

Customizing Load Test Parameters

Load Test provides a number of ways to customize load tests. This topic explains how to customize load tests and the available customization options. In this chapter:

- Customizing Test Suite Scenarios
- Configuring Environments
- Configuring Asynchronous Tests
- Configuring Data Source Usage
- Configuring Setup/Teardown Test Execution
- Customizing Profiles
- Limiting Hits per Second in the Virtual User Mode
- Customizing the Data Recording Parameters
- Customizing the Load Test Stop Procedure
- Customizing Machine Options

Customizing Test Suite Scenarios

You customize how a particular test is run by customizing the scenario you plan to use. You can use scenarios to customize the following parameters:

- Test duration
- Distribution of virtual users over time and machines
- Distribution of hit rates over time and machines
- Distribution of user profiles over time

To customize an existing scenario or create a new scenario:

1. Open or create the scenario you want to customize by performing one of the following steps from the Load Tests tab:
 - To open an existing scenario: Click the appropriate node in the Scenarios branch. If profiles are not visible, double-click **Scenarios** to expand this branch.
 - To create a new scenario: Right-click the **Scenarios** node, then choose **New Scenario** from the shortcut menu.
2. Customize the scenario using the controls in the right GUI panel. The following table explains which controls correspond to particular customization goals.

To change this...	Do this...
Scenario name	Type a new name in the Name field.
Scenario type (determines whether you can specify the exact number of virtual users or hits per second for each test suite profile, or you express test suite profile distribution as a general ratio and let Load Test randomly assign test suite profiles according to the specified ratio)	<p>Choose the appropriate value from the Scenario Type box (to the right of the Name field).</p> <p>With Weighted Profiles, you specify the test suite profile distribution as a weight ratio; The virtual users are then distributed among profiles in a randomized weighted manner that allows an arbitrary total load graph and "statistical" following of the profile distribution.</p> <p>With Direct Profiles, you specify the exact load (in virtual users or hits per second) for each test suite profile. You can specify the load for all of the machines, or for each individual machine. The total number of VU/HPS cannot be specified directly, but comes as a sum of all profiles for a machine.</p>
Test duration	Type new values in the Duration fields. Days are limited to 30, hours are limited to 23, minutes are limited to 59, and seconds are limited to 59.
Controlled parameter (determines whether the test is controlled for number of virtual users or the number of hits per second [hit rate])	<p>Choose the appropriate value in the Controlled Parameter box.</p> <p>If you want Load Test to try to achieve the specified virtual user quantities (and possibly vary the number of hits per second in the process), choose Number of Users.</p> <p>If you want Load Test to try to achieve the specified hit rates by varying the number of virtual users as needed, choose Hits per Second, Hits per Minute, Hits per Hour, or Hits per Day</p>

<p>Randomization (determines the randomization of the Controlled Parameters)</p>	<p>For the Number of Users parameter, the virtual user think time is randomized according to the following distributions:</p> <p>Uniform: If the virtual user think time defined in the profile configuration is Tprof. then during load testing the actual virtual user think time will be a random value uniformly distributed in the interval from 0 to 2*Tprof. with the mean value of Tprof.</p> <p>Poisson: If the virtual user think time defined in the profile configuration is Tprof. then during load testing the actual virtual user think time will be a random value with the bell shaped distribution and the mean value of Tprof.</p> <p>None: No randomization is applied.</p> <p>For the Hits per Second parameter, the inter-invocation time is randomized according to the following distributions:</p> <p>Uniform: If the hit per second rate defined in the load test scenario is Nhps. then during load testing Load Test will generate a request sequence with a random inter-invocation time (the time between subsequent requests) uniformly distributed in the interval between 0 and 2* 1/Nhps. seconds and the mean value of 1/Nhps seconds.</p> <p>Poisson: If the hit per second rate defined in the load test scenario is Nhps, then during load testing Load Test will generate a request sequence with a random inter-invocation time (the time between subsequent requests) with the bell shaped distribution and the mean value of 1/Nhps seconds.</p>
<p>Maximum number of users to be simulated during the test run.</p> <p><i>Applies only to tests controlled for number of users</i></p>	<p>Choose the desired value from the Vertical scale box in the Users tab.</p> <p>Important: The load that you apply is the sum of users and hits on all machines in the selected scenario. The maximum combined number of users on all machines that can be run in a scenario is determined by your license. To see license details, choose Help> About in the Load Test program that controls the tests and read the information in the About panel that opens.</p>
<p>Maximum number of hits per second</p> <p><i>Applies only to tests controlled for number of hits</i></p>	<p>Choose the desired value from the Vertical scale box in the Users tab.</p> <p>Note that if you choose this option, profile delay options will be unavailable and any preexisting delay settings will be ignored.</p> <p>Important: The load that you apply is determined by the number of hits per second you implement for a given test as well as the number of machines running the tests. The number of machines and hits per second you can use is determined by your license. To see license details, choose Help> About in the Load Test program that controls the tests and read the information in the About panel that opens. To determine the number of hits per second you are licensed to execute, take the number of virtual users for which you are licensed, then divide it by 10. For example, if you are licensed to use 100 virtual users, you will be able to execute tests at 10 hits per second.</p>

<p>Distribution of number of users over time or the hit rate over time</p>	<p>Modify the Users tab graph as follows:</p> <p>To apply the same settings to all test machines, check the Machine Independent check box (this option is available only if there is more than one machine under the Machines node). The graph will contain one line (All Machines); to control the settings for all machines, you modify the position and shape of this line.</p> <p>To apply different settings to different test machines, clear the Machine Independent check box. Load Test will display one line for each machine; to control the settings for a particular machine, you modify the position and shape of the related line.</p> <p>To scale a line's shape for a different range of users or hit rates, right-click that line's representation in the top right side of the panel, choose Scale Graph from the shortcut menu, then enter a scaling factor in the dialog box that opens.</p> <p>To manually enter and edit point values on the graph, right-click that line's representation in the top right side of the panel, choose Edit Graph from the shortcut menu. Points can be manually edited by entering the X and Y Values in the Edit Point dialog.</p> <p>To maintain a steady amount of virtual users or hit rate, ensure that the line is flat, then drag the line up or down until it corresponds to the number of users or hits per second you want for the entire test duration.</p> <p>To have the number of virtual users or hit rate vary over time, create a "point" for each time interval for which you want to specify the precise number of virtual users or hits per second, then drag that point to the desired location. To create a point, right-click the appropriate machine line at the point that corresponds to the time interval for which you want to specify the exact number of users or hits per second, then choose Add point from the shortcut menu. Load Test will automatically determine the number of virtual users or hits per second for each time interval that does not have a specific point by plotting the slope between each of the points.</p> <p>To automatically double the number of points you have created, click More points. The new points will be added at regular intervals between your existing points. To remove one point, right-click a particular point and choose Remove point. To remove points which are not points of inflection, click the Less points button.</p>
<p>To display only specific machine graphs when many machines are of similar colors.</p> <p><i>Applies only if multiple machines are available in the Load Tests tab</i></p>	<p>Modify the Users tab settings as follows:</p> <p>Clear the Machine independent checkbox. Load Test will display one line for each machine:</p> <p>To display all machine graphs, select the All check box.</p> <p>To display specific machine graphs, select only the desired checkboxes of the necessary machines.</p>
<p>To display only specific profile graphs when many profiles are of similar colors.</p> <p><i>Applies only if multiple test suite profiles are available in the Load Tests tab</i></p>	<p>Modify the Profiles tab settings as follows:</p> <p>To display all profile graphs, select the All check box.</p> <p>To display specific profile graphs, select only the desired checkboxes of the necessary profiles.</p>

