

# Hierarchical Modeling and Material Handling in Process Simulator Webinar



Process  
simulator

Professional

Instructor Info:  
Rebecca Santos  
Technical Support  
[rdossantos@promodel.com](mailto:rdossantos@promodel.com)

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705 E Timpanogos Pkwy  
Orem UT 84097  
801-223-4600

# Agenda

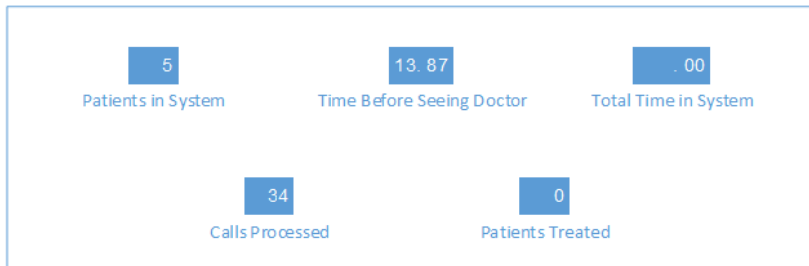
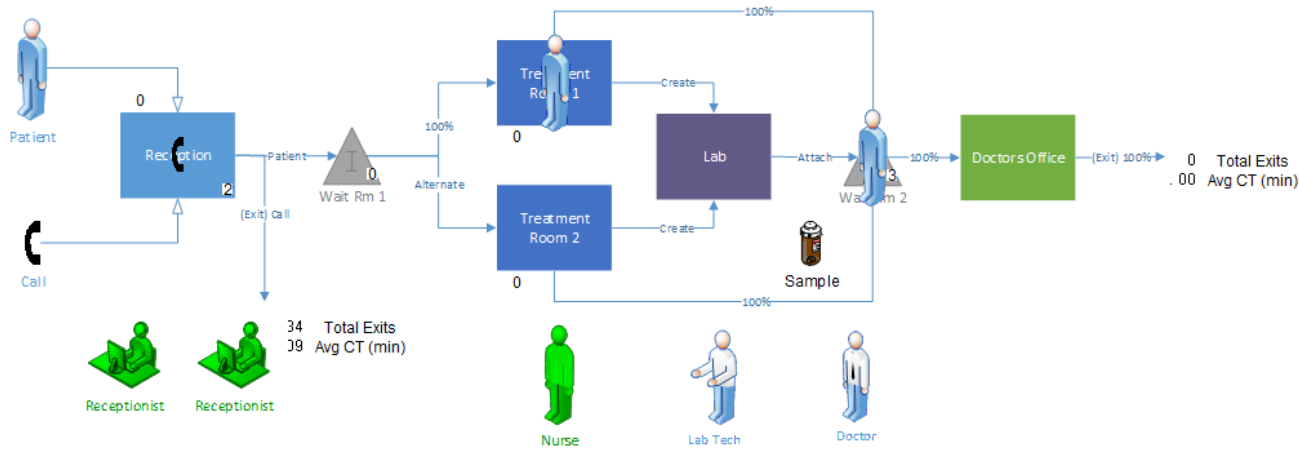
- Hierarchical Models in Process Simulator
- Material Handling in Process Simulator

# What are Hierarchical Models?

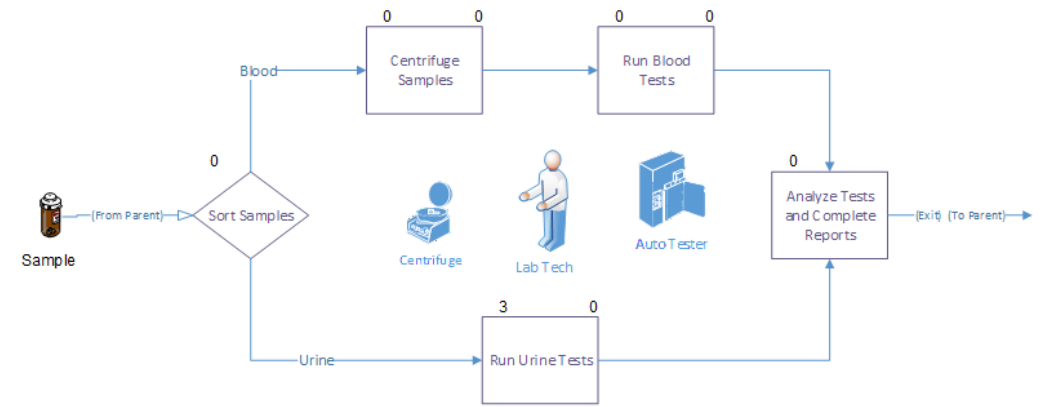
- Hierarchical models are simply models that are built on top of models (or submodels).
- It's a way of rolling-up detailed processes into high level views, or “black box-ing” areas of your model at a higher level.

