Load Testing How To

The process of load testing a web application can be a daunting task for someone new to QA Wizard Pro or to load testing in general. This How To walks you through planning, recording, modifying, and running a web load test script, and then analyzing the results.

Load Testing Overview

Load testing is the process of simulating normal and peak usage of an application in order to measure overall performance, application behavior, response time, bottlenecks, and other aspects relating to the user experience. QA Wizard Pro allows you to create a variety of load test scripts, from simple user actions (for example, filling out a form) to much more complex interactions with the web application. Creating proper load testing scripts that accurately represent the actions taken by your users is the most important part of configuring your load testing scenario.

Proper load testing has many benefits including:

- Identifying application bottlenecks
- Identifying network bottlenecks
- Improving performance and reliability
- Increasing customer satisfaction
- Tracking performance changes as your application evolves
- Reducing the risk of costly downtimes or outages

Keep the following in mind when planning your load testing:

- Before you record a load test script, make sure the testing environment is as basic as possible and does not contain elements that are not part of the application, which could affect the test results. For example, you may need to clear the cache or disable browser toolbars.
- Before you run a load test, you may need to modify some scripts so they do not affect the test results. For example, keep basic setup and read/write actions in standard QA Wizard Pro scripts and call those scripts from load test scripts. Load tests should only include statements for testing performance under load.
- Before you create a load test script, you must first add the web application to the repository.
- Recorded load test scripts may capture requests to external sites that are not a part of your actual application, such as Google Analytics, phishing and malware protection sites, or web tracking sites. Examine load test scripts and remove statements that are not directly related to the web site you are testing before running load tests.
- The load test must start on the computer that hosts the load testing licenses.
- The QA Wizard Pro Status Tool does not capture load test script information.

Load Testing Scenario

This load testing scenario describes how to plan, create, configure, run, and analyze a load test for a web application that allows users to upload documents, such as image files, Word documents, scanned documents, audio and video files, or presentations with a maximum file size limit.

Setup

Before you begin this load test scenario, take the time to perform the following setup tasks:

- **Set up the testing environment**—Make sure you have access to the hardware, software, and network resources that you need to record or run tests.
- **Create a workspace**—Workspaces organize scripts and related reports and datasheets. Depending on your organization's process, you may use one workspace for each application or one workspace for each functional area.
- **Set up the application in the application repository**—Application repositories store information about the tested application and version. Each version contains window and control data that identifies and locates objects.
- **Set general and playback options**—Take a few minutes to set general options that control how QA Wizard Pro works and set playback options that control how scripts run.

Planning questions

Ask yourself the following questions and plan your load testing scripts around the answers:

- What percentage of users upload small files versus large files?
- What is the most common type of file uploaded?
- What time of day is traffic at its low or at its peak?
- Do all users have permission to upload files or is it restricted to a certain user type?
- If it is restricted, what percentage of the user base is made up of users with upload permissions?
- Can users upload more than one file at a time?
- What is the most common web browser used to access the application? Is more than one browser officially supported?

Note: The above questions are a good place to start, however you may end up with many more when researching and planning your load testing scripts.

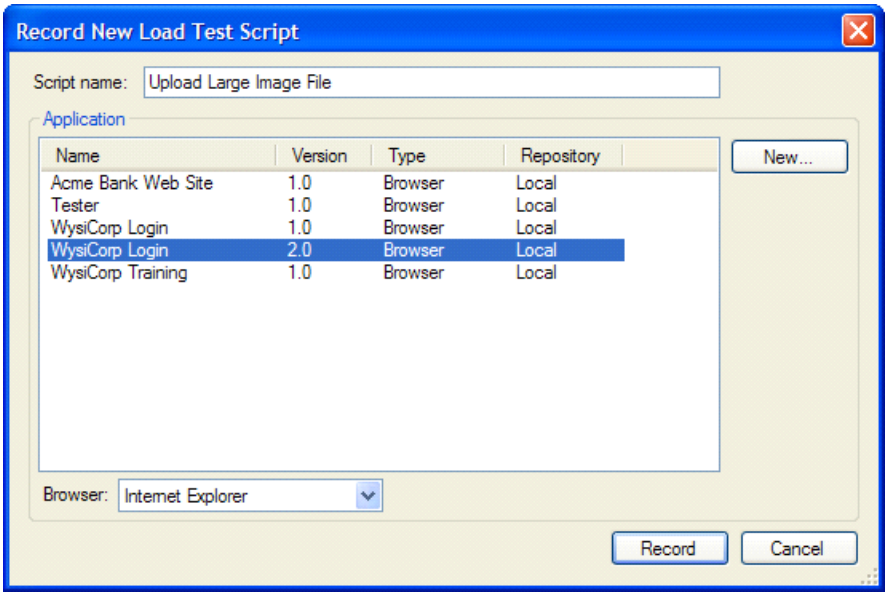
Record and Run Load Test Scripts

The load test scripts you create capture the information exchanged between your web application and the hosting web server. To accurately load test your web application, you may need to create multiple load test scripts with each script running a specific action (for example, uploading a small Word document, or uploading a large image file). The information gathered during the planning of your load testing and the answers to the planning questions (see **Load Testing Scenario**, page 2) determine the complexity and amount of load test scripts you create.

Recording load test scripts

1. Choose **Script > Record Load Test**.

   The Record New Load Test Script dialog box opens.