<p>To manually enter and edit point values on the graph rather than clicking and dragging graph points.</p>	<p>Modify the Profiles tab settings as follows:</p> <p>Right-click the desired profile graph in the legend found beneath the pie chart and choose Edit Graph from the shortcut menu. An Edit Point dialog displays. The name of the graph that is being edited is displayed in the Title bar of the Edit point dialog window, (i.e. Default User, or New User 3, etc.).</p> <p>Points can be manually edited by entering the X and Y Values in the Edit Point dialog. The Previous and Next buttons cycle through the different points for the selected graph. You may also press Alt-Left Arrow on your keyboard as a Previous button shortcut, or Alt-Right Arrow as a Next button shortcut.</p>
<p>Chance that Load Test will select a particular profile at any point in the test duration.</p> <p>(The higher the ratio assigned to a profile, the more likely it is to be chosen).</p> <p><i>Applies only if multiple test suite profiles are available in the Load Tests tab</i></p>	<p>Modify the Profiles tab settings as follows:</p> <ul style="list-style-type: none"> • To change the maximum ratio of profiles, choose an item from the Vertical scale drop-down list on the right side of the Profiles tab. The higher the ratio you choose, the more different ratio intervals you will be able to use when determining how Load Test distributes user profiles over time. (The ratio of user profiles determines how likely Load Test is to select a particular profile at any point in the test duration.) • To scale a line's shape for a different range of profile ratios, right-click that line's representation in the top right side of the panel, choose Scale Graph from the shortcut menu, then enter a scaling factor in the dialog box that opens. • To maintain a steady ratio of user profiles, ensure that the line is flat, then drag the horizontal bar for each profile up or down until it corresponds to the profile weight you want for all time intervals. • To vary the ratio of user profiles, create a "point" for each time interval for which you want to specify the profile weight, then drag that point to the desired location. To create a point, right-click the appropriate profile line at the point that corresponds to the time interval for which you want to indicate a specific profile weight, then choose Add point from the shortcut menu. Load Test will automatically determine the profile weights for each time interval that does not have a specific point; it does this by plotting the slope between each of the points. • To automatically double the number of points you have created, click More points. The new points will be added at regular intervals between your existing points. To remove one point, right-click a particular point and choose Remove point. To remove points which are not points of inflection, click the Less points button.

Tip

You can save any scenario graph (configuration graphs as well as test progress graphs) as a GIF by right-clicking the graph that you want to save, then choosing **Save Image** from the shortcut menu.

Customizing QoS Metrics for Scenarios

The Load Test Quality of Service (QoS) analysis feature allows users to estimate the performance of a service/application by applying QoS metrics to Load Test results. Based on these metrics, Load Test can evaluate performance to determine the success or failure of the load test. QoS analysis is particularly important when a service/application is required to meet specific performance requirements before it can be considered ready for deployment.

Introducing QoS Metrics

QoS Metrics allow you to define a set of regression tests for a load test. On a succeeding load test, all metrics will pass successfully. Any metrics that fail are indications of a regression in the performance of their service/application.

QoS functionality can be accessed from the load test tree. Under each of the Scenario nodes (Bell, Buffer Test, Linear Increase, Steady Load) is a corresponding QoS node. After selecting a QoS node, the **Summary** and **Details** tabs display in the right GUI panel.

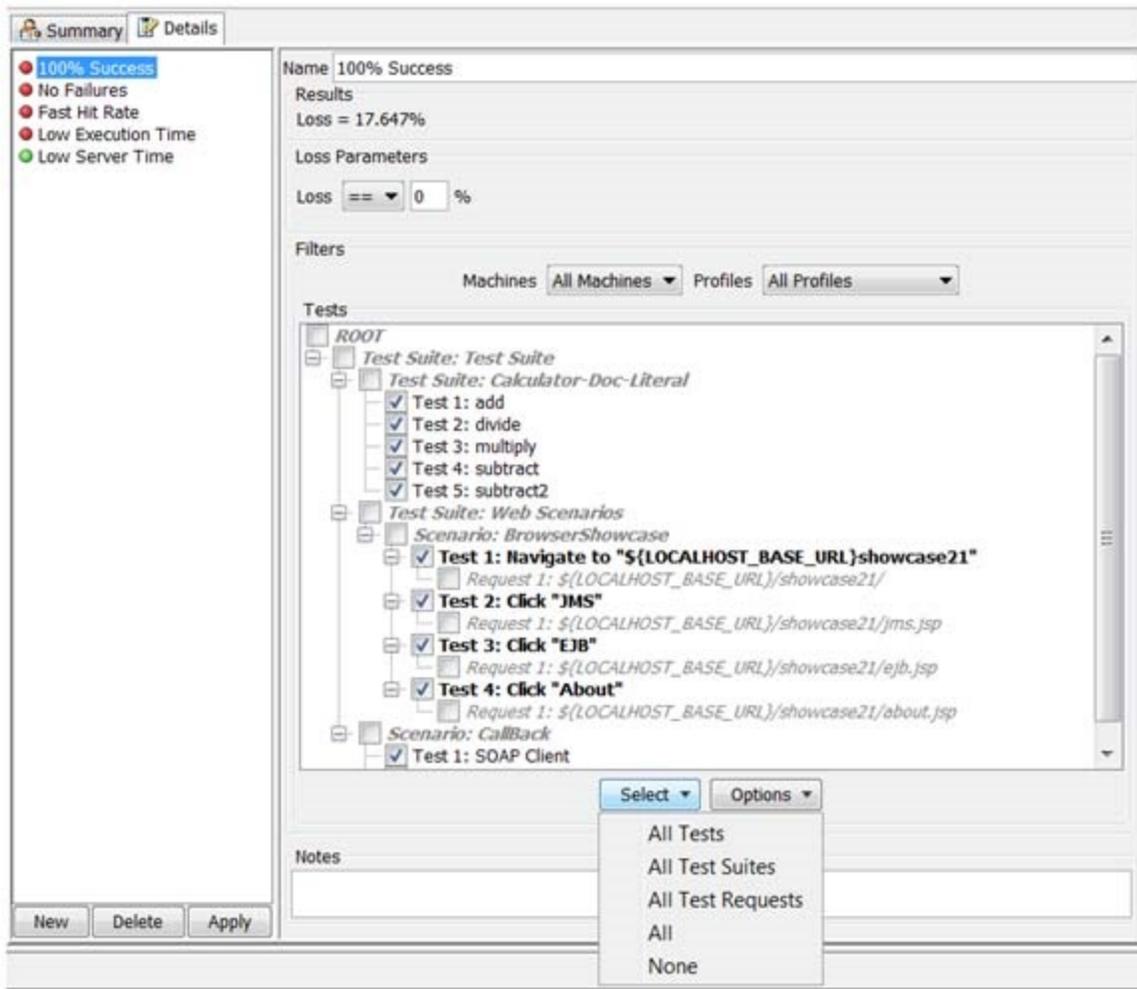
Metric	Description
Statistic	
Low Execution Time	Avg. Exe. Time (ms) must be < 750.0
Low Server Time	Avg. Server Time (ms) must be < 500.0
Count	
No Failures	Failure Count must be == 0
Throughput	
Fast Hit Rate	Final throughput must be >= 100 Hits per Minute
Loss	
100% Success	Percent of total loss (failing hits) must be == 0%

The **Summary** tab displays a global view of QoS metrics that have been configured within the **Details** tab. The **Summary** tab contains a list of metrics and their descriptions. There are five default metrics in the **Summary** tab **Metric** list:

- **Low Execution Time:** Verifies that the average execution time is below the specified threshold.
- **Low Server Time:** Verifies that the average server time is below the specified threshold.
- **No Failures:** The total number of failures occurring during the load test must be zero.
- **Fast Hit Rate:** The throughput achieved during the load test must be above the defined level.
- **100% Success:** The measured percent of succeeding request messages must be exactly 100%.

Each of the above metrics are grouped according to its type (e.g. Statistic, Count, Throughput, Loss). Any additional metrics you configure will also display in the Summary tab.

The **Description** list contains automatically generated descriptions of what each metric is verifying based on the parameters that have been specified for that metric.

