GoldSim 11.1 Summary

Summary of Major New Features and Changes

May 2014

GoldSim

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INTRODUCTION

This document describes the changes and new features implemented in GoldSim 11.1. This version includes a number of new features and user interface improvements. It also includes a number of bug fixes.

This doument assumes the reader is already familiar with and using GoldSim 11 (released in July 2013). If not, prior to updating to GoldSim 11.1, you should first read the GoldSim 11 Summary document.

Documentation of New Features

This document summarizes the major changes in GoldSim11.1. All new features discussed in this document are described in detail in the accompanying Help file and user manuals for this release.

Of course, if you have questions about any of the new features in GoldSim, please contact us at support@goldsim.com. We also encourage you to visit our online user forum at http://www.goldsim.com/Forum.

Installation Instructions for this Version

You do not need to uninstall other GoldSim versions (such as GoldSim 10.50 or 11) in order to install GoldSim 11.1. The new version will be installed in parallel to any existing pre-Version 11.1 GoldSim versions currently on your machine (it will not overwrite them).

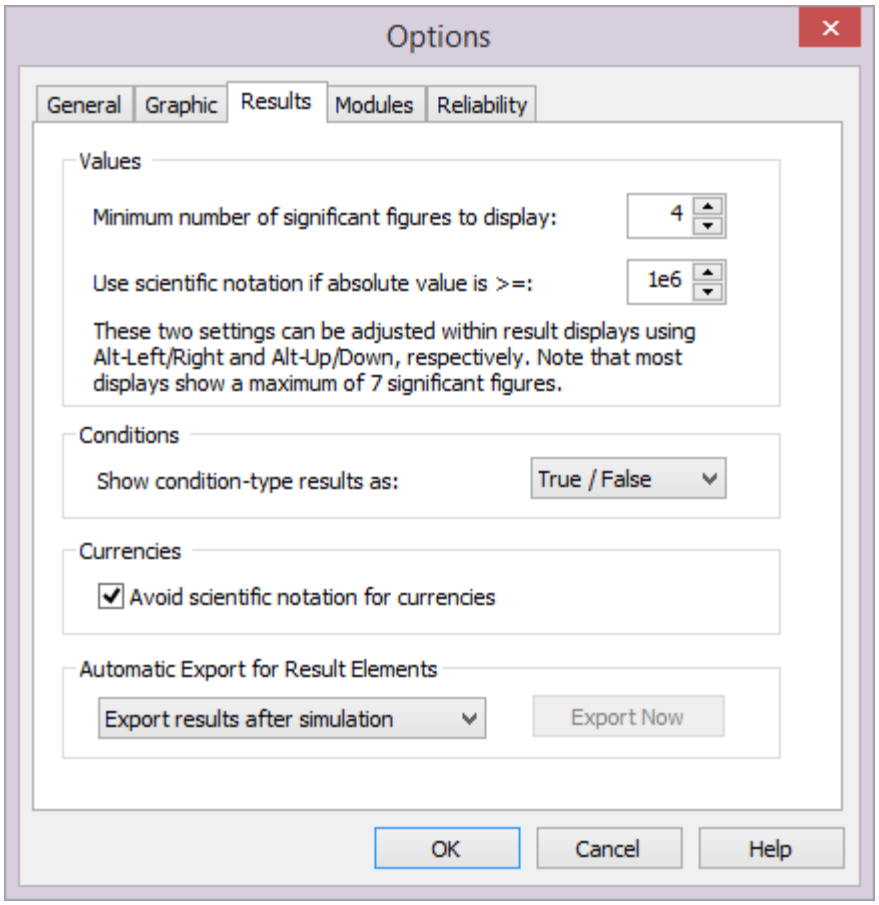
To install GoldSim 11.1, you must download the full installation file: "GoldSim_11.1_Setup.exe". Download the file from the website, and run it. You should have at least 400 MB of disk space available before downloading and installing. Note that you must have administrative privileges in order to install GoldSim successfully.

After installing this version, when you start the program it will automatically detect and use your existing license**.**

NEW FEATURES

Controlling Significant Figures and Scientific Notation in Result Displays

GoldSim 11.1 provides a number of new options for controlling the way that Results are displayed. These options are provided on the **Results** tab of the Options dialog (accessed via **Model |Options…** from the main menu):



The first two options control how numeric values are displayed in charts, tables and tool-tips:

> **Minimum number of significant figures to display**: This allows you to control the number of significant figures displayed in result displays and tool-tips (as described below). This setting can be changed dynamically from within most result displays using Alt-Left and Alt-Right.
>
> **Use scientific notation if absolute value is** >=: This allows you to control when scientific notation is used in result displays and tool-tips (as described below). This setting can be changed dynamically from within most result displays using Alt-Up and Alt-Down.

When displaying numeric values (other than dates), GoldSim respects the two settings noted above. Several points related to how these are applied should be noted:

- If the magnitude of the value is less than 0.0001 or greater than 1e10, GoldSim will always use scientific notation (rounding it at the prescribed number of significant figures). Otherwise, it will use the specified setting.

- If the magnitude of the value is below the threshold for scientific notation, GoldSim rounds off any decimal places beyond the prescribed number of significant figures and displays the value conventionally, with a decimal point if it has a fractional part. For example, to display 123.456 with four significant figures, GoldSim would show 123.5.

- When displaying values conventionally (i.e., not using scientific notation), GoldSim never rounds off left of the decimal point; hence the setting represents the minimum number of significant figures, not necessarily the actual number of significant figures (i.e., GoldSim may show more). For example, to display 123456.7 with four significant figures specified, GoldSim would show 123457.

