

# Why and How to Use Simio Data Tables

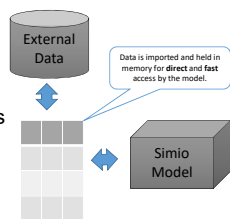
## Model Enhancements with Data Tables

## Data Tables

- ▶ Data Table
- ▶ Binding
- ▶ Relational Tables
- ▶ Referencing
- ▶ Output Tables
- ▶ Input Parameter Table
- ▶ Property Spreadsheet
- ▶ Tip

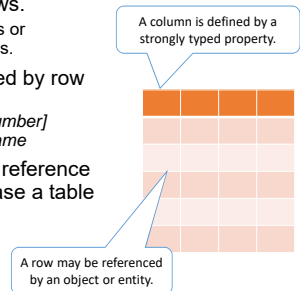
## Model Data

- ▶ Models often have large amounts of data that describe the different objects and entities that move through the system.
- ▶ It is slow and inconvenient to repeatedly access the external data as the model is running. Simio brings the data into memory for fast access.
- ▶ Simio can represent data in simple tables or in complete data sets with multiple relations.
- ▶ The data schema for the tables are user-defined.



## Tables

- ▶ **Tables** have columns and rows.
  - Columns are standard properties or references to objects or elements.
- ▶ A table value can be referenced by row and column using the syntax:
  - `TableName[RowNumber, ColumnNumber]`
  - `TableName[RowNumber].ColumnName`
- ▶ An object may have an active reference to a row in the table. In this case a table value can be referenced as:
  - `TableName.ColumnName`
- ▶ Other table functions:
  - `TableName.AvailableRowCount`
  - `TableName.ColumnName.RandomRow`



## Table Ribbon

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## Table Column Properties

- ▶ Select a Table's column to see its properties
- ▶ Change column name
- ▶ Required Value allows cells to be blank
- ▶ Numeric and Expression Columns have **Unit Type** and **Default Unit** Properties

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## Duplicate a Table

- ▶ Activate desired table
- ▶ Click **Project Home** ribbon
- ▶ Use the **Copy** and **Paste** Buttons (not ctrl+c/ctrl+v)

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## Multiple Table Groups

- ▶ The tables can be grouped for easy access
- ▶ **Right click** a Table Tab and click **Horizontal Tab Groups** or **Vertical Tab Groups**

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## Split Tables

- ▶ The table may be split to easily view multiple portions of a large table while editing.
- ▶ **Right click** anywhere on the table and select **Split** to turn on and off

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## Auto Filter Row

- ▶ Filter based on partial input
- ▶ **Right click** a column Header and select **Show Auto Filter Row**

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## Binding Data

- ▶ **\*New\*** Temporarily disable Automatic importing when developing the model

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## Selecting Entity Type

- ▶ You can add a numeric column to your table that specifies the weighting of each row (or entity type).
- ▶ Specify that you'll randomly select a row based on that column by using the function **TableName.ColumnName.RandomRow**.

Product Table			
	Part Type	Product Mix	ProcessTime (Minutes)
1	PartA	50	.1
2	PartB	30	.3
3	PartC	20	Random.Uniform(.3,.5)

- ▶ SimBit: Select Entity Type from Table

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## Arrival Table



- ▶ A table containing specific arrivals.
- ▶ Used to generate entities with specific known arrival times.
- ▶ Can represent individual entities or batches.
- ▶ Deterministic mode useful for model validation and scheduling applications.
- ▶ Stochastic mode useful for scheduled arrivals like a doctor's office.
- ▶ SimBits: Appointed Arrival, Using Relational Tables

Properties: Source1 [Source]	
Show Commonly Used Properties Only	
Entity Arrival Logic	DefaultEntity
Entity Type	Arrival Table
Arrival Mode	Table1.ArrivalTime
Arrival Time Property	Table1.Quantity
Entities Per Arrival	False
Repeat Arrival Pattern	False
Other Arrival Stream Options	
Arrival Events Per Time Slot	1
Arrival Time Deviation	0.0
Arrival No-Show Probability	0.0

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## Relational Tables



- ▶ **Relational Tables** are tables that have a defined relationship to each other
- ▶ Relationships are formed by using the *Table Key* and *Foreign Key* capabilities.
- ▶ Relational tables include a Master-Detail view, which allows the relationships between tables to be visually seen.
- ▶ Table relations can be nested to an arbitrary level.

