3. Choose the connection type - **Direct Connection** or **Use Proxy**. If the connection has to be done through proxy, then specify the Proxy host name, Proxy port where the proxy server is running and the username and password to authenticate and connect to the proxy server.
4. After specifying the QEngine server details and LAN Connection Details, click the **OK** button to connect to the server. This will display the login page.
5. Enter the appropriate username and password and click the **Login** button to authenticate and login. This will display the SuiteManager page which allows you to create suites and perform functionality testing of your web applications.

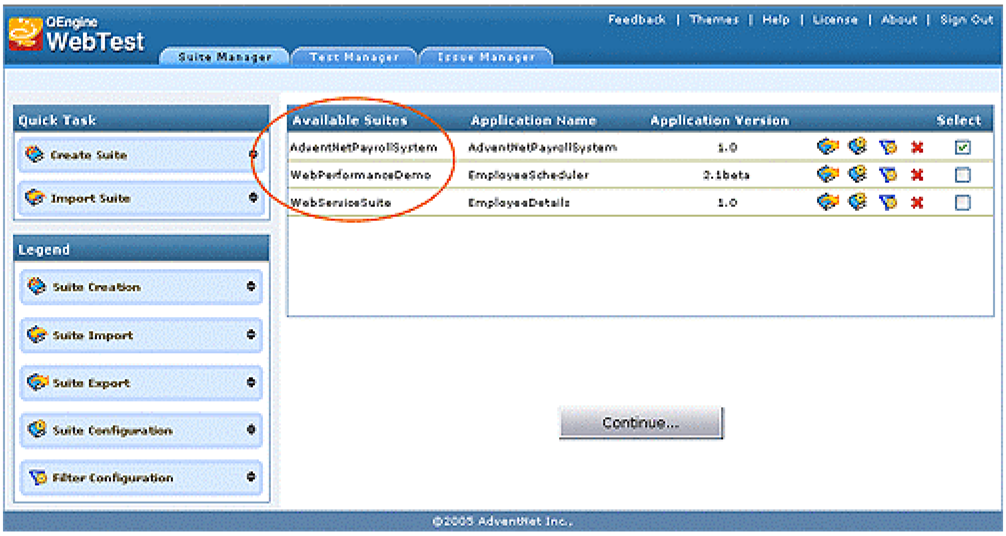
Exploring QEngine Web Performance UI

Organizing Test Scripts using Suite Manager UI

The Suite Manager UI is displayed after connecting and logging-into QEngine server.

Creating Test Suite

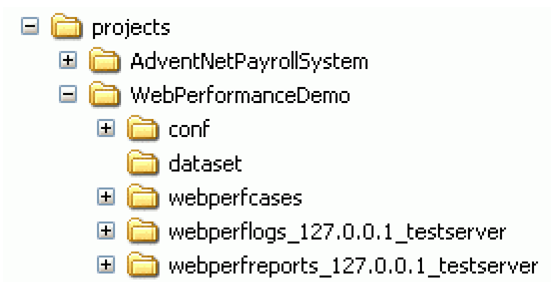
In the SuiteManager page as shown below, select the required suite from the **Available Suites** table or create a new suite by clicking the **Create Suite** option in **Quick Task** from the left pane. The **Quick Task** section also provides the **Import Suite** option to import a suite.



For each suite in the **Available Suites** table, you can use the export option to export a suite as a .qed file, configure the suite details such as, proxy details, severity, bug tracker, mail server details and reports using the Suite Configuration UI, set filters to execute specific scripts and delete a suite.

Understanding QEngine Web Performance Test Suite Structure

The recorded load test scripts are created under a defined test suite. QEngine Web Performance Test Suite has the following structure:



WebPerformanceDemo	The Suite name.
conf	Contains configuration files required to execute the Suite.
dataset	Contains the CSV files and datasource files to include data-driven load test scripts wherein the values are dynamically fetched from a CSV file or database.
webperfreports	Contains the reports generated during load test execution to analyze the performance bottlenecks.

Exploring Quick Links Options

The function of each quick link option is explained in the table below:

Toolbar Option	Description
	Invokes the Script Creation screen to create a new business case.
	Invokes the Suite Creation screen to create a new Suite.
	Opens the selected test suite.
	Invokes the Suite Configuration UI to configure the proxy details, suite details, severity, bug tracker, mail server details and test reports.
	To move to the Suite Manager page.

Exploring Script Editor Toolbar Options

The function of each toolbar option available in the script editor is explained in the table below:

Toolbar Options	Description
	Invokes the Load Test Configurator screen to define user profiles, work loads and create load test cases.
	Invokes the Response Validation screen to add verifiction functions in load test scripts.

Understanding Load Testing Process

Objective:

Planning a Load Test:

- Identify System Configurations
- Identify Key User Scenarios
- Identify Workload
- Identify Metrics
- Identify Test Cases

QEngine Load Testing Process:

- Record User Scenarios
- Parameterize Load Test Script
- Group User Scenarios as User Profiles and Associate % of Workload
- Simulate Load
- Create Load Test Cases
- Run Load Test Cases
- Analyze Test Results

Following are the steps that will guide to plan your load test and know the details of how to proceed with the load testing process to test your web application.

