

# **SimEvents Release Notes**



<b>Summary by Version</b> .....	<b>1</b>
About Release Notes .....	<b>1</b>
<b>Version 1.2 (R2006b) SimEvents</b> .....	<b>4</b>
Event-Based Sequence Generator Block .....	<b>4</b>
New Tutorial and Application Demos .....	<b>5</b>
Event Translation Block Supports Delay from a Signal ...	<b>5</b>
Routing Blocks Support Unlimited Entity Ports .....	<b>6</b>
Initial Outputs of SimEvents Blocks .....	<b>7</b>
History Options and Other Changes in Scope Blocks .....	<b>9</b>
Parameters for Lognormal Distribution .....	<b>10</b>
SimEvents Blocks Compatible with Simulink	
Accelerator .....	<b>11</b>
Livelock Detection .....	<b>11</b>
<b>Version 1.1 (R2006a) SimEvents</b> .....	<b>12</b>
Replicate Block Supports Partial Replication .....	<b>12</b>
<b>Version 1.0 (R14SP3+) SimEvents</b> .....	<b>14</b>
Introduction to SimEvents .....	<b>14</b>
<b>Compatibility Summary for SimEvents</b> .....	<b>16</b>



## Summary by Version

This table provides quick access to what's new in each version. For clarification, see "About Release Notes" on page 1.

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
<b>Latest Version V1.2 (R2006b)</b>	Yes Details	Yes Summary	Bug Reports Includes fixes	Printable Release Notes: PDF  Current product documentation
V1.1 (R2006a)	Yes Details	Yes Summary	Bug Reports Includes fixes	No
V1.0 (R14SP3+)	Yes Details	Not applicable	Bug Reports	No

### About Release Notes

Use release notes when upgrading to a newer version to learn about new features and changes, and the potential impact on your existing files and practices. Release notes are also beneficial if you use or support multiple versions.

If you are not upgrading from the most recent previous version, review release notes for all interim versions, not just for the version you are installing. For example, when upgrading from V1.0 to V1.2, review the New Features and Changes, Version Compatibility Considerations, and Bug Reports for V1.1 and V1.2.

### New Features and Changes

These include

- New functionality
- Changes to existing functionality

- Changes to system requirements (complete system requirements for the current version are at the MathWorks Web site)
- Any version compatibility considerations associated with each new feature or change

### **Version Compatibility Considerations**

When a new feature or change introduces a known incompatibility between versions, its description includes a **Compatibility Considerations** subsection that details the impact. For a list of all new features and changes that have compatibility impact, see the “Compatibility Summary for SimEvents” on page 16.

Compatibility issues that become known after the product has been released are added to Bug Reports at the MathWorks Web site. Because bug fixes can sometimes result in incompatibilities, also review fixed bugs in Bug Reports for any compatibility impact.

### **Fixed Bugs and Known Problems**

MathWorks Bug Reports is a user-searchable database of known problems, workarounds, and fixes. The MathWorks updates the Bug Reports database as new problems and resolutions become known, so check it as needed for the latest information.

Access Bug Reports at the MathWorks Web site using your MathWorks Account. If you are not logged in to your MathWorks Account when you link to Bug Reports, you are prompted to log in or create an account. You then can view bug fixes and known problems for R14SP2 and more recent releases.

### **Related Documentation at Web Site**

**Printable Release Notes (PDF).** You can print release notes from the PDF version, located at the MathWorks Web site. The PDF version does not support links to other documents or to the Web site, such as to Bug Reports. Use the browser-based version of release notes for access to all information.

**Product Documentation.** At the MathWorks Web site, you can access complete product documentation for the current version and some previous versions, as noted in the summary table.

## Version 1.2 (R2006b) SimEvents

This table summarizes what's new in Version 1.2 (R2006b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	Yes—Details labeled as <b>Compatibility Considerations</b> , below. See also Summary.	Bug Reports Includes fixes	Printable Release Notes: PDF  Current product documentation

New features and changes introduced in this version are

- “Event-Based Sequence Generator Block” on page 4
- “New Tutorial and Application Demos” on page 5
- “Event Translation Block Supports Delay from a Signal” on page 5
- “Routing Blocks Support Unlimited Entity Ports” on page 6
- “Initial Outputs of SimEvents Blocks” on page 7
- “History Options and Other Changes in Scope Blocks” on page 9
- “Parameters for Lognormal Distribution” on page 10
- “SimEvents Blocks Compatible with Simulink Accelerator” on page 11
- “Livelock Detection” on page 11

### Event-Based Sequence Generator Block

The new Event-Based Sequence block provides data to an event-driven process by producing a scalar event-based output signal whose values come from a vector. The block selects the next value from the vector upon each notification from a port of a subsequent block. For example, if you connect the Event-Based Sequence block to the **t** input port of a Single Server block, the values in the vector become the service times for the entities arriving at the server. You provide the values in the vector, but do not need to know in advance when the entities arrive at the server.