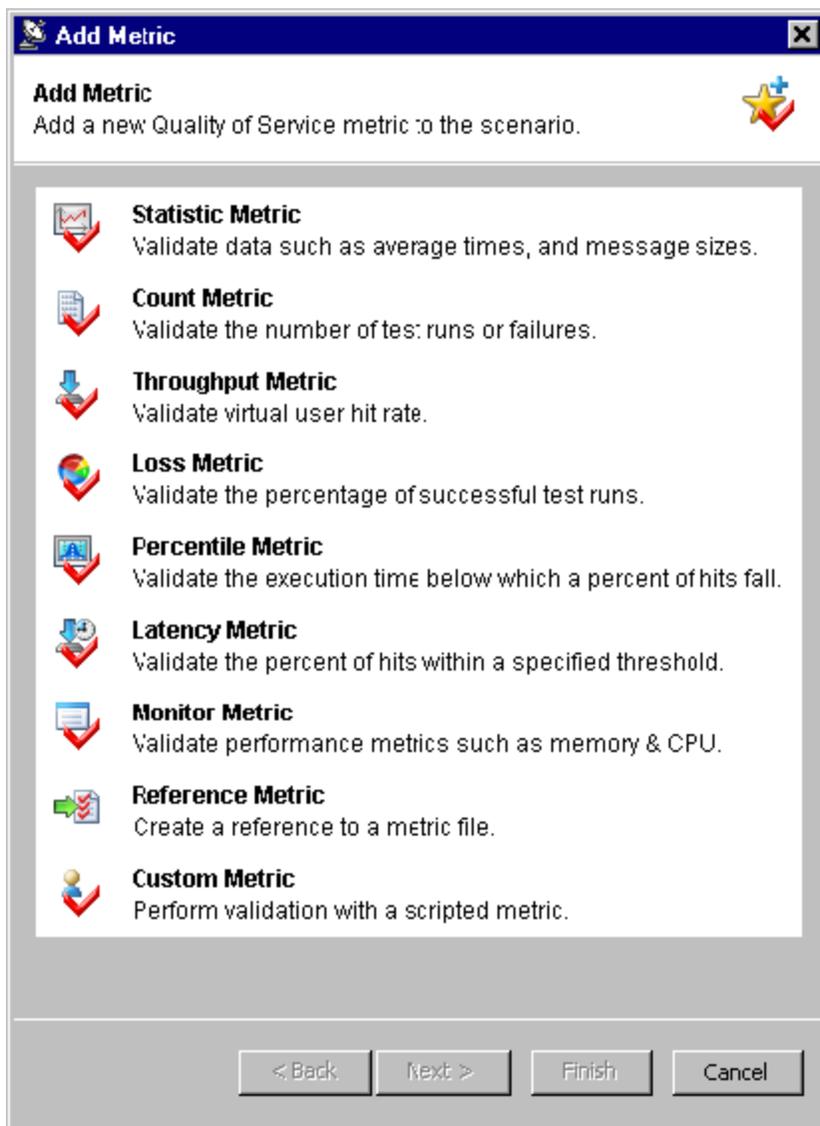


The **Details** tab displays the available metrics that have been configured for the selected scenario. The **Details** tab also displays the name, parameters, and notes for the metric selected from the Metric List.

Creating a New QoS Metric

To create a new QoS metric, complete the following:

1. Click the **New** button beneath the Metric List. The **Add Metric** wizard displays.



2. Select the desired QoS metric from the **Add Metric** wizard and click **Finish**.
The QoS metric is added to the left panel while its parameters display in the right panel of the **Details** tab.

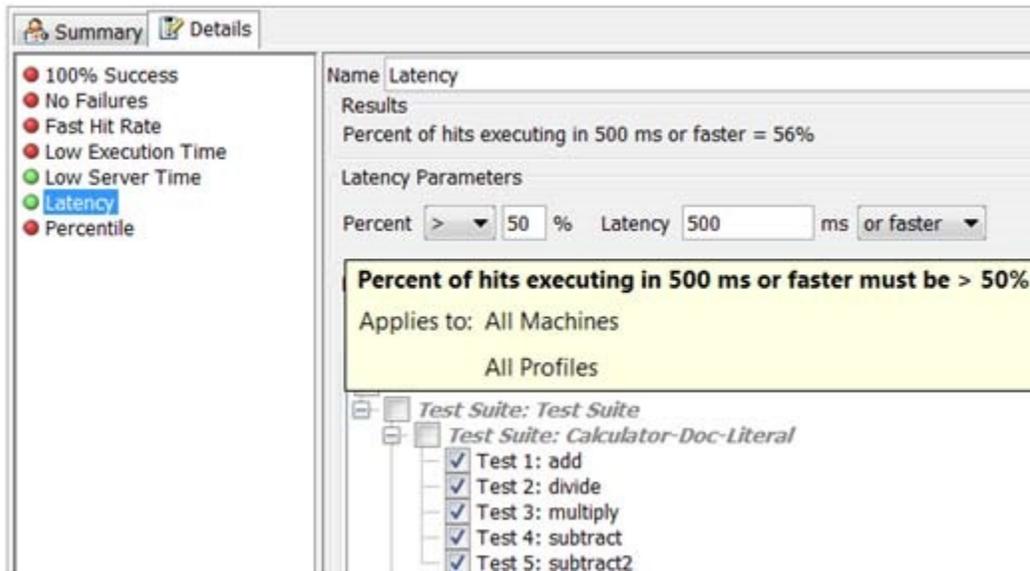
Each metric performs a different set of validation on completed load test results. After a load test is run, a QoS Report Summary will display in the Test Information report, while a separate and more detailed QoS Report will also be available.

The Effect of Filter Selections on QoS Metric calculation

The selections you make in the Test Tree Selection panel (described in [Test Tree Selection Panel Navigation and Options](#)) within QoS Metric Machines, Profiles and Tests filter panels affect the data sets that are used for calculation of the metric value. This will subsequently affect the success or failure outcome of the metric. You can preview the data used in calculation of the metric types listed below in the relevant sections of the load test report.

- **Statistic Metric** – See the Statistics section of the report. Note that the Avg. (average) parameters of the Statistic Metric are calculated based on the number of runs of each test selected for that metric. You can see these numbers in the Run Count column of the load test report's Statistics section.
- **Count Metric, Loss Metric** – See the Statistics section of the report.
- **Throughput** – See the Graph tab of the Detailed Report section.
- **Percentile Metric, Latency Metric** – Select **Show Individual Hits** in the Graph tab of the Detailed Report view.
- **Error Ratio Metric** – Select **Show Recorded Details** in the Graph tab of the Detailed Report view. See the Details column of the Table view that comes forward after selection.

Also, see the tool tip displayed in the Parameters panel of a QoS Metric view for further metric explanation based on current metric values.



Configuring QoS Metric Parameters

To make changes to any of the QoS metrics, select a metric from the list in the left pane of the **Details** tab and configure its parameters accordingly in the right pane of the **Details** tab. Depending on the metric selected, the options will vary. However, if you hold your cursor above the parameters in the right pane, a tool tip will display information about the parameter configuration.

You can also select one or multiple (CTRL-click) metrics from the list, then right-click your selection(s) and **Cut**, **Copy**, **Paste**, or **Delete** as needed from the shortcut menu. When right-clicking one or multiple (CTRL-click) metrics from the list, you can select **Save Metrics As** to save the selected metrics as a QoS metric set (.ms file), and you can also select **Load Metrics** to load previously saved metric sets. You can also change the order of the list by dragging and dropping the desired metrics into the desired order.

Customizing Scenarios that Contain a Large Number of Profiles

For scenarios that contain a large number of profiles, and/or a large number of graph points, it may become difficult to configure and keep track of the various options in each graph of the User and Profiles tab. In such cases, it may be easier to use the **Summary Table** and **Details Table** available for each scenario.

To view the Summary Table and Details Table, select the desired Scenario node and the **Summary Table** and **Details Table** tabs display in the right GUI panel.

Within the Summary Table and Details table views, you can edit the green fields such as the Number of Users for each machine and the Profile Weight of each profile. Changes you make in these green fields will reflect in the corresponding Users and Profiles tabs and vice versa. For example, if you change the Profile Weight of the Default User from 1 to 5, that change will reflect in the Profiles tab. Similarly, the same change in the Profiles tab will reflect in the Summary Table tab or Details Table tab.

Summary Table

The **Summary Table** view provides different information depending on whether Weighted Profiles or Direct Profiles are selected as the Scenario Type.

- The **Summary Table** view for **Weighted Profiles** provides two separate tables: one for machines and one for profiles.