- When labeling chart axes, GoldSim respects the specified scientific notation setting, but ignores the significant figures setting (significant figures in chart axes are determined automatically and cannot be user-controlled).

- Values displayed in Result elements are limited to single precision (7 significant figures). Values in tool-tips can show up to 16 significant figures.

Other options for controlling result display are:

Show condition result outputs as: This allows you to select how condition outputs are displayed in tables, tool-tips and input fields (e.g., 1/0, True/False, On/Off, etc.).

Avoid scientific notation for currencies. If this option is checked (the default), any value that represents a currency will never be displayed in any result using scientific notation. If it is cleared, the rules outlined above will be used.

Disabling Unscheduled Updates (Inserted Timesteps)

In order to carry out a dynamic simulation, GoldSim steps through time in discrete intervals (referred to as *timesteps*). Calculations (referred to as *updates* of the model) are carried out at the end of every timestep. Although the term timestep actually refers to an interval of time, it is often used interchangeably with the term *update* (indicating a calculation at a point in time). In GoldSim, there are two kinds of updates/timesteps: *scheduled updates (or timesteps)* and *unscheduled updates (or timesteps)*.

Scheduled updates are specified directly prior to running the model. That is, you tell GoldSim when you want these updates to occur. Unscheduled updates are timesteps that are dynamically inserted by GoldSim during the simulation in order to more accurately simulate the system. That is, they are not specified directly prior to running the model. GoldSim inserts them automatically (and, generally, without you needing to be aware of it).

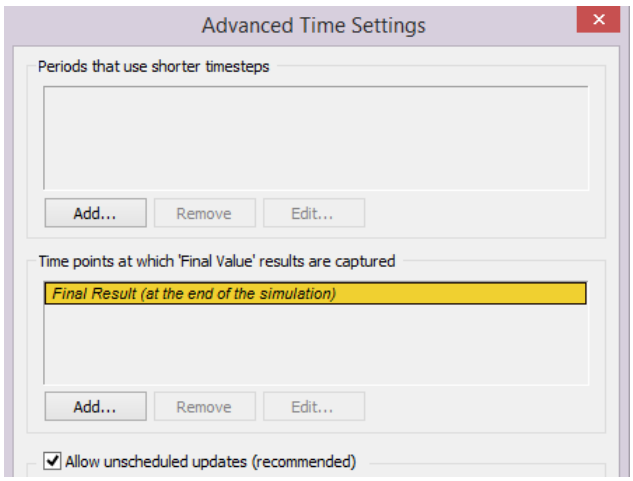
In versions previous to GoldSim 11 (e.g., 10.5), you could disable these unscheduled updates so that they were not inserted. In GoldSim 11, this option was removed so that

unscheduled updates were always inserted. In GoldSim 11.1, you again have the option to disable unscheduled updates.

The reason we are providing this option again in GoldSim 11.1 is twofold:

- We were unaware of how many users were actually disabling unscheduled updates, and for many such models, allowing unscheduled updates to occur produces unexpected results. Although in most cases, we believe it would be best to redesign such models to account for unscheduled updates (i.e., the timestep is a numerical artefact and generally should not be explicitly referenced in a model), doing so for large, existing models is often not practically possible.
- In some cases, it may in fact be valid to want to prevent unscheduled updates from being inserted. For example, if your model included a specialized algorithm (e.g., a legacy program) that was designed based on the assumption that the timestep was constant, inserting unscheduled updates could invalidate the algorithm.

Therefore, to address these issues, GoldSim 11.1 now allows you to disable unscheduled updates (by clearing a checkbox in the Advanced Time Settings (accessed via the Time tab of the Simulation Settings dialog)):



Note, however, that because unscheduled updates are intended to more accurately represent a complex dynamic system, disabling this feature should be done with great caution, and is generally not recommended. In most cases, it will have the effect of deferring events to the next scheduled update, which under some circumstances could cause significant inaccuracies. In some cases (e.g., a Reservoir hitting an upper bound), its effects can be somewhat more complex (e.g., it changes how an Overflow_Rate is computed). Some advanced features in GoldSim cannot function properly at all without using unscheduled updates. In these situations, GoldSim will throw a fatal error during a simulation if you have disabled unscheduled updates and are using such a feature.

Restoring Files After an Unexpected Failure Using Auto-Save

GoldSim 11.1 allows you to recover a copy of your model file should GoldSim unexpectedly terminate for some reason while your file is open. This would allow you to restore changes you made to the file since you last manually saved it.

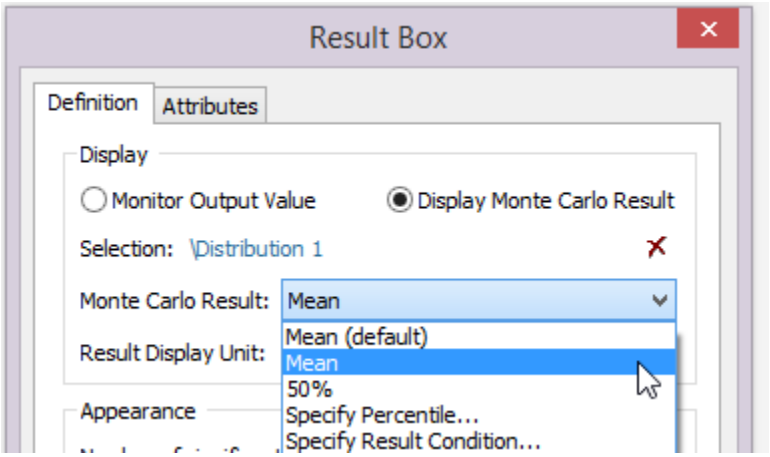
The feature works by saving a copy of your model at a user-specified frequency (by default, every 10 minutes) to a separate location. In particular, the recovery file is saved temporarily in the local AppData directory of your computer (i.e., it does not overwrite the original file). If GoldSim encounters a problem and closes abruptly (i.e., the software crashes), Windows will automatically restart GoldSim, and you will be given an opportunity to view the auto-saved recovery file. If you had made a number of changes and had not saved your original file for some time prior to the crash, the recovery file may represent a "newer" version of the file than the original file. When GoldSim restarts, you will be given the opportunity to replace your original file with the recovery file. If you choose not to use the recovery file, it will be automatically deleted (until it is regenerated with the next auto-save).