## New Tutorial and Application Demos

Version 1.2 (R2006b) introduces these new demonstration models:

### Tutorial Demos

- “Aggregation: Assembling a Vehicle Chassis”
- “Preemptive Operating System with Two Levels of Priority”
- “Multitasking Model with Dependent Tasks”

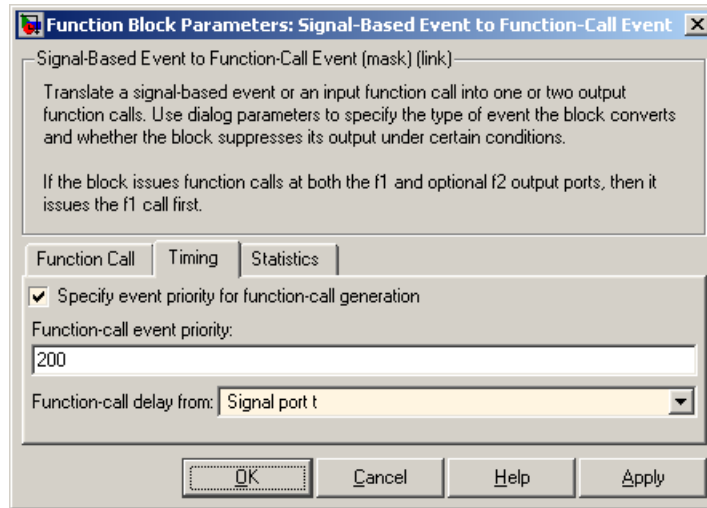
### Application Demos

- “Go-Back-N Automatic Repeat Request (ARQ)”
- “Operating System Model with Prioritized Task Execution”
- “Ethernet Local Area Network”
- “Anti-Lock Braking System (ABS) Model”
- “Anti-Lock Braking System (ABS) Model with Queuing Delay”
- “Anti-Lock Braking System (ABS) Model Using CAN Communications”

## Event Translation Block Supports Delay from a Signal

The Signal-Based Event to Function-Call Event block can delay its generation of a function call by an amount of time that you specify using either an input signal or the **Function-call time delay** parameter. In V1.1 (R2006a), the block lets you specify the delay amount using the parameter, but not an input signal.

To access the new feature, select **Specify event priority for function-call generation** and set the new **Function-call delay from** parameter to Signal port **t**, as shown. Then connect a nonnegative-valued signal to the **t** signal input port that appears on the block.



## Compatibility Considerations

If you save a model containing the Signal-Based Event to Function-Call Event or Discrete Event Subsystem block using V1.2 (R2006b), then opening the model in V1.1 (R2006a) produces warnings like these:

```
Warning: In instantiating linked block 'untitled/Signal-Based
Event to Function-Call Event' : Signal-Based Event to Function-
Call Event block (mask) does not have a parameter named
'FunctionCallDelayFrom'.
```

Saving the model in the earlier version prevents the warnings from reappearing, but causes the Signal-Based Event to Function-Call Event block to omit the **t** input port if you later open the model in V1.2 (R2006b).

## Routing Blocks Support Unlimited Entity Ports

The **Number of entity input ports** parameter of the Input Switch and Path Combiner blocks can be any positive integer. The **Number of entity output ports** parameter of the Output Switch and Replicate blocks also can be any positive integer. In V1.1 (R2006a), these parameters can assume only the values 1, 2, 3, and 4.

## Compatibility Considerations

If you save a model in which one of the blocks listed above has more than four entity input ports or more than four entity output ports, then the model will not work in V1.1 (R2006a).

## Initial Outputs of SimEvents Blocks

All blocks in SimEvents now have well-defined initial values for any numerical output signals they produce.