Name: Scenario Type:

Users | Profiles | Summary Table | Details Table

Machine	Number of Users
localhost	5
localhost:8189	2-4
Total	7-9

Profile Name	Profile Weight
Default User	1
New User	1-3
New User 2	0-1
New User 3	1
New User 4	1-3
New User 5	10

Duration: Days Hours Minutes Seconds

Controlled Parameter: Randomization:

- The **Summary Table** view for **Direct Profiles** provides one table in which you can change the Number of Users for each machine:

Name: Scenario Type:

Profiles | Summary Table | Details Table

Profile Name	Controlled Parameter	localhost	localhost:8189	All 2 Machines
Default User	Number of Users	0-3	1	1-4
New User	Number of Users	1-5	1-5	2-10
New User 2	Number of Users	1-4	1-3	2-7
New User 3	Number of Users	0-3	1-2	1-5
New User 4	Number of Users	1-2	0-1	1-3
New User 5	Number of Users	1-4	1	2-5
Total	Number of Users	4-21	5-13	9-34

Detail Table

The **Detail Table** view provides different information depending on whether Weighted Profiles or Direct Profiles are selected as the Scenario Type.

- The **Detail Table** view for **Weighted Profiles** provides two separate tables: one for machines and one for profiles.

Name Scenario Type

Users Profiles Summary Table Details Table

Machine	Time/Value	Time/Value	Time/Value	Time/Value	Time/Value
localhost	Time	0s	2m:30s	5m	7m:30s
	Number of Users	5	5	5	5
localhost:8189	Time	0s	2m:30s	5m	7m:30s
	Number of Users	2	4	4	4

Profile	Time/Value	Time/Value	Time/Value	Time/Value	Time/Value	Time/Value	Time/Va
Default User	Time	0s	1m:15s	2m:30s	3m:45s	5m	6m:15s
	Profile Weight	5	5	5	5	5	5
New User	Time	0s	1m:23s	2m:47s	3m:53s	5m	6m:15s
	Profile Weight	1	2	3	2	1	2
New User 2	Time	0s	1m:22s	2m:44s	3m:52s	5m	6m:15s
	Profile Weight	1	0	0	0	1	1
New User 3	Time	0s	1m:31s	3m:3s	4m:1s	5m	6m:15s
	Profile Weight	1	1	1	1	1	1
New User 4	Time	0s	1m:38s	3m:16s	4m:8s	5m	6m:15s
	Profile Weight	1	2	3	2	1	1
New User 5	Time	0s	1m:15s	2m:30s	3m:45s	5m	6m:15s
	Profile Weight	10	10	10	10	10	10

Duration Days Hours Minutes Seconds
 Controlled Parameter
 Randomization

- The **Detail Table** view for **Direct Profiles** provides one table in which you can change the Time/Value for each user profile:

Profile	Machine	Time/Value	Time/Value	Time/Value	Time/Value	Time/Value
Default User	localhost	Time	0s	2m:30s	5m	7m:30s
		Number of Users	3	3	1	0
	localhost:8189	Time	0s	5n		
		Number of Users	1	1		
New User	localhost	Time	0s	2m:30s	5m	7m:30s
		Number of Users	2	2	1	5
	localhost:8189	Time	0s	5n		
		Number of Users	1	5		
New User 2	localhost	Time	0s	2m:30s	5m	7m:30s
		Number of Users	1	1	1	4
	localhost:8189	Time	0s	5n		
		Number of Users	1	3		
New User 3	localhost	Time	0s	2m:30s	5m	7m:30s
		Number of Users	0	0	1	3
	localhost:8189	Time	0s	5n		
		Number of Users	1	2		
New User 4	localhost	Time	0s	2m:30s	5m	7m:30s
		Number of Users	1	1	1	2
	localhost:8189	Time	0s	5n		
		Number of Users	1	0		
New User 5	localhost	Time	0s	2m:30s	5m	7m:30s
		Number of Users	4	4	1	1
	localhost:8189	Time	0s	5n		
		Number of Users	1	1		

Configuring Environments

An environment is a collection of variables that can be referenced in your Load Test configuration. When running a test, Load Test will substitute the names of variables in your project configurations with the values of those variables in the active environment. By changing which Environment is active, you can quickly and easily change which values Load Test uses.

Creating and switching environments is done through the **Environments** tab. To access this tab:

1. Select the **Profiles** node in the Load Test Configuration tree.
2. Open the **Environments** tab.

The **Environments** tab is divided into two sections, the **Environments List** panel (left) and the **Environment Details** panel (right).

The screenshot shows the 'Environments' configuration window. On the left, there is a list of environments, with 'Default Store-01 Environment' selected. On the right, the 'Environment Details' panel is visible, showing the 'Environment Name' as 'Default Store-01 Environment'. Below this, there is a table with the following data:

Name	Value
STORE-01_HOST	ws1.parasoft.com
STORE-01_PORT	80
STORE-01_PATH	/glue/store-01

At the bottom of the window, there are buttons for 'Add', 'Remove', and 'Set'.

Configuring the Environments List

The environments list panel contains the following buttons to manage environments:

- **Add:** Click to add a new environment to your project. The Add button can also be dropped down by clicking the down arrow on the right of the button. The following options are available.
 - **Import...:** Click to load existing environments from a *.env file into your project. Subsequent changes to the *.env file will not be reflected in your project.
 - **Reference...:** Click to reference existing environments from a *.env in your project. Subsequent changes to the *.env file will be reflected in your project.
- **Remove:** Click to remove the selected environment(s) from your project.
- **Set:** Click to make the selected environment the active environment.

Configuring the Environment Details Panel

After creating and/or selecting an environment, the **Environment Details** panel will display a table and buttons for managing environment variables.

- **Add:** Click to add a new environment variable.
- **Remove:** Click to remove the selected environment variable.

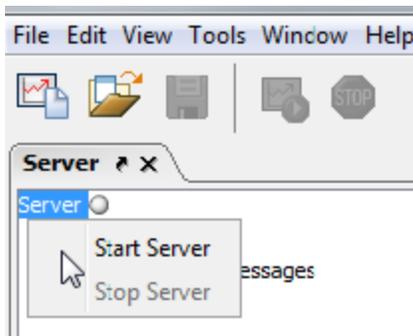
To edit an existing environment variable, either double-click on a value or simply click to highlight the value and type to overwrite it.

Configuring Asynchronous Tests

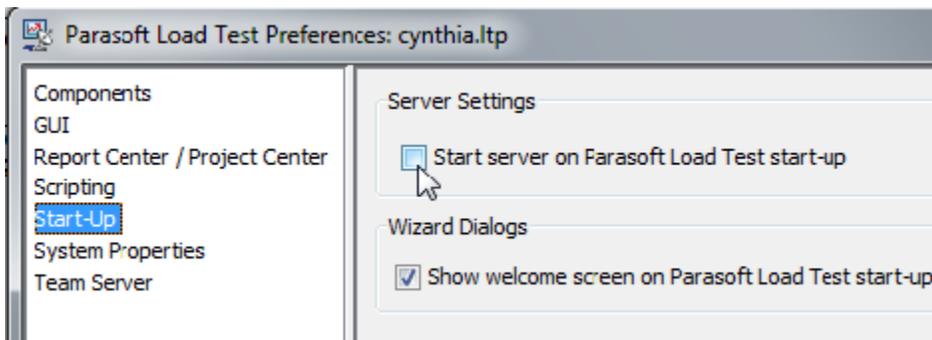
If the SOAtest project that you are using for load testing contains tests with Call Back tools and Asynchronous testing features—or Message Stub tools—you will need to start the SOAtest server inside Load Test in order to process the SOAtest project related asynchronous messaging.

You can start the SOAtest Server in two ways:

- **Manually:** Select **View> Show Server** in the toolbar. The **Server** tab will appear in the left panel of the Load Test GUI. Then, right-click the **Server** node and choose **Start Server**.



- **Automatically:** In the Load Test preferences, select the **Start-Up** section and enable the **Start server on Parasoft Load Test start-up** option. After you save your preferences, you will need to restart Load Test before this setting takes effect.



