendor

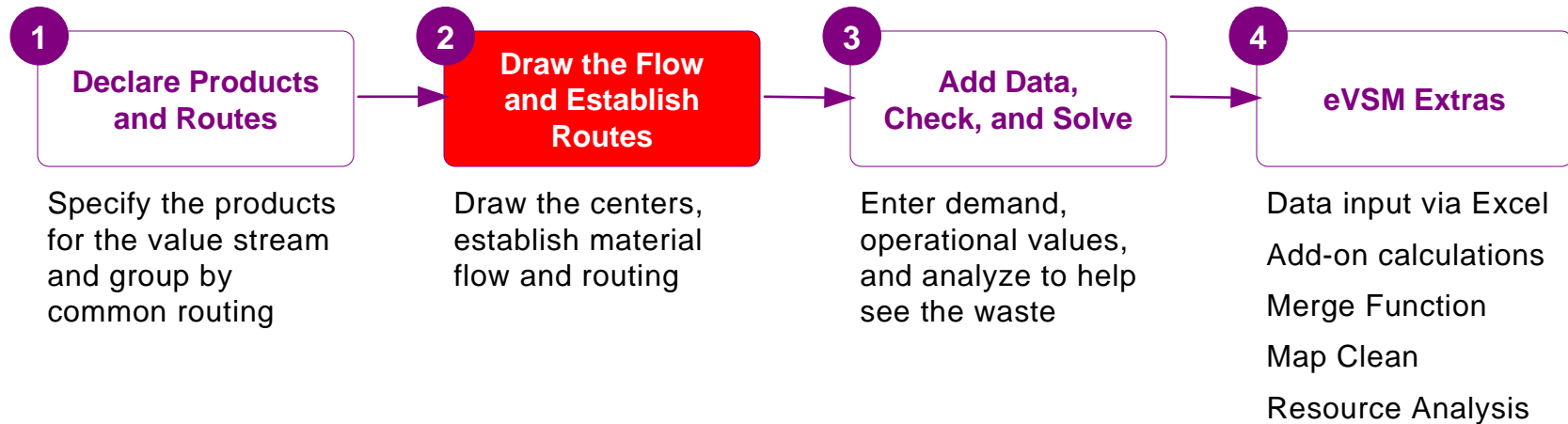


Units	Year	Wk	Wk
	52	40	5
	Wk	Hr	day

You learned:

- How to import products, route sets, and centers from an Excel template
- How to represent material flow with Sequence arrows
- How to establish routes on the map with Set Gates

Summary:



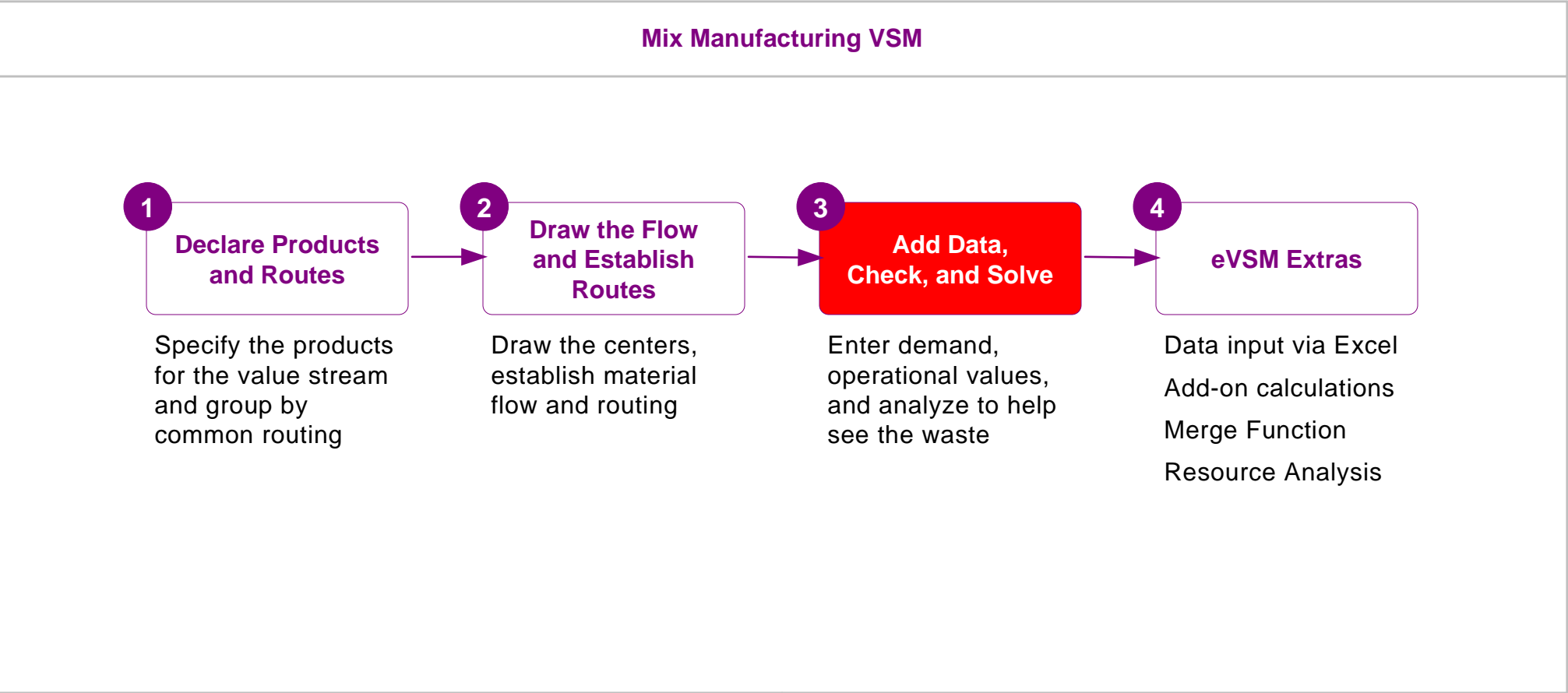
What's next:

You will see how to enter demand and operational data on the map, and how to set up the map for automatic calculations.




Add Data and Solve

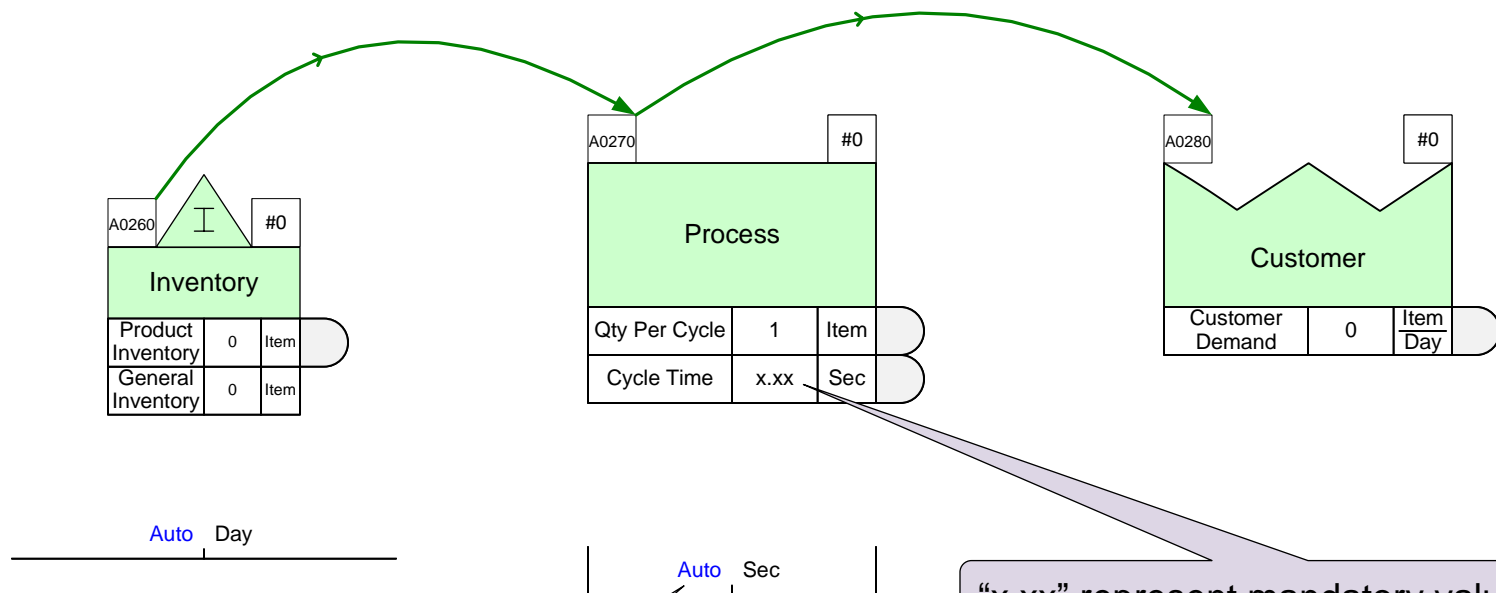
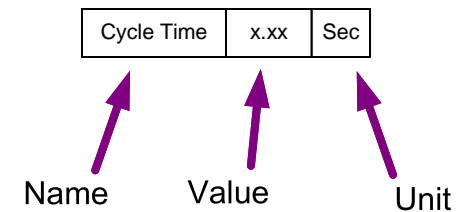
In the previous lessons you learnt how to declare products in Excel, how to import these into Visio, draw the flow, and set up the routes.

In this lesson, you will learn to enter data, check the map, and then solve to perform the automated calculations.



Working with Data on a Map

- Map data is stored in special data shapes. These data shapes consist of a name, value, and unit.
- To change any field, double-click and then follow the on-screen instructions.
- To move or delete a data shape, you must click on the value field.
- Data shapes contain data for the centers (inventory, activity, customer, etc.) they are glued to.
- The Views (accessed with the  Views button) provides a way to hide/show data shapes associated with each center.
- All data shapes, including hidden ones, can be accessed through the  List Variables button.
- eVSM comes with a long list of variable names and units. New names and units can be added through “Name and Unit Manager” form which is accessed with the  NUM button.

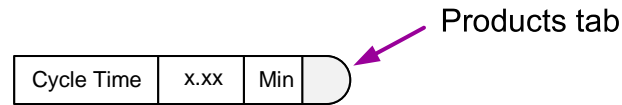


Blue values are automatically calculated by eVSM. Just leave these alone

“x.xx” represent mandatory values you must provide. eVSM cannot perform calculations without these

Entering Variable Values for Products

A “products tab” attached to the right side of a data shape means the variable can have product specific values.



Double-click the products tab to open the product specific values dialog.

