



QUICK REFERENCE CARD

The purpose of this Simio quick reference card is to summarize the key points that a student or a routine user needs while building a new model.

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1. Model Windows:

	Model Windows
Facility Window	Defines the model in terms of animated objects.
Processes Window	Defines the model logic in terms of traditional process flow.
Definition Window	Displays a panel of buttons where the user can define element, states, events, etc.
Data Window	Allows the user to access a number of panels to create and edit data.
Results	Allows the user to display the results in the form of a Pivot Grid, Reports, Dashboard Reports or Logs.
Ribbons	Multiple ribbon tabs (Project Home, Run, Animation, Drawing, View, Support, etc.)
Navigation Window	used to switch between the different models that exist within the project
Libraries	The Project Library is a list of objects (i.e. models) that are contained within a project

2. Standard Library:

Name	Class	Description
Source	Fixed	Creates entities that arrive to the system.
Sink	Fixed	Destroys entities and records statistics.
Server	Fixed	Models a multi-channel service process with input/output queues.
Resource	Fixed	Models a resource that can be used by other objects.
Combiner	Fixed	Combines entities in batches.
Separator	Fixed	Separates entities from batches.
Workstation	Fixed	Models a 3-phase workstation with setup, processing, and teardown.
Vehicle	Transporter	Carries entities between Fixed objects.
Worker	Transporter	Carries entities between Fixed objects and processes entities at a fixed location.
Basic Node	Node	A simple intersection of Links.
Transfer Node	Node	An intersection where entities set destination and wait on Transporters.
Connector	Link	A zero-time connection between two Nodes.
Path	Link	A pathway between two Nodes where entities travel based on speed.
Time Path	Link	A pathway with a specified travel time.
Conveyor	Link	An accumulating/non-accumulating Conveyor device.

3. What is an Object?

Object	1. Objects Terminology
Definition	The behavior of object and is shared by all instances of the object in all models in which it is used. Object definitions reside in a library, either the Standard Library, a custom library, or a
instance	An occurrence of an Object Definition within a parent object, such as a model or another object definition. This is what you get when you place a definition into the Facility window.
Runspace	Once a simulation run is started, Object Instances are represented with object realizations. Object realizations hold the state values for that object instance.
Object	2. Objects Characteristics
2.1. Properties	The input parameters associated with that object. They are added to a model from the Properties panel of the Definitions window.
2.2. State	Represents a numeric or string value that may change during the run. States are added to a model from the States panel within the Definitions window
2.3. Events	An Event is a notification that can be given by one object and responded to by several. An Event is added to a model from the Events panel within the Definitions window.
Object	2.1. Properties Types
Standard	Integer, Real, Expression, Boolean, DateTime...
Element	Station, Network, Material, TallyStatistic...
Object Entity	Transporter, or other generic or specific object reference
Repeat Group	A repeating set of any of the above
Object	2.2. States Types
Real	a real numeric value that may change by assignment logic at discrete times during a model run.
Integer	an integer numeric value that may change by assignment logic at discrete times during a model run.
Boolean	a boolean (true or false) value that may change by assignment logic at discrete times during a model run.
DateTime	a datetime value that may change by assignment logic at discrete times during a model run.
List	an integer variable with a discrete set of possible values from 0 to N.
String	a string value that may change by assignment logic at discrete times during a model run. String expression function could be used.
Element Reference	an object reference variable that may be changed by assignment logic at discrete times during a model run. You can assign a value to an element reference state using an Assign step in a process.

4. Results and Experiments:

4.1	Interactive Results Verses Experiment Results
Interactive Results	Allows the user to makes certain changes to the model during the run. Certain tools are available while running the model interactively, such as the ability to view or hide the Trace window
Experiment Results	An Experiment allows the user to run multiple scenarios, multiple replications, add controls and get responses. An Experiment is run in batch mode, without animation, so it is the faster way to run a model. If the user would like to add a warm up period for the model, this can be specified in the properties of an experiment.

4.2	Pivot Table
Definition	Displays result data from a simulation run(s). It lets the user interactively analyze the results in the form of a dynamic rotatable table.
Content	1. Pivot Table categories Statistics on the number of things inside or on something, such as NumberInSystem or NumberOnLink.
Throughput	Category used for totals on items entered/created or items exited/destroyed.
Capacity	Statistics related to capacity, including number of units allocated over time, units scheduled and utilization of the object.
FlowTime	Category used for entity time in system (population or by Sink) or entity time on link.
HoldingTime	Category used for entity time held in a station location or held in a batch.
ResourceState	Category used to show occurrences, percent and average times in each of the resource states in which an object may be.
Costs	Category used to show final values of cost for each object or cost center, in addition to Population.Cost statistics for Entity and Transporter type objects.
Grouping	Drag the columns to different positions to cause the data to be grouped differently
Sorting	Click on that triangle to toggle the column sort order between ascending and descending.
Filtering	Click on the funnel in column heading for a menu to enable/disable of any field in that column

The red circle in figure (1) below identifies the columns and their symbols. Columns may be moved around within the pivot grid. The up/down arrow may be used to sort the rows within a column into alphabetical order.