Planning a Load Test:

Step 1: Identify System Configurations

Identify and setup the system configurations in which your web application should run to measure the performance statistics. For example, your web application running in two machines PIII 1 GHz 512 MB RAM and PIV 2 GHz 2 GB RAM. This will help you to compare two system configurations and identify which system configuration performs better and meets the expected performance criteria in which you can host your web application.

Step 2: Identify Key User Scenarios

Identify the key user scenarios or user transactions that a real-world user would perform and that are critical for your web application from a performance perspective. User scenarios include multiple application activities. Key user scenarios are identified based on specific performance goals such as transactions that consumes time or those that have a significant impact on your application's performance. For example, determine the approximate time required to process a user transaction and return the results .for. e.g., processing the credit card details and returning the status takes approximately 5 seconds, etc. Some of the key user scenarios are as follows:

- Log into the application, browse the shopping cart details and log out of the application.
- Log into the application, purchase items from the shopping cart and log out of the application.
- Log into the application, search for required items and log out of the application.

Step 3: Identify Workload

Identifying the workload determines the amount of load to be placed on your web application and how it is going to be placed over the test duration time. Decide on the type of load to be placed:

- Whether you need to place a constant number of virtual users for the duration of the test (load testing) to determine the minimum configuration under which the web application can perform satisfactorily. or
- Follow an approach to ramp up the test and then ramp down (peak testing) - say you ramp upto 100 users and remain in the peak state for 20 seconds and then drop the number of users to ramp down at every 20 seconds. This will help you to find the maximum performance limit of your web application. or
- Choose the load type where you run the load test over long periods of time with normal user loads and exit the test when the specified criteria is met. This will help you to assess the web application's stability over long periods of time.

For each user scenario, identify the following:

1. **Number of users** - The total number of users accessing your web application in a given time frame.
2. **Percentage of users** - Identify the percentage of users accessing parts of your web application or the users to be associated with each user scenario such as 60% of users browsing the home page, 20% of users purchasing items from the shopping cart and the other 20% of users searching for required items, etc.

Step 4: Identify Metrics

Identify the relevant metrics that you need to collect in your load test. This will help you to easily analyze the potential bottlenecks in your web application in relation to your performance objectives. Metrics collected could be such as, CPU usage, memory usage, hits per second, server response time, page download time, error percentage, etc.

Following are the performance metrics that can be monitored:

System-specific metrics: This set of metrics helps you to measure the resource utitlization in your web server. The system resources, such as total % of CPU usage and memory usage of the configured system can be measured.

Web application-specific metrics: This set of metrics helps you to measure the server response time (time between Request sent to time of receiving First Byte), page download time, errors in web pages, throughput (which measures the data transferred relative to some unit of time), etc. You can also measure the overall application throughput, hits per second, response time, page download time, etc.

Database-specific metrics: This set of metrics helps you to measure the database issues. Metrics collected for MySQL include: Thread details, Connection details, query details, table related statistics, etc.

Step 5: Identify Test Cases

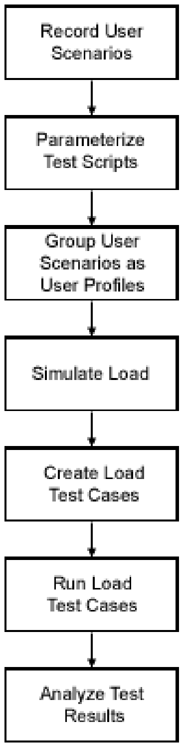
Identify and draft the test cases to be load tested. Test cases are identified by deciding which user scenarios identified in Step 2 should be associated with which workload identified in Step 3.

Once you identify the above, create the load test case and run the test for multiple iterations, analyze the results, use the results to improve both the subsequent testing and/or tune the system resources or your web application being tested, and run the load test again.

QEngine Load Testing Process

Once you plan your load test, the next step is to perform the load testing process. Load testing is the process of identifying performance bottlenecks in your web application under normal and peak loads. This will help you to tune the resources (both the hardware and the software) of your web application and optimize the user experience for maximum performance.

Following are the steps involved in QEngine Load Testing process:



Step 1: Record User Scenarios

Create a load test script and record the user scenarios or transactions in your web application. Here, the user scenarios are the one identified in your planning phase in Step1. For more details about recording user scenarios, you can refer to How Tos->Creating Load Test Scripts section in this guide.

Step 2: Parameterize Test Scripts

Once you have your basic recorded load test script, you have to parameterize the load test script to vary the input to the server. This will help you to emulate real-world testing and avoid errors arising out of duplicate values.

Identify the list of values to be parameterized. Replace the recorded values with parameters to pass different set of data to the server each time the script is executed. For example, user name and password values can be parameterized using the Dataset option in a login script to pass different user name and password for each replay. The values for the parameter can be fetched from an external datasource (CSV or database) or from a cookie or from a previous response body or from a hidden field or from a previous URL or by executing a Javascript or using a constant value. For more details about parameterization, you can refer to How Tos->Parameterizing Load Test Scripts section in this guide.