This capability is described in detail in the GoldSim User's Guide, starting on page 73. Alternatively, open the Help file, and on the Index tab enter *Auto-save.*

Displaying Statistical Results in Output Controls in Dashboards

GoldSim 11.1 allows you to display statistical results in output controls within a Dashboard. In previous versions, you could display the final value of an output, but could not display a statistical value for that output generated using Monte Carlo simulation (e.g., the mean, or a particular percentile).

Each output control now provides additional options for defining the statistical result to display:



This capability is described in detail in the GoldSim Dashboard Authoring Module User's Guide, starting on page 65. Alternatively, open the Help file, and on the Index tab enter *Output controls*, and then select the subtopic *displaying statistics.*

Specifying Which Input Controls are Scenario-Specific and Which are Scenario-Independent in a Dashboard

When using GoldSim's scenario capabilities in conjunction with a Dashboard, it is possible to specify the scenario using a Scenario control in the Dashboard, and subsequently modify input parameters for that scenario.

In GoldSim 11, when a scenario was selected in a Dashboard, and you changed a value in an input control, the Data element linked to that control automatically became a Scenario Data element (i.e., it was scenario-specific). As a result, it was not possible to have an input control in a Dashboard that was not scenario-specific. That is, if you wanted to change an input and have it be the same value for all scenarios, you needed to change it in each scenario separately.

In GoldSim 11.1, it is now possible for the author to specify two different types of input controls: those that control scenario-specific data, and those that control scenario-independent data. In particular, in order for a Data element linked to an input control to be defined as Scenario Data, the author must specifically do so outside of the Dashboard (i.e., in the Data element dialog or the Scenario Manager dialog). Merely changing the input control's value in the Dashboard no longer makes the Data element a Scenario Data element.

As a result, because not all of the input controls in a Dashboard will necessarily be linked to Scenario Data, when you design your Dashboard(s), it will be critical to make it clear to the Player user which input controls are scenario-specific and which are not.

This capability is described in detail in the GoldSim Dashboard Authoring Module User's Guide, starting on page 76. Alternatively, open the Help file, and on the Index tab enter *Scenarios*, and then select the subtopic *editing in Dashboards.*

Browsing Between Result Elements and Referenced Outputs

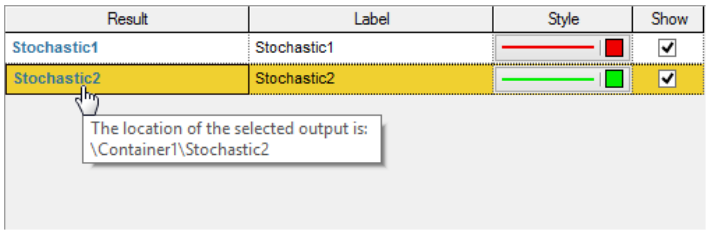
In Version 11, Result elements were redesigned such that unlike other elements in GoldSim, when you reference an output of an element within a Result element, it is no longer treated as a "link". The most noticeable impact of this change (and one of the major reasons the change was made) is that influences are no longer drawn between the element(s) being referenced and the Result element.

While this has the effect of cleaning up many models considerably (eliminating large numbers of influences), it made it more difficult to quickly find the elements being referenced by a Result element (and conversely, the Result element that references a

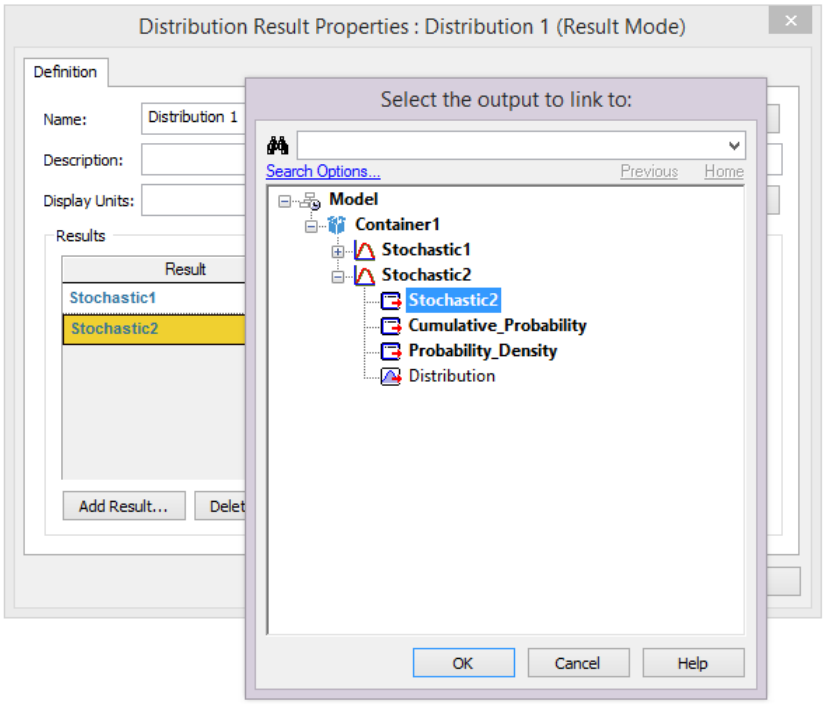
particular element). To facilitate this, GoldSim 11.1 provides a number of tools for browsing between Result elements and the outputs (and hence elements) that they reference:

- From within the Properties dialog for a Result element, if you select a result (i.e., an output), and then press the **Go to Result>>** button in the dialog the dialog will close and the output's element will be selected (i.e., GoldSim will jump directly to that location in the graphics pane). (Note that Array results do not have a Go to Result>> button, as this button is most valuable when a Result element contains multiple results).