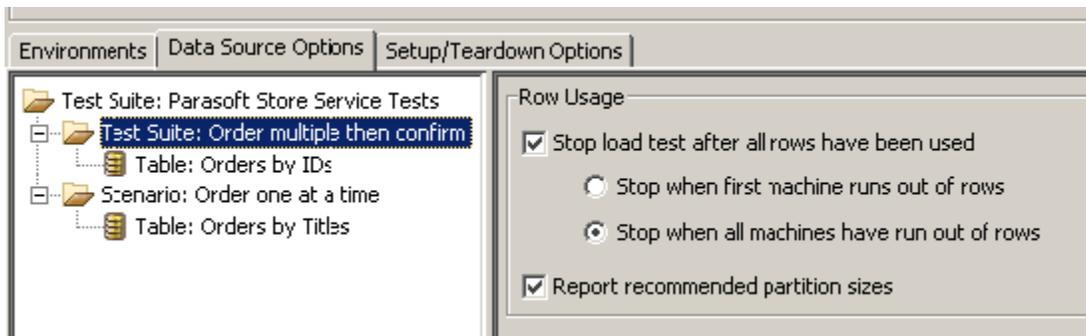
If you are running a load test with SOAtest asynchronous tools in command line mode or in Load Test server mode, you will need to enable the automatic SOAtest Server startup on each of these machines (because in command line mode, the SOAtest Server can only be started automatically).

Configuring Data Source Usage

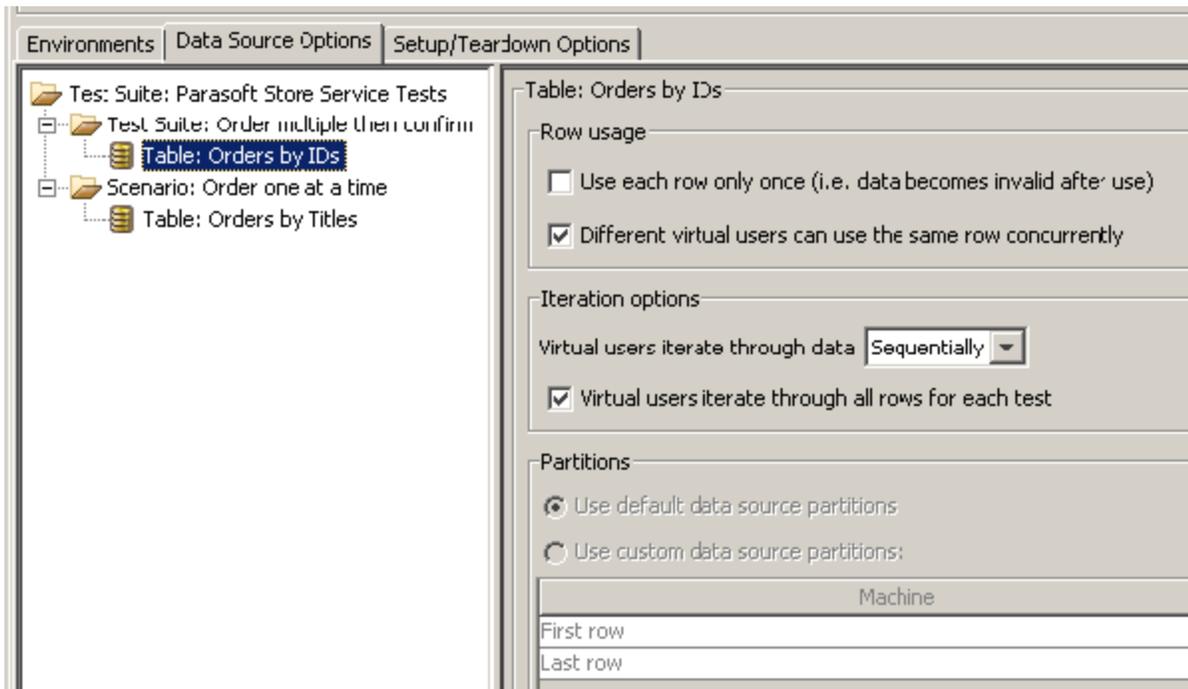
If your SOAtest .tst file references data sources, you can configure how those data sources are used during load testing.

To configure data source options:

1. Select the **Profiles** node in the Load Test Configuration tree.
2. Open the **Data Source Options** tab. The available data sources will be listed in the left panel.
3. To configure data source options that apply across the test suite, select the test suite you want to configure, then customize the following options as needed in the right panel:
 - **Stop load test after all rows have been used:** If data source rows become invalid after they are used, enable this option, then specify when you want the load test to stop—either when the first machine runs out of rows or when all machines run out of rows. This helps you to manage the duration of your load test.
 - **Report recommended partition sizes:** Determines if Parasoft Load Test generates a report (based on the results of the load test) that includes recommended partition sizes for each data source on each machine.



4. To configure options for a specific data source, select the data source whose options you want to configure, then customize the following options as needed in the right panel:
 - **Use each row only once (i.e., data becomes invalid after use):** Determines whether the values in a data source row can be used more than once during a test. If this option is enabled, SOAtest will sequentially iterate through the data source values; random iteration through the data source values is not allowed. This option is particularly useful for Web applications where certain kinds of data can only be entered into the application once (for example, social security numbers, unique id numbers, and so on).
 - **Different users can use the same row concurrently:** Determines if the values in this data source can be used by only one virtual user at a time. Disabling this option is particularly useful if you want SOAtest to assign login username/password pairs from this data source, but your site prohibits multiple simultaneous logins from each user. If this option is disabled, SOAtest will report a message if the number of virtual users attempting to use the data source during a test exceeds the number of available rows. If this occurs, you should ensure that the number of rows in the data source exceeds the number of virtual users that will be using the data source, then rerun the test. *This option is only available if the Use each row only once (i.e., data becomes invalid after use) option is not selected.*
 - **Virtual users iterate through data:** Determines whether SOAtest iterates through the data randomly or sequentially. *This option is only available if the Use each row only once (i.e., data becomes invalid after use) option is not selected.*
 - In sequential mode, SOAtest repeatedly iterates through the data throughout the test. It uses all data source values, starting with the values in the first data source row, and moving sequentially through the data source rows up until the last data source row. Once SOAtest uses the values in the last data source row, it starts over again with the values from the first row.
 - In random mode, SOAtest randomly selects a data source row each time it needs a data source.
 - **Virtual users iterate through all rows for each test:** Determines if virtual users can iterate through all rows of this data source before running the next test. If this option is not selected, virtual users execute a single row at a time, then runs the next test and so on. *This option is only available if the Use each row only once (i.e., data becomes invalid after use) option is not selected.*
 - **Partitions:** Allows you to customize how the data source is partitioned for distribution to load test server machines.
 - Data sources will be partitioned when either the **Use each row only once** option is enabled or the **Different virtual users can use the same row concurrently** option is disabled.
 - To customize how the data source is partitioned for distribution to load test server machines, enable **Use custom data source partitions**, then enter specify the desired distribution in the table.
 - To specify that a given machine should receive no data source rows, enter 0 for both the **First** row and **Last** row cells. All data source rows *must* be distributed to one load test server machine.



Configuring Setup/Teardown Test Execution

If your SOAtest .tst file uses setup or teardown tests, you can configure how those tests are used during load testing.

To configure setup/teardown options:

1. Select the **Profiles** node in the Load Test Configuration tree.
2. Open the **Setup/Teardown Options** tab.
3. Choose the desired option. Available options are:
 - **Run once per virtual user:** Setup and teardown tests will be run once for each virtual user.
 - **Run once per machine:** Each machine will run setup and teardown tests once per load test.
 - **Run once per load test:** Setup and teardown tests will be run once per load test.

Customizing Profiles

Each time a virtual user is created, it is based on one of the available profiles. Virtual users are created at the beginning of a load test, and whenever a virtual user completes a test run and the specified load test duration has not yet been exceeded.

You can configure any number of profiles or machines, but the number of virtual users or number of hits per second you use is limited by your license. For example, if you are only licensed to run 100 virtual users, you can configure any number of profiles, but only 100 virtual users based on those profiles can be active at any given time. If you have 20 profiles, but are only licensed to run one virtual user, all 20 profiles will eventually be used during the test (provided that the test has a sufficient duration), but only one profile will be active at any given time.