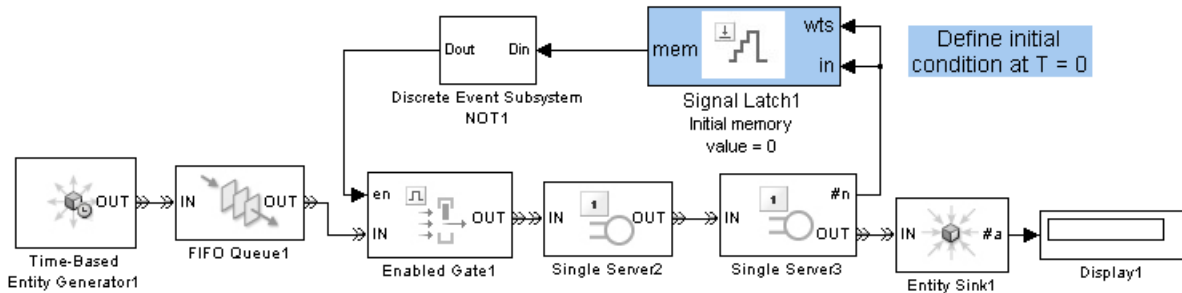
The initial value of an output signal of a SimEvents block is in effect from the start of the simulation until the block updates the output signal for the first time during the simulation. For example, if an N-Server block is configured to produce a **#n** output signal representing the number of entities in the server, then **#n** has a well-defined initial value of 0 at the start of the simulation. The initial value persists until the first arrival of an entity at the N-Server block, which could occur well after the start of the simulation, if at all.

The block reference pages indicate the initial values of the block output signals.

## Compatibility Considerations

If you connect the Signal Latch block to a **ts**, **tr**, or **vc** signal input port of a SimEvents block, the input port might detect an event at the start of the simulation in V1.1 (R2006a) that no longer occurs in V1.2 (R2006b). This is because the Signal Latch block assumes its initial condition in a true initialization stage in V1.2 (R2006b) rather than slightly after the simulation start in V1.1 (R2006a). If your model relies on an event at the start of the simulation (to invoke a discrete event subsystem or generate an event or an entity, for example), then you might see a change in simulation behavior between the two versions.

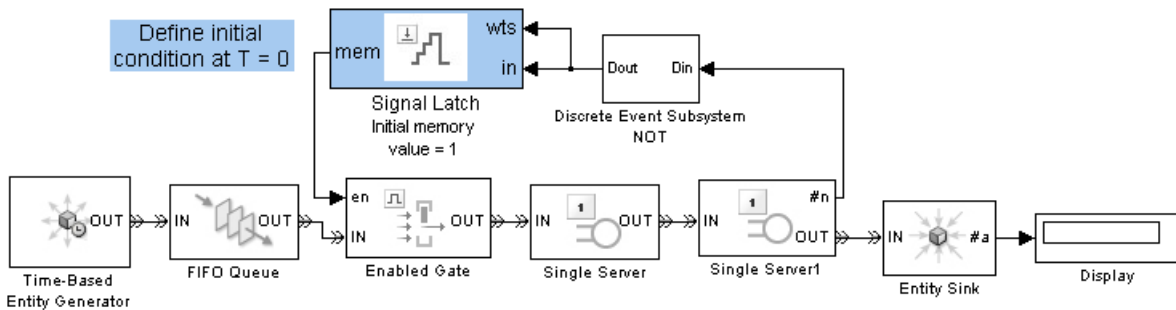
For example, the model below uses a Discrete Event Subsystem block to compute a signal that indicates whether a gate is open or closed.



**Subsystem Invoked at Simulation Start in V1.1 (R2006a), but Not V1.2 (R2006b)**

In V1.1 (R2006a), the Signal Latch block’s output signal has a sample time hit at the start of the simulation. This sample time hit invokes the subsystem, which initializes the gate’s **en** input signal to 1. As a result, the gate is open at the start of the simulation. In V1.2 (R2006b), the Signal Latch block does not have a sample time hit at the start of the simulation, so the initial condition of the subsystem’s outport determines the initial condition of the gate’s **en** input signal. As a result, the gate is closed at the start of the simulation.

An alternative approach that works in both versions is to move the Signal Latch block so that it follows the Discrete Event Subsystem block. The Signal Latch block directly provides the gate’s initial condition.