Step 3: Group User Scenarios as User Profiles and Associate % of Workload

After recording the user scenarios as load test scripts, the next step is to group the user scenarios as user profiles and configure the % of workload for each user scenario. The objective of grouping the user scenarios as user profiles is to map the real time user activities i.e., users accessing different parts of the web application, performing different operations. User profiles greatly increases the accuracy of your load test, since it better simulates what your web server will be seeing in the real world.

For example, consider the following user scenarios grouped as user profile for the sample online bookstore application:

User Profile: Named **testprofile** includes three user scenarios where 60% of users are browsing the home page, 20% of users are purchasing items from the shopping cart and the other 20% of users are searching for required items.

User Profile	User Scenarios	User Profile Settings
testprofile	Users browsing the home page	Business case Name - testbc1 Percentage Load - **60%** User Agent - Mozilla Modem Simulation - **64 kbps (ISDN)**
	Users purchasing items from the shopping cart	Business case Name – testbc2 Percentage Load - **20%** User Agent - Internet Explorer Modem Simulation - **56 kbps (Analog Modem)**
	Users searching the site	Business case Name - testbc3 Percentage Load - **20%** User Agent - Firefox Modem Simulation - **512 kbps (DSL)**

For more details about creating user scenarios, you can refer to How Tos->Creating User Scenarios section in this guide.

Step 4: Simulate Load

In this step, you examine your web application's behavior under simulated load conditions. This will help you to identify whether your application is trending toward or away from its defined performance objectives. Once you identify the load type to be simulated based on the instructions given in **Step 4** in **Planning Your Load Test**, select the appropriate load type and configure the workload details. For example, let us consider the following load for a sample online bookstore application.

- Load Type - Normal
- User Count - 100 users
- Sample Period - 60 seconds
- Test Duration - 120 seconds

In the above configuration, sample period is 60 seconds and the test duration is 120 seconds. With this configuration, QEngine will run for 2 (120/60) samples. You should always ensure that the given sample period is enough to complete all the urls within the given test duration time.

Load Distribution for the above load configuration in **Step 4** and user profile configuration as given in **Step 3** will be as follows:

User Scenarios	% of users	Load distribution for each user scenario from the total number of users
Users browsing the home page Users purchasing items from the shopping cart Users searching for required items	60% 20% 20%	60 users 20 users 20 users

For more details about creating load or number of users, you can refer to How Tos->Creating Workload section in this guide.

Step 5: Create Load Test Cases

Create load test cases where you associate the user profiles (one or more user scenarios) created in **Step 3** with the workload (users to be simulated against the web application) created in **Step 4**. Each test case consists of the following:

- User Profiles with key user scenarios and unique settings specific to each scenario.
- Workload details which includes load type, users to be simulated, sample period and test duration.
- Report Sample Period.

Here, report sample period is the length of time over which the values collected during the testcase execution should be reported. For example, if the sample period is 15 seconds, the statistics views showing the results of a test will have values every 15 seconds. This value should be shorter for short tests, and longer for long tests.

For more details about creating test cases, you can refer to How Tos->Creating Load Test Cases section in this guide.

Step 6: Run Load Test Cases

Run the load test case. You can run the load test case created in **Step 5** using the verify mode to verify it with a single user or with the configured load using the following steps:

- Click on the **Start Play** option from QEngine Toolbar.
- From the **Play Details** pane, select the load test case to be verified from the **Select a Testcase** combo and choose the Run with **Verify mode** or **Configured mode** radio option.

During load test execution, QEngine automatically simulates the test runs for various workload models emulating real-time user roles and access patterns. Displays runtime graphs during execution and after test completion, displays the detailed reports and graphs.

Step 7: Analyze Test Results

The final step is to analyze the test results which is both the most important and the most difficult part of performance testing process. To make this process easier, the reports and graphs page that gets displayed after load test execution is organized in a clear and easy to understand format. This will help you to just click the various links in the left pane and identify the performance bottlenecks.

When you run the load test for the test case created in Step 4, the results will be as follows:

- **Avg. Hits/sec or load generated against server**: 20 hits per second.
- **Avg. Page Download Time:** 4,371 milliseconds.

- **Avg. Throughput or Data Transfer Rate**: 83,552 bytes per second.
- **Avg. Response Time or How Fast your Server Responds:** 4,334 milliseconds response time.
- **Avg. Error Percentage:** 25% for 120 active users when the elapsed time is at 30 seconds.
- **Server Monitoring Results**:

  % CPU Usage: 40 percent
  Memory Usage: 60 percent

For more details about analyzing test results, you can refer to How Tos->Analyzing Test Results section in this guide.

How Tos

Working with Test Suites

What is a Suite ?

Suite is a collection of test scripts, test data, environment data and configuration data.

Why should I create a new Suite ?

Suite helps you to store test scripts or test information in an organized manner and share configuration and environment data amongst the different test types it contains.

How do I create a new Suite ?

To create a new Suite, from the Suite Manager UI , click the **Create Suite** option in the **Quick Task** section in the left pane.

How do I import a Suite ?

Use the **Import Suite** option in the Suite Manager page to import a Suite. The Suite Manager page gets displayed after connecting to the server and after logging-in. From the Suite Manager page, choose the **Import Suite** option in the **Quick Task** section to browse and specify the .qed file and click on the **Import**

How do I export a Suite ?