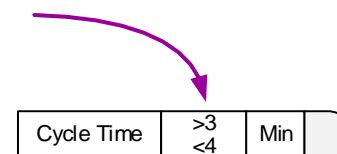
The dialog box is titled "Edit product-specific values" and has a close button (X) in the top right corner. It contains a table with the following structure:

Cycle Time	Value
Default	x.xx
1 - Product 1	
2 - Product 2	
3 - Product 3	
4 - Product 4	

The Default value (if entered) is used when product specific data is not available

The values must be entered in the same units as selected in the data shape

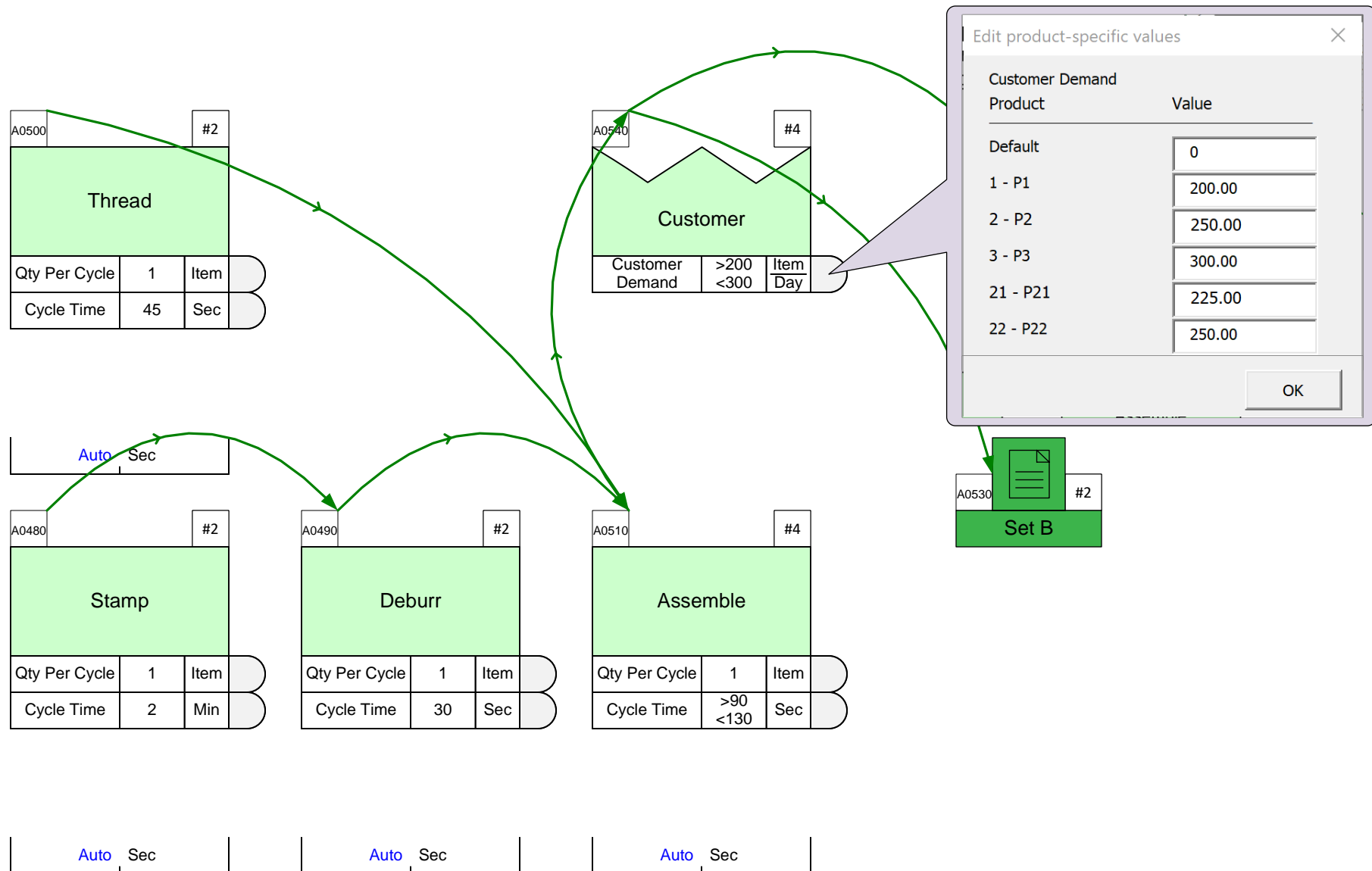
Once you enter the values, the center field will show the range of values as shown below:



Entering in Customer Demand Values and demand propagation

The Customer Demand variable at the customer center allows input of demand for each product. These demands flow upstream and can be affected by losses such as scrap along the way.

If demand has to split into multiple paths as it flows upstream, a “Path Demand %” variable is available on all the sequence arrows to control the percentage flowing through each arrow.





Steps to Add Data, Check, and Solve



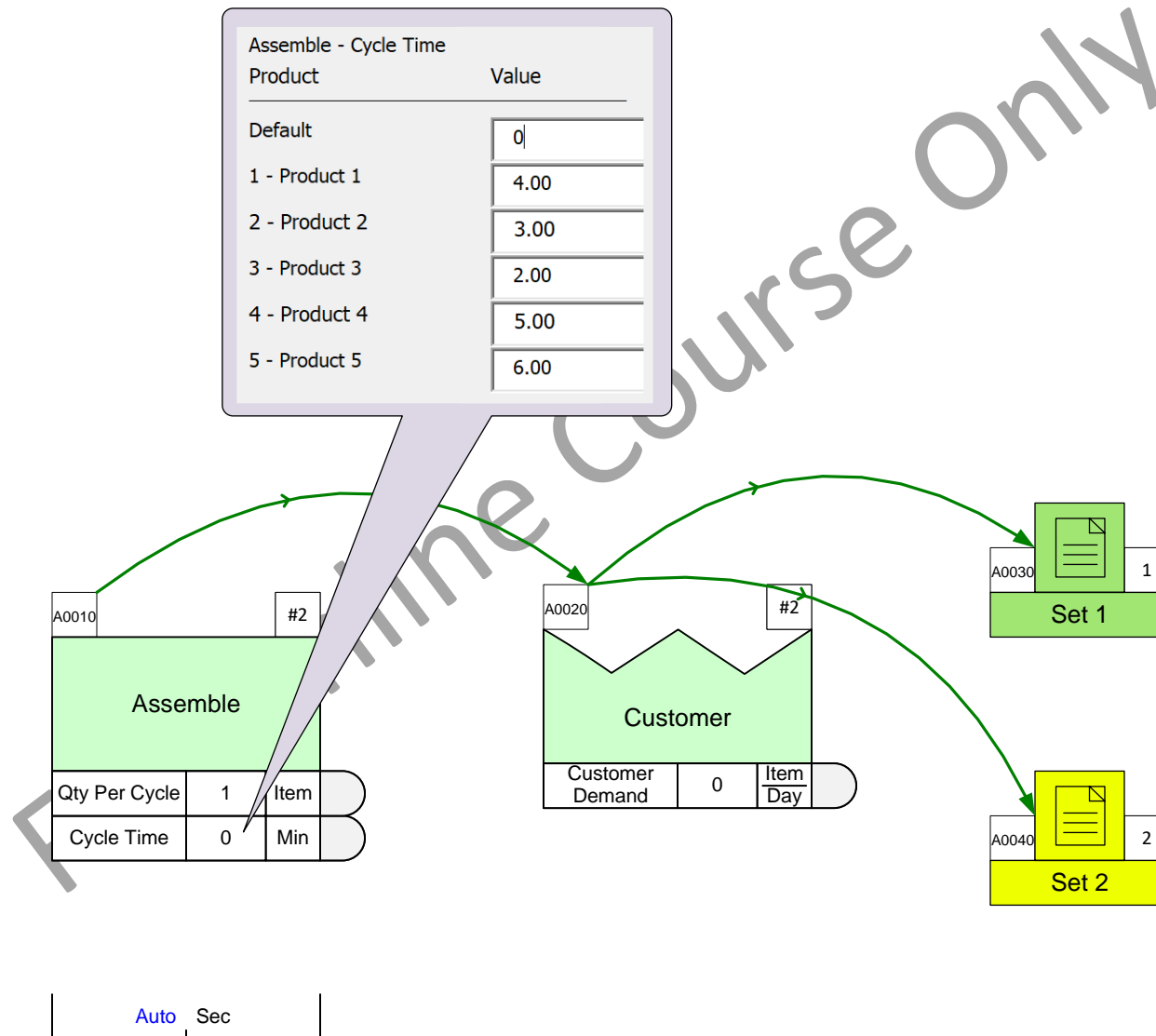
Watch the Movie

Click the Video button in the eLearner panel to start the video

Reference Notes

1. Enter plant production hours in the Time center.
2. Enter customer demand at the Customer center in the Demand variable.
3. Enter Cycle Times and other operational data.
4. Run  **Check** and resolve any problems reported.
5. Run  **Solve** for the automated calculations.

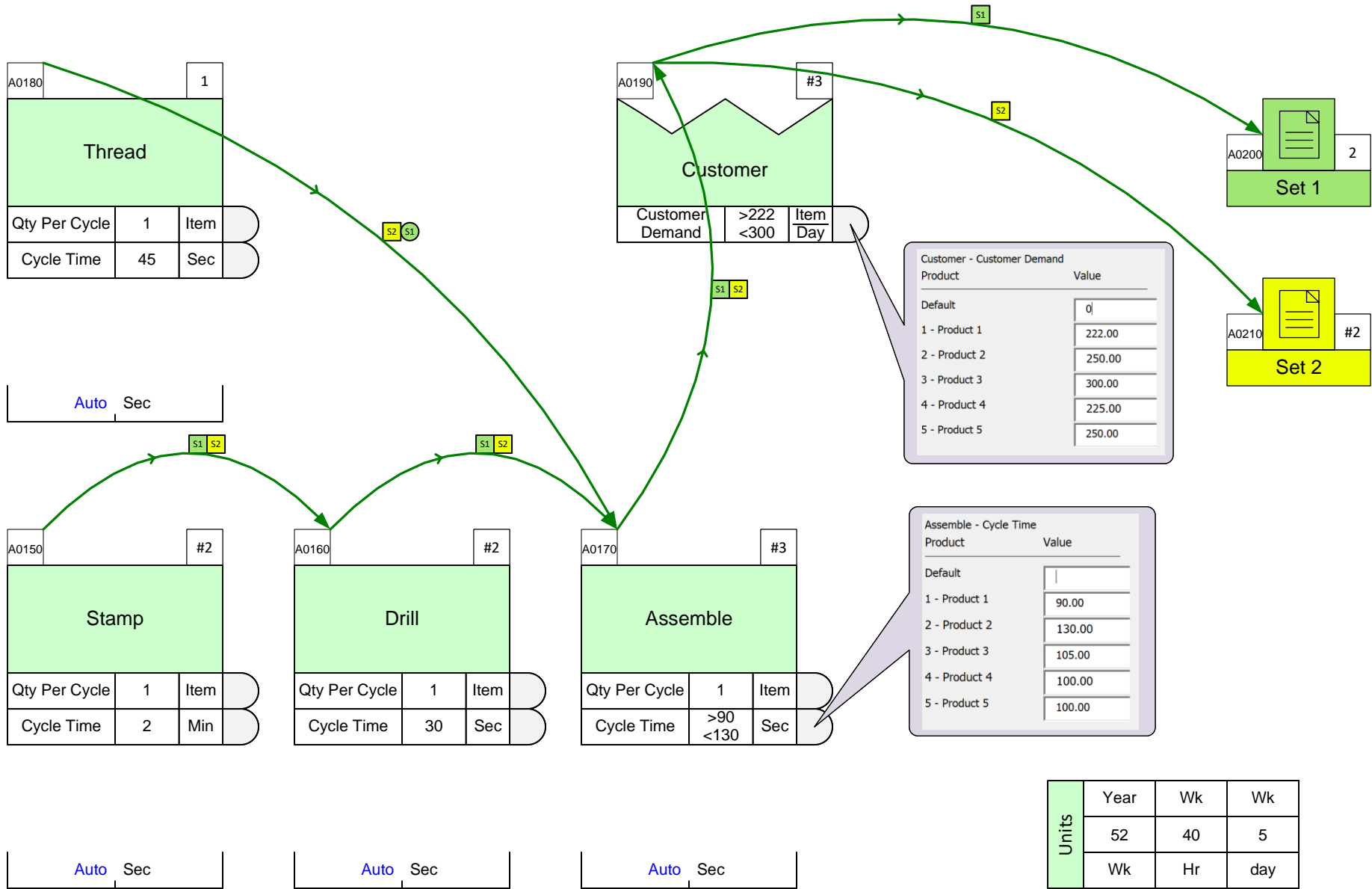
Set the Cycle Time values for the Assemble operation as shown in the callout.



Example Map 1

In the next exercise, you will draw the map below from scratch. It would be a good idea to keep a printed copy of this page besides you. Otherwise use the ◀ ▶ buttons in the eLearor panel toggle back/forth.

	A	B	C	D	F	G	H	I	J
1	Set ID	Set Name	Product ID	Product Name	Stamp	Drill	Assemble	Thread	Customer
2	Auto Name			Sort Products	Activity	Activity	Activity	Activity	Customer
3	S1	Set 1	1	Product 1	X	X	X	X	X
4	S1	Set 1	5	Product 5	X	X	X	X	X
5	S2	Set 2	2	Product 2	X	X	X		X
6	S2	Set 2	3	Product 3	X	X	X		X
7	S2	Set 2	4	Product 4	X	X	X		X



Draw the map shown on the previous page below including sequence arrows, routes, and data values.

