

Why is my model behaving this way?!

Techniques to Eradicate Difficult Bugs

Debugging in Simio

- ▶ Different Types of Model Errors
- ▶ Animation
- ▶ Breakpoints
- ▶ Trace
- ▶ Watch
- ▶ Step Mode
- ▶ Notify Step
- ▶ Color Steps
- ▶ Observation Logs / Gantt Charts (Enterprise)
- ▶ Run-Time Profiling
- ▶ Run a Specific Replication

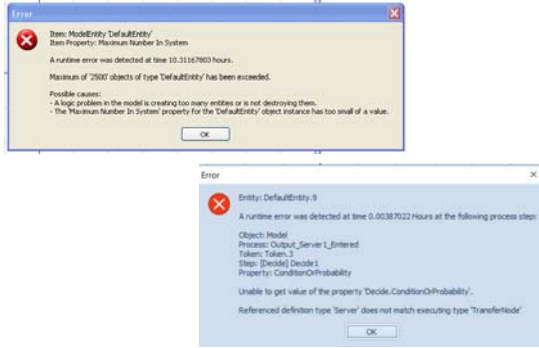
Detecting and Resolving Model Errors

- ▶ In general, there are three classes of errors encountered during the development and implementation of a simulation model:
 - **Syntax errors** – Incorrect usage of language constructs/modules.
 - **Runtime errors** – Program errors that occur during the simulation run (e.g., exceeding the memory limits).
 - **Logic errors** – Errors in the modeling logic that cause the simulation to run in an unexpected manner.

Syntax Errors

- ▶ Some of the common errors that are automatically detected include:
 - Misspellings of keywords and reserved words
 - Undefined states, resources, statistics, etc.
 - Unconnected objects
 - Duplicate use of object names or other “strings”
- ▶ Syntax errors are reported to the user and Simio provides functions to try to “find” the error and lists possible causes.
- ▶ These errors are generally easy to find and fix.

Runtime Errors



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Logic Errors

- ▶ While Simio is fairly helpful in finding and fixing syntax and runtime errors, it generally cannot automatically find logic errors.
- ▶ With a logic error, the model compiles and runs without errors, but the logic error makes the model results not “correct”.
- ▶ *A significant part of most modeling efforts is often spent resolving bugs!*
- ▶ Your effectiveness at dealing with them can determine your effectiveness as a modeler.

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Animation

- ▶ 2D Animation (Top down view)
- ▶ 3D
 - “H” to display navigation tips
 - “R” to start rotation, “Esc” to stop
 - “W” to walk at floor level
- ▶ View Ribbon
 - Named Views
 - Camera Placement

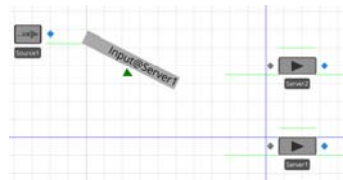
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Animation

▶ Status Labels



▶ Queues



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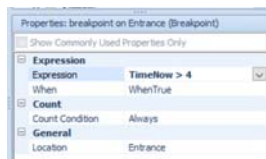
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Breakpoints



- ▶ Facility Window – Objects
- ▶ Process Window – Steps
- ▶ Control Behavior via Properties RT1



When: When True
When Changed

Count Condition: Always
Equal To
At Least

Turn Breakpoints on/off

Breakpoint	Location	Expression
RT1	Entrance	When Timeflow > 4 is true
	Server1	(none)
	BagPiles1	(none)

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Trace



- ▶ Trace provides a complete listing of all actions that take place while trace is enabled.
- ▶ Column size can be adjusted to take best advantage of space available.
- ▶ Filtering allows focusing your attention on a subset.
- ▶ Trace is automatically copied to a CSV file
 - Found in same location as project (SPF) file
 - Can be imported into Excel to take advantage of its sorting and filtering.
- ▶ Trace works well in combination with setting Breakpoints and using Step to run incrementally through the model.

