

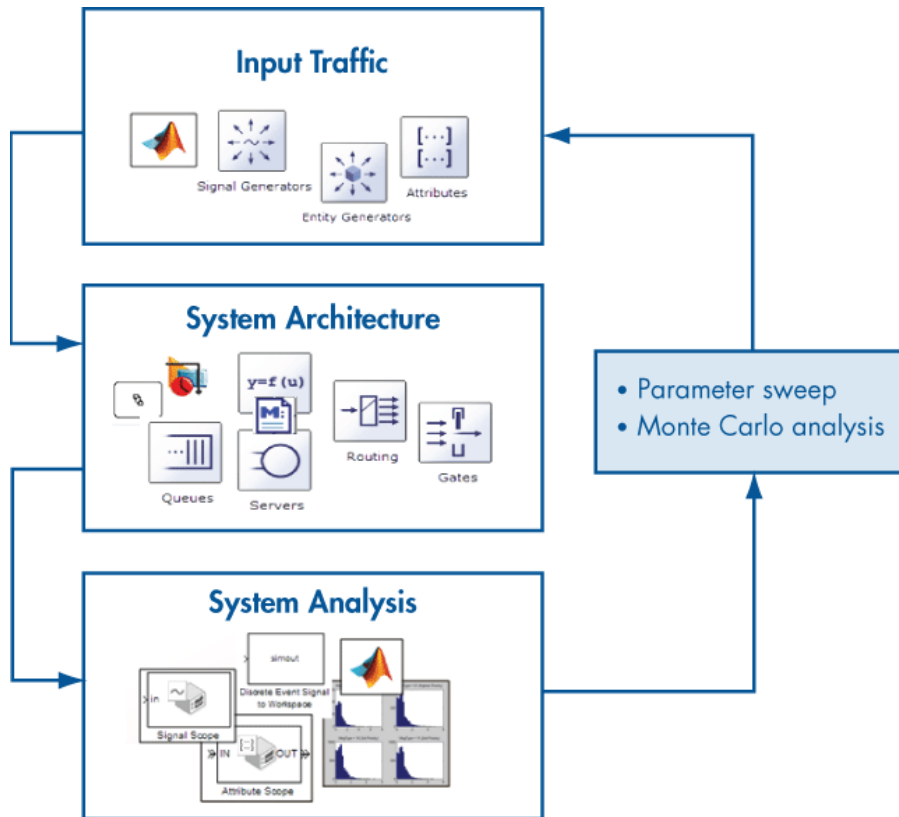
SimEvents 3.0

Model and simulate discrete-event systems

SimEvents® extends Simulink® with tools for discrete-event simulation of the transactions between components in a system architecture. You can use the architecture model to analyze performance characteristics such as end-to-end latencies, throughput, and packet loss. SimEvents can also be used to simulate a process, such as a mission plan or a manufacturing process, to determine resource requirements or identify bottlenecks. Libraries of predefined blocks, such as queues, servers, and switches, enable you to represent the components in your system architecture or process flow diagram. You can accurately represent your system by customizing operations such as routing, processing delays, and prioritization.