# Hierarchical Models

Medical Clinic Demo



Lab Processing Sub-model



# Creating a Submodel

- Process Simulator allows you to model detailed processes and link them to a higher level process or summary view.
- The first step is to create a submodel. This submodel could be an entirely separate Visio (.vsdx) file, or simply another page within your existing model.

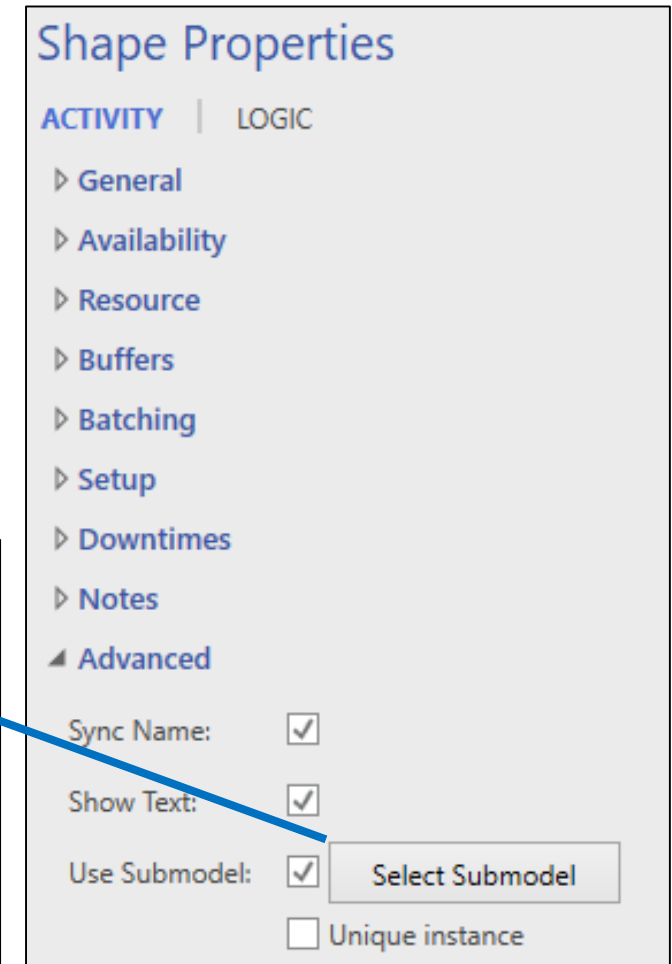
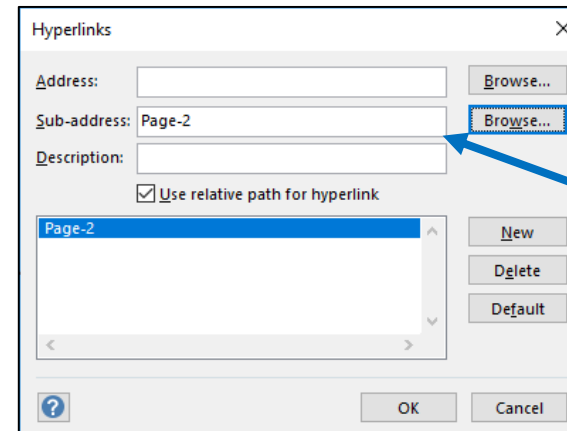
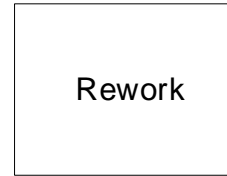
- To create a sub-model within your current model, select the New Page icon at the bottom of the Visio screen.



- On the New Page (i.e. Page-2), you can create a separate model.
- The second step will be to create a link between the two pages.