- From within the Properties dialog for a Result element, if you place your cursor over the result, a tool-tip will be displayed showing the location of the element being referenced:

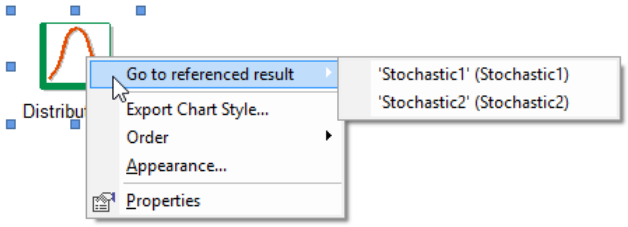


If you double-click on the result, a browser will be shown illustrating the location of the element in the hierarchy:



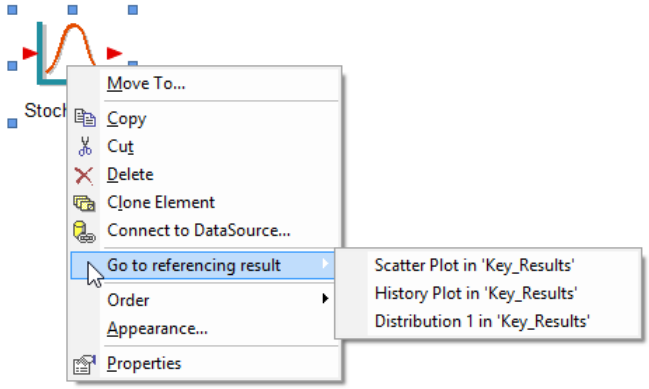
If you Ctrl+double-click on the result, the dialog will close and the output's element will be selected (i.e., GoldSim will jump directly to that location in the graphics pane).

- If your right-click on a Result element in the graphics pane (or the browser), a context menu will be displayed listing all of the referenced outputs:



If you click on one of the outputs listed, the output's element will be selected (i.e., GoldSim will jump directly to that location in the graphics pane).

- If you right-click on a referenced element in the graphics pane (or the browser), a context menu will be displayed listing all of the Result elements that reference outputs from the element:

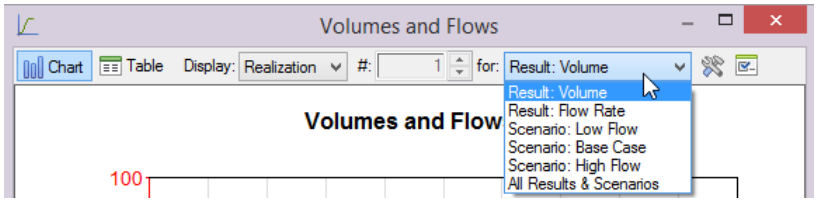


If you click on one of the Result elements listed, the Result element will be selected (i.e., GoldSim will jump directly to that location in the graphics pane).

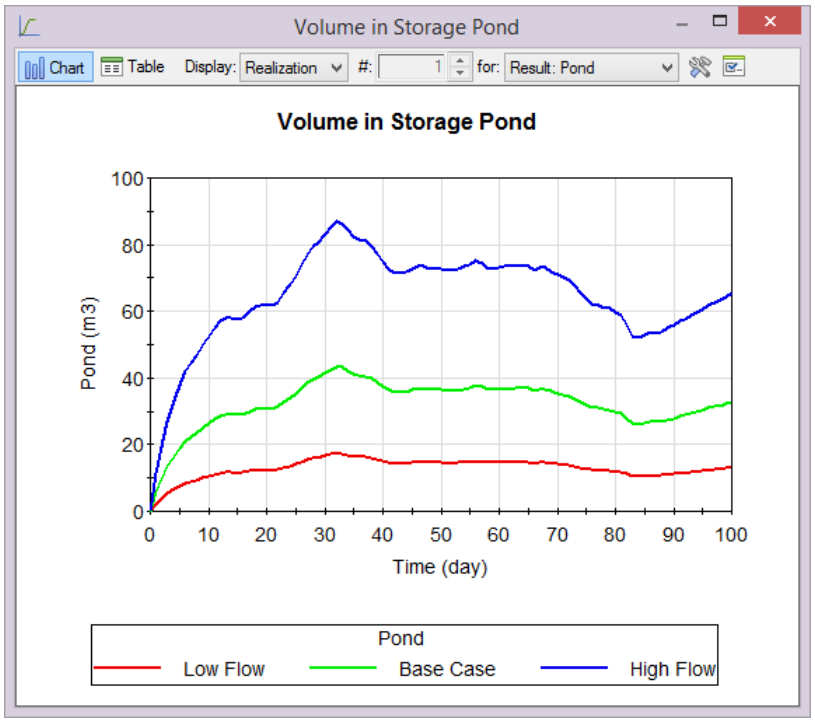
Viewing Scenario Results in Time Histories for Multiple Outputs

In GoldSim 11, time history displays of scenarios could only display results for one output at a time. That is, you could show all scenarios for a specific output, but if you had multiple outputs that you wanted to view, you could *not* display all outputs for a specific scenario. GoldSim 11.1 allows you to displays results for multiple outputs in both ways.