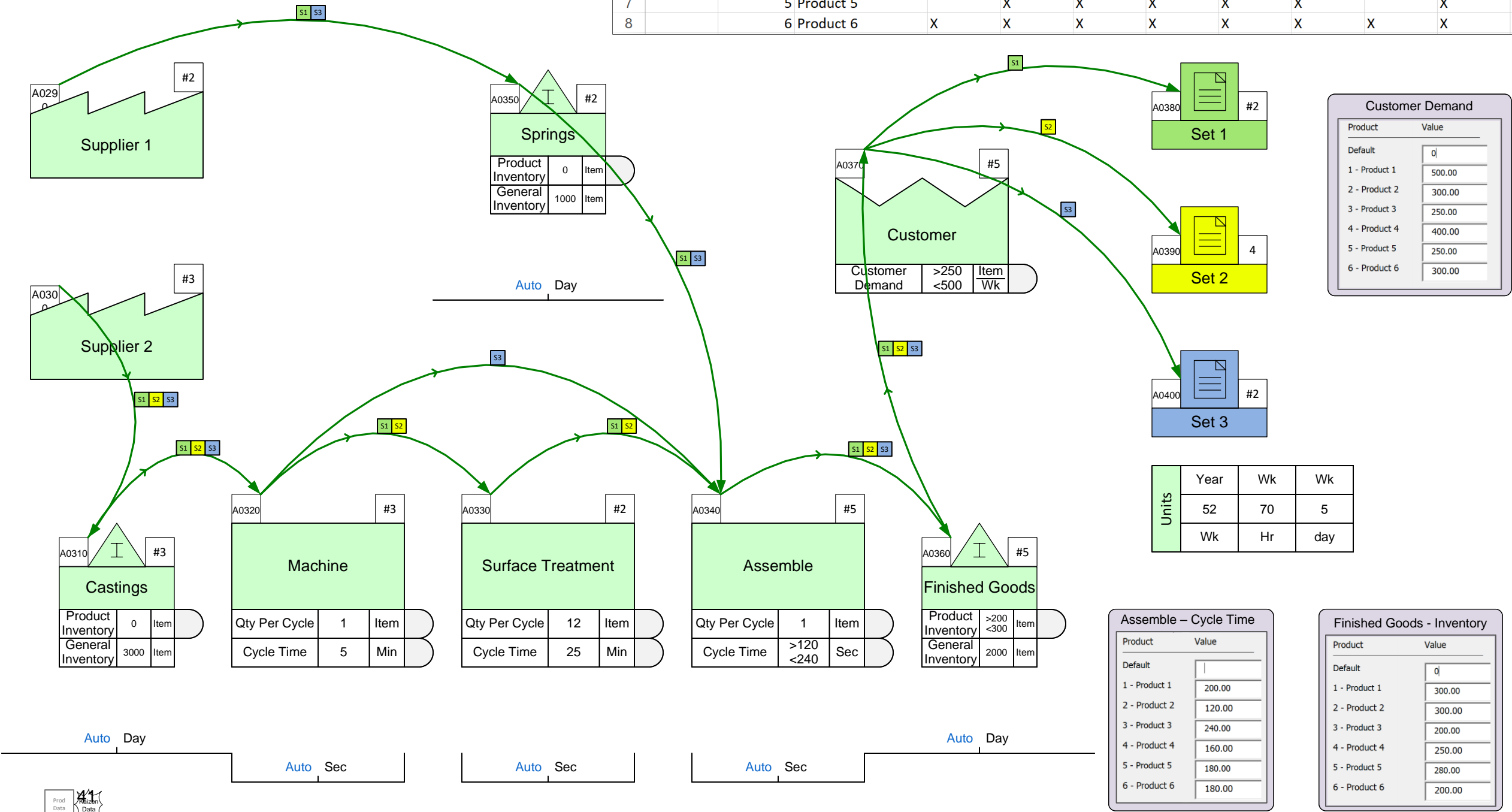
You will need to initialize the page for Quick Mix Mfg, create the product matrix shown, import it, arrange the centers, add sequence arrows, specify routes, and enter data. No need to Solve the map.

For Online Course Only

Example Map 2

In the next exercise, you will draw the map below from scratch. It would be a good idea to keep a printed copy of this page besides you. Otherwise use the ◀ ▶ buttons in the eLearner panel toggle back/forth.

	B	C	D	F	G	H	I	J	K	L	M	N
	Set Name	Product ID	Product Name	Supplier 1	Supplier 2	Castings	Machine	Surface Treatment	Assemble	Springs	Finished Goods	Customer
1												
2	o Name		Sort Products	Supplier	Supplier	Inventory	Activity	Activity	Activity	Inventory	Inventory	Customer
3		1	Product 1	X	X	X	X	X	X	X	X	X
4		2	Product 2	X	X	X	X		X	X	X	X
5		3	Product 3		X	X	X	X	X		X	X
6		4	Product 4		X	X	X	X	X		X	X
7		5	Product 5		X	X	X	X	X		X	X
8		6	Product 6	X	X	X	X	X	X	X	X	X



Draw the map shown on the previous page below including sequence arrows and data values.

You will need initialize the page for Quick Mix Mfg, create the product matrix shown, import it, arrange the centers, add sequence arrows, specify routes, and enter data. Note the customer demand values are shown in the Set centers, but entered in the Customer center. Make the page bigger if needed. No need to Solve the map.

For Online Course Only

Checking for Common Mapping Mistakes

The Check function identifies common user mistakes on the map. It also attempts to fix certain problems. You should always run the Check function before the first Solve.

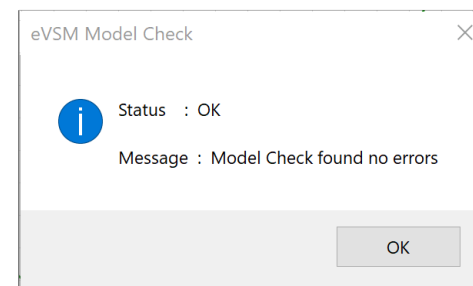
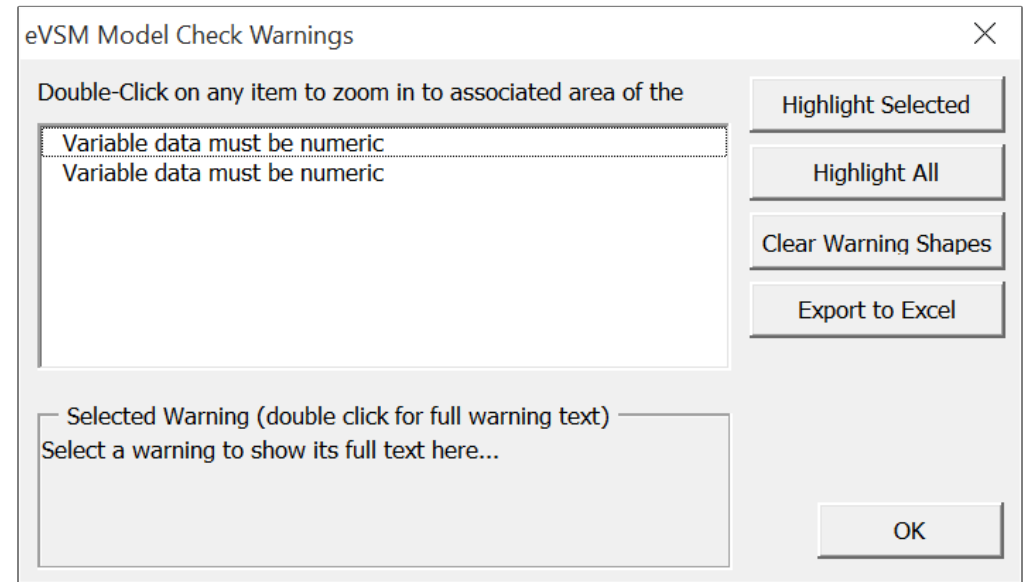
The “Check” button Check

Examples of problems the Check function will identify are:

- Unconnected Sequence arrow
- Missing mandatory data
- Missing units convertors
- Unglued data shapes
- Duplicate Operation tags

The problems will be reported in a form like this. You can select the error in the form and use the Highlight buttons in the form to highlight and zoom into the problem area on the map.

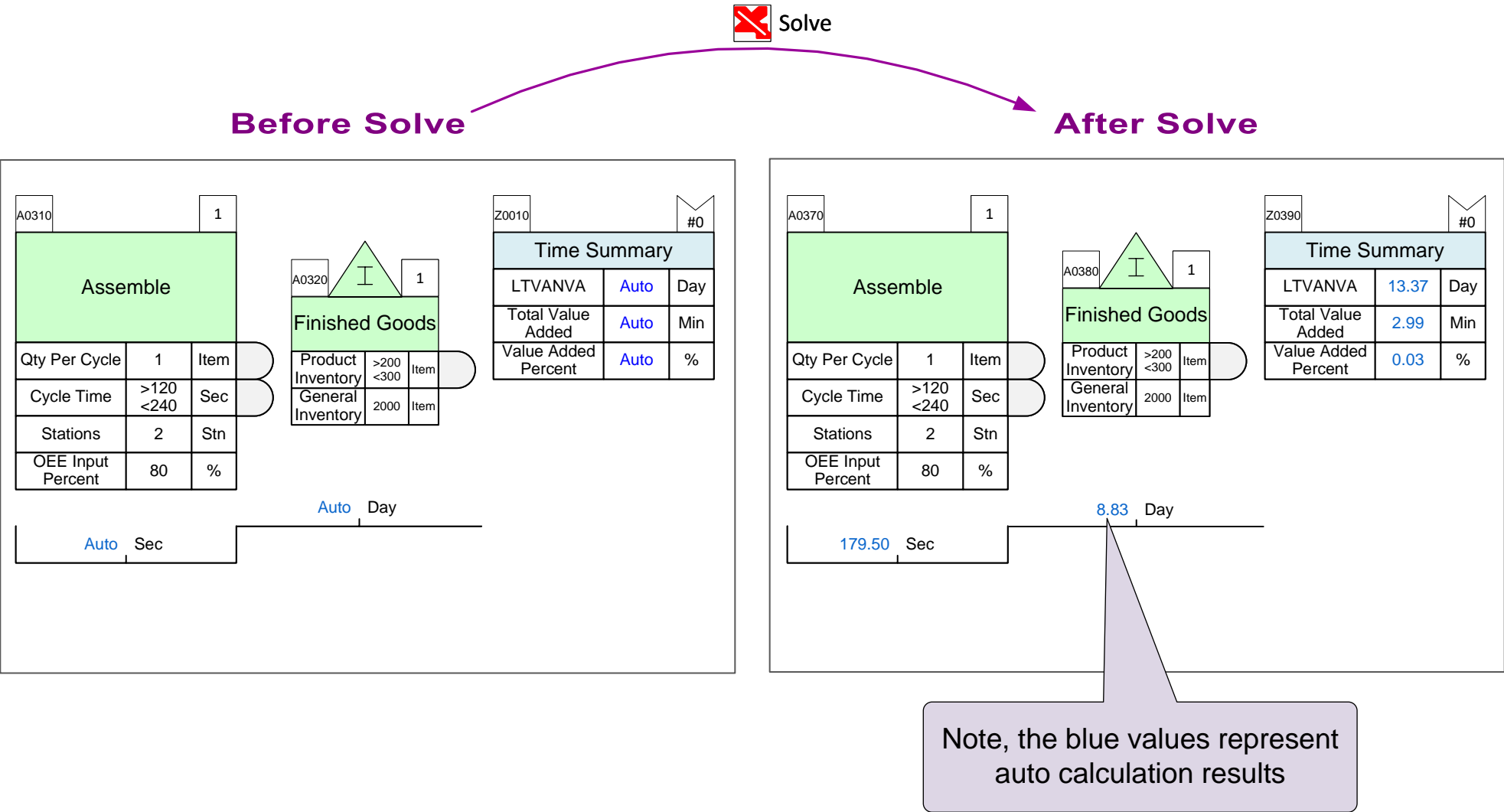
The problems will be reported incrementally. So, fix the problems reported and then run the Check function again. Repeat until you see a message like this:



Solving the Map Solve

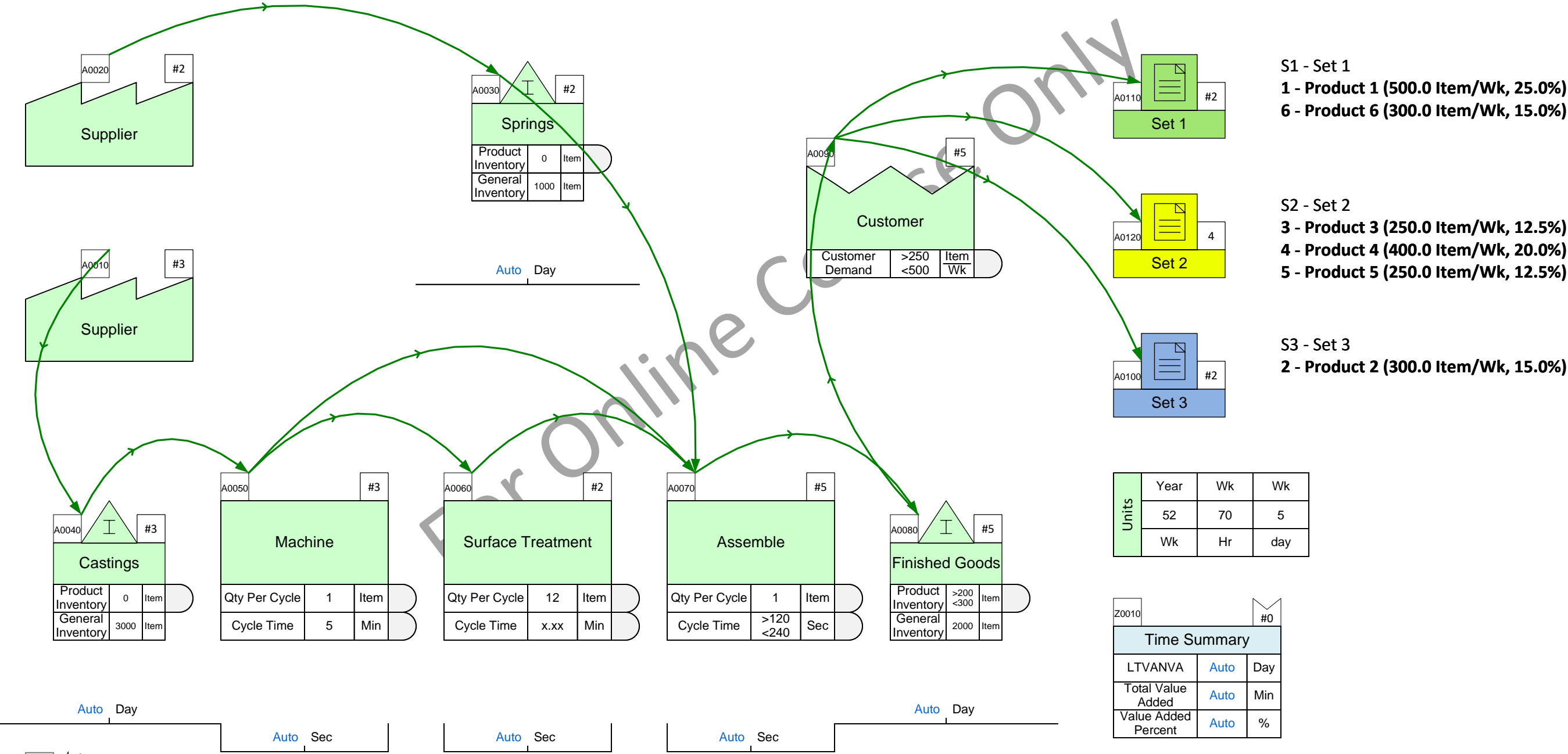
eVSM has pre-built equations that do the lean calculations for capacity, lead time, etc.

Once you have checked the map, use the Solve button to apply the equations. Values on the map that are a result of the equations are shown in blue.



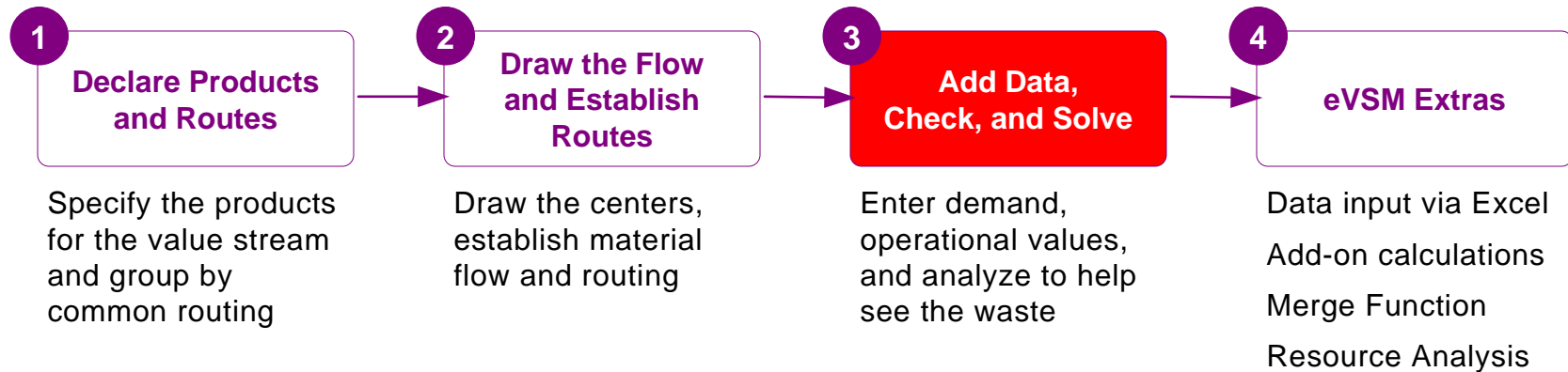
Fix any problems reported by the Check function, then Solve this map

For any missing data, see the map used in Exercise 3.



- You learned:**
- How to enter product specific demand and operational data on the map
 - How to check the map for completeness
 - How to Solve the model and see the calculation results

Summary:



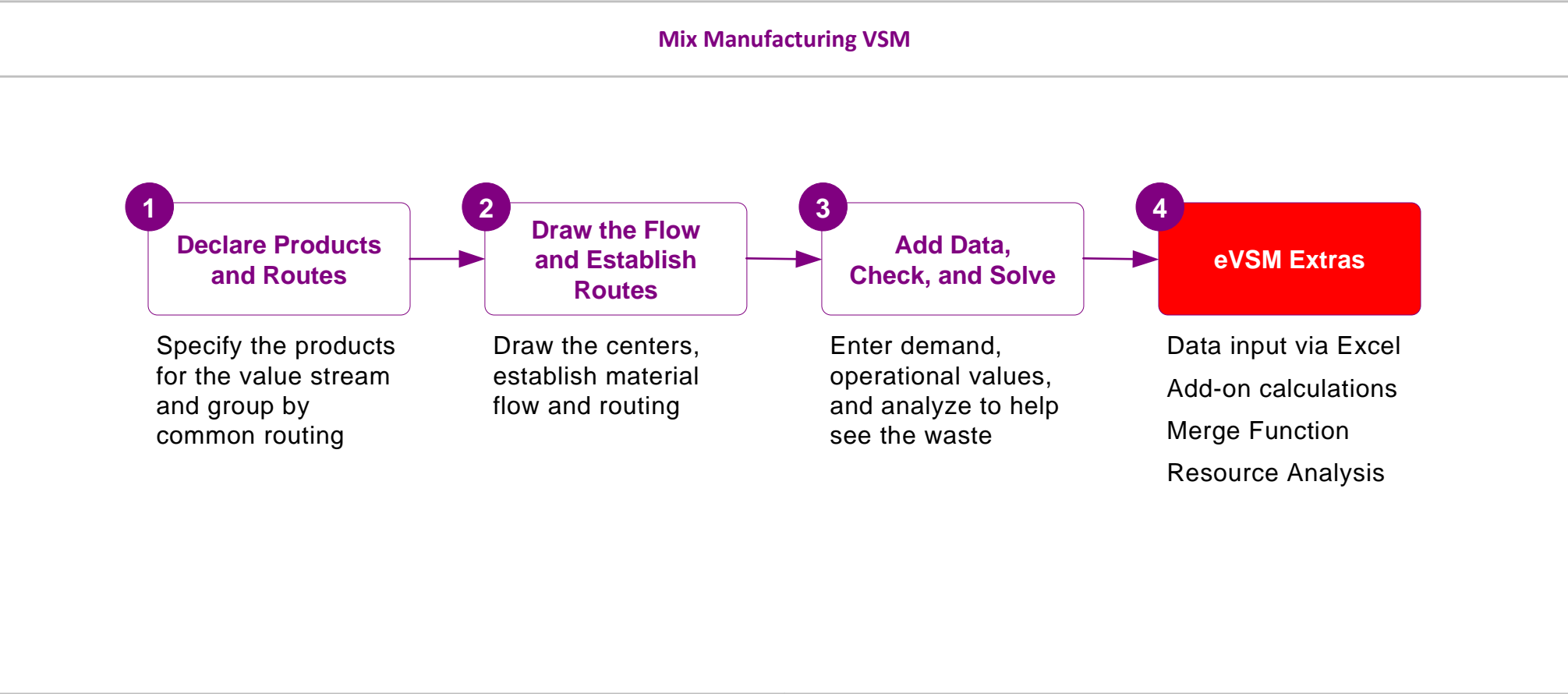
What's next:

Once you create the map and solve it, you can use standard charts for utilization, capacity, production interval and lead time to see the waste in the value stream and come up with improvement ideas

Additional Topics

In the previous lessons you learnt how to declare products in Excel, how to import these into Visio, draw the flow, and set up the routes.

In this lesson, you will learn to enter data, check the map, and then solve to perform the automated calculations.



Data Input through Excel

Mix model value streams need require significantly more data. Data input can get tedious, time consuming, and error prone. To address this, eVSM facilitates data input through Excel.



Create XL - Creates an Excel file which represents all the data input values for the current map.



Import XL - Import XL pulls the data in from Excel to the map.



Watch the Movie

Click the Video button in the eLeonor panel to start the video

The columns have pre-set filters to quickly home in

Only input values are output to Excel. No calculated values

	A	B	C	D	E	F	G
1	Tag	ID	Type	Produ	Variable	Value	Unit
2	A0170	Machine	Activity Center	Default	Cycle Time	x.xx	Min
3	A0170	Machine	Activity Center	P1	Cycle Time		Min
4	A0170	Machine	Activity Center	Default	Qty Per Cycle	1	Item
5	A0170	Machine	Activity Center	P1	Qty Per Cycle		Item
17	A0180	Drill	Activity Center	Default	Cycle Time	x.xx	Min
18	A0180	Drill	Activity Center	P1	Cycle Time		Min
19	A0180	Drill	Activity Center	Default	Qty Per Cycle	12	Item
20	A0180	Drill	Activity Center	P1	Qty Per Cycle		Item
32	A0190	Assemble	Activity Center	Default	Cycle Time	x.xx	Sec
33	A0190	Assemble	Activity Center	P1	Cycle Time		Sec
34	A0190	Assemble	Activity Center	P3	Cycle Time		Sec
35	A0190	Assemble	Activity Center	P2	Cycle Time		Sec
36	A0190	Assemble	Activity Center	Default	Qty Per Cycle	1	Item
37	A0190	Assemble	Activity Center	P1	Qty Per Cycle		Item
38	A0190	Assemble	Activity Center	P3	Qty Per Cycle		Item
39	A0190	Assemble	Activity Center	P2	Qty Per Cycle		Item