**Correct Gate Initialization in Both V1.1 (R2006a) and V1.2 (R2006b)**

## History Options and Other Changes in Scope Blocks

The following blocks include new **Store data when scope is closed** and **Limit data points to** parameters on the new **Data History** tab of the dialog box:

- Attribute Scope
- Instantaneous Entity Counting Scope
- Instantaneous Event Counting Scope
- Signal Scope
- X-Y Attribute Scope
- X-Y Signal Scope

The parameters determine how much data the blocks cache, letting you balance data visibility with simulation efficiency. Caching data lets you view it later, even if the scope is closed during part or all of the simulation. Caching less or no data accelerates the simulation and uses less memory. In V1.1 (R2006a), if you have the scope closed for the first  $T$  seconds of simulation and then open the scope, you can view only the data for  $t > T$ .

## Other Changes in Scope Blocks

Version 1.2 (R2006b) changes some aspects of the way you interact with the scope blocks:

- A Pan toolbar button lets you move your view of a plot.
- A Parameters toolbar button opens the block dialog box.
- Double-clicking on the block opens the plot if it is not already open. In V1.1 (R2006a), double-clicking on the block opens the block dialog box. To open the block dialog box in V1.2 (R2006b), click the Parameters toolbar button on the plot.
- The autoscale feature no longer changes the initial axis limits that you specify in the block dialog box. A new **Save axes limits** menu option lets you update the initial axis limits to match the plot's current limits. The current limits might differ from their initial values due to stretching, shifting, panning, zooming, or autoscaling operations that occurred since the initial values were last set.

- The former **Open at start of simulation** parameter is now called **Open scope at start of simulation** and has moved from the **Figure** tab of the dialog box to the **Plotting** tab.

The scope blocks also plot initial conditions without a plotting marker. In V1.1 (R2006a), initial conditions typically do not appear in plots.

Finally, the scope blocks run significantly faster in V1.2 (R2006b).

### Compatibility Considerations

If your legacy models contain scope blocks that plot more than 1000 points, then the default values of the new **Store data when scope is closed** and **Limit data points to** parameters cause the scope to retain only the last 1000 points. To plot all points, set **Store data when scope is closed** to Unlimited.

If you save a model containing a scope block using V1.2 (R2006b), then opening the model in an earlier version produces warnings about the parameters that are not in the earlier block. For example,

```
Warning: In instantiating linked block 'untitled/Attribute
Scope' : Attribute Scope block (mask) does not have a parameter
named 'DataStoreOption'.
```

```
Warning: In instantiating linked block 'untitled/Attribute
Scope' : Attribute Scope block (mask) does not have a parameter
named 'DataPointsLimit'.
```

Saving the model in the earlier version prevents the warnings from reappearing, but also causes the block to use default values for the new parameters if you later open the model in V1.2 (R2006b).

### Parameters for Lognormal Distribution

The Event-Based Random Number block produces random numbers from a lognormal distribution when you set the **Distribution** parameter to Lognormal1. Different texts use different parameterizations of the lognormal distribution. V1.2 (R2006b) renames some parameters in this block to clarify the relationship between a lognormal random variable  $X$  and the normal random variable  $\log(X)$ .

<b>V1.1 (R2006a) Parameter Name</b>	<b>V1.2 (R2006b) Parameter Name</b>
<b>Scale</b>	<b>Mu</b>
<b>Shape</b>	<b>Sigma</b>

### **Compatibility Considerations**

The block behaves the same in V1.1 (R2006a) and V1.2 (R2006b) because the change merely renames parameters. However, the parameter names in V1.2 (R2006b) more accurately reflect the block's behavior.

### **SimEvents Blocks Compatible with Simulink Accelerator**

All blocks in SimEvents are compatible with the Simulink® Accelerator. Version 1.1 (R2006a) does not support simulating models in Accelerator mode if the models contain the Event-Based Random Number block.

### **Livelock Detection**

SimEvents can detect livelock during a simulation. When it detects livelock, it halts the simulation with an error message that indicates too many simultaneous events. In V1.1 (R2006a), livelock can potentially cause MATLAB® to crash.

For details, see “Livelock Detection”.

### **Compatibility Considerations**

It is possible for SimEvents to consider a situation to be livelock when it is actually a large but finite loop. Such simulations might work in V1.1 (R2006a) but not in V1.2 (R2006b).

## Version 1.1 (R2006a) SimEvents

This table summarizes what's new in Version 1.1 (R2006a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	Yes—Details labeled as <b>Compatibility Considerations</b> , below. See also Summary.	Bug Reports Includes fixes	No

New features and changes introduced in this version are described here.

### Replicate Block Supports Partial Replication

The Replicate block supports partial replication and offers more flexibility when you choose complete replication. New parameters in the block's dialog box are in the table below.

