



## SAS® Simulation Studio for JMP®

Build a computer model that mimics the behavior of a complex real-life system so you can better understand and optimize it.

### What is different about SAS® Simulation Studio for JMP®?

It is an add-on to JMP software for conducting discrete-event simulation, which enables you to model, analyze and understand complex real-life systems and processes.

### Why is SAS® Simulation Studio for JMP® important?

It lets you model complex systems that ordinarily would be difficult to model using traditional analytical techniques. And it integrates with other SAS products.

### Who should use SAS® Simulation Studio for JMP®?

JMP users who would like to model dynamic processes in which events that affect the process occur at distinct points in time.

A large fast-food restaurant chain needs to understand the operational characteristics of a restaurant: How many cashiers, cooks, service lines, drive-through windows and drink stations does it need? How do staffing levels affect one another?

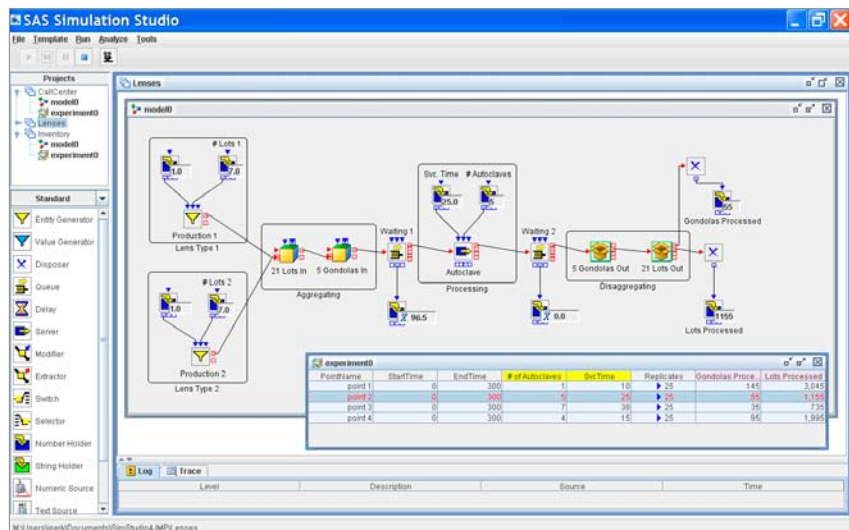
A retailer is planning a new shipping facility. How many loading docks, pallet-packing stations, packaging lines and workers should the retailer employ to maximize the use of resources during peak and non-peak seasons?

A consumer electronics manufacturer is unable to meet goals for units delivered. Executives know there are bottlenecks in operations but are not sure how to correct them. Will a capital investment in a second manufacturing line make things better or worse?

A hospital needs to improve its pharmacy to reduce errors. Administrators are concerned that the changes may result in slower delivery times. How can they reshape operations to reduce errors while maintaining efficiencies?

Whether you are a novice or expert, SAS Simulation Studio for JMP lets you harness the power of discrete-event simulation to model and analyze critical operational systems like these in such areas as health care, manufacturing and transportation.

The graphical user interface in SAS Simulation Studio for JMP requires no programming and provides a full set of tools for building, executing and analyzing results of discrete-event simulation models.



You can use SAS Simulation Studio for JMP to model, analyze and understand complex real-life systems, such as the production process shown here. Each node models a piece of the process, enabling you to accurately represent and simulate dynamic systems.

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## What is discrete-event simulation?

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Systems like those described above involve dynamic processes. Events that affect those processes occur at distinct points in time. In addition, steps in the processes reflect a particular status or state at a particular time.

For example, a bank teller serves customers who arrive at random intervals and need different amounts of the teller's time. A customer's state at any time is either waiting or being served, and the teller's state at any point is either serving or waiting. By building a model of this bank queue, you can simulate the effect of adding more tellers during the busiest times. SAS Simulation Studio for JMP tallies the total time spent in each state, allowing you to estimate the efficiency of the bank queue and improve it.

Systematically varying the inputs through designed experiments has long been recognized as the best way to improve *physical* processes. This approach is equally effective with processes modeled through *computer simulation*. By carefully controlling the parameters of a modeled system, you can optimize the most complex of systems. For example, in the bank queue model, the bank may need to know how many tellers and drive-

through lines it should employ at peak times in order to maintain customer satisfaction and control costs.

SAS Simulation Studio integrates seamlessly with JMP to generate efficient experimental designs for simulation, and it passes the results of the simulation to JMP for interactive analysis and visualization. You will gain unique insights into the relationships in your system with the Profilers in JMP. By optimizing multiple outputs simultaneously, you can understand the tradeoffs required for maximum effectiveness.

One of the most important factors in a discrete-event simulation is determining the appropriate distributional model for the events to be simulated – and JMP's distribution estimation capabilities handle this with ease. This ensures that the insights produced by your simulations are as accurate and, therefore, useful as possible.

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### Design experiments, your way

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Experimenting with models by varying one factor at a time is inefficient and limits your ability to understand your system. Instead, by carefully choosing settings for multiple experimental factors, you can vary many factors at once and gain more insights from fewer trials.

SAS Simulation Studio automates the design of experiments. By integrating closely with JMP, it creates an optimal set of experimental trials to generate the maximum amount of information from the fewest experimental trials. This gives you the opportunity to extend your models to include many more factors than you may have thought possible.

If you prefer to make a direct comparison between a small number of versions of your model or if you want to carry out a highly specialized experimental design, SAS Simulation Studio also allows you to manually vary the inputs to the simulation model for ad hoc experimentation.

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### Visually analyze results

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SAS Simulation Studio for JMP produces graphical analysis of results, both as the model runs and at the end of the simulation. You can use these displays for debugging or tuning a model, and to see the outcome of a single run of a model.

SAS Simulation Studio for JMP also collects data during simulation. That way, you can store the data for more extensive analysis later. Through its tight integration with JMP, analysis of a simulation is easy. JMP's graphical exploration and powerful analysis tools let you make discoveries quicker.



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