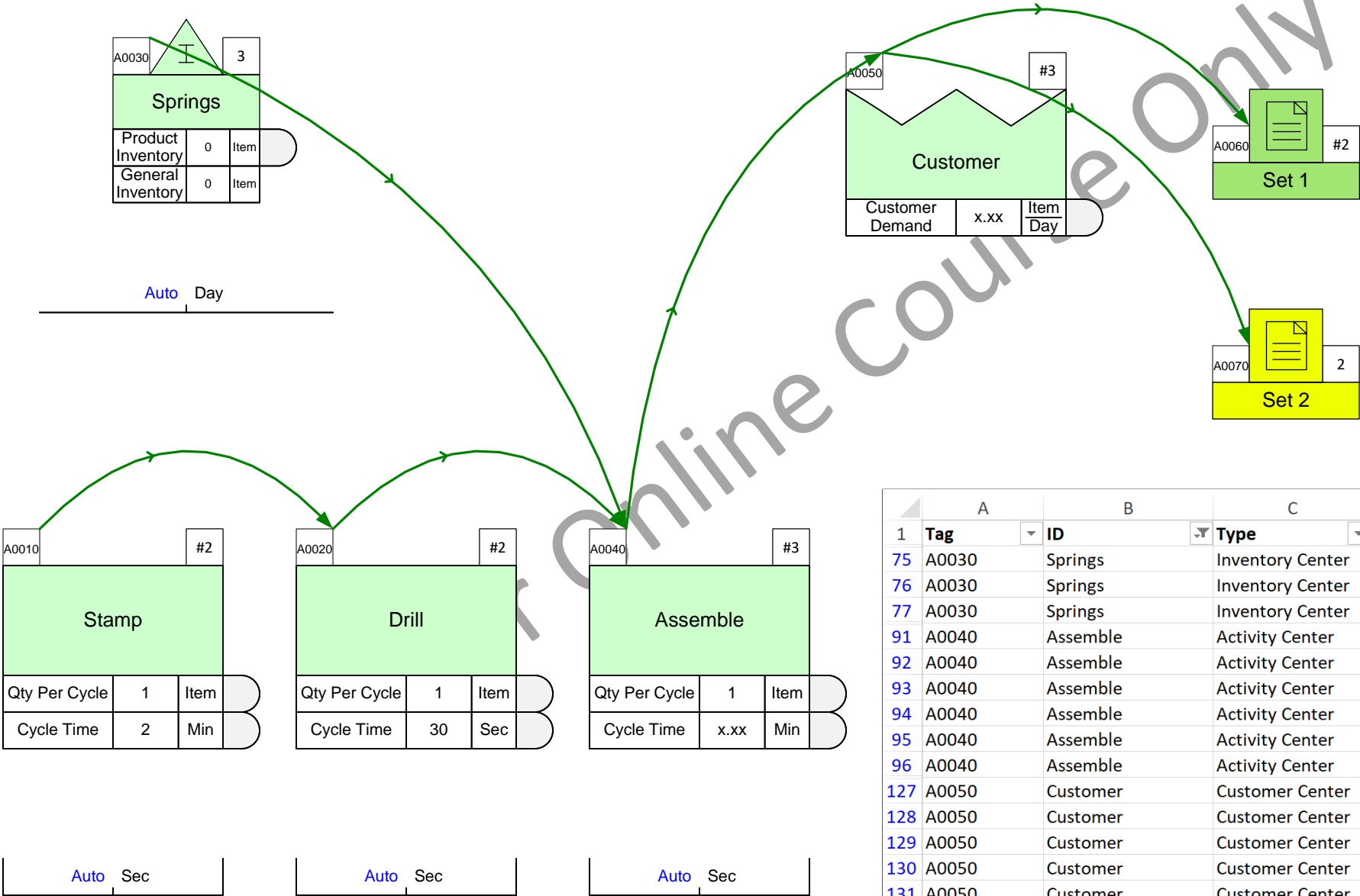
No fields allocated to products which do not go through an activity

See how P1, P2, P3 are included for Assemble, while only P1 for Drill

Enter the product specific data using Create XL and Import XL

Use the Create XL button to export all data items to Excel. Enter the data values in Excel as shown in the image on the bottom right of the page. Then use the Import XL button to populate on the map.

Units	Year	Wk	Wk
	52	40	5
	Wk	Hr	day



	A	B	C	D	E	F	G
1	Tag	ID	Type	Produ	Variable	Value	Unit
75	A0030	Springs	Inventory Center	Default	Product Inventory	0	Item
76	A0030	Springs	Inventory Center	1	Product Inventory	1000	Item
77	A0030	Springs	Inventory Center	5	Product Inventory	1200	Item
91	A0040	Assemble	Activity Center	Default	Cycle Time	0	Min
92	A0040	Assemble	Activity Center	1	Cycle Time	10	Min
93	A0040	Assemble	Activity Center	5	Cycle Time	8	Min
94	A0040	Assemble	Activity Center	2	Cycle Time	6	Min
95	A0040	Assemble	Activity Center	3	Cycle Time	10	Min
96	A0040	Assemble	Activity Center	4	Cycle Time	12	Min
127	A0050	Customer	Customer Center	Default	Customer Demand	0	Item/Day
128	A0050	Customer	Customer Center	1	Customer Demand	500	Item/Day
129	A0050	Customer	Customer Center	5	Customer Demand	600	Item/Day
130	A0050	Customer	Customer Center	2	Customer Demand	400	Item/Day
131	A0050	Customer	Customer Center	3	Customer Demand	150	Item/Day
132	A0050	Customer	Customer Center	4	Customer Demand	150	Item/Day

Merging products to reduce solve times

eVSM does multiple solves in support of analytics for mixed model value streams. The solve can take a lot of time and the solve time can be approximated as proportional to

Number of Activities On Map * (Number of Routing Sets + Number of Products)

One of our maps with 50 products, 4 sets and 10 activities takes 30 mins to solve on our test laptop. If we are able to reduce the number of products from 50 to 10 we find the solve time is about 5 minutes. Hence the idea for merging products. If we can solve the map faster, it becomes more useful to us.

What is a merged group of products?

Lets say that the value stream is making 10 products and that the top 2 products comprise 80% of the volume. We could consider merging the other 8 products into a effective single product so the map effectively has the top 2 products and a “merged” product. We would expect a 3X reduction in solve times.

How do we merge products?

We enter in demand and operational values for the Individual products. Via the “Mix Manager” button in the toolbar, we now have an “Auto Merge” function that allows us to specify a cumulative demand % below which products are merged. The software takes product operational values and combines them for merged products using weighted average logic based on customer demand values for each product.

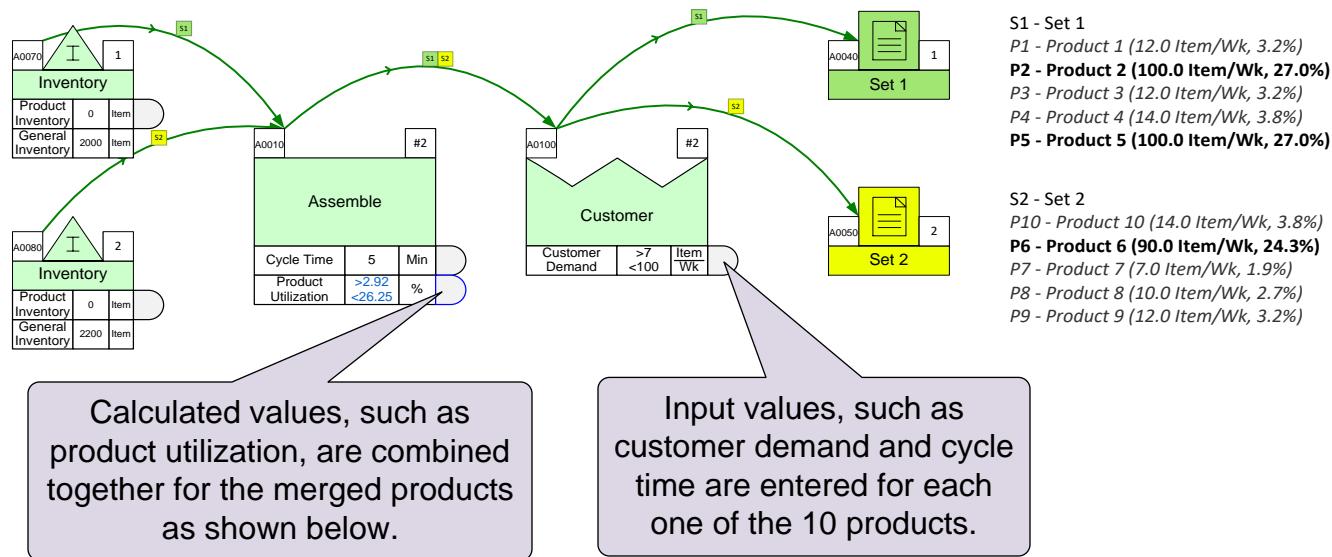
The user can return to the Mix manager and change the cumulative demand % value at any time ahead of the next solve

Will the software merge products with different routings?

No, the software will create a merged product as needed for products with common routings but will NOT merge products across routings. So for each routing set we may have zero or 1 merged product. The merged product name is always the routing set name merge. So for example “Set1_Merge”

Merged Products Example

This simple value stream represents 10 products divided into two sets. The customer demand is shown on the right.



Product Utilization values **Before** Merge

Edit product-specific values	
Assemble - Product Utilization	
Product	Value
P1 - Product 1	2.50
P10 - Product 10	2.92
P2 - Product 2	20.83
P3 - Product 3	2.50
P4 - Product 4	2.92
P5 - Product 5	20.83
P6 - Product 6	18.75
P7 - Product 7	1.46
P8 - Product 8	2.08
P9 - Product 9	2.50
Copy Paste OK	

Product Utilization values **After** Merge

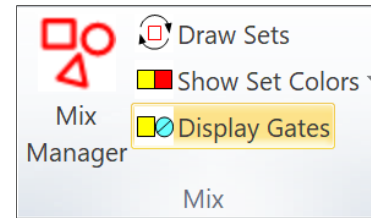
Edit product-specific values	
Assemble - Product Utilization	
Product	Value
P2 - Product 2	20.83
P5 - Product 5	20.83
P6 - Product 6	18.75
S1_M - S1_Merge	7.92
S2_M - S2_Merge	8.96
Copy Paste OK	

Merged products for Set 1

Merged products for Set 2

Merging products step by step

- 1 Define products, sets and routes
- 2 Enter demand and operational values for products
- 3 Enter the “Mix Manager” via the eVSM toolbar
- 4 Click on the “Auto Merge” button
- 5 Select a cumulative demand % below which products are merged and click the “try” button to see merge statistics
- 6 Selecting “OK” on the form will merge the products. You can edit the form again later.
- 7 In the Set keys to the right of the routing sets on the map, merged products will be indicated in Italics



Mix Manager - Define Products and Sets

ID	Name	Set	Can Merge?	Must Merge?	Is Merged?
1	P1	S1	Y	N	Y
10	P10	S1	Y	N	Y
11	P11	S2	Y	N	Y
12	P12	S2	Y	N	Y
13	P13	S2	Y	N	Y
14	P14	S2	Y	N	Y
15	P15	S2	Y	N	Y
16	P16	S2	Y	N	Y
17	P17	S2	Y	N	Y
18	P18	S2	Y	N	Y

Buttons: Add, Edit, Remove, **Auto Merge** (highlighted with a purple circle 4)

Merge Products

ID	Name	Can Merge?	Must Merge?	Is Merged?	Demand %	Cumulative Demand %
41	P41	Y	N	N	12.5	100.0
35	P35	Y	N	N	12.4	87.5
34	P34	Y	N	N	11.3	75.0
42	P42	Y	N	N	11.3	63.7
20	P20	Y	N	N	11.3	52.4
8	P8	Y	N	N	11.3	41.1
7	P7	Y	N	N	11.3	29.8
40	P40	Y	N	Y	1.2	18.5
39	P39	Y	N	Y	1.2	17.3