A Suite can be exported by clicking the icon next to each of the suite in the Suite Manager page. The Suite Manager gets displayed after connecting to the server and after logging-in. Choose the icon or the Export Suite option in the Quick Task section in the Suite Manager page to export the suite. The exported Suite will be available as a .qed file under < *QEngine Home* > directory.

Creating Load Test Scripts

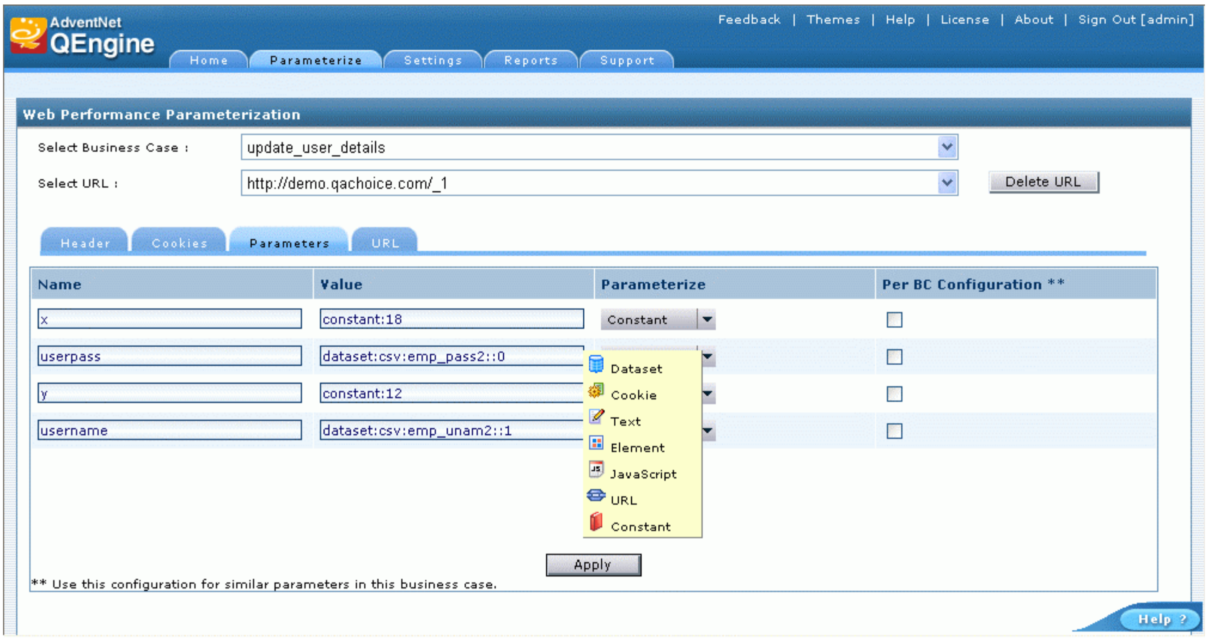
How are scripts created ?

To create scripts, choose **New Script** option from **Quick Links** placed below the tabs in the top frame or right-click the **webscripts** node from the Web Performance Main UI and choose the **Create New Script** option from the popup menu. In the dialog, specify the name of the new script file and click the **OK** button. The script file is by default saved in *<QEngine_Home>/webscripts/<script_name>* directory. You can also save the script file in any other directory under *<QEngine_Home>/webscripts/* directory (by creating a new directory).

How do I record URLs for load testing ?

1. Create a New Script by choosing the **New Script** option from **Quick Links** placed below the tabs in the top frame. Or, right-click the **webscripts** node from the Web Performance Main UI and choose the **Create New Script** option from the popup menu. In the dialog, specify the name of the new script file and click the **OK** button. This will create a new script.

2. Launch a browser using the **Launch Browser** option in QEngine toolbar. The default browser will be launched. Specify a valid URL in the launched browser.
   3. To record the URLs, choose the **Start Record** toolbar option from the QEngine toolbar. The list of URLs will be recorded in the newly created script file. The script file can be viewed in the script editor.



To pass different user name for each replay, select the **Dataset** option. This displays the **View Data Configuration** screen from where you can select the existing data source or add new datasource to fetch values from a CSV file or a Database for each replay. For example, consider you are fetching the values from a CSV file. You can have a single CSV file name login.csv file and store the values for both the username and password such as column 0 will have user name and column 1 will have password. To know the details of how to fetch values from a Dataset, please refer to the following URL:
http://www.adventnet.com/products/qengine/help/context_sensitive_help/dataparameterizationfor_url.html#Parameterizing_for_dataset