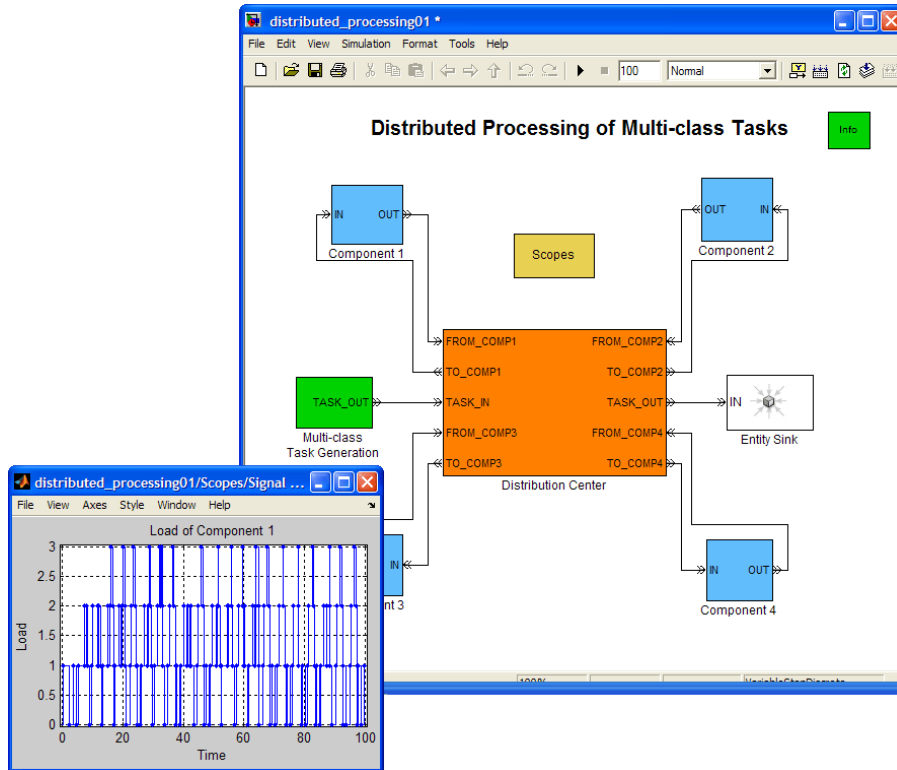
Key Features

- Entity-based modeling for representing packets, tasks, and parts
- Attributes for attaching scalar, matrix, and complex data to packets, tasks, and parts
- Libraries of predefined blocks, such as queues, servers, routing, and generators, for modeling system architecture and process flow diagrams
- Built-in statistics such as delay, throughput, and average queue length
- Library block for writing algorithms to customize operations such as routing, processing delays, and prioritization
- Entity and attribute aggregation blocks for modeling data hierarchy
- Hybrid simulation capabilities for models that contain both event-based and time-based components



A typical workflow that can be conducted in SimEvents to visualize the performance characteristics of a system.

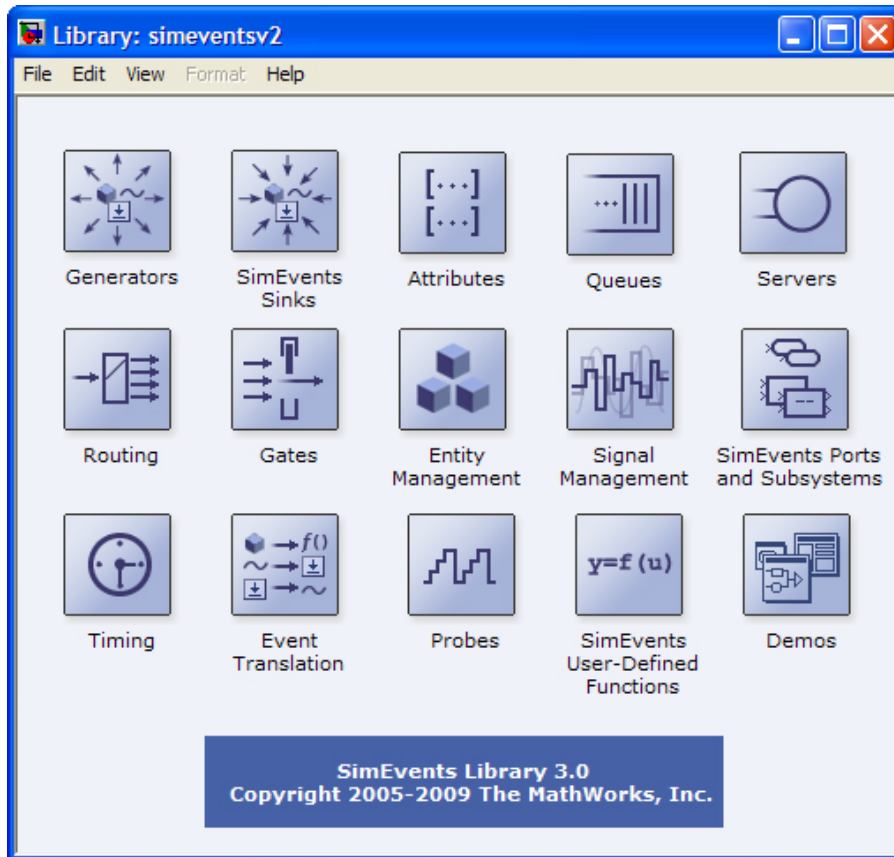
SimEvents works with Stateflow® to represent systems containing detailed state-transition charts that may produce or be controlled by discrete events. SimEvents and Simulink provide an integrated environment for modeling hybrid dynamic systems containing continuous-time, discrete-time, and discrete-event components. Typical examples occur in communications, automotive, electronic systems, sensor networks, and other distributed control applications.