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## Relational Tables Example



- ▶ SimBit – UsingRelationalTables
- ▶ Advanced Simbit: ServersUsingTaskSequenceWithDataTables\_JobShop & Scheduling Examples

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## Sequence Table



Job Table	Part Type	Product Mix	Sequence Type
1	PartA	10	A
2	PartB	20	B
3	PartC	30	C

Job Table	Sequence	Sequence Type	Process Time
1	Input@Server1	A	Random.Uniform(5, 9)
2	Input@Server2	A	Random.Triangular(5, 1.1, 1.2)
3	Input@Sink1	A	0.0
4	Input@Server3	B	Random.Triangular(5, .8, 1.2)
5	Input@Server2	B	1.5
6	Input@Server1	B	1
7	Input@Sink1	B	0.0
8	Input@Server2	C	Random.Triangular(5, 1.2, 1.6)
9	Input@Sink1	C	0.0

- ▶ SimBit: Entity Follows Sequence With Table 2

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## Auto Set Table Row Reference



- ▶ The *Auto-set Table Row Reference* property, if true, then at run initialization, the Element pointed to by each row in the table will have a table reference set to that row.
- ▶ This will allow an entry in an Element column to 'correspond' to the same row entry in another column, which is essential for defining Element properties.
- ▶ For an Element or Object column
  - ▶ SimBit: Initialize Object Properties From A Table
  - ▶ Advanced SimBit: ServersUsingTaskSequenceWithDataTables\_FlowLine

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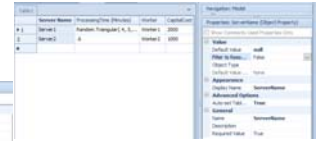
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## Auto Set Table Row Reference



- ▶ On Object or Element Columns set Auto-set Table Row Reference to True



- ▶ In the Object's Property window reference `TableName.ColumnName` (the row was automatically reference ☺)

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## Table-Based Elements (Auto-Create)



- ▶ Automatically create Elements (Tally Stats, Material, Timers, ect) from a table
- ▶ Set Element column Reference Type property to **Create**
- ▶ Set the Initial Property Values to static value or other columns in the table
  - Set Auto-set Table Row Reference to True

Material Name	Material Class	Material Cost	Material Color	GenClr Color	Material State
1 FinishedGoodA	Finished Goods	0	Green	limeGreen	FinishedGoodASD
2 FinishedGoodB	Finished Goods	0	Red	red	FinishedGoodBSD
3 FinishedGoodC	Finished Goods	0	Blue	deepBlue	FinishedGoodCSO
4 MaterialA	Raw Materials	60	Other	orange	MaterialASO
5 MaterialB	Raw Materials	80	Other	purple	MaterialBSO

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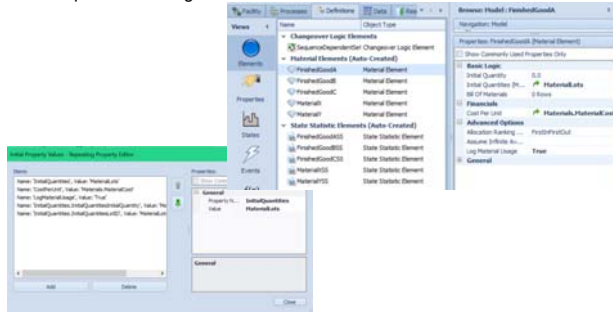
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## Table-Based Elements (Auto-Create)



- ▶ Step by Step in Help: Table-Based Elements (Auto-Create)
- ▶ Example: SchedulingDiscretePartProduction



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## State Columns (Enterprise)



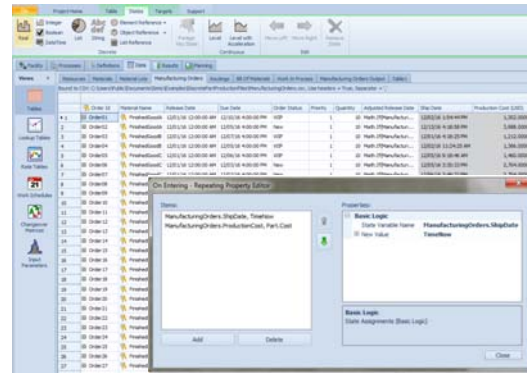
- ▶ The table state column values are not input by the user at the start of the simulation run.
- ▶ These values are assigned during the simulation run by an Assign step, based on the current row of the associated object.
- ▶ The table name and column name are used in the assignment, similar to referencing other table columns.
- ▶ Grey columns in Table
- ▶ Example: SchedulingDiscretePartProduction
- ▶ Help: States (Enterprise)