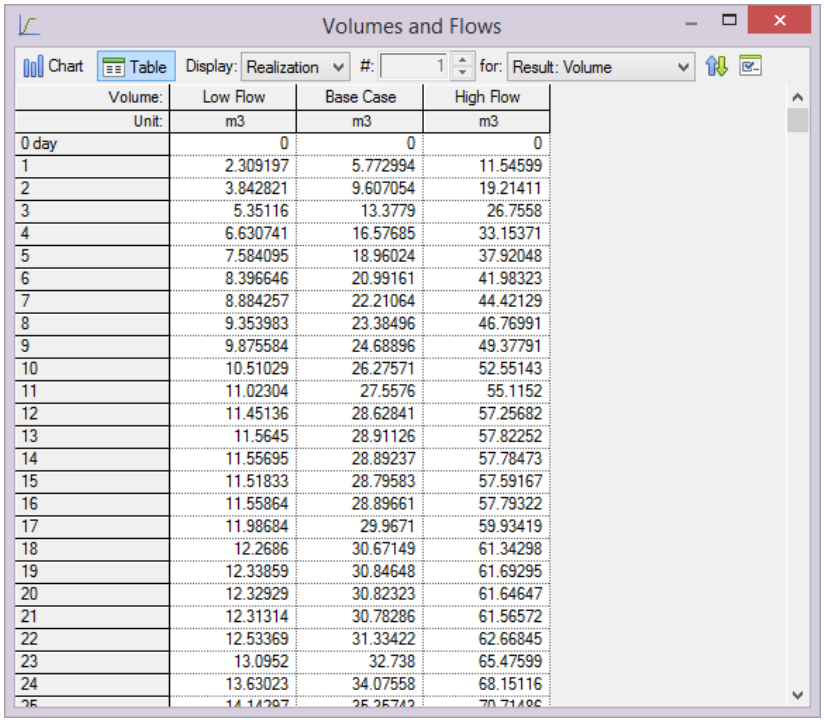
In GoldSim 11.1, you do this by specifying exactly which scenarios and results you wish to display using a drop-list at the top of the display window. In the example below, there are two results and three scenarios:



Selecting an option prefaced with "Result" displays all the scenarios for that particular result:



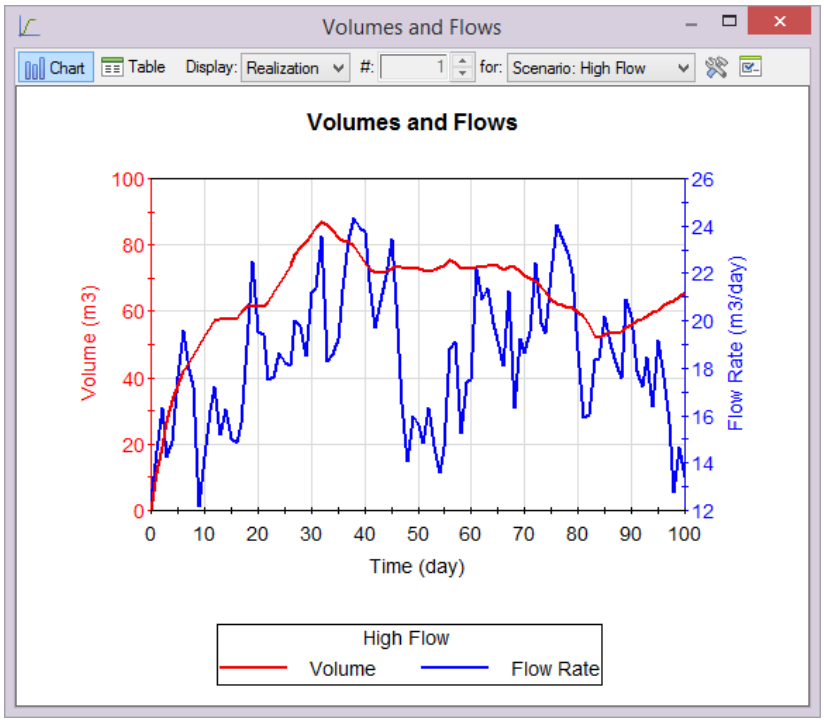
In this example, three different scenarios are shown (Low Flow, Base Case and High Flow) for the selected result (Pond). The corresponding Table display would look like this:



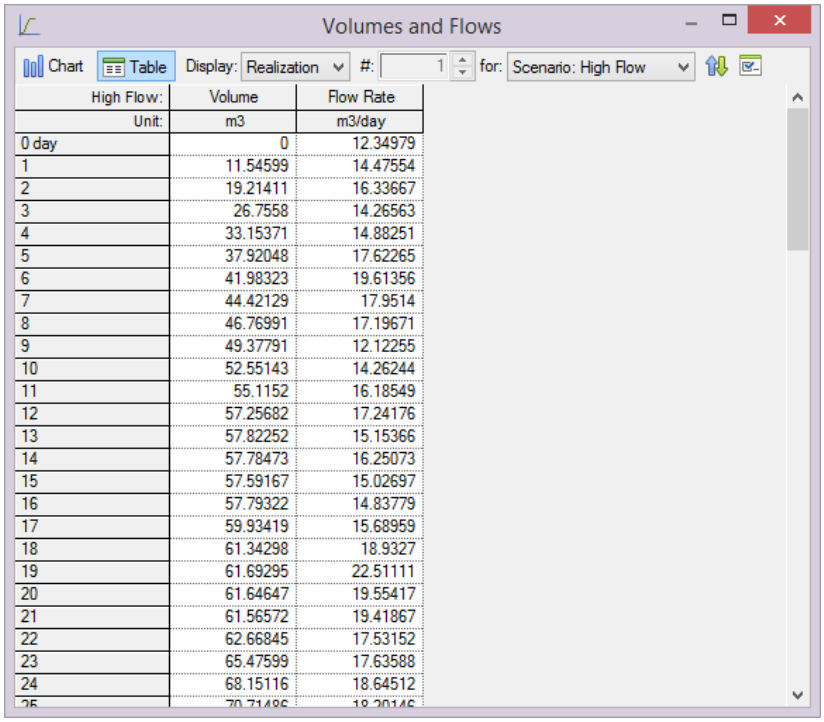
Volume:	Low Flow	Base Case	High Flow
Unit:	m3	m3	m3
0 day	0	0	0
1	2.309197	5.772994	11.54599
2	3.842821	9.607054	19.21411
3	5.35116	13.3779	26.7558
4	6.630741	16.57685	33.15371
5	7.584095	18.96024	37.92048
6	8.396646	20.99161	41.98323
7	8.884257	22.21064	44.42129
8	9.353983	23.38496	46.76991
9	9.875584	24.68896	49.37791
10	10.51029	26.27571	52.55143
11	11.02304	27.5576	55.1152
12	11.45136	28.62841	57.25682
13	11.5645	28.91126	57.82252
14	11.55695	28.89237	57.78473
15	11.51833	28.79583	57.59167
16	11.55864	28.89661	57.79322
17	11.98684	29.9671	59.93419
18	12.2686	30.67149	61.34298
19	12.33859	30.84648	61.69295
20	12.32929	30.82323	61.64647
21	12.31314	30.78286	61.56572
22	12.53369	31.33422	62.66845
23	13.0952	32.738	65.47599
24	13.63023	34.07558	68.15116

Each column then represents a scenario.

Selecting an option prefaced with "Scenario" displays all the results for that particular scenario:



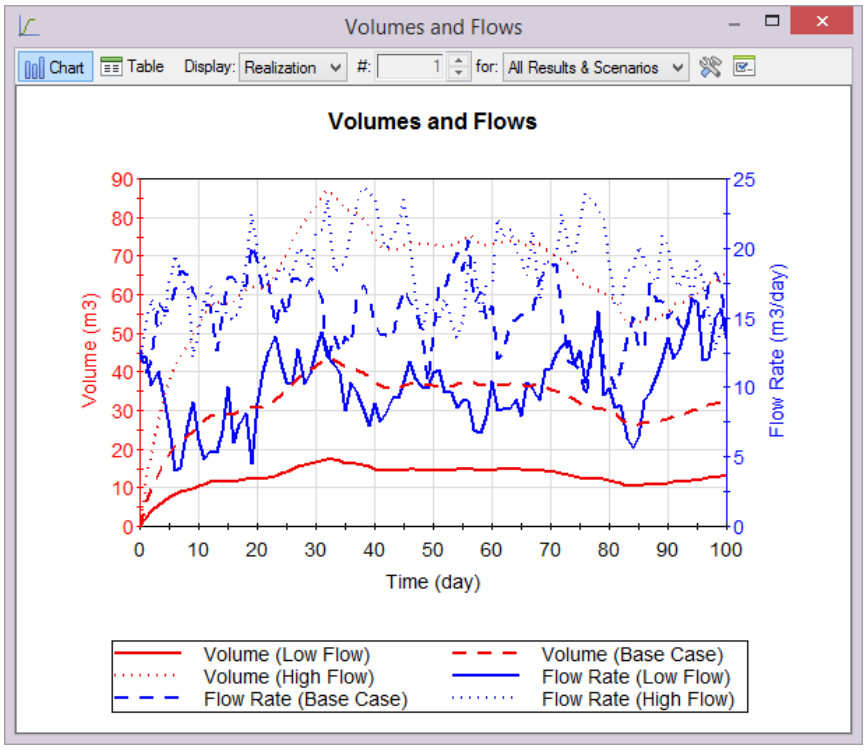
In this example, two different results are shown (Volume and Flow Rate) for the selected scenario (High Flow). The corresponding Table display would look like this:



High Flow:	Volume	Flow Rate
Unit:	m3	m3/day
0 day	0	12.34979
1	11.54599	14.47554
2	19.21411	16.33667
3	26.7558	14.26563
4	33.15371	14.88251
5	37.92048	17.62265
6	41.98323	19.61356
7	44.42129	17.9514
8	46.76991	17.19671
9	49.37791	12.12255
10	52.55143	14.26244
11	55.1152	16.18549
12	57.25682	17.24176
13	57.82252	15.15366
14	57.78473	16.25073
15	57.59167	15.02697
16	57.79322	14.83779
17	59.93419	15.68959
18	61.34298	18.9327
19	61.69295	22.51111
20	61.64647	19.55417
21	61.56572	19.41867
22	62.66845	17.53152
23	65.47599	17.63588
24	68.15116	18.64512

Each column represents a result.

There is also an option to display "All Results & Scenarios":



This capability is described in detail in the GoldSim User's Guide, starting on page 578. Alternatively, open the Help file, and on the Index tab enter *Time history results*, and then select the subtopic *viewing scenarios*.

Redesigned SubModel Output Interface

These changes provide great flexibility and power to users who utilize GoldSim's advanced SubModel features.

