milk run / Key Concepts

What does it do ?

- It allows you to plan one or more milk run routes to provide materials replenishment at workstations at fixed time intervals. It estimates the route time. You can then add or remove stops, change the route geometry, and couple/decouple loading and unloading operations.

How is the material delivered ?

- The material is delivered using one or more sizes of containers (bins) each with their own load, unload and retrieval times. You collect data in advance to understand how many of the containers of each size are need by each workstation based on demand. You then convert this to the percent of containers of each size for the overall route.

How is the material transported ?

- You also select the transport method with its operational parameters(speed, mount time , dismount time, walk back times)

Can multiple routes be designed ?

- Yes, you can design one or more routes on the same map and play with which stops are served by which route. Important that the underlying floor plan is really scaled up to reduce mapping congestion

What about large, non-container items ?

- These can have their own materials motion strategy. Everything does not have to be delivered via the milk run method

Where is the demand represented on the map ?

- One input you provide is the number of containers to be delivered or loaded at different points. These correspond to the materials needed to support the current demand (100% level). You can change the demand % for what-if study purposes

What if the stations support multiple value streams and you are delivering materials for each?

- That's fine. You just specify the total number of containers at each station

What if the milk run is assigned any additional task at a stop other than load, unload, retrieval ?

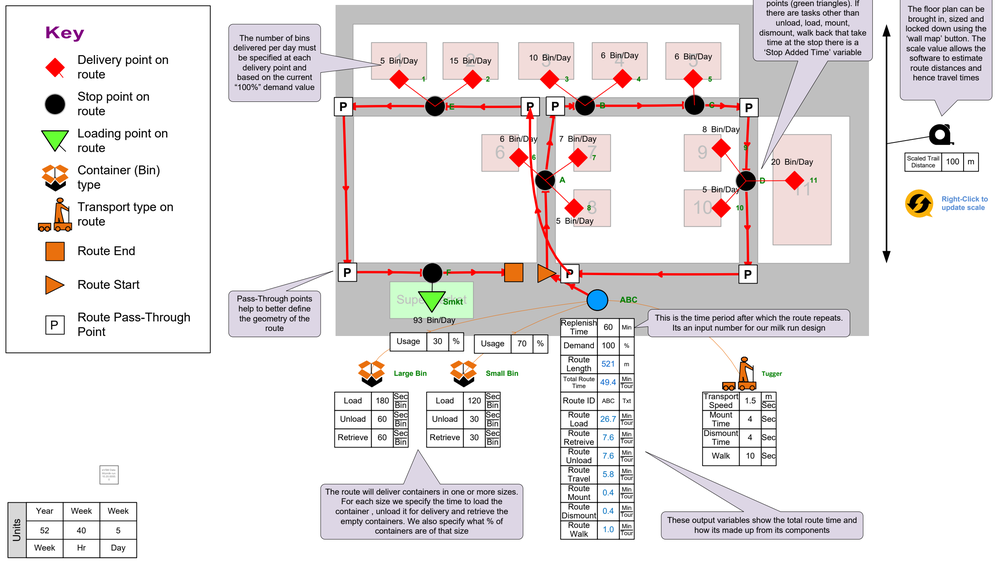
- You can enter a value for 'Stop Added Time' to cover this at any stop

Units	Year	Week	Week
	52	40	5
	Week	Hr	Day

milk run / Typical Application

ACME is planning its materials replenishment strategy for a production area and wants to design a materials delivery milk run on a fixed time interval. They plan to use a tugger as the delivery vehicle and have the related parts binned into two standard container sizes.. The diagram below shows the planned stops and the containers required per day at each stop based on current demand. Also shown are operational parameter's related to the tugger and the containers. The goal is to:

1. Develop a route that passes through all the stops (no reversals in the passageways). Shown by the red arrows
2. Understand the delivery time and the loading time associated with a 60 minute replenishment cycle (Data under blue circle)
3. Decide if the tugger operator can also do the loading within the 60 minute period (Total Route Time value must be < 60 mins)
4. Test the model with a demand increase of 20% (Change Demand % value to 120% and rerun the model)



milk run Model / Step By Step

Import the Floor Layout

- A to-scale floor-plan is needed because the analytics will include the time taken for the tugger travel along the route specified
- On a new page in eVSM, Use the Wall Map button in the eVSM toolbar to import the image. In the pop-up form with the image preview drag over a aisle in the image (create a square about the width of the aisle) to establish the scale

Open the milk run application

- Use "Open" button in the "Sketch" module of the eVSM toolbar and select the 'Facility Planning' category and then the 'Plant milk run' application.The application will open as a Visio stencil labeled 'Wizmilk run' on the left of the page

Start the route design

- The 'Time Units' shape MUST be the first shape you put on the page. Use CTRL-Drag on the top page edge to extend it upwards. Drop the time units shape in the white space created at the top. Select the appropriate units for your region. Change the time values to establish production hours per week

Scale' stencil shape

- This is a means to establish the scale of the floor plan image that you imported. Drop this out in any white space around the layout, and then move the arrow end points to a known length on the floor plan. Set the 'Scaled Trail Distance" value to that length.Whenever you change the scale factor you must right-click the orange interaction shape and select 'update scale'

Route Center' stencil shape

- This shape will allow you to enter the replenishment period (route frequency) and after solve will summarize the route time, travel distance and other metrics
- Use CTRL-Drag on the bottom page edge to extend it downwards. Drop the 'Route Center' shape below the layout in the white space. Fill in an initial value of 'Replenishment Time'. You will be providing information later on bins/day to be delivered and loaded. Make sure these are nominal values for 100% demand. You can then scale these values automatically by changing the demand % value.