Figure 1. Pivot Table Columns and Filtering

4.3 Dashboard reports:

Dashboard reports allow you to display a dashboard based report of generated model data. A dashboard allows you to organize and present model information that is customizable and easy to read. Model data can be displayed in many graphical forms such as grids, charts and gauges. It also allows you to customize your dashboard by adding images, text boxes and filter ranges.

4.4 Reports:

The Reports panel of the Results tab displays a traditionally formatted report that provides flexible visual formatting for inclusion in printed documents and is useful in presenting results to others. Reports are provided for both a single scenario and for comparing two scenarios.

4.5 SMORE Plots

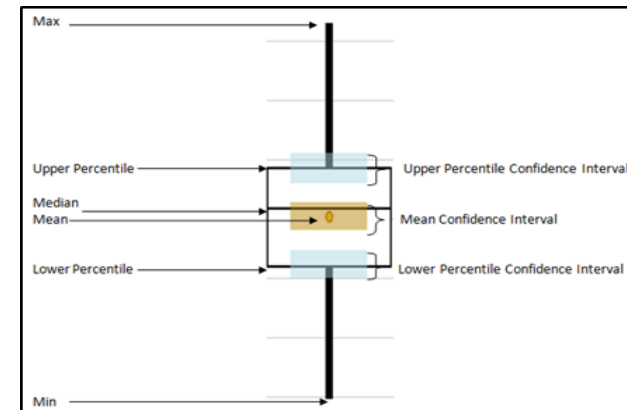


Figure 2 SMORE plot Components

5. Processes

5	Process Types
	5.1. Standard Processes
Definition	Automatically run by Simio at specific points in the logic
Seven standard processes	OnCapacityAllocated - This is executed when a resource's capacity is allocated (seized).
	OnCapacityChanged - This is executed when a resource's capacity has changed.
	OnCapacityReleased - This is executed when a resource's capacity is released.
	OnEnteredFreeSpace - This is executed when an entity object transfers from a non-free space location into free space.
	OnEvaluatingAllocation - This is executed when determining whether or not the object's capacity should be allocated (seized).
	OnRunEnding - If running in interactive mode, then this is executed when the Stop or Reset button action occurs.
	OnRunInitialized - This is executed when this object/model is first initialized.
	5.2. Add-On Processes
Definition	Add-on processes are typically defined by a user to help customize object behavior or add specific behavior into a model.
Steps for Add-On Process	2.1 Select the object in the Facility Window and then expand the Add-On Process Triggers list.
	2.2 Click on the trigger that you would like to use and select (Run Initialized, Run Ending, Creating Entities, Exited, etc.)
	2.3 Add Steps to the Process. The functionality of each Step can be customized by changing the properties in the Properties window. See figure (2)
	5.3. Event Triggered Process
Definition	The user can create a new process with the Create Process icon in the ribbon menu. The user can specify a triggering event (in the Process Properties Window) for these new processes. See Figure(3)