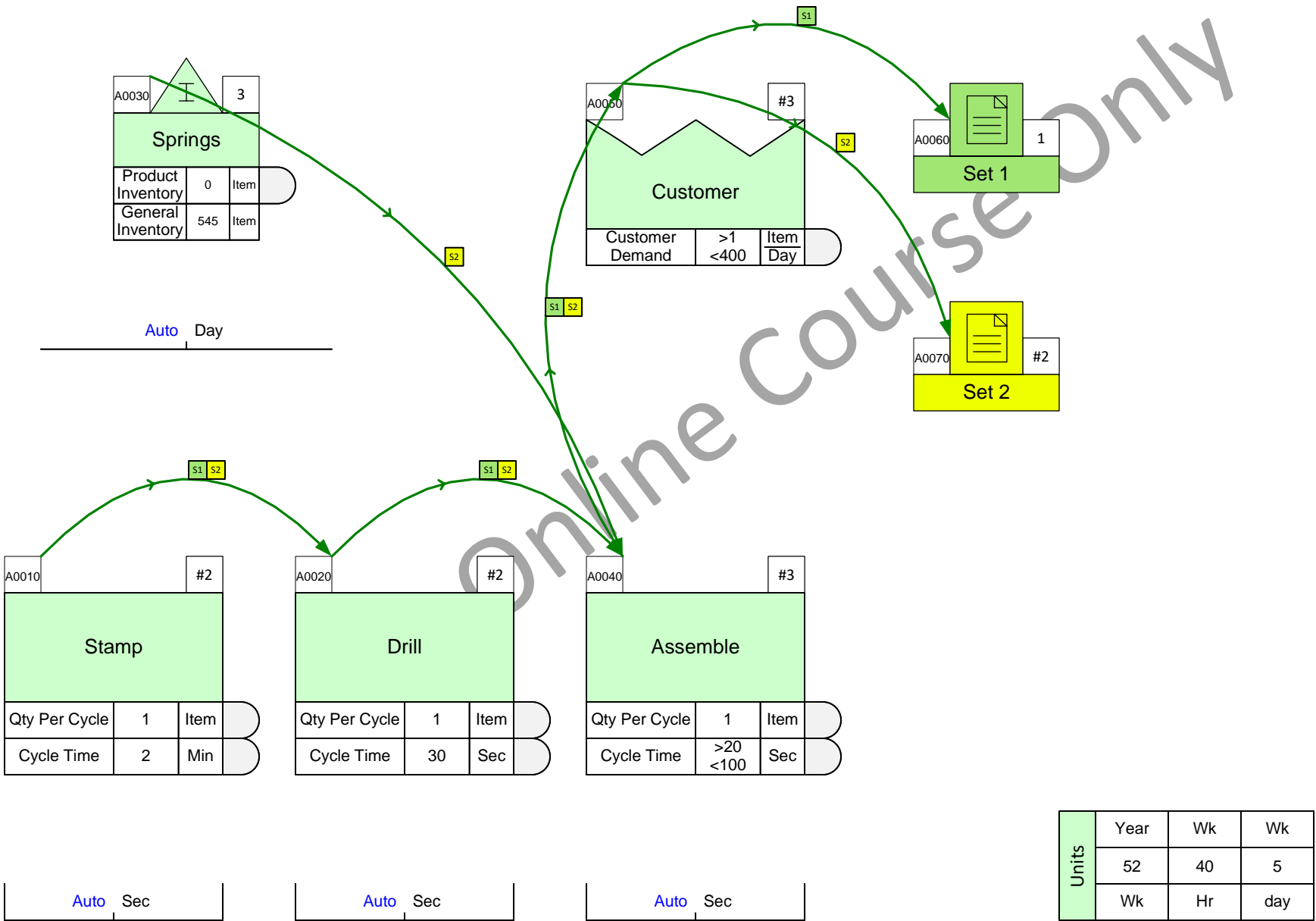
% of demand to merge: 25 **Try** (highlighted with a purple circle 5)

Total # of products: 50

of products after merge: 7

Merge the low demand products to reduce Solve time

Open the Mix Manager and click on the Auto Merge button. Set the merge percentage to 20% and merge. Solve the map.



Units	Year	Wk	Wk
	52	40	5
	Wk	Hr	day

Using the Yellow Add-ons in Quick Stencils

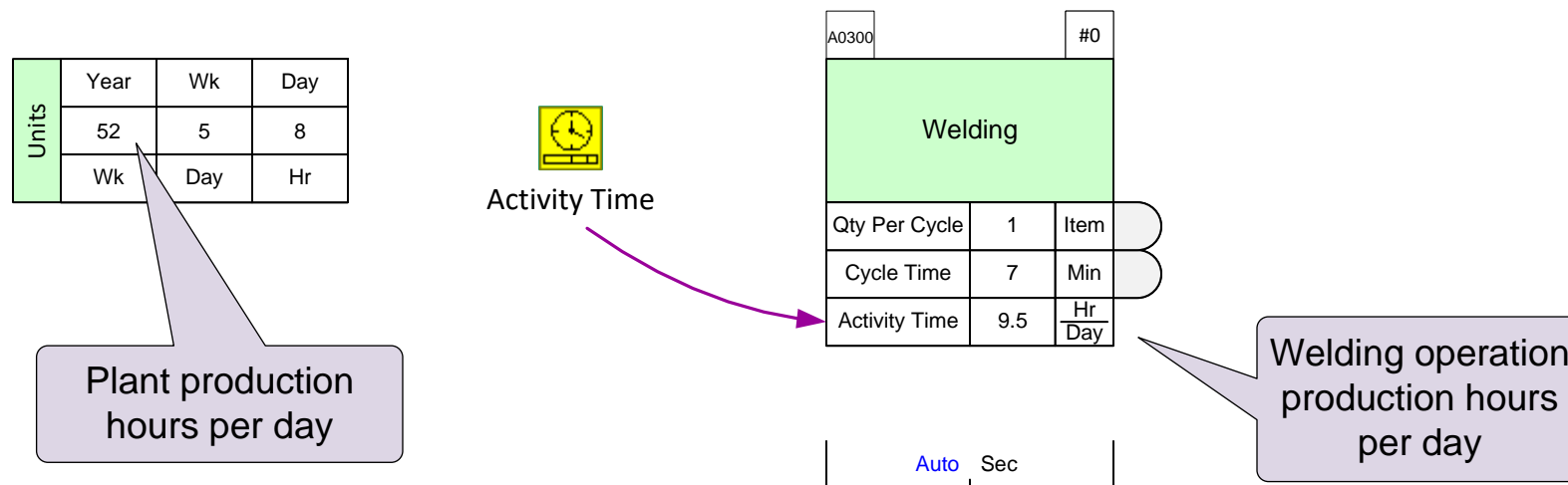
Many common calculations are built into main centers and sequence arrows. The yellow icons in the Quick stencils provide additional modifications and calculations.

How to Use Add-ons

Just drag out the desired add-on from the stencil and glue it to the bottom of the data shapes stack. New add-ons can also be dropped on the green center shape and it will automatically get attached to the bottom of the stack.

Example

This plant has 8 Hrs/Day of production time as indicated in the Time Center. Therefore it is assumed the welding process is available for 8 Hrs/Day. However, what if the welding process is required to work 1.5 Hrs overtime? You can use the Activity Time yellow add-on to show the actual total production hours.



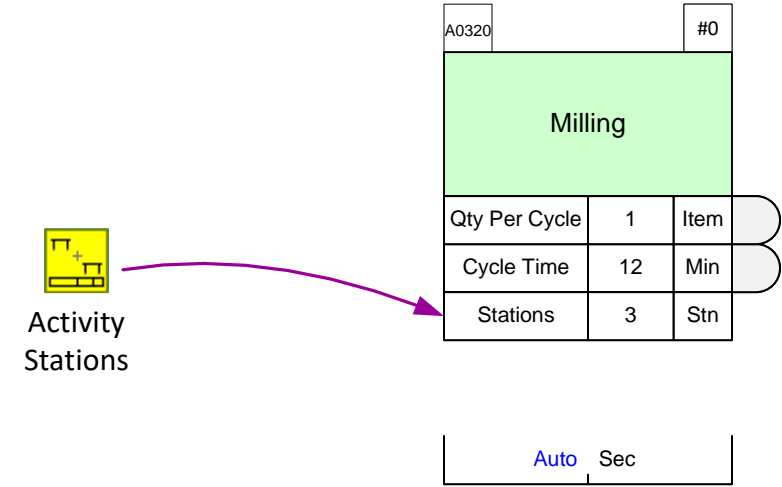
Add-ons Icon Positions in the Stencil

There is a unique correspondence between green icons in the stencil and the yellow icons that immediately follow the green icon. So yellow icons must be used ONLY with the green icons they “belong” to.

eVSM Mix Mfg Add-ons Examples

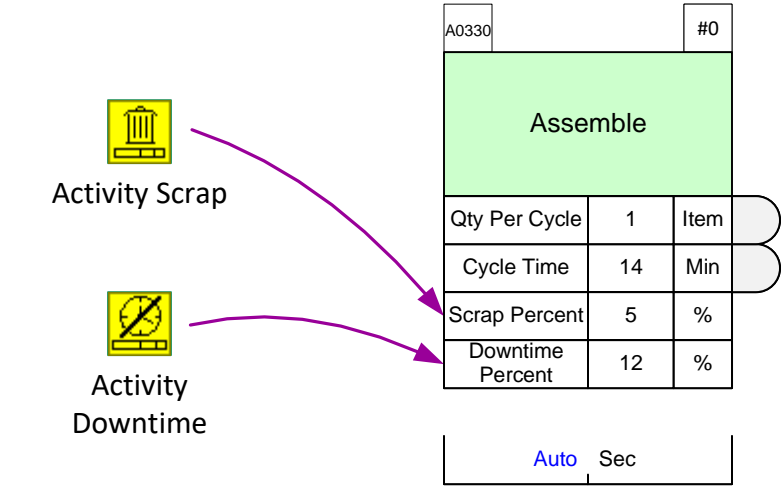
Example 1

Milling Process with 3 Stations.



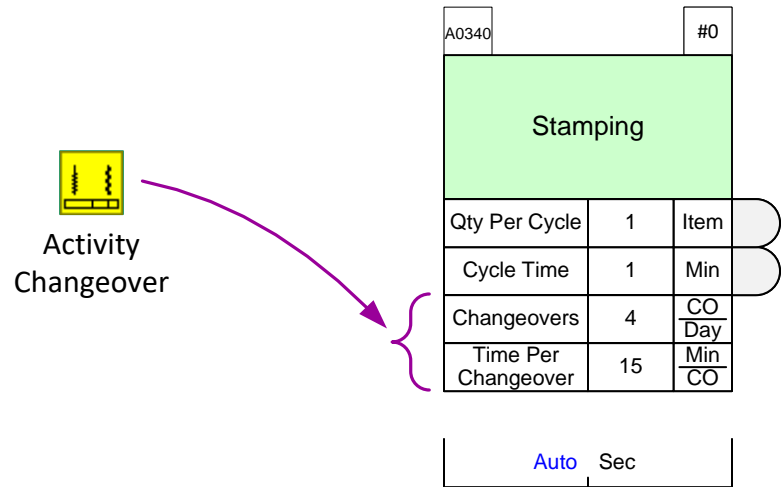
Example 2

Assemble process has 5% scrap and 12% downtime.