In GoldSim 11, a major change was made in to how SubModels pass Monte Carlo results through the output interface to the parent model. In previous versions of GoldSim, when Monte Carlo results were exported from a SubModel via the output interface, you were required to specify a particular statistic (e.g., mean), and that is what was actually made available on the interface. Starting in GoldSim 11, Monte Carlo results from a SubModel are actually output in the form of a Distribution output. This output is a complex output representing all the distribution information. Among other things, this change facilitated display of nested Monte Carlo results.

GoldSim 11.1 extends these changes in three major ways:

- Additional options are provided when passing Final Values for outputs within the SubModel to the parent model. In addition to passing distributions, you can also pass specified statistics or the last calculated value for each SubModel simulation.
- When passing Final Values for outputs within the SubModel to the parent model, arrays can be passed (previous versions only allow scalars).
- SubModels can now pass *time history* results through the output interface to the parent model, allowing you to view all of the time histories generated inside the SubModel.

This capability is described in detail in the GoldSim User's Guide, starting on page 925. Alternatively, open the Help file, and on the Index tab enter *SubModels*, and then select the subtopic *output interface*.

MINOR MODIFICATIONS

Logging Simulation Events

GoldSim 11.1 includes some options to allow you to capture information about key events that may affect the behavior of your model. In particular, you can:

- Record when Reservoirs reach or drop below their upper bounds, and when they drop down to or rise above their lower bounds;
- Record the times of activation and deactivation for all Conditional Containers, and in the case of deactivation events, indicate whether the Container's Completion status was true when it was deactivated.

The information is written to the Run Log. Their purpose of this information is to help you to understand and diagnose your model's behavior.

This capability is described in detail in the GoldSim User's Guide, starting on page 408. Alternatively, open the Help file, and on the Index tab enter *Logging simulation events.*

New Definition for Duration Output of Conditional Containers

In previous versions of GoldSim, the Duration output of a conditional Container represented the duration that the Container had been in its current Activity Status (e.g., duration active, duration inactive). Hence, whenever the Activity Status changed, the Duration was reset to zero.

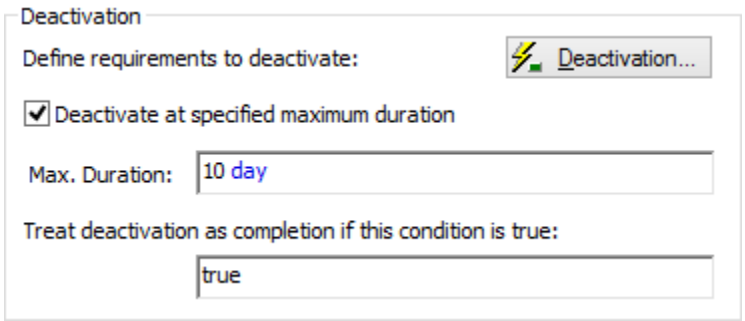
In GoldSim 11.1, The Duration output has been redefined to only represent the duration that the Container has been active. Hence, if it changes from active to inactive, it is not reset. Rather, when it becomes inactive, it simply "freezes" at its last value until it is reactivated.

More Flexible Method for Referencing Optimization and Sensitivity Analysis Variables

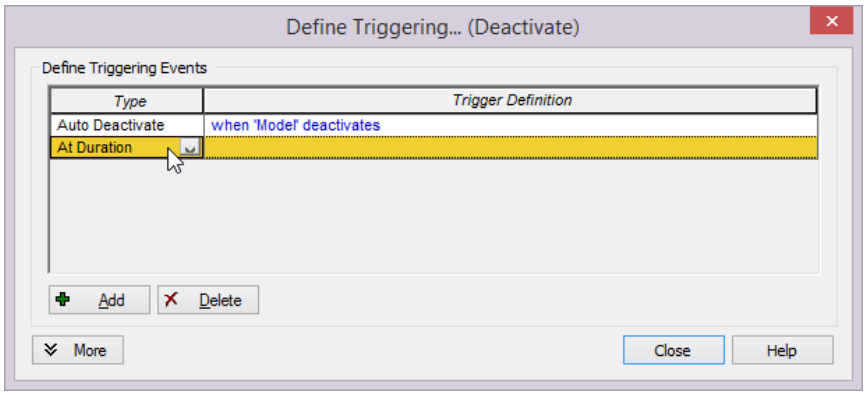
In previous GoldSim versions, the Objective Function and Optimization Variables for Optimization runs and the Result to Analyze and Independent Variables for Sensitivity Analysis runs were required to be global variables. In GoldSim 11.1, any qualifying element or output anywhere in the model can be used, including those located in localized Containers.

New Deactivation Logic for Conditional Containers

In previous versions of GoldSim, you could deactivate a conditional Container when the Duration output reached a certain value:



In GoldSim 11.1, this option has been removed, and replaced with a new trigger type (At Duration):



The At Duration trigger deactivates the Container when the Duration output exceeds the specified Trigger Definition (which must represent a length of time). The Duration output represents the amount of time that the Container has been active. Hence, this provides a convenient mechanism to deactivate a Container once it has been active for a specified amount of time. The Trigger Definition input in this case would typically be defined by an element inside the Container. This change makes it much simpler when the Container needs to be run to a specified duration ***and*** also wait for other criteria before deactivating.