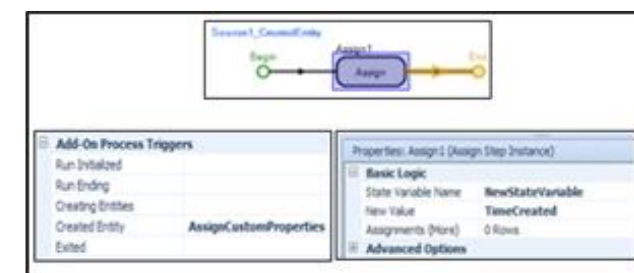


Figure 3 Add On Processes Steps

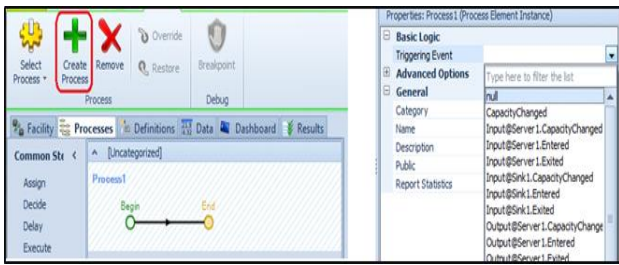


Figure 4 Event Triggered Processes Steps

6. Working with Model Data

6.1	Data Table
Definition	Tables are used to hold model data that may be referenced by individual entities and/or tokens. The data columns in the table can be any of the property types provided by Simio
6.2	Table Expressions
References a property value in the active row.	TableName.PropertyName
References a property value in any row	TableName[RowNumber].
References a property value in any row and column.	TableName[RowNumber, ColumnNumber]
Returns a random row index using the values in the property as weights (e.g. product mix).	TableName.PropertyName.RandomRow:
Returns the number of rows in the given table.	TableName.AvailableRowCount:
6.3	Table Types
6.3.1 Sequence Tables	A Sequence Table is a data table that has a destination column that is used to specify a sequence of destinations for an entity (e.g. the job routing sequence in a job shop).
6.3.1.1. How to make entities follow Sequence table	The sequence table that an entity follows can be initially set as the Initial Sequence property of the entity instance. The routing logic for an entity can specify that the entity destination is to be set "By Sequence". This may be specified in the Entity Destination Type for the TransferNode or Destination Type of the SetNode step. See figure (5)
6.3.2 Relational Tables	A Foreign Key reference is used to relate data from multiple data and/or sequence tables.
6.3.3 Arrival Tables	Change the arrival mode property on the source to arrival table. Then, change the arrival time property to TableName.ArrivalTime.
6.3.4 Schedules	Schedules are used to model situations where the capacity of an object varies over time
6.3.4.1 Work schedule table	A Work Schedule is defined by specifying the number of repeating days within the schedule and the associated Day Pattern for each day
6.3.4.2 Day Patterns table	A Day Pattern consists of a single or multiple Work Periods that define on shift and off shift periods with a starting time, duration and ending time
6.3.5 Rate Table	The Rate Tables panel in the Data window allows the user to model situations where an arrival/event rate varies discretely over time. The number of fixed rate periods and the length of each rate period can be specified in the Rate table. The rate pattern automatically repeats during the running of the simulation.

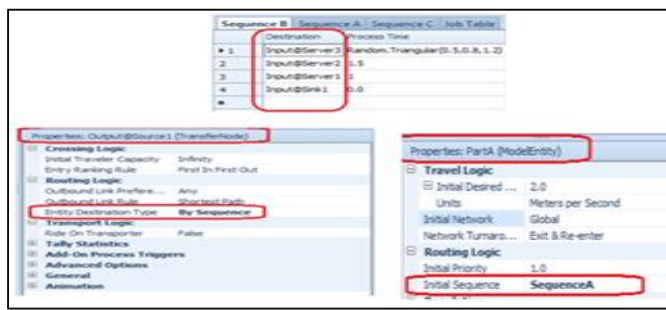


Figure 5. Sequence Table Steps

7. Tokens Vs Entities:

	Tokens and Entities
ModelEntity	Within the Project Library, the ModelEntity object is typically used to place an Entity type within the Facility window
Entity	Entities are part of an object model and can have their own intelligent behavior. Entities do not flow through processes, as Tokens do
Token	A Token executes the Steps in a process flow, and it may have one or more user-defined States that carry information from Step to Step. It lives inside of a process - it is created at the beginning of a process and it is destroyed at the end of that same process

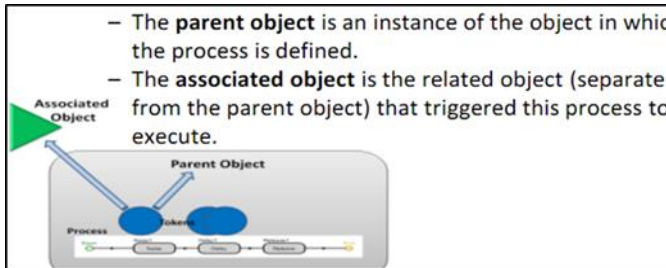


Figure 6 Relationships between Tokens, Objects, and Processes

8. Animations:

It used for these purposes:

8.1 visualization & communication

8.2 verification

Animation Tools	Description
Symbols	A user can add animation components, such as attached queues and status labels, as well as download, import and create new symbols from the Symbols tab ribbon. See figure 7
Drawing	A user can add symbols, lines, rectangles, ellipses, curves, polygons and labels to the Facility Window or External Window of their model. See figure 8
Adding Additional Symbols	A user might want to add additional symbols to an object in order to have some model logic change the appearance of the object from one symbol to another while the model is running. See figure 9
Changing the View	From within the Facility Window, the View Ribbon can be used to change how the objects and the background appear in the window. See figure 10
Visibility	From within the Facility Window, the Visibility Ribbon can be used to toggle on and off various objects, as well as view the networks. See figure 11