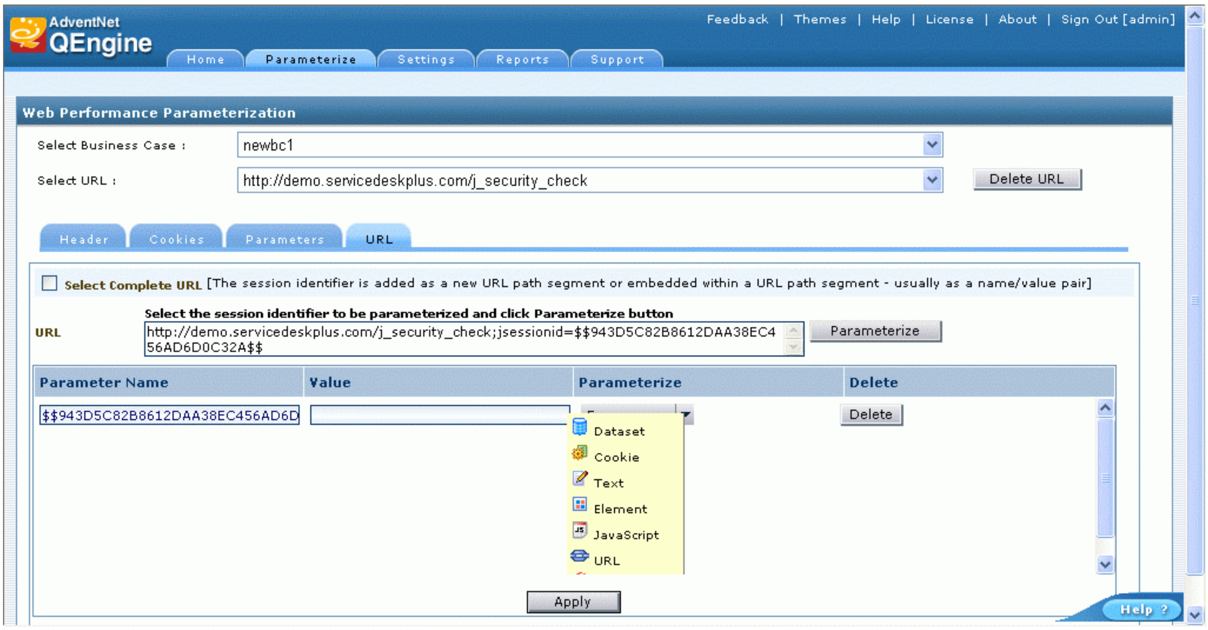
What is url-rewriting ?

URL-Rewriting inserts the session identifier or session key as a parameter in every HTML link in a web page. URL-Rewriting is used when a browser has cookie support disabled.

How do I use url-rewriting for session tracking ?

To track session variables or tokens in recorded URLs,

1. Click on the required business case from the tree view of Web Performance Main UI.
2. Select the **Parameterize** tab. This will display the list of recorded URLs for the selected business case and the various tabs to parameterize.
3. Select the required URL which contains the session variables from the **Select URL** combo.
4. Select the **URL** tab. This will display the URL in the **URL** field.
5. From the URL field, select the session identifier to be parameterized and click the **Parameterize** button. This will display the selected session identifier in the **Parameter Name** field.
6. From the **Parameterize** column, click on the list button which will list the options to parameterize as shown in the image below:



7. You can fetch the value for the session identifier from a cookie, from a previous response body, from a hidden field, from a previous URL, by executing Javascript or using a constant value. To know the details of how to handle session identifiers, please refer to the following URL: http://www.adventnet.com/products/qengine/help/webperformance_testing/loadscript_creation/recording_bc/handling_sessiondatainurl.html

Can I reuse the same script with different data for iterative execution of a business process ?

Yes, you can use the same script with different data for iterative execution of a business process using the **Dataset** option in the **Parameterize** tab of Web Performance Main UI. This will dynamically fetch the values from a CSV file or a database and replaces it with the configured form fields or query parameters for each execution of a business process.

Creating User Scenarios

Can I create multiple user scenarios ?

Yes, you can create multiple user scenarios that consists of one or more business cases with unique settings.

1. Choose the **Load Test Configurator** option from the script editor toolbar.
2. Select the **Profile** tab from the **Load Test Configuration** screen to create one or more user scenarios.
3. Click **New** button to add a new profile.
4. Select the required business cases to be grouped into a new profile by selecting it from the **Select Business Case** list and configure the settings for each business case. For more details, refer to the following URL: http://www.adventnet.com/products/qengine/help/context_sensitive_help/loadtestconfigurator.html#Creating_userprofile

Can I use different browsers for each user scenario ?

Yes, you can use different browsers for each user scenario.

1. Choose the **Load Test Configurator** option from the script editor toolbar.
2. Select the **Profile** tab from the **Load Test Configuration** screen.
3. Choose the required profile from the **Profile Name** combo.
4. From the **User Agent** combo under **Business Case Details**, select the required browser such as Mozilla, Internet Explorer, Firefox, Opera or Galeon for each user scenario. For more details, refer to the following URL: http://www.adventnet.com/products/qengine/help/context_sensitive_help/loadtestconfigurator.html#Creating_userprofile

Can I change my server host without re-recording URLs ?

Yes, you can dynamically change your server host during playback without re-recording the URLs.

1. Choose the **Load Test Configurator** option from the script editor toolbar.
2. Select the **Profile** tab from the **Load Test Configuration** screen.
3. Choose the required profile from the **Profile Name** combo.
4. In the **Server Host** field under **Business Case Details**, enter the new server name or host name to dynamically replace the server host during playback without re-recording the URLs. For more details, refer to the following URL: http://www.adventnet.com/products/qengine/help/context_sensitive_help/loadtestconfigurator.html#Creating_userprofile

Can I vary the user load for each user scenario ?