To customize the default profile or create a new profile:

1. Open, disable, enable, or create the profile you want to customize by performing one of the following steps:
 - To open an existing profile: Click the appropriate node in the **Profiles** branch. If profiles are not visible, double-click **Profiles** to expand this branch.
 - To disable/enable an existing profile: Right-click the appropriate node in the **Profiles** branch and select **Disable/Enable** from the shortcut menu. If disabling a profile, the profile will not run with the load test until it is enabled again.
 - To create a new profile: Right-click the Test Suite Profiles node, then choose **New Profile** from the shortcut menu.
2. Customize profile options using the controls in the right GUI panel. Available options include:
 - **Name:** Determines the profile name.
 - **Profile Runnables:** Determines what tests or custom operations are executed. Check the check boxes that represent the tests you want to use. *You must select at least one test.* If you want child tests to assume the parent test's setting (enabled or disabled), check the **Propagate Selection** option. If you add multiple test suites, they will be executed in the order in which they are listed in this panel.
 - **Delay:** Indicates the length and type of delay you would like to simulate between this profile's test iterations. If this profile is used in a scenario that controls the test for number hits per second (rather than for number of virtual users), all delay options will be ignored. Delay options include:

- **End-to-Begin:** Prompts Load Test to measure the delay from the end of the previous virtual user invocation to the beginning of the subsequent virtual user invocation.
- **Begin-to-Begin:** Prompts Load Test to measure the delay from the beginning of the previous virtual user invocation to the beginning of the subsequent virtual user invocation.
- **Minutes:** Determines the delay in minutes. Enter the number of minutes in the text field or move the slider accordingly.
- **Seconds:** Determines the delay in seconds. Enter the number of minutes in the text field or move the slider accordingly.
- **Milliseconds:** Determines the delay in milliseconds. Enter the number of minutes in the text field or move the slider accordingly.

Tip

If you want different tests to use different delays, you can configure the delays at the test level in SOAtest (in the **Execution Options> Test Flow Logic** tab within the test suite's configuration panel). Any delays configured at the test level will override delays specified in the Load Test profile. The Load Test Begin-to-Begin/End-to-Begin selection will not be applied for tests with individual delays.

Limiting Hits per Second in the Virtual User Mode

It is sometimes desirable to limit the Hit per Second rate in a load test scenario that has Virtual Users selected as a controlled parameter. There are two ways to limit the hit per second rate in the Virtual User mode:

- **Set the appropriate delays in the Virtual User profile configuration:** This is the preferred method. The hit per second rate is inversely proportionate to the time between Virtual User test invocations. This time consists of the test execution time and the Virtual User Delay time. For instance setting a Virtual User profile Begin-to-Begin delay to 1 second will cause the hit per second rate of a 4 virtual user load test scenario to stay at or under 4 hits per second. For more information on the Virtual User profile delays see the Customizing Profiles section of the documentation.
- **Configure Hit per Second throttling in the Scenario Summary Table view:** In the Weighted Profiles mode of a Load Test scenario that has Virtual Users selected as a controlled parameter, you can directly set the Hit per Second limit for each machine in the load test configuration. The Summary Table of the load test Scenario view (see the screenshot below) includes a table that allows you to enable Hit per Second throttling for any machine in the load test configuration and set the Hit per Second limit for that machine. When using this mode, be aware that the HPS throttling controller of the load test has a priority over the part of the application that enforces the Virtual User delays. As a result, the Virtual User profile delay times may likely will be ignored in order to throttle the Hit per Second rate.

The following image shows an example of configuring Hit per Second throttling in the Scenario Summary Table view:

Machine	HPS limit	Allow HPS Throttling
localhost	4	<input checked="" type="checkbox"/>
bison:8189	2	<input checked="" type="checkbox"/>
Total	6	

Customizing the Data Recording Parameters

The **Report Settings** tab of the Scenarios control panel lets you configure what data is recorded during the load test.

Report Settings Requirements Tracking Stop Settings

Record Graphs

Record Individual Hits

Record Individual Hit Details

Error Details Success Details

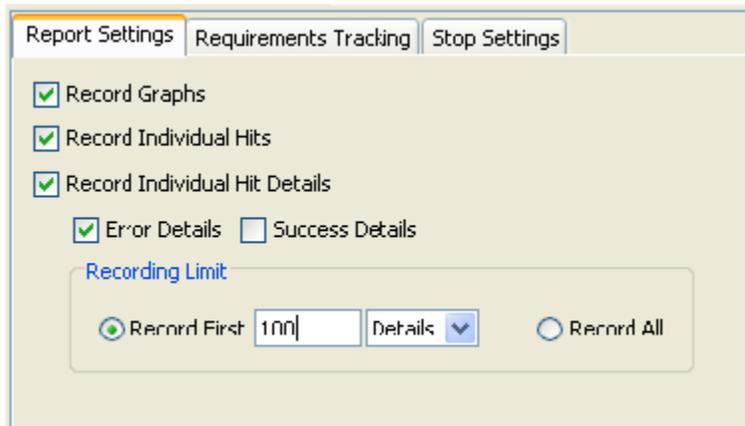
Recording Limit

Record First 100 Details Record All

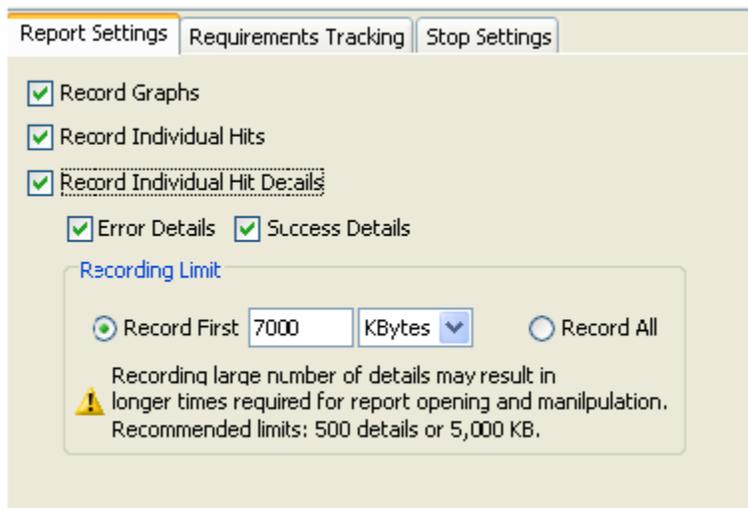
Available options are:

- **Record Graphs:** Record the load test graph data that are available in the Detailed Report section of the load test report.
- **Record Individual Hits:** Record all individual hits that are available as a "scatter" view in the Detailed Report section of the load test report.
- **Record Individual Hit Details:** Record Error and/or Success details of individual hit execution. Error and Success details depend on the Load Test component type. For SOAtest components, the following is recorded as Error/Success details:
 - **Error Details:** Contains an error description string for all tests and test traffic for the following SOAtest tool tests: SOAP Client, Browser Test, REST Client, Messaging Client.
 - **Success Details:** Contains traffic for the following SOAtest tool tools: SOAP Client, Browser Test, REST Client, Messaging Client.
 - **Recording limit:** Limits the amount of Error and/or Success data recorded in the load test report. The limit can be set to either the maximum number of the collected test execution details or to the size of details data.

To limit the report size by setting the *maximum number of recorded details*, select the **Details** option in the Recording Limit panel:



To limit the report size by the *maximum allowed recorded data size*, select the **KBytes(kilobytes)** option in the Recording Limit panel.



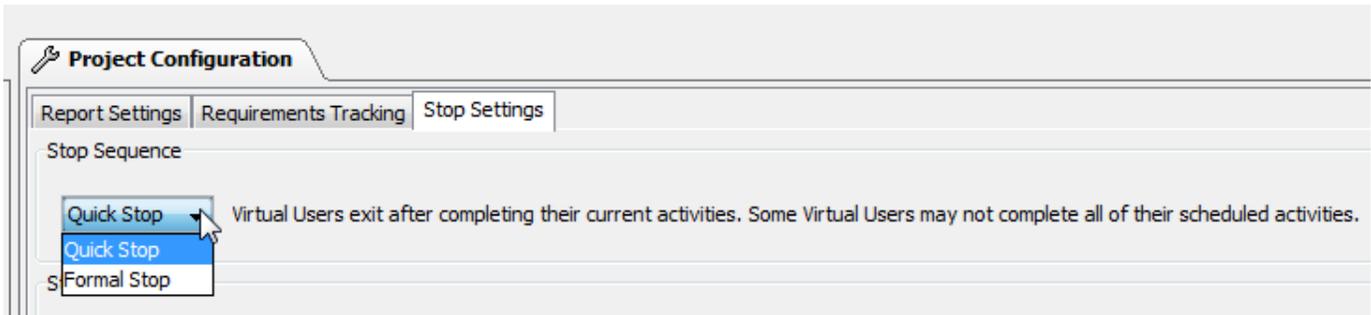
Note that the **Record Individual Hit Details** option can be used when the **Record Individual Hits** option is unchecked. In this case, the individual hit data (the scatter view section of the report) will not be recorded, but the test execution details will still be available via the **Show Recorded Details** right-click menu option of the load test report graph view.