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Watch



- ▶ Right click on any object to add to Watch window
 - Static objects
 - Dynamic objects (while in system)
- ▶ Explode the tree under each item in the watch window to display current values of
 - States
 - Functions
 - Elements
 - Processes
 - Tokens
- ▶ Works well with setting Breaks

Watch



Name	Value
Four31	
Size	287.49136850065219 Cubic Meters
AllocationQueue	0
CurrentCapacity	1
Cost	0 USD
ResourceState	Processing
TotalMeters	0
LocationID	23
LocationAreaID	8
CurrentCharge	
LocationName	Four31
ID	0
Fe	0
ReserveEmptySpot	False
TruckArrived	False
Functions	
InputBuffer	
TransferInState	0
Contents	1
52 (Crucible1.3358)	
Size	13.61456885134014 Cubic Meters
AllocationQueue	0
CurrentCapacity	0
Cost	0 USD
Movement	0 Meters
DesiredSpeed	3999999400 Meters per Hour

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Slide 9

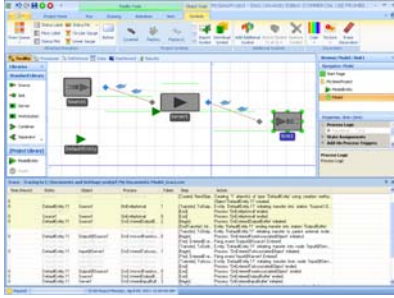
RT1

Renee Thiesing, 5/22/2017

Step Mode



► Facility Window Vs Process Window

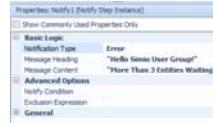


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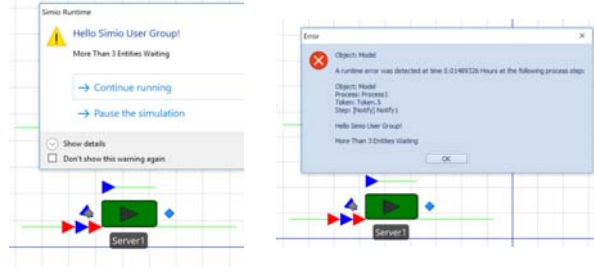
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Notify Step



Error, Warning, Trace

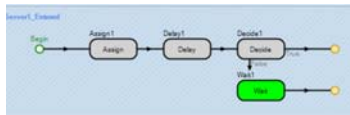


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Color Steps



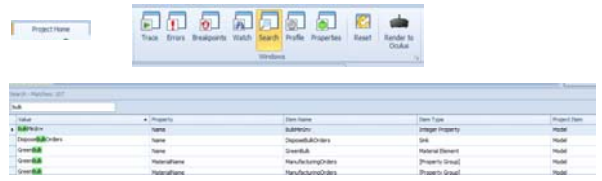
Step	Action
[Begin]	Process Server 1.OrtInterGroupBuffer started.
[Execute] Entered_A	Executing process Server 1_EnterA.
[Begin]	Process Server 1_EnterA started.
[Delay] Delay1	Delaying taken for 0.1111111111111117 Hours until time 0.1114206346206357 Hours.
[Decide] Decide1	Taken branching on condition 'timeNow > 1'. Taken sent to 'Take1' exit.
[View] View1	Viewing step for event 'Time 1.Event'. Viewing step at time 0.12 (seconds).
[Begin]	Firing event 'Source 1.EntityArrival.Event'.
[Begin]	Process 'Source 1.OrtEntityArrival' started.
[Create] Entities	Creating '1' object(s) of entity type 'DefaultEntity' using creation method 'NewObject'. Object 'DefaultEntity_12' created.

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Search



Double Click to Navigate to the found reference

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Properties Spreadsheet

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Observation Logs (Enterprise)

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Gantt Charts (Enterprise)

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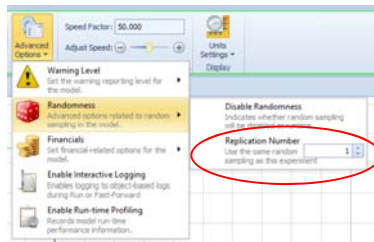
Run-Time Profiling

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Run a Specific Replication



Run Ribbon



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Discovering Subtle Problems



- ▶ Develop your expectations before running the model
- ▶ Watch the animation carefully
- ▶ Enhance the animation to be more informative
 - Attached labels
- ▶ Examine output statistics carefully
- ▶ Take full advantage of provided debugging tools

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