Parameter	Description
<b>Replicate entity when</b>	Lets you choose whether the block accepts arriving entities for replication only when all entity output ports are not blocked or whenever at least one entity output port is not blocked. The first option is the default.
<b>If an output port becomes blocked during replication</b>	Determines how the block responds if a departure through one entity output port causes another entity output port to become blocked.
<b>Number of entities departed</b>	Toggles the optional output signal <b>#d</b> , representing the number of departed entities.



## Compatibility Considerations

By default in V1.1 (R2006a), when a departure through one entity output port causes another entity output port to become blocked, the result is a discarded entity with no error or warning message. If this phenomenon occurs in your legacy models, then the result in V1.0 (R14SP3+) might be an error message or incorrect behavior. If you want to learn when this phenomenon occurs in your legacy models that you simulate using V1.1 (R2006a), then set **If an output port becomes blocked during replication** to either Warn and discard entity, or Error.

The default values of the other new parameters added in V1.1 (R2006a) are consistent with the block's behavior in V1.0 (R14SP3+), so legacy models need no changes to accommodate these new features.

If you save a model containing the Replicate block using V1.1 (R2006a), then opening the model in V1.0 (R14SP3+) produces warnings about the parameters that are not in the V1.0 block. For example,

```
Warning: In instantiating linked block 'untitled/Replicate' :
  Replicate block (mask) does not have a parameter named
  'ReplicateEntityWhen'.
Warning: In instantiating linked block 'untitled/Replicate' :
  Replicate block (mask) does not have a parameter named
  'ActionUponBlocking'.
Warning: In instantiating linked block 'untitled/Replicate' :
  Replicate block (mask) does not have a parameter named
  'StatNumberDeparted'.
```

Also, simulating that model under V1.0 causes the block to exhibit its V1.0 behavior, which is to omit a **#d** output signal and to replicate the arriving entity only when all entity output ports are not blocked. Saving the model in V1.0 prevents the warnings from reappearing in V1.0 but also causes the block to exhibit its V1.0 behavior if you later open the model in V1.1.

## Version 1.0 (R14SP3+) SimEvents

This table summarizes what's new in Version 1.0 (R14SP3+):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	Not applicable	Bug Reports	No

New features introduced in this version are described here.

### Introduction to SimEvents

SimEvents extends Simulink with tools for modeling and simulating discrete-event systems using queues and servers. With SimEvents you can create a discrete-event simulation model in Simulink to simulate the passing of entities through a network of queues, servers, gates, and switches based on events. SimEvents and Simulink provide an integrated environment for modeling hybrid dynamic systems containing continuous-time, discrete-time, and discrete-event components.

A key concept that SimEvents adds to the Simulink environment is that of *entities*, which are discrete items of interest in a discrete-event simulation. For example, entities could represent messages to be communicated or parts to be assembled. Entities can carry data in one or more scalar structures called *attributes*. For example, attributes could represent destinations of messages or dimensions of parts.

The libraries in SimEvents contain blocks that can

- Create entities
- Store entities in a queue
- Serve or delay entities
- Forbid or allow entities to depart, depending on specified criteria
- Manipulate the paths on which entities travel

- Attach data or timers to entities
- Create plots using data from entities or statistics gathered during simulation
- Manipulate or generate discrete events that can affect the behavior of blocks and entities
- Control the simulation timing in situations where event-driven behavior and time-driven behavior interact

## Compatibility Summary for SimEvents

This table summarizes new features and changes that might cause incompatibilities when you upgrade from an earlier version, or when you use files on multiple versions. Details are provided in the description of the new feature or change.

Version (Release)	New Features and Changes with Version Compatibility Impact
<b>Latest Version V1.2 (R2006b)</b>	See the <b>Compatibility Considerations</b> subheading for each of these new features or changes: <ul style="list-style-type: none"> <li>• “Event Translation Block Supports Delay from a Signal” on page 5</li> <li>• “Routing Blocks Support Unlimited Entity Ports” on page 6</li> <li>• “Initial Outputs of SimEvents Blocks” on page 7</li> <li>• “History Options and Other Changes in Scope Blocks” on page 9</li> <li>• “Parameters for Lognormal Distribution” on page 10</li> <li>• “Livelock Detection” on page 11</li> </ul>
V1.1 (R2006a)	See the <b>Compatibility Considerations</b> subheading under “Replicate Block Supports Partial Replication” on page 12.
V1.0 (R14SP3+)	Not applicable