Transport Center' Stencil Shape

- This shape will allow you to specify the transport method with associated speed and other operational values like mount and dismount times
- Drop this near the 'Route Center' and right click the transport shape to select the transport type to be used on this route. Edit the speed, mount, dismount and walk times accordingly
- Select the 'Transport Shape' and then holding down the shift key ALSO select the 'Route Center' shape. Now use the 'Autopipe' button in the toolbar to generate a pipe connection from the transport to the Route Center. Note that there can only be ONE transport center for each Route Center

Container Center' Stencil Shape

- You can use one or more container types for the route and each with their own operational characteristics (load time, unload time, retrieval time)
- Drop one (or more) of these near the 'Route Center' depending on the main types of containers that will be handled on this route
- Select the 'Container Shape' and then holding down the shift key ALSO select the 'Route Center' shape. Now use the 'Autopipe' button in the toolbar to generate a pipe connection from the container to the Route Center. Repeat for each container shape type and finally enter the appropriate values for load, unload and retrieve empty for each container type
- For each container type, enter the 'Usage' percent on the pipe arrows between the container and the route center. The sum of the Usage Percent values must be 100

Stop Centers

- The transport will stop at each of the stop points on the route. A stop point can serve one or more delivery points and one or more load points.
- Drop the stop centers at the appropriate locations.

Route Path

- This defines the route taken by the delivery vehicle through the stop points and any pass-through points (for better geometry definition of the route)
- First drop out the 'Start Route' and 'End Route' shapes. The route is defined by picking shapes in sequence and then using the AutoSequence button. It begins at the Route center, goes to the "Start Route" shape, then to each of the stop points (and any pass through points) and finishes at the 'End Route' shape

Delivery Centers

- This is where the containers are delivered and empty containers are retrieved
- Drop the delivery centers at the stations served by this route. Give each center the name of the station. Glue the delivery center via the flying yellow connector to the stop center that serves it. Double-click on the data field to specify the number of containers to be delivered per time period (NOT per single tour of the route)

Load Centers

- This is where empty containers are filled up (loaded)
- Drop the load centers at each location where material is being loaded in this route. Give each center the name of the location. Glue the load center via the flying yellow connector to the stop center that serves it. Double-click on the data field to specify the number of containers to be loaded per time period (NOT per single tour of the route)

Check

- Use the 'Check' button in the eVSM toolbar to make sure that the required input value have been specified

Solve

- Use the 'Solve' button in the eVSM toolbar to calculate the values in blue in the Route Center . You may have to unhide some of the variables using the eVSM 'Views' button or examine using the 'List Variables' button

Map Variables

Demand : Demand percent. This is used to scale the number of containers given higher or lower demand
Dismount Time : Time to dismount from the vehicle once you arrive at a stop
Load : Nominal time to fill one bin of material at the supermarket or other source. For a specific materials this time can be adjusted via the materials 'Fill Factor'
Mount Time : Time to mount the vehicle after completing activities at a stop
Replenish Time : Time between knwing that a replenishment quantity is required to that quantity arriving at the station. Include the information processing time, getting the materials from the supermarket or source and the transport time to the station
Retrieve : Nominal time to retrieve an empty bin (for a material) from the station back to the transport vehicle. This can be adjusted for a specific material via its 'Retrieve Factor'
Route Dismount : The sum of the dismount times at each stop on the Route
Route ID : Text ID for this route
Route Length : The real world trail length based on the underlying trail that the transport shape is on. The transport shape also has a "leader line" that can be enabled for finer placement onto the trail via the flying yellow diamond at the end of the leader line
Route Load : The time to get the bins and trailers ready to go on the Route
Route Mount : The sum of the mount times at each stop on the Route
Route Retreive : The sum of the empty bin retreval times for each material at each stop on the Route
Route Travel : Travel time per Route given Route distance and speed. Does not include time spent at stops
Route Unload : The sum of the unload times for each material at each stop on the Route
Route Walk : The sum of the walk times at each stop on the Route
Scaled Trail Distance : The length represented by the scale line
Total Route Time : Time from the start to the end of the Route.
Transport Speed : The average speed of the Small load carrier WHEN it is moving. Does not include stoppage times.
Unload : Nominal time to move a full bin of the material from the trailer to the station. This can be adjusted for a specific materials via its 'Unload Factor'
Usage : The approx percent usage of these types of containers on the Route
Walk : Time to walk to and from the vehicle to the material