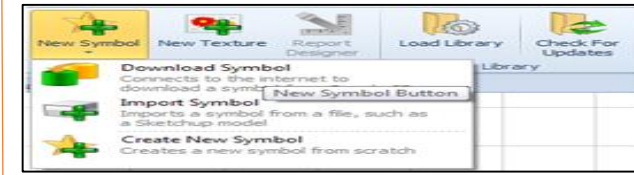


Figure 7. New Symbol Icon



Figure 8. Drawing Tab Ribbon

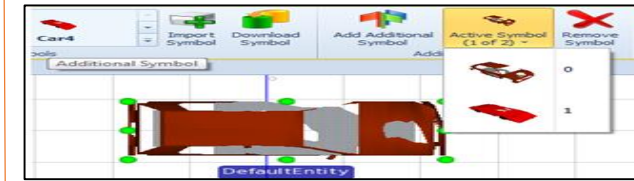


Figure 9. Additional Symbols

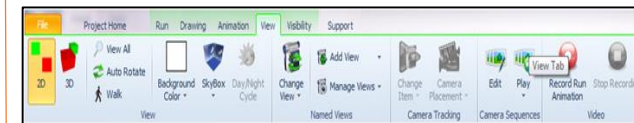


Figure 10. View Ribbon

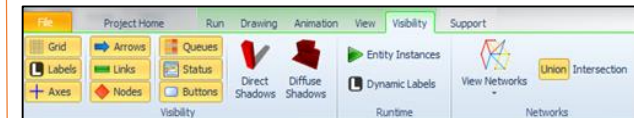


Figure 11. Visibility Ribbon

9. Debugging Tools.

Debugging Tools	Description
Animation	Simio includes both 2D and 3D animation graphics that allow you to quickly and easily build a model and watch it run.
Trace	The model trace allows you to see exactly what is occurring during the simulation run with each step that occurs. This enables you to slowly "walk through" the simulation events one
Break	A Breakpoint can be added to an object, node or link in the Facility window, or to a step within the Processes window. It causes the execution of the model to pause when an entity
Watch	Within this window, you can view the values of various states and functions for any number of objects in the system. To add a Watch on a particular object, right click on the object in the
Step	If the Processes window is active, the simulation model will pause much more frequently, as it stops at each step within the processes window

10. Risk Based Planning and Scheduling:

You need to download the Simio Enterprise Edition to have the planning tab in your model.

Planning Tools	Description
Target	A target is an expression that will be evaluated at the end of the simulation run to determine if a particular goal is met. Within the Targets ribbon, there are two buttons, including Add Target and Remove Target, as well as a performance slider. See Figure 12
Entity Workflow	Provides a Gantt chart that displays each entity along with time bars that shows each resource the entity utilizes. You can expand each row to show each constraint that impedes the progress of the entity. The Gantt also displays date-time based milestones and targets for each entity, along with associated risk measures. See figure 13
Resource Plan	Provides a Gantt chart that displays each resource along with time bars that show each entity (e.g. a job) that utilizes the resource. See figure 14
Facility Model	A 3D animated facility view that is useful for viewing an animation of the plan. You can jump to a specific resource and time in the animation by right clicking on a resource bar in Gantt within the Resource Plan view and selecting "Re-run to here".
Log	The Resource Usage Log provides information detailing each resource and the entity / order that utilized it. There are eight automatic columns that are provided with the log(Resource - Owner -Start Time -End Time -Duration -Avg -Min -Max)



Figure 12. Target

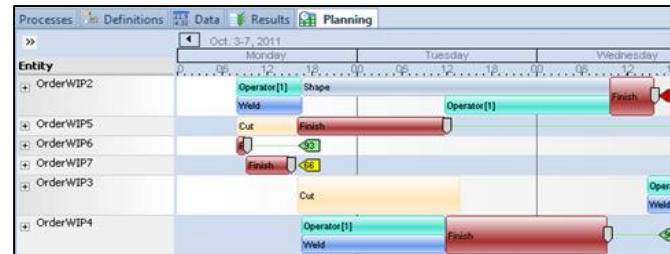


Figure 13. Entity WorkFlow



Figure 14. Resource Plan

11. Bibliography

W.David Kelton, J. Smith, D Sturrock. (2014). *Simio Simulation : Modeling, Analysis, Applications*. Simio LLC.

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