Yes, you can vary the user load for each user scenario.

1. Choose the **Load Test Configurator** option from the script editor toolbar.
2. Select the **Profile** tab from the **Load Test Configuration** screen.
3. Choose the required profile from the **Profile Name** combo.
4. From the **Percentage Load** combo under **Business Case Details,** select the percentage of load to be simulated for each user scenario.

What is think time ?

Think time is the time that a real user waits before performing the next action in the web page.

What is repeat delay ?

A virtual user is assigned to play back a single business case repeatedly. The repeat delay setting is the number of milliseconds to delay between repeats.

Can I vary the connection speed for virtual clients ?

Yes, you can vary the connection speed with which the virtual client or user connects to the web-server using the Modem Simulation option in the **Profile** UI of **Load Test Configuration** screen.

1. Choose the **Load Test Configurator** option from the script editor toolbar.
2. Select the **Profile** tab from the **Load Test Configuration** screen.
3. Choose the required profile from the **Profile Name** combo.
4. From the **Modem Simulation** combo under **Business Case Details,** select any of the options such as, Analog modem (14.4 kbps, 28.8 kbps, and 56 kbps), ISDN modem (64 kbps), Dual ISDN modem (128 kbps), or DSL modem (512 kbps).

Defining Work Load

How do I create load tests ?

Load tests helps you to determine the response time of your website under anticipated production workload. To create load tests,

1. Choose the **Load Test Configurator** option from the script editor toolbar.
2. Select the **Workload** tab from the **Load Test Configuration** screen.
3. Choose the required workload from the **Workload** combo.
4. Choose the radio option **Normal** and configure the appropriate values for **UserCount**,

Sample Period, and **Test Duration** fields. For more details, refer to the document in the following URL: http://www.adventnet.com/products/qengine/help/context_sensitive_help/loadtestconfigurator.html#Configuring_WorkLoads.

Can a load test be ramped up and ramped down ?

Yes, you can create load test cases with ramp up and ramp down load models. Ramp up load test simulates heavy load by gradually increasing the number of users at defined periods until the count reaches the maximum number of users. This will help you to determine the peak load at which your web site fails to respond.Ramp down load test gradually drops off load at defined periods from a peak value to a lowest value. You can create load test cases with ramp-up and ramp-down to compare and determine how well your web site responds at peak hours of the system and when it goes back to an idle state.

1. Choose the **Load Test Configurator** option from the script editor toolbar.
2. Select the **Workload** tab from the **Load Test Configuration** screen.
3. Choose the required workload from the **Workload** combo.
4. Choose the radio option **Ramp-up** or **Ramp-down** and configure the appropriate values for **Startwith**, **Increment**/**Decrement** and **Limit to** fields. For more details, refer to the document in the following URL: http://www.adventnet.com/products/qengine/help/context_sensitive_help/loadtestconfigurator.html#Configuring_WorkLoads.

How do I create a goal-based load test ?

Goal-based load testing enables you to determine how much load your system can support before reaching a limiting factor such as exit the load test when the CPU reaches 80% or when the server crashes. etc. To create goal-based load test,

1. Choose the **Load Test Configurator** option from the script editor toolbar.
2. Select the **Workload** tab from the **Load Test Configuration** screen.
3. Choose the required workload from the **Workload** combo.
4. Choose the radio option **Burn-in** and configure the appropriate value for **UserCount.**
5. Select the appropriate exit criteria from the **Exit Criteria Configuration** pane. This is mandatory for goal-based testing. For more details, refer to the document in the following URL: http://www.adventnet.com/products/qengine/help/context_sensitive_help/loadtestconfigurator.html#Configuring_WorkLoads

Creating Load Test Cases

How do I configure a load test case ?

To configure a load test case:

1. Choose the **Load Test Configurator** option from the script editor toolbar.
2. Select the **Testcase** tab from the **Load Test Configurator** screen.
3. Click the **New** button from the test case configurator screen.
4. From the test case configurator screen, select a user profile from the **Select a Profile** combo.
5. Select a workload from the **Select a Workload** combo.
6. Enter the report sample period in the **Report Sample Period** text field.
7. Click the **Save** button to save the configurations. For more details, refer to the document in the following URL:

   http://www.adventnet.com/products/qengine/help/context_sensitive_help/loadtestconfigurator.html#Configuring_Test_Case

How do I collect data from a remote server in a load test ?

To collect data from a remote server:

1. Choose the **Load Test Configurator** option from the script editor toolbar.
2. Select the **Testcase** tab from the **Load Test Configurator** screen.
3. Click **New** or **Edit** button from the test case configurator screen.
4. From the test case configurator screen, click on the **Add/Edit Server Monitors** link to add multiple server monitors. To know the details, please refer to the following URL: http://www.adventnet.com/products/qengine/help/webperformance_testing/loadscript_creation/playback_test/configuring_servermonitoring.html

How do I find database related issues in a load test ?

To find database related issues in a load test, you can configure Database monitors for MySQL and Oracle database and analyze the database monitoring graphs after load test execution.