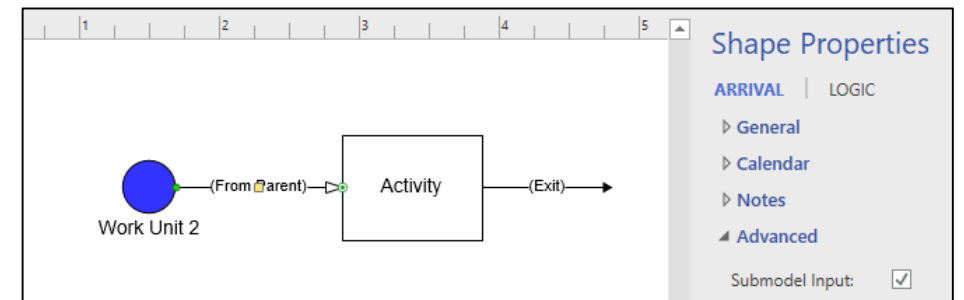
# Defining a Submodel

- Select the parent activity you wish to link to a submodel
- Select Advances in the Shape Properties. You can Enable or Disable the use of this submodels within your Process Simulator logic by selecting or deselecting "Use Submodel"
- Check Use Submodel. And Select the submodel to use.
  - Enter the Visio file name or the Page name and click OK
  - For pages within the same .vsdx, use the "Sub-address" field
  - To link to other .vsdx files (on a hard drive or network drive), use the "Address" field



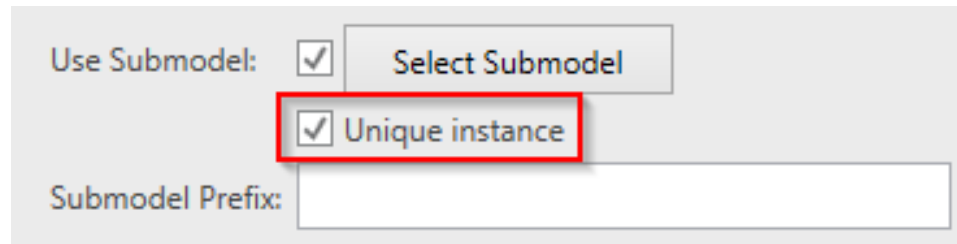
# Hierarchical Modeling Rules

- If the Submodel checkbox is checked for an activity, there must be a submodel defined.
- Entities enter a submodel at an activity that has either:
  - No incoming routing connection
  - An arrival connection with “Input to Submodel” checkbox checked
- Entities either exit the model from their submodel, or route back to the parent if the “Output from Submodel” checkbox is checked.



# Unique Instances

- If you are going to use the same submodel in multiple activities you have the option to make it a unique instance or not.
  - If you select the option Unique Instance your submodel will be duplicated.
  - In order to show correct results on Output Viewer of duplicated models you have to defines a Submodel Prefix that identifies each submodel individually.



The screenshot shows a configuration panel with the following elements:

- A label "Use Submodel:" followed by a checked checkbox  and a button labeled "Select Submodel".
- A checked checkbox  labeled "Unique instance", which is highlighted with a red rectangular border.
- A label "Submodel Prefix:" followed by an empty text input field.



# Model Building Demonstration

Let's build a simple model with...

1. Hierarchical model
2. Unique Instances of Hierarchical models

# Other Assumptions

- Resources, entities, attributes and variables with the same name in the parent document or submodel documents are assumed to be the same:
  - If the same resource, entity, attribute, or variable is defined in both the main document and any submodels document, the duplicate object definitions in the submodels are ignored.
  - If the same attribute or variable definition is in two separate documents (and not the main document), the first instance encountered will be the one defined, any others are ignored.
  - If the same resource or entity is defined in two separate submodel documents (and not the main document), the two objects will be given unique names and treated as two separate objects. For example, if two submodel documents have a Worker1 defined, where submodel1 is linked to Act1 in the main model and submodel2 is linked to Act2, then the resources will be renamed Act1\_Worker1 and Act2\_Worker1, respectively.
- Models and submodels can not be circularly referenced.
- Only Scenario Parameters in the main document will be used, to experiment on factors in the submodel

# Common Material Handling Systems

## ▶ Manufacturing

- Conveyor Systems
  - Roller and Belt Conveyors
  - Power & Free Systems
  - Overhead Conveyors
- Forklifts, Pallet Jacks
- Tuggers, “Waterspiders”
- AGVs & AGCs