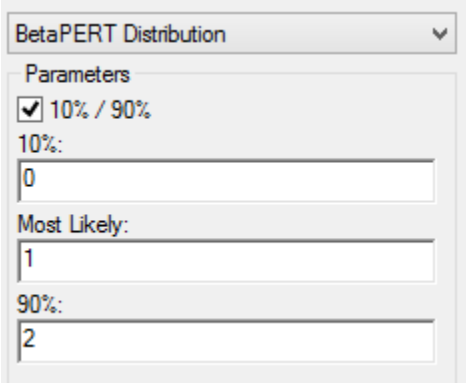
All models using the old deactivation logic are automatically converted (and represented using the new trigger type) when read in GoldSim 11.1.

This capability is described in detail in the GoldSim User's Guide, starting on page 847. Alternatively, open the Help file, and on the Index tab enter *Conditional Containers*, and then select the subtopic *deactivating*.

Modifications to Triangular and BetaPERT Distributions

Traditionally, Triangular and BetaPERT distributions are defined by specifying a Minimum (0^{th} percentile), Most Likely, and Maximum (100^{th} percentile).

In GoldSim 11.1, you now also have the option to define these distributions using the 10^{th} and 90^{th} percentiles (instead of the Minimum and Maximum):



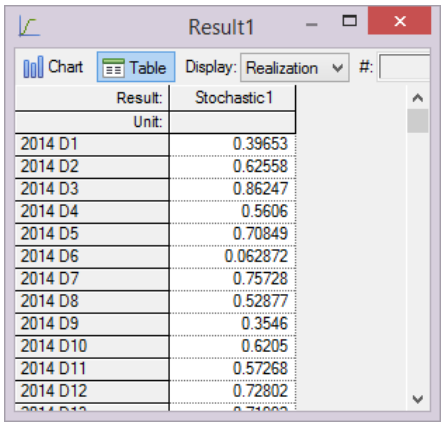
Exporting Time History Custom Statistics to Text Files

In GoldSim 11, when running multiple realizations, you could export all realization histories to a text file. In GoldSim 11.1, you can now export realization histories and/or custom statistics to a text file.

This capability is described in detail in the GoldSim User's Guide, starting on page 686. Alternatively, open the Help file, and on the Index tab enter *Time History results*, and then select the subtopic *exporting results to text files*.

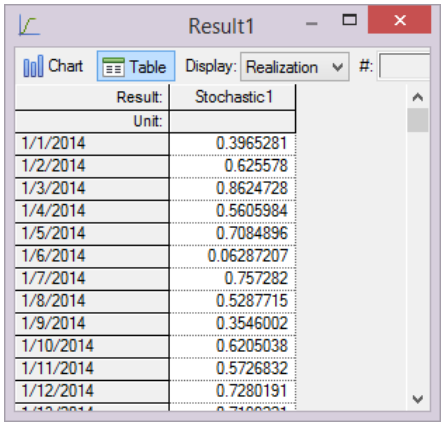
Changes to Time Labels in Time History Result Tables with Daily Reporting Periods

In GoldSim 11, when viewing a Time History Result table for a model with daily reporting periods (in a Calendar Time simulation), the time labels were not useful for simulation with durations of more than a few days (as they simply labeled the days as D1, D2, etc.):



Result:	Stochastic1
Unit:	
2014 D1	0.39653
2014 D2	0.62558
2014 D3	0.86247
2014 D4	0.5606
2014 D5	0.70849
2014 D6	0.062872
2014 D7	0.75728
2014 D8	0.52877
2014 D9	0.3546
2014 D10	0.6205
2014 D11	0.57268
2014 D12	0.72802

In GoldSim 11.1, the label now shows the actual date:



Support for Global Database Download Command Line Flag in GoldSim Player

In GoldSim 11, the "-getdb" command line flag can be used to execute a global download to all elements linked to databases. In version 11.1, support for the "-getdb" command line flag was extended to GoldSim Player.

CONVERSION ISSUES WHEN READING AND RUNNING EXISTING MODELS

GoldSim 11.1 represents a minor upgrade from GoldSim 11. All GoldSim 11 model files can be successfully read by GoldSim 11.1. For the most part, we have worked very hard to ensure that these model files will be correctly converted, and no user action will need to be taken. However, in some rare instances, you may need to make minor modifications to your file after reading it into GoldSim 11.1 in order for it to run properly. In no case should these changes be extensive or time-consuming. In particular, the following points should be noted:

- Because the Duration output for Conditional Containers was modified in 11.1 (see "New Definition for Duration Output of Conditional Containers" on page 15 above), existing models with at least one Conditional Container will show a warning message if the Duration output is referenced by an input or a Dashboard output control: "As of GoldSim 11.1, the 'Duration' output for conditional Containers such as 'Container1' represents the duration the Container has been active. Hence, it will no longer be updated when the Container is inactive. This message will not be repeated for other conditional Containers." Depending on your logic, you may need to modify your model to account for this change.

- Because extensive new features have been added to the SubModel Interface (see "Redesigned SubModel Output Interface" on page 14 above), when converting a SubModel element in an existing model file a detailed conversion report may be

shown. The message will detail which interface items were converted, and whether that conversion was successful or not.

- Beause the manner in which optimization and sensitivity analysis variables are specified and stored has been changed (see "More Flexible Method for Referencing Optimization and Sensitivity Analysis Variables" on page 15 above), in some rare cases it is possible the existing links will become invalid. In such a case, GoldSim will provide a warning message referencing the inputs which could not be converted.

Note: Converting models from 10.5 to GoldSim 11 or 11.1 is more complex due to the large number of changes in GoldSim 11. Before doing so, you should read the GoldSim 11 Summary Document, which discusses conversion issues for GoldSim 11 in detail.

Note that if you are having anydifficulty converting a model to GoldSim 11.1, do not hesitate to contact us at support@goldsim.com.