For information on viewing the Success and Error details in the load test report, see [Detailed Reports](#).

Customizing the Load Test Stop Procedure

Customizing Load Test Stop Sequence

The **Stop Settings> Stop Sequence** area of the Scenarios control panel lets you configure how Load Test behaves after a load test Stop event has been generated and the actual stop of the load testing activities. (We will use the term "Load Test Stop time" to refer to the time between the moment a load test Stop event is generated and the actual stop of all load testing activities.)



A load test Stop event is generated if:

- A Load Test user manually stops the load test by clicking the **Stop** toolbar button.
- The load test duration reaches its scheduled time length.
- The load test Stop Action "fires" (see the [Customizing Load Test Stop Actions](#) section below).

After a Load Test Stop event is generated, Load Test stops creating Virtual Users and waits for the existing Virtual Users to exit. The Quick Stop and Formal Stop options control whether the Virtual Users exit after the completion of the current test or complete all their scheduled tests:

- **Quick Stop** (default option) - If selected, each Virtual User exits after the completion of its current test. Selecting this option will cause load test to stop quickly; however, the Virtual Users that were active when the Stop command was issued might not complete all the tests or data source iterations scheduled for the Profile to which they belong.
- **Formal Stop** - If selected, Virtual Users execute all their tests and data source iterations as scheduled in the Virtual User profile configuration. Choosing this option might cause the Load Test Stop time to increase (compared to the Quick Stop sequence). If the Virtual User test list or data source iteration list is long, the increase might be significant.

Tip

If the stop procedure is taking too long, use the Force Stop button in the Load Test stop progress dialog (See [Tip: Stopping a Test for more details](#)).

Customizing Load Test Stop Actions

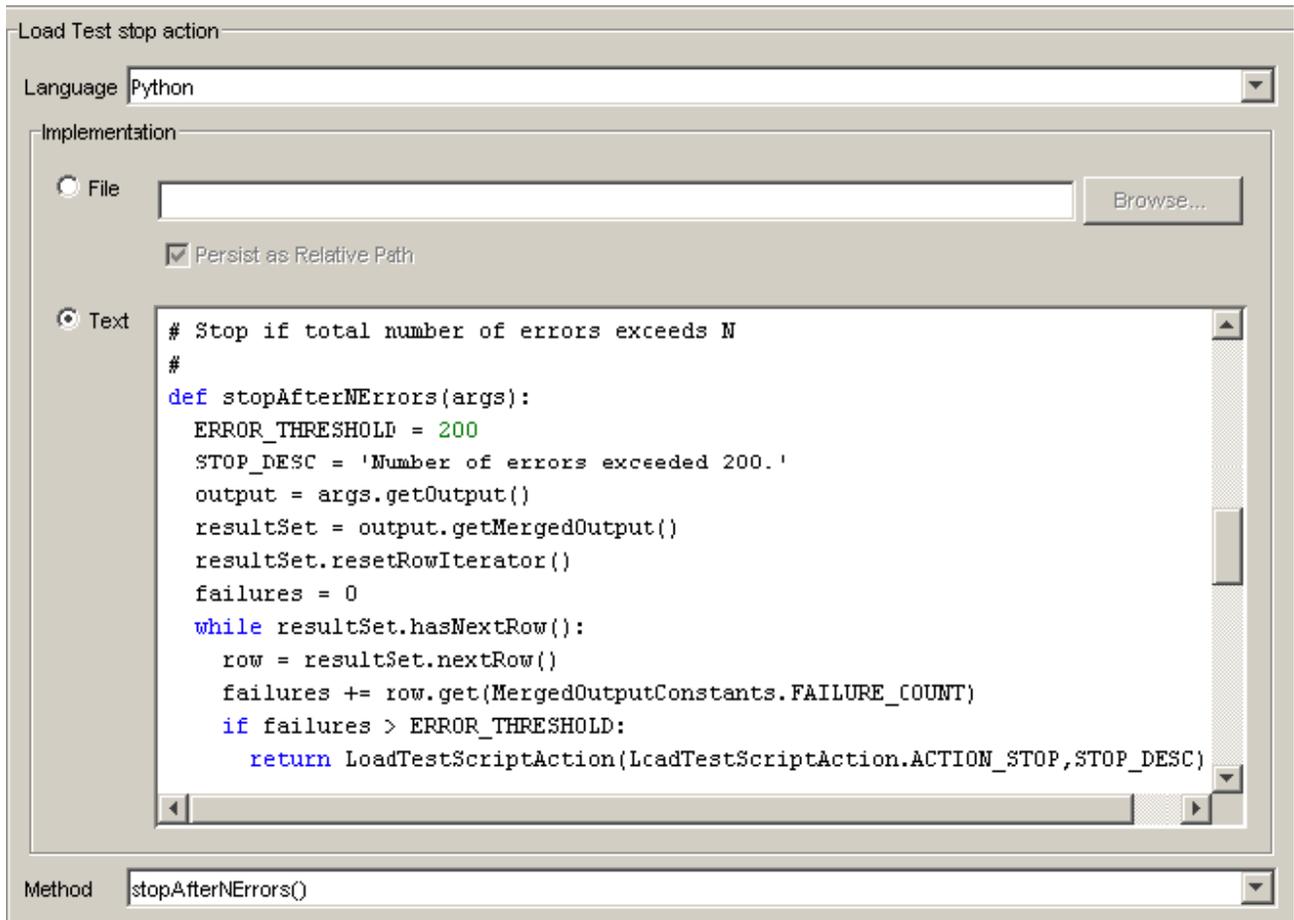
You can customize how a load test is stopped by utilizing Java, JavaScript, or Jython scripts. This feature is especially useful in automatically stopping load tests for specific circumstances that may cause undesirable results. For example, during nightly load test runs you may want to stop load testing if a certain amount of errors have been reached, or you may want to stop load testing if your CPU utilization reaches a specific threshold.

The script you define communicates with the Load Tester via the `com.parasoft.api.loadtester` API and receives `LoadTestScriptArgs` and `Context` as arguments, and can also return a `LoadTestScriptAction`. A returned `LoadTestScriptAction.Action_Stop` has the same effect as pressing the **Stop** button in the Load Test GUI during a load test.

You can find sample scripts available in the following directory on your machine:
`[Load_Test/SOAtest_installation_dir]\[version number]\examples\loadtest\LoadTesterScripting.`

To use scripts to customize Load Test stop actions:

1. Select the **Scenarios** node in the Load Tests tab and choose the **StopSettings** tab in the configuration panel on the right.



2. Select **Java**, **JavaScript**, or **Jython** from the **Language** drop-down list to indicate the language that your script is or will be written in.
3. Define the script to be implemented in the Implementation box.
 - For Java methods, specify the appropriate class in the **Class** field. Note that the class you choose must be on your classpath.
 - For JavaScript and Jython scripts, you can use an existing file as the source of code for your method or you can create the method within Load Test.
 - To use an existing file, select the **File** radio button and click **Browse**. Select the file from the file chooser that opens, then click **OK** to complete the selection.
 - To create the method from scratch from within Load Test, select the **Text** radio button and type or cut and paste your code in the associated text window.
 - To check that the specified script is legal and runnable, right-click the **File** or **Text** field (click whichever one you used to specify your script), then choose **Evaluate** from the shortcut menu. Load Test will report any problems found.
4. Select the appropriate argument from the **Method** drop-down list. This list will be composed of any definitions contained in your script. Since a script can contain multiple arguments you can select the one that you want to use in this method.
5. Run the load test.