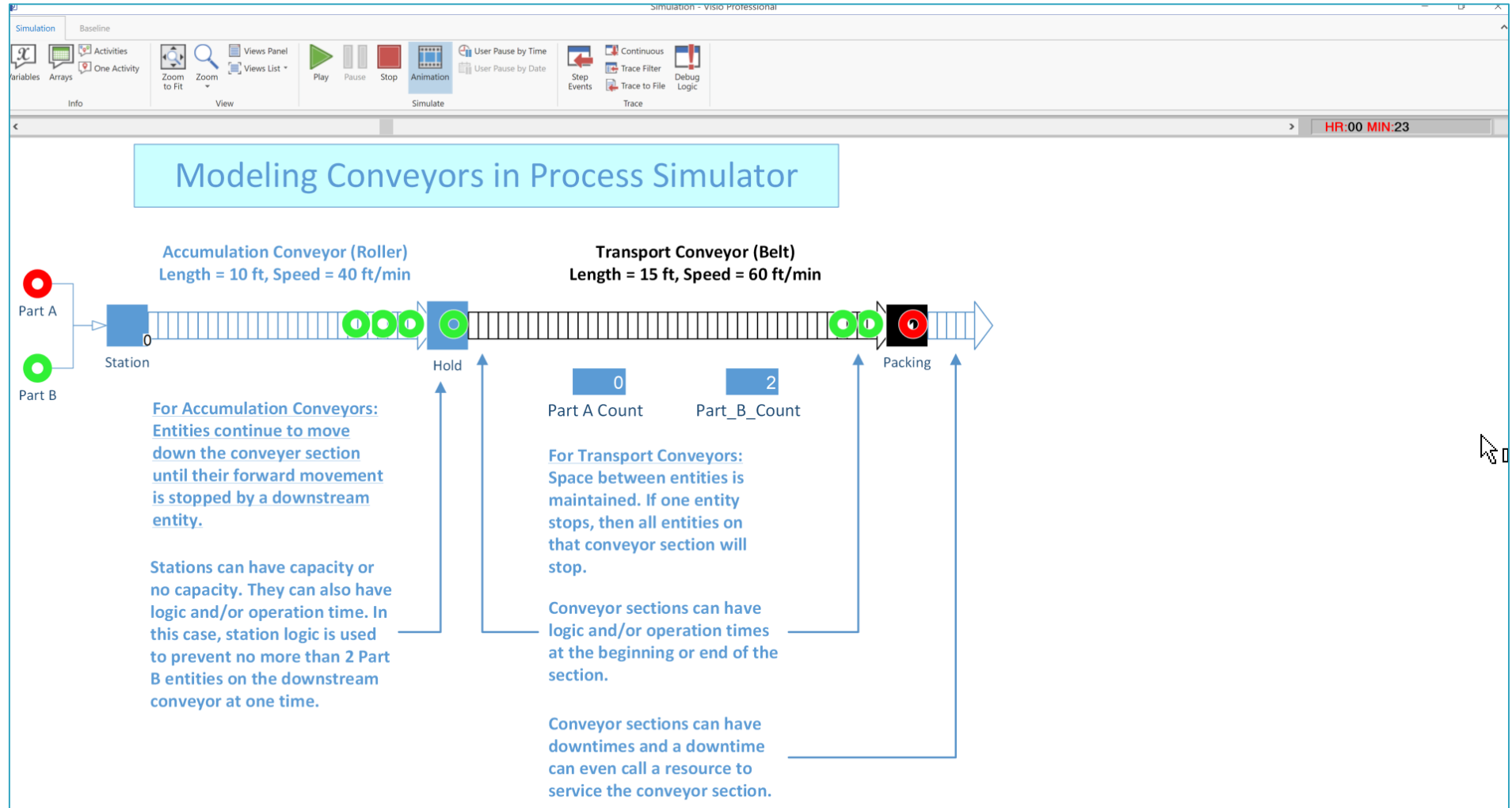
## ▶ Distribution Networks

- Truck, Train, Ship, Plane
- Multi-modal systems

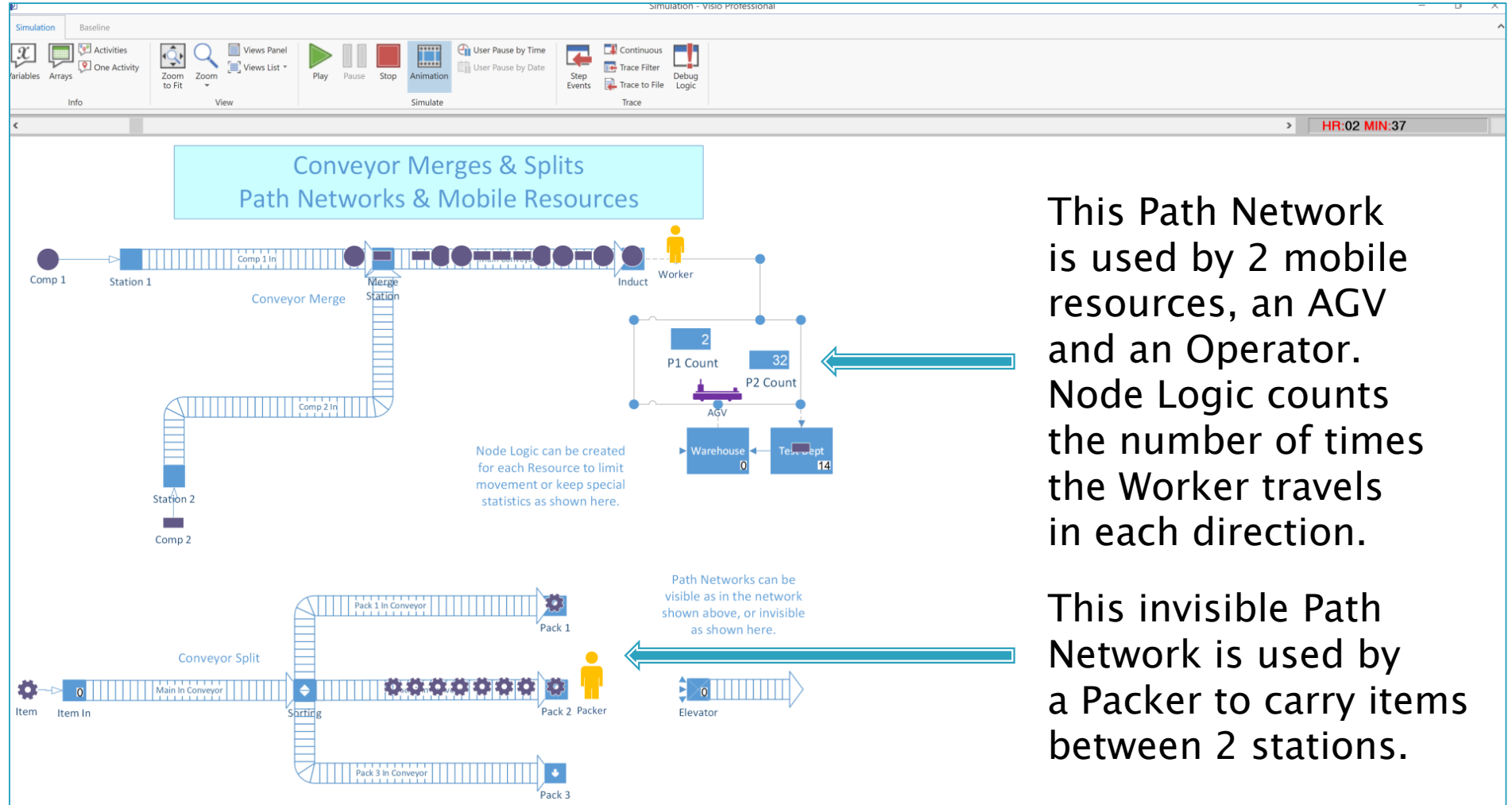
## ▶ Service Systems

- Hospital Networks
- Passenger Flow
- Queuing Systems
  - Banks, Theme Parks

# Conveyor Systems



# Dynamic Resources



This Path Network is used by 2 mobile resources, an AGV and an Operator. Node Logic counts the number of times the Worker travels in each direction.

This invisible Path Network is used by a Packer to carry items between 2 stations.

# Model Building Demonstration

Let's build a simple model with...

1. A simple conveyor system
2. A path network and a dynamic resource

# For ProModel / MedModel Users...

1. Conveyor sections are modeled as Routings in Process Simulator and not as Activities. This was necessary to be able to use more of Visio's powerful drawing functions.
  - Conveyor sections become Locations duration translation to the .mod file. If you open the .mod file in PM/MM, the conveyor sections will be in the Locations module.
  - (When building a model in ProModel or MedModel, conveyor sections are created as Locations and always remain as such.)
2. In order for a Resource to be dynamic and travel from one Activity to another, it must move on a Path Network and the Activities it services must interface with the Path Network.

# Process Simulator vs. ProModel

- ProModel Capabilities that are Not available in the Process Simulator, Material Handling Edition
  - No Queue functionality, only Conveyors
  - Entities cannot travel independently on Path Networks
  - Bridge Cranes



# FINISHED

- Thanks for attending this webinar! We hope it was helpful.
- Remember, help is only an email or phone call away.
- Good luck and happy modeling!

Technical Support  
888-776-6633  
support@promodel.com  
6 am - 6 pm M-F, Mountain Time