1. Choose the **Load Test Configurator** option from the script editor toolbar.
2. Select the **Testcase** tab from the **Load Test Configurator** screen.
3. Click **New** or **Edit** button from the test case configurator screen.
4. From the test case configurator screen, click on the **Add/Edit Database Monitors** link to add multiple database monitors. To know the details, please refer to the following URL: http://www.adventnet.com/products/qengine/help/webperformance_testing/loadscript_creation/playback_test/configuring_dbmonitoring.html

What are the common issues faced in server monitoring ?

Some of the common issues faced in server monitoring are due to the following reasons:

1. The remote host and the client machine might not be in the same domain.
2. Check whether WMI service is running or not in the remote and local machines.
3. Check whether RPC server is running or not in the remote and local machines.
4. Check if firewall is not enabled in the remote machine.

Adding Verification Functions

Can I add verification functions in my load test ?

Yes, you can add verification functions in load test scripts using the **Response Validation** option in the Script Editor toolbar. To know the details, please refer to the following URL:
http://www.adventnet.com/products/qengine/help/context_sensitive_help/responsevalidator.html

Running Your Load Test

Are there any runtime settings to be done ?

Yes, there are a wide variety of runtime options available. All are optional. For details, refer to the following URL:
http://www.adventnet.com/products/qengine/help/context_sensitive_help/playsettings.html

How do I verify my load test case ?

To verify your load test case,

- Click on the **Start Play** option from QEngine Toolbar.
- From the **Play Details** pane, select the load test case to be verified from the **Select a Testcase** combo and choose the Run with **Verify mode** radio option. This will execute the load test case with a single user. Displays runtime graphs during execution and after test completion, displays the detailed reports and graphs.

How do I run my load test case with the configured load ?

To verify your load test case with the configured workload,

- Click on the **Start Play** option from QEngine Toolbar.
- From the **Play Details** pane, select the load test case to be verified from the **Select a Testcase** combo and choose the Run with **Configured mode** radio option. This will execute the load test case with the configured workload. Displays runtime graphs during execution and after test completion, displays the detailed reports and graphs.

Can I view dynamic graphs during load test execution ?

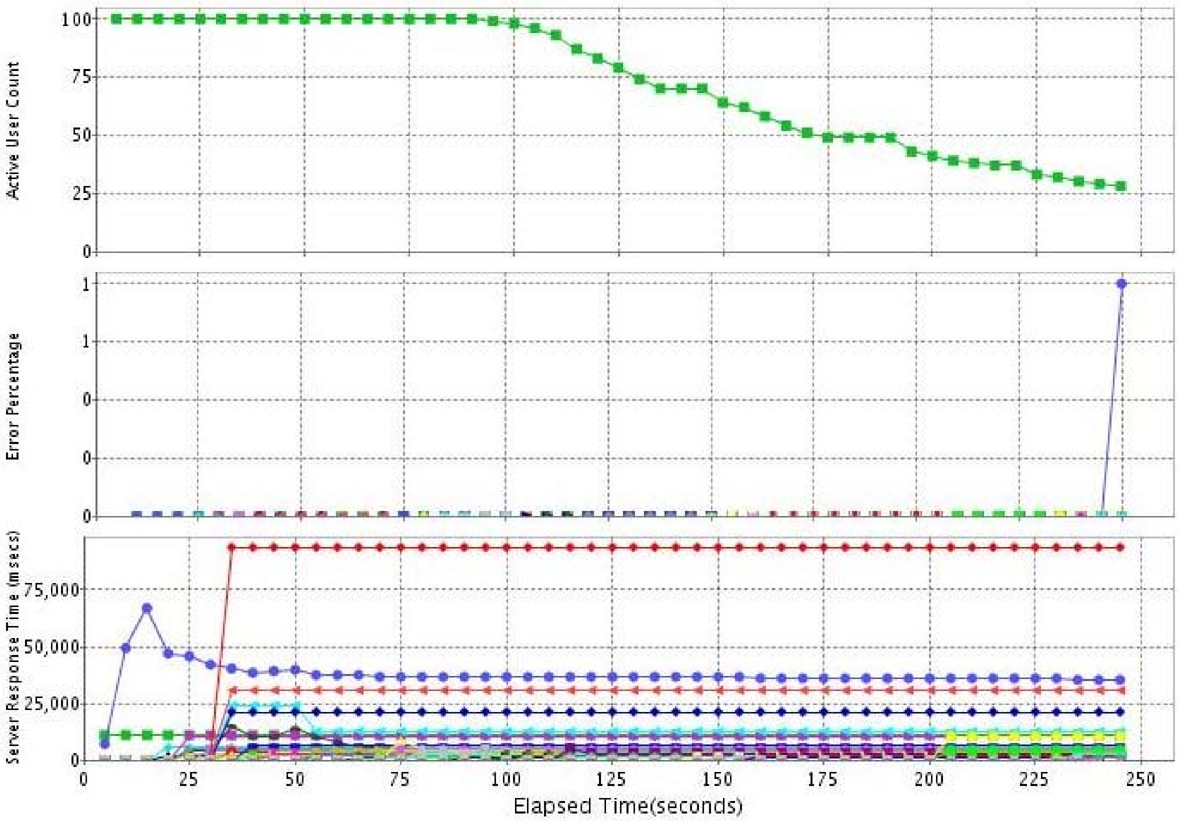
Yes, you can view dynamic graphs during load test execution.