A SimEvents model showing four processing components shared by the input traffic of multiclass tasks. From the model, you can plot the loading conditions on an individual processing component (left).

Working with SimEvents

SimEvents provides a library of blocks for modeling the motion of entities in a system. You can model both simple and complex networks of queues and servers. By connecting gate and switching blocks you can establish paths along which entities can travel in response to events. These paths can include delays and selective switching criteria. Many parameters within SimEvents can be statistically determined to model probabilistic variations in the system.



SimEvents block library containing common elements for building discrete-event simulation models. Scopes let you view entity attributes and statistics.

Creating Entities and Setting Attributes

With SimEvents you can create entities in response to events or on a scheduled basis, where the time of generation can be controlled by a signal or a statistical distribution. You can give the entity attributes appropriate to your application, such as a destination address on a communication bus, processing times or delays for servers, or any relevant data. Attributes can also be vectors or matrices required to model larger payloads of data in packet-based systems. Attribute values can be modified during simulation based on an algorithm implemented as an [Embedded MATLAB™](#) function. For example, a complex switching algorithm written as an Embedded MATLAB function can be used in a SimEvents model that simulates the entire switch fabric.

Modeling Queues and Servers

SimEvents provides first-in, first-out (FIFO) and last-in, first-out (LIFO) queue blocks, as well as a priority queue block that sorts incoming entities based on the value of an attribute. Server blocks range from a single server with blocking to an infinite server that accepts all incoming entities. By combining the single server's preemption capability with the priority queue block, you can implement a variety of preemption policies.

Routing and Gating Entities

SimEvents routes or gates entities using switches that operate either deterministically, in response to input signals or attribute values, or statistically, based on a first-available-port, round-robin, or equiprobable switching criterion. By cascading these switches, you can form more complex switching arrangements. You can incorporate various gates to implement admission control procedures and manage entity movement in your model.

Debugging Your Model

In discrete-event simulation, the processing of one event often triggers other events, which may occur immediately or after a delay. SimEvents uses an event calendar to sequence these events according to simulation time and priority. You can use MATLAB® functions in the debugger to pause a simulation at each step or a breakpoint and then query simulation behavior. Knowing the time and priority of an event, or the block that processes an event, can help you debug both discrete-event and hybrid simulations.

Accessing Statistics for Discrete-Event Systems

Statistics provide essential information for characterizing the performance of a discrete-event system. SimEvents blocks provide optional outputs that let you monitor performance using statistical measures such as average service times, queue lengths, and server utilization. Custom scopes enable you to visualize these signals using familiar staircase and stem plots.

Interfacing with Simulink and Stateflow

The discrete-event behavior of SimEvents interacts with the time-based dynamics of Simulink in various ways. You can generate signals based on asynchronous events to control Simulink blocks and subsystems, or you can use Simulink signals to control the generation of entities. SimEvents also provides event translation blocks for generating function calls based on signal changes or entity movement, enabling you to control the processing of Stateflow charts.

Resources

Product Details, Demos, and System Requirements

www.mathworks.com/products/simevents

Trial Software

www.mathworks.com/trialrequest

Sales

www.mathworks.com/contactsales

Technical Support

www.mathworks.com/support

Online User Community

www.mathworks.com/matlabcentral

Training Services

www.mathworks.com/training

Third-Party Products and Services

www.mathworks.com/connections

Worldwide Contacts

www.mathworks.com/contact

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