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## State Columns



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## Output Tables (Enterprise)



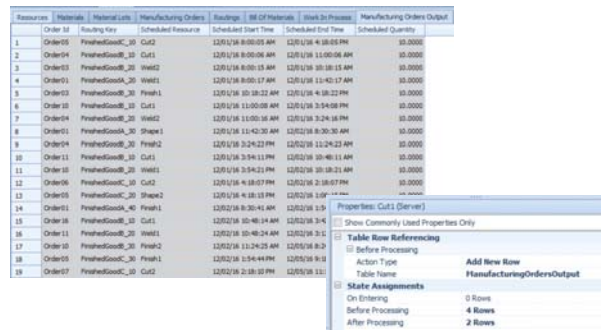
- ▶ Output Tables are all State Columns
- ▶ Use the Add Row step or Table Row Referencing on fixed objects to add rows during run
- ▶ Use as a Temporary table or log results
- ▶ The Foreign Key State column on Output Table allows access to parent tables for Table Reports
- ▶ **\*NEW\*** RemoveRow step to remove rows from an output table
- ▶ SimBit: UsingAddRowAndOutputTable\_Enterprise
- ▶ Example: SchedulingDiscretePartProduction
- ▶ Help: Enterprise Data Window

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## Output Tables



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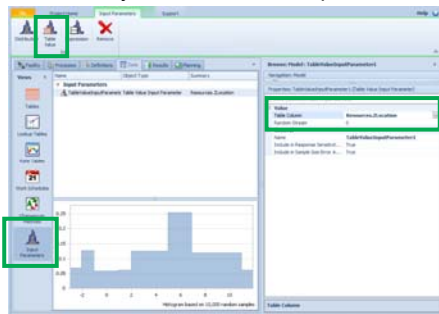
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## Input Parameter: Table Value



- ▶ Import data directly into Simio Data Table
- ▶ Useful when you have lots of Empirical Data



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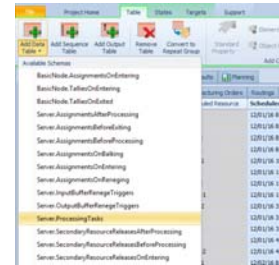
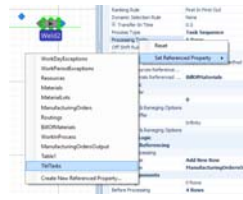
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## Add Data Table Dropdown



- ▶ Schemas of Repeat Groups on Object in model
- ▶ Useful to Create the Task Sequence Table with all possible columns needed



- ▶ Autofill Repeat Group with table reference: Right Click Server Processing Task> Set Reference Property>TblName

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## New - Table Column For List



- ▶ For Seize, Release, and Move steps (but planning to add support for Nodes)
- ▶ Access data in the other columns for selection conditions/expressions
- ▶ Works with Relational Tables
- ▶ Can now import list data into model
- ▶ Will be Released in Sprint 9.156

## New - Table Column For List



Table	Obj Name	Secondary Resource Name	Secondary Resource Efficiency
1	Press11	Emp50Group	0.25
2	Press11	Emp50Group	0.25
3	Press11	Emp50Group	0.3
4	Press12	Emp50Group	0.75
5	Press12	Emp50Group	0.75
6	Press13	Emp50Group	1
7	Press13	Emp50Group	0.75
8	Press13	Emp50Group	0.75

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## Property Spreadsheet

The screenshot shows a Simio Property Spreadsheet. The top part of the spreadsheet lists objects and their types. The bottom part lists properties for each object. The columns are: Object Name, Object Type, and Property Name. The rows include objects like 'Workstation' and their properties such as 'ArrivalRate', 'ServiceTime', and 'Priority'.

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## Table Tips

- ▶ `TblAWESOME.ColumnName` (start all table names with same letter to find faster)
- ▶ For Object Columns (object, node, entity, transporter) you can access the object's properties/states with:  
`TblName.ObjectCol.ObjectType.PropertyName`

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