Analyzing Test Results

How do I identify the performance bottlenecks ?

To identify performance bottlenecks, after load test execution, from the reports and graphs page, click on the link **How Fast Your Server Responds**->**URL Wise**->**"<Business_Case_Name>"**->**To Identify Bottlenecks** from the left pane. This will display the graph as shown in the sample screen below:

This graph provides a consolidated graph view to identify the performance bottlenecks in your web application. Plots the Elapsed time (in seconds) in the X-axis and the Server Response Time, Error Percentage and the Active User Count in the Y-axis. At one shot, you can identify the server response time for individual URLs, error percentage and the number of active users over elapsed time.



How do I determine the user load generated against my web server ?

To determine the load generated against your web server, after load test execution, from the reports and graphs page, click on the link **Load Generated Against Server**. This displays the **Time Vs User Count** and **Time Vs Hits per second** graphs for each business case and consolidated report for all the business.

Time Vs User Count - This graph shows the user addition interval over elapsed time for each business case and consolidated user count report for all the business cases.
Time Vs Hits per second - This graph shows the Elapsed time vs Number of requests handled successfully, per unit time for each business case and consolidated hits per second report for all the business cases.

How do I determine the data transfer rate ?

To determine the data transfer rate, after load test execution, from the reports and graphs page, click on the link **Data Transfer Rate** link. This displays the **Time Vs Throughput Graph** for each business case and consolidated throughput report for all the business cases. Throughput measures the users or clients served relative to some unit of time.

How do I determine the server response time ?

To determine the server response time, after load test execution, from the reports and graphs page, click on the link **How Fast Your Server Responds**->**Overall-**>**Time Vs Response Time** or **How Fast Your Server Responds**->"**<Business_Case_Name>"**->**Time Vs Response Time**.

This graph will show the Elapsed time Vs Response time (time between Request sent to time of receiving First Byte), in seconds for each business case and consolidated report for all the business cases.

You can also view the response time vs user count and response time vs URLs for each business case by clicking the **How Fast Your Server Responds**->**URL Wise** link.

How do I determine the page download time ?

To determine the page download time, after load test execution, from the reports and graphs page, click on the link **How Fast Your Pages are Loaded**. This display the page download time graphs that shows the page download time (in milliseconds) in the Y-axis and the elapsed time in the X-axis for each business case and consolidated report for all the business cases.

How do I determine the errors in my web page ?

To determine the errors in your web page, after load test execution, from the reports and graphs page, click on the link in the left pane **Error Report->Overall->Time Vs Error Percentage** or **Error Report->Businesscase Wise->Time Vs Error Percentage**.

This graph shows the cumulative number of errors recorded during the test run on the Y-axis, with elapsed time on the X-axis for each business case and for all the business cases in the load test. These errors are typically connection refused or unexpected socket closure errors.

How do I determine the CPU and memory usage ?

If you have configured and selected server monitors while creating load test cases then after test execution, from the reports and graphs page, click on the link in the left pane **Server Monitoring Graphs** which shows the cumulative CPU utilization over time and memory usage over elapsed time.

How do I identify the database issues ?

If you have configured database monitors while creating load test cases then after test execution, from the reports and graphs page, click on the link in the left pane **Database Monitoring Graphs** which shows the transaction summary and connection summary graphs.

Transaction Summary - This graph shows the total requests, total bytes sent and total bytes received.
Connection Summary - This graph shows the number of open connections and the total number of aborted connections.

Additional Features

How do I run load test from Command Line ?

To know the details of how to run load test cases from command line, please refer to the following URL:
http://www.adventnet.com/products/qengine/help/webperformance_testing/loadscript_creation/playback_test/executing_loadtest.html#command_line

Can I change the order of load test execution ?

Yes, you can change the order of load test execution using the automatic or manual sequencing option. To know the details of test sequencing, please refer to the following URL:
http://www.adventnet.com/products/qengine/help/context_sensitive_help/sequencing_test_scripts.html.

Performance Tips & Tricks

Following are the do's and dont's to consider while performing the load test:

Do's

- Identify the appropriate system requirements to mirror your production environment.
- Consider using think time to pause between requests based on the operations performed in the web application to capture real-life testing. By default, think time is not considered during load test execution. You can configure the appropriate think time for each submitURL() statement in the load test script and choose the Use think time option in User Profile settings.
- While configuring the workload to ramp up or ramp down users for a load test, consider including a buffer time between the incremental increases of users.
- Parameterize your load test script after recording, to send different set of data for each replay or to avoid errors due to duplication of values.
- Identify and prioritize the key user scenarios according to critical functionality and time-consuming transactions.

Dont's

- Do not place too much load on a single client machine. This will create bottlenecks during load testing. To avoid this, use distributed load testing to distribute the load on multiple client machines.
- Do not run your load tests in a live production environment. Use an in-house test environment that mirrors your production environment.
- Do not allow the CPU and memory usage of your client machines that generates load to cross the threshold limit. Since, this might not give appropriate data in the load test reports.