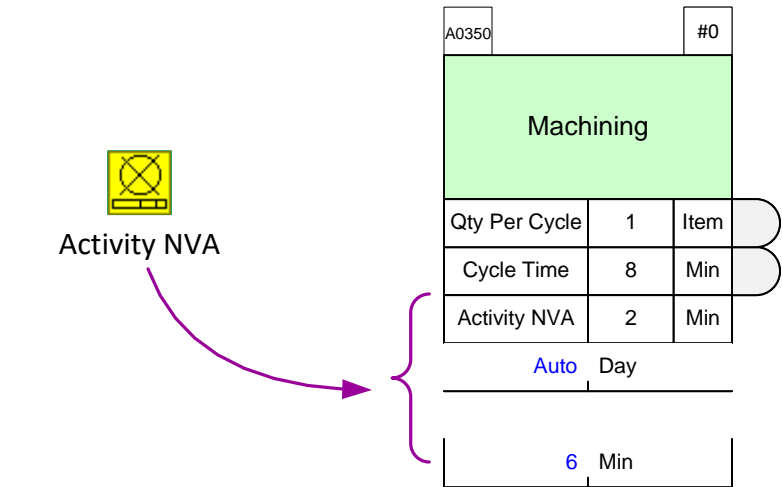
Example 3

Stamping process has 4 changeovers per day

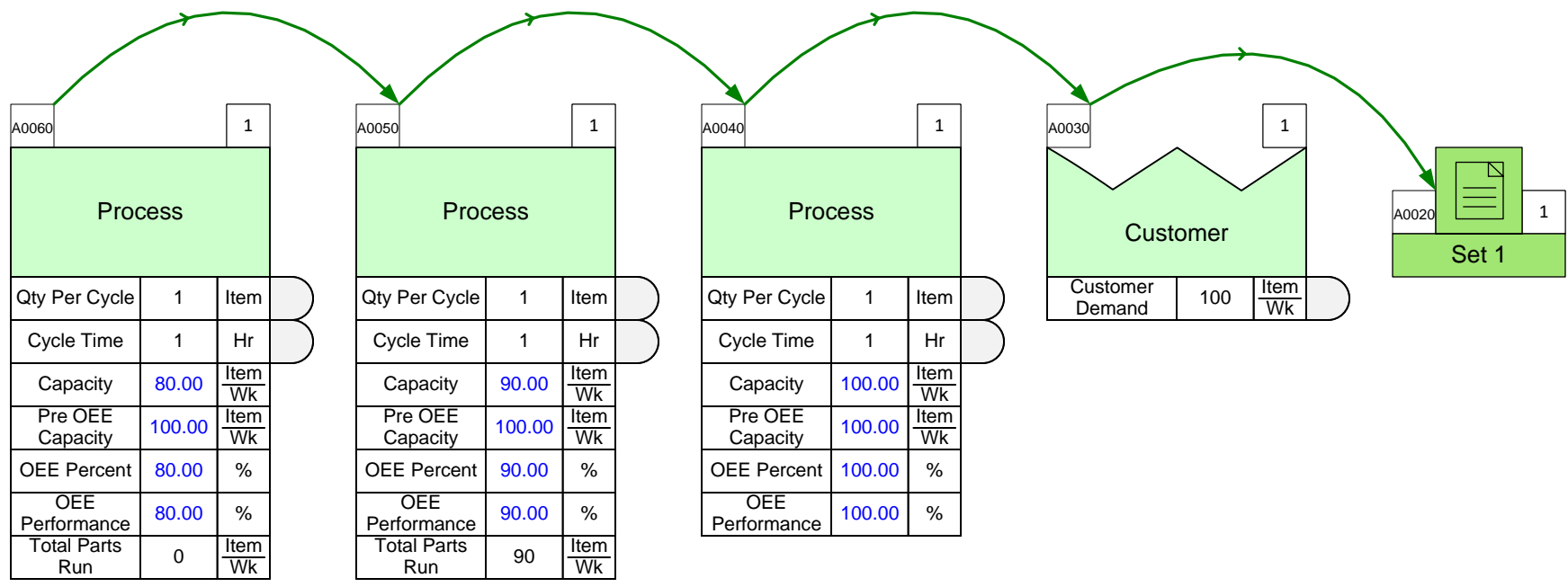


Example 4

Machining process with NVA of 2 Minutes per item



OEE Performance Input



OEE Perf Input > 0
so calculations
based on OEE Perf
Input. Total Parts
Run is not used

OEE Perf Input = 0
so calculations
based on Total
Parts Run


Activity
Performance

The add-on now has two variables. The original “Total Parts Run” which is visible and the new “OEE Perf Input” which is hidden but can be made visible through the “Views” button in the eVSM toolbar

If OEE Perf Input has a non zero value then it is used for the OEE performance calculation instead of the “Total Parts Run”

Units	Year	Wk	Wk
	52	100	5
	Wk	Hr	day

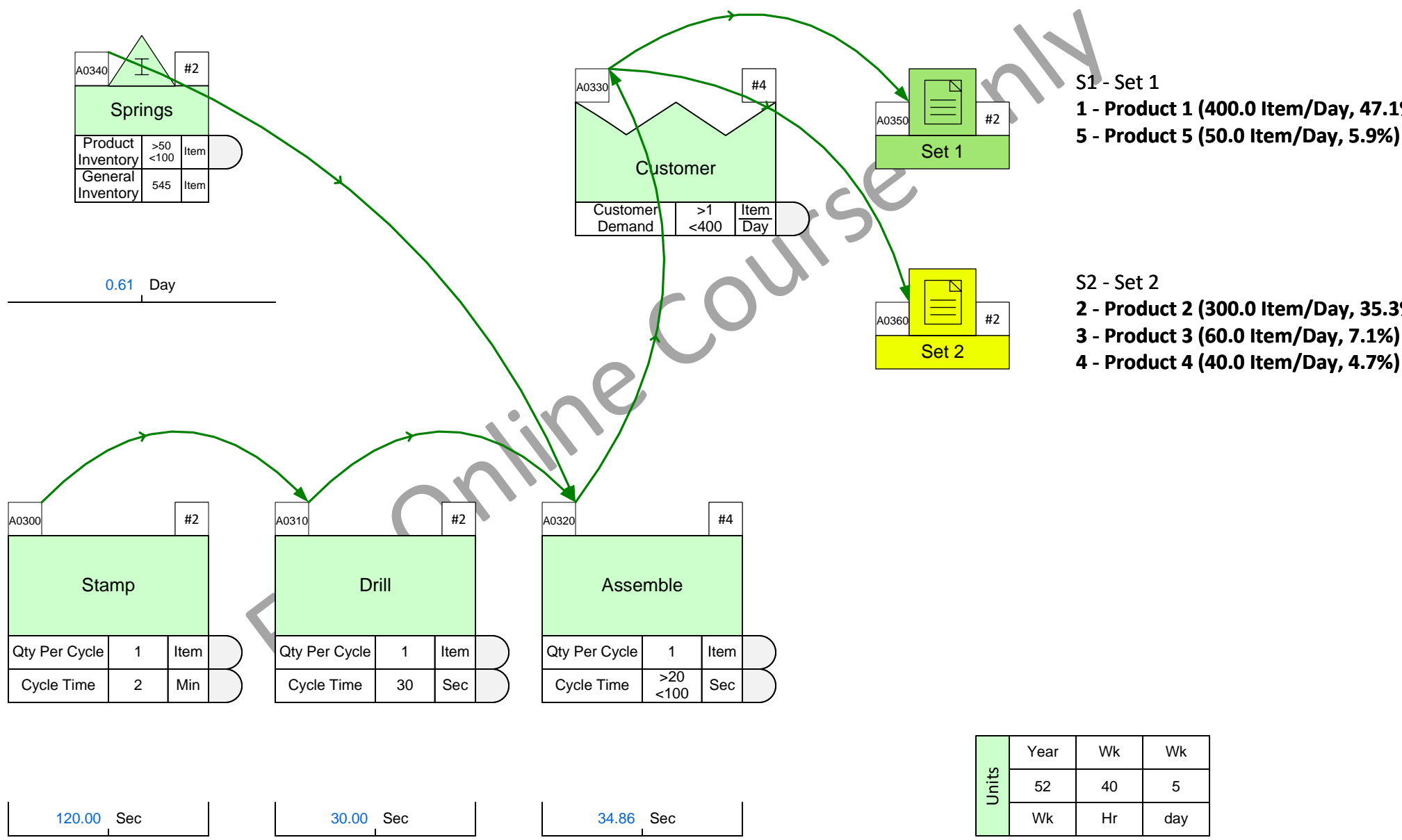
Prod Data

56

Open Data

Add the necessary Add-ons to the map.

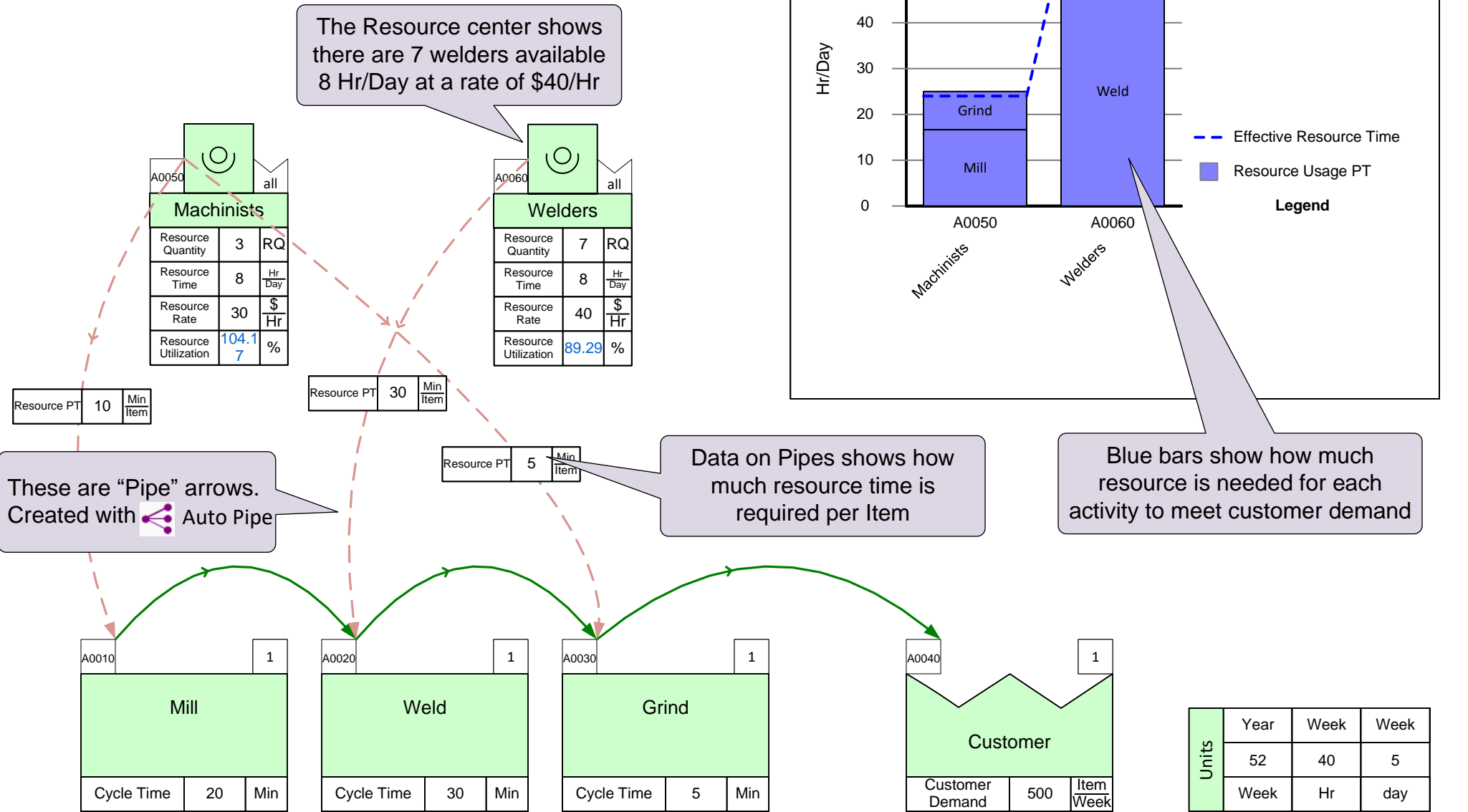
Use add-ons from the Quick Mix Mfg to show there are 3 stations at the Stamp activity and 15% scrap at the Assemble activity. No need to Solve the map.



Units	Year	Wk	Wk
	52	40	5
	Wk	Hr	day

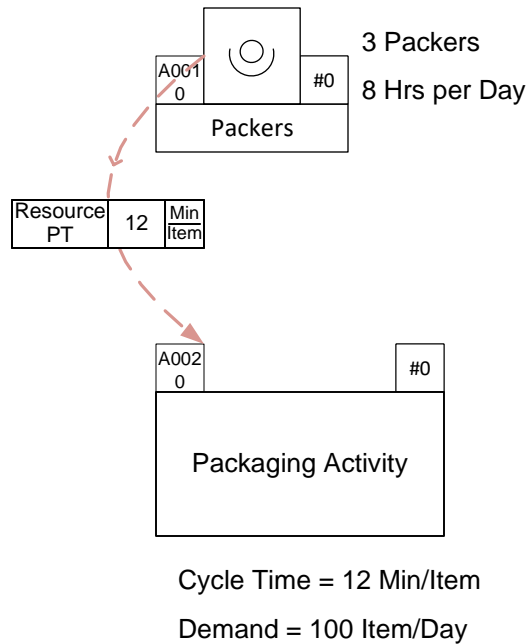
eVSM Resource Analyses

The resource analysis function allows you to represent the different types of resources serving the value stream. It calculates utilization and plots a resource balance chart.