The script you define is called every three seconds (the frequency of load test output collection) during load testing. The load test will stop if any of the criteria you specify in your script is met. The user-defined description of the load test stop action will be reflected in the Load Test report if the script causes the load test to stop. Any script errors are reported in the **Log** tab of the Load Test Progress view.

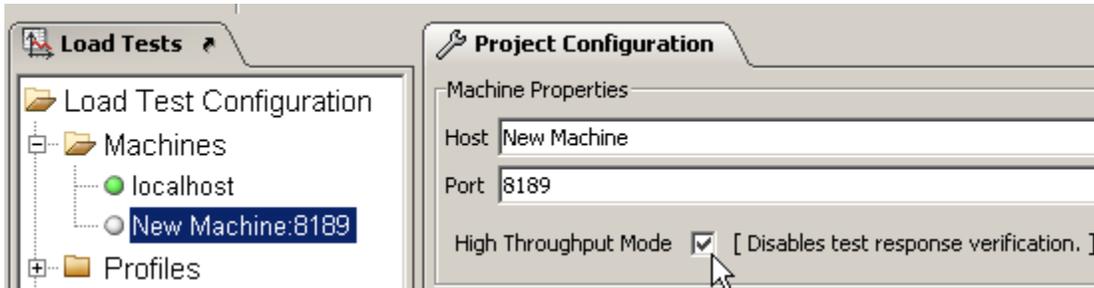
Customizing Machine Options

Using High Throughput Mode

High Throughput Mode can be used to apply higher levels of load to the system under test—while minimizing the hardware required to generate such load.

Each Load Test machine participating in a load test can be configured to run in a High Throughput Mode. In this mode, the test response verification and non-critical attached tools are disabled. As a result, fewer system resources, such as CPU cycles, are required to run the load test. This allows machines in High Throughput Mode to run at a higher test per second execution rate.

To enable this mode, select the appropriate machine from the **Machines** node in the **Load Test Configuration** tree, then enable the **High Throughput Mode** option.



Typically, users select some of the machines to run in a regular Verified and some in an Unverified – High Throughput mode. The machines that run in the Verified mode act as both load generators and Test result collectors, while the machines in the Unverified mode act only as load generators. Upon the completion of a load test, the results which were collected in the Verified mode are used to estimate the error count intervals for the machines in the Unverified mode and Total error count estimate intervals for the entire load test.

Below are several typical questions and answers that could help better understand how to apply the High Throughput Mode feature:

When should I use the High Throughput Mode?

You should use the High Throughput Mode if you do not have enough hardware to generate the desired load. For instance if your load generating machines are running at or above 75-80% CPU utilization.

What kind of throughput increase can I expect?

The throughput increase will vary depending on the structure of your functional tests. The more tools you have attached to the tests in the functional test configuration, the greater the performance gain in the High Throughput Mode.

How are the error estimates calculated?

The calculation of the error estimates is based on the calculation of the "Binomial proportion confidence interval" using Wilson's method. More on this subject can be found via the following links:

- National Institute of Standards and Technology: <http://www.itl.nist.gov/div898/handbook/prc/section2/prc241.htm>
- Wikipedia: http://en.wikipedia.org/wiki/Binomial_proportion_confidence_interval

What should be the proportion of tests that are run in the Verified and Unverified modes?

In general, the more tests you run in the Verified mode, the more narrow error estimate intervals you will get. As a rule of thumb, the number of runs for each Test in the Verified mode should be at least in the mid tens, such as 40-60.

Generating Network Traffic from Multiple IP Addresses

Parasoft Load Test can be configured to use multiple IP addresses for its Virtual Users. Configuring this ip spoofing involve two steps:

1. Setting up IP aliases on the load test machine(s) as described in the appropriate section below:
 - [Windows Configuration](#)
 - [Linux Configuration](#)
 - [Configuring Load Test Machines to use Multiple IP Addresses](#)
2. Configuring Virtual Users to use multiple IP addresses as described in [Configuring Load Test Machines to use Multiple IP Addresses](#)

Supported Parasoft SOAtest Components

The following SOAtest tools and transports support the multiple IP address functionality:

- SOAP Client - HTTP & HTTPS
- Messaging Client - HTTP & HTTPS
- REST Client - HTTP & HTTPS
- Browser Tool - HTTP & HTTPS
- FTP Client - FTP only, not FTPS

- Transmit Tool

Windows Configuration

To set up IP aliases on a Windows machine:

1. Use the `ipconfig` command to see the list of available network interfaces, their IP addresses, and masks.
2. Use the `netsh` command in a DOS prompt window (DOS shell) or in a batch script to add or remove IP addresses.
 - To add an IP address, run a `netsh` command similar to the one in the following example (substituting your own network interface name, IP address and mask).

```
netsh -c Interface ip add address name="Local Area Connection"  
addr=10.10.29.9 mask=255.0.0.0
```

- To remove an IP address, run a `netsh` command similar to the one in the following example (substituting your own network interface name, IP address and mask).

```
netsh -c Interface ip delete address name="Local Area  
Connection" addr=10.10.29.9
```

Linux Configuration

To set up IP aliases on a Linux machine:

- Use the `ip` command to add or remove IP aliases to a network interface.

The example below adds an IP alias to eth0 interface:

- `# ip address add 10.10.29.9 dev eth0`

The example below removes an IP alias.

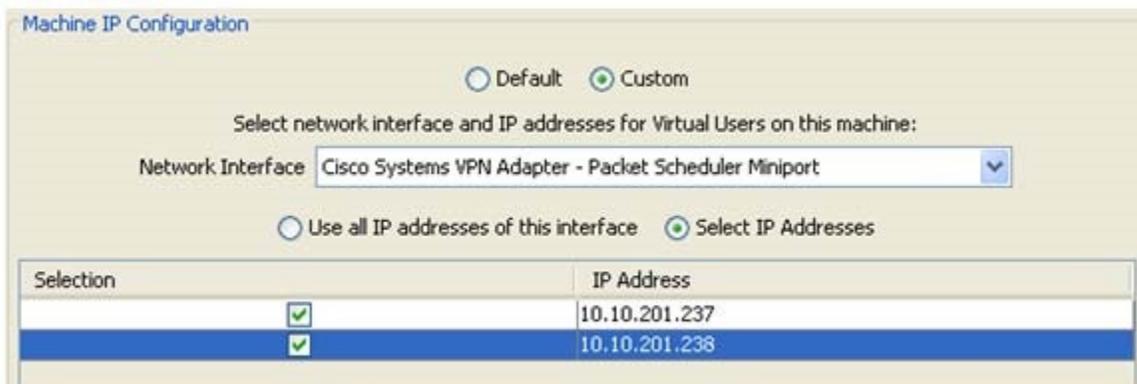
- `# ip address del 10.10.29.9 dev eth0`

Configuring Load Test Machines to use Multiple IP Addresses

To configuring Virtual Users to use multiple IP addresses:

1. Select the appropriate machine from the **Machines** node in the **Load Test Configuration** tree.
2. In the Machine IP Configuration panel of the machine configuration view, select **Custom** and choose the network interface that you would like to use. You can either choose to use all IPs of the selected interface or select specific IP addresses.

The machine network interface and IP configuration view is shown below:



During the load test execution, each Virtual User on a machine will be assigned an IP address from the list of IP addresses for this machine.

Virtual Users (VUs) will be assigned IP addresses in a round-robin manner. For instance, if the machine "localhost" was configured to use two IP addresses as shown in the image above, then the VUs would be assigned IP addresses in the following order:

- VU 1 – 10.10.201.237
- VU 2 – 10.10.201.238
- VU 3 – 10.10.201.237
- VU 4 – 10.10.201.238

Once an IP address is assigned to a Virtual User, it will be used in all the tests which that Virtual User has to execute.

Synchronizing Remote Machines

A SOAtest project that you use in Load Test can have external dependencies in the form of files that are used by the SOAtest tests while they are being executed by the Virtual Users of the load test. The correct functioning of the SOAtest project tests depends on the availability of these external resources on both the Load Test controller machine and remote machines running load generators. Load Test automates the process of transferring the external dependencies to remote machines.

For details on how to ensure that all external resources required by the project are available on the remote machine, see [Transferring Project External Dependencies to Remote Machines](#).