Resource Calculations

Example 1

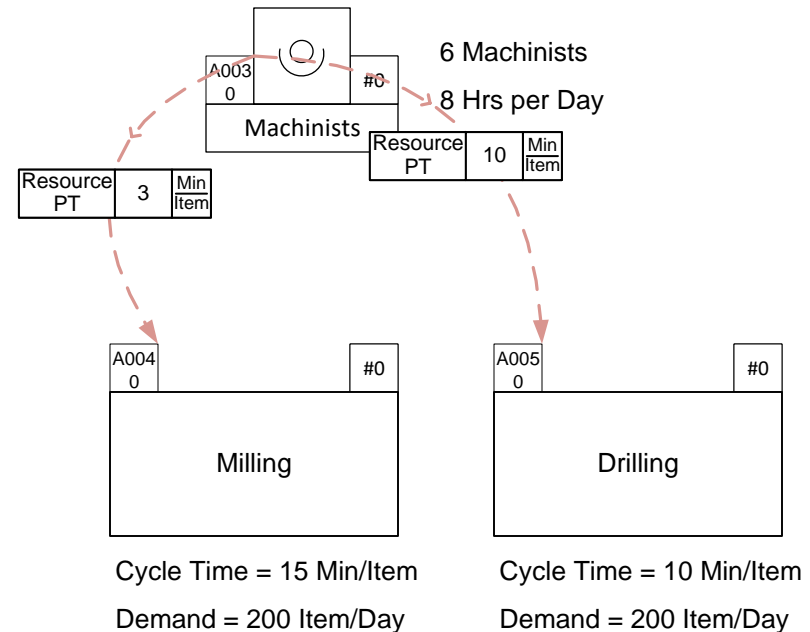


Available Resource Time = $3 \times 8 \times 60 = 1440$ Min

Resource Used = $12 \times 100 = 1200$ Min

Resource Utilization = $1200/1440 = 86\%$

Example 2



Available Resource Time = $6 \times 8 \times 60 = 2880$ Min

Resource Used = $(3 \times 200) + (10 \times 200) = 2600$ Min

Resource Utilization = $2600/2880 = 90\%$

Note: resource process time (Resource PT) is not always equal to cycle time. For example, a baker does not have to stay at the oven while the bread bakes

Resource Analyses Steps

1 Drag out a Resource center for each type of resource you wish to model



Resource Center

Note: The Resource Center is not available in the "Quick Mfg LT" stencil. It is in the "Quick Mfg" stencil.

2 Connect the Resource center to the activities they serve with Pipe arrows. Just select the resource center, shift select the activity, and click Auto Pipe



Auto Pipe

3 Enter data values

4 Solve the map



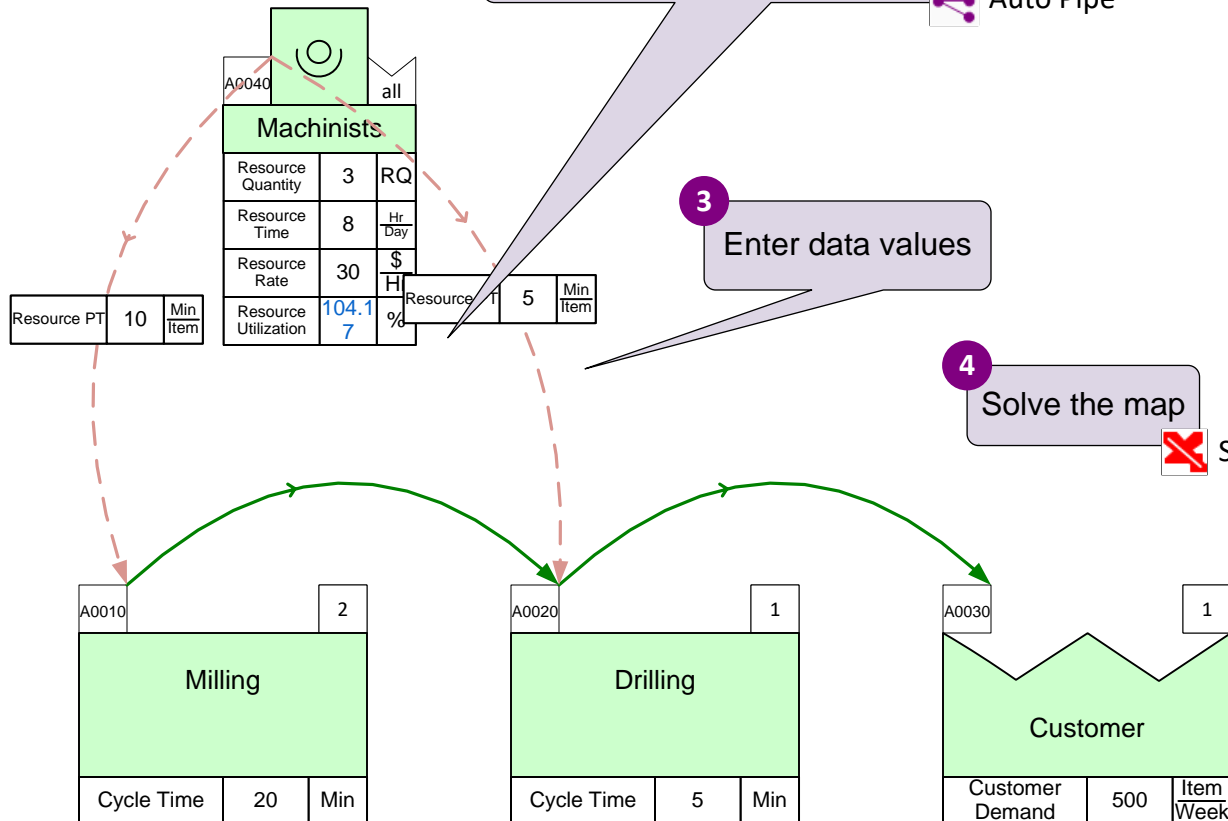
Solve

5 Drag out the Resource Balance chart shape, and plot through the right-mouse button menu



Resource Balance Chart

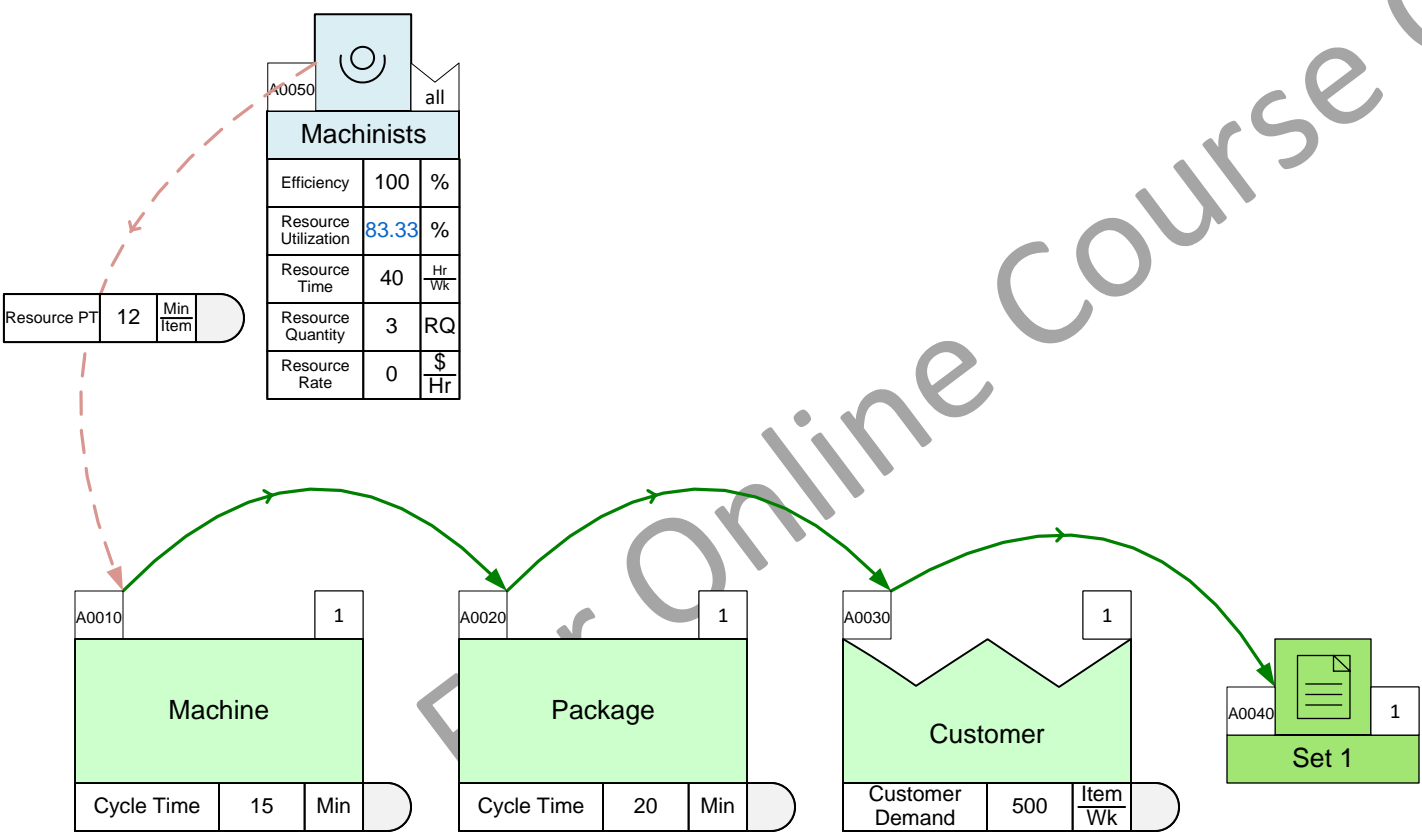
Units	Year	Week	Week
	52	40	5
	Week	Hr	day



Resource Analysis Exercise

Add a new resource called “Packers” with the data below and pipe it into the “Package” activity. Solve the model and plot a resource balance chart

- Resource Quantity = 4 Packers
- Resource Time = 40 Hrs/Wk
- Resource PT = 20 Min/Item



s1 - Set 1
p1 - Product 1 (500.0 Item/Wk, 100.0%)



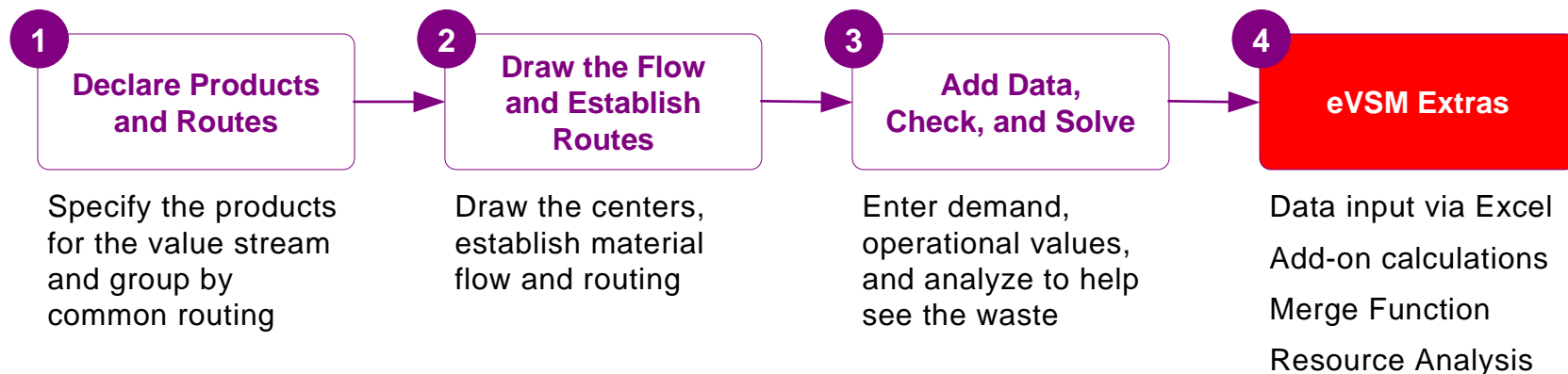
961.00 Sec

1200.00 Sec

Units	Wk	Year	Wk
	40	52	5
	Hr	Wk	day

- You learned:**
- How to enter data through Excel
 - How to simplify the mix model by merging low demand products
 - How to use Add-on calculations for more sophisticated analyses

Summary:



What's next:

1. Capture your value stream in eVSM and request a review from support@evsm.com.
2. Visit the Skills Dashboard (<https://evsm.com/my-skills>) to learn other skills.

—Useful Links—

eVSM Toolbar Guide

evsm.com/toolbarguide

Map Examples

evsm.com/examples

eVSM Blogs

evsm.com/blog

eVSM Support FAQ

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