2. Enter a **Script name**.
3. Select the application you want to load test from the **Application** list.

   Click **New** to add a web application.
4. Select the appropriate **Browser**.
5. Click **Record**.

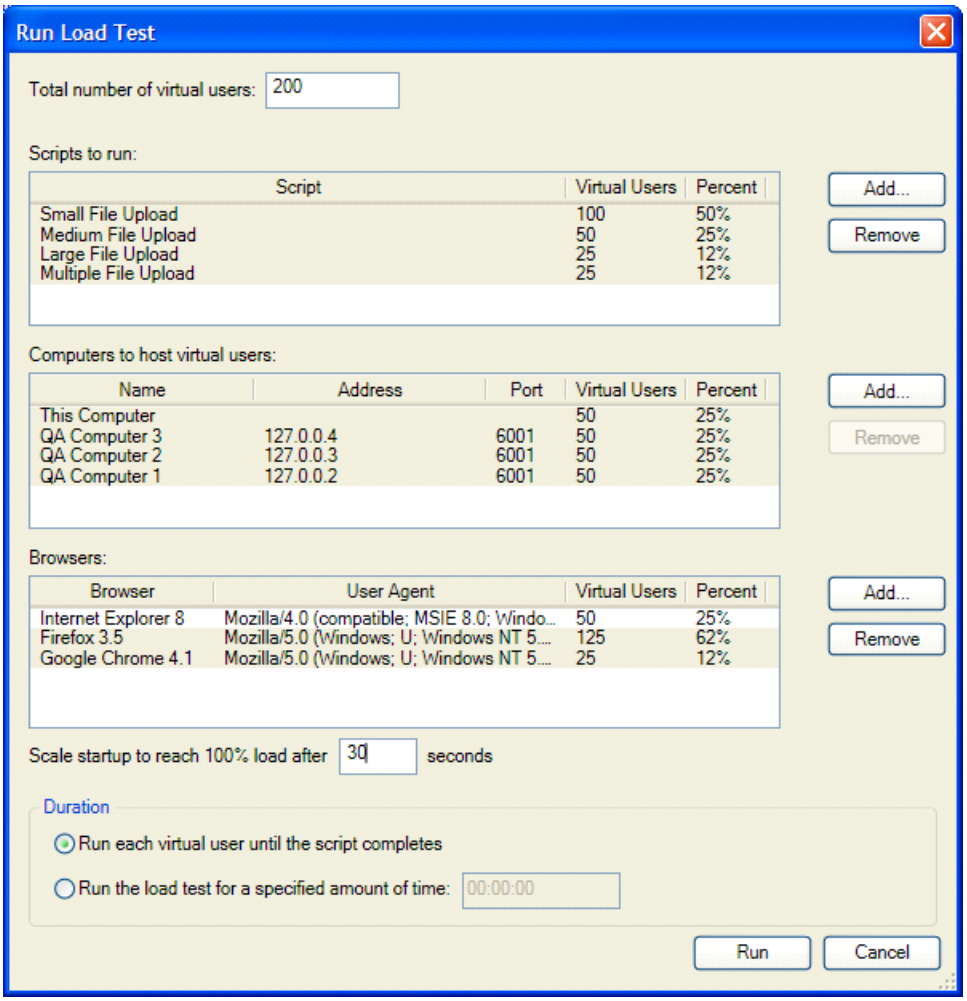
   The web application opens in the selected browser along with the Recording toolbar.
6. Navigate through your web application, performing the actions for the user base you are simulating. For example, to test the user base that uploads large image files, click through the application and upload the image file to the web server.
7. Click **Stop** on the Recording toolbar to finish the recording.

   The load test script is created and opened in the Script pane. Repeat steps 1 through 7 to create all the load test scripts necessary for testing your web application.

Running load test scripts

1. Choose **Script > Run Load Test**.

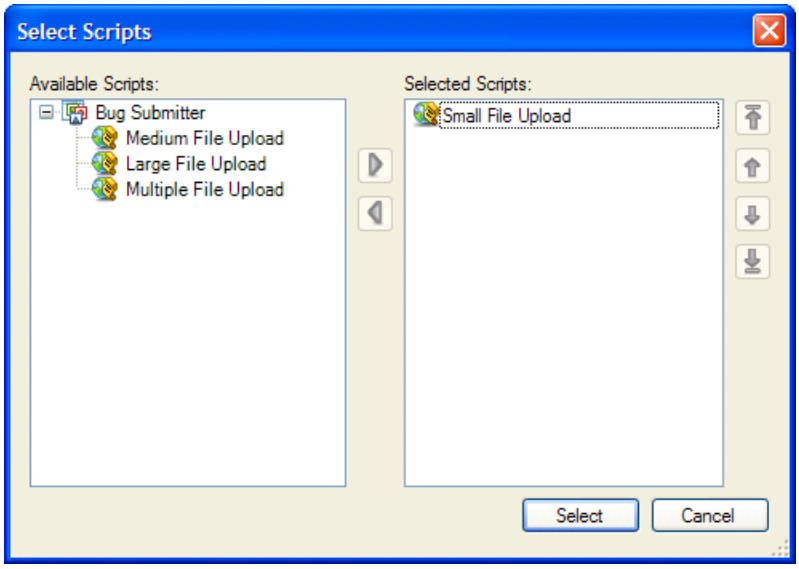
   The Run Load Test dialog box opens.



> **Note:** The Run Load Test dialog box automatically uses the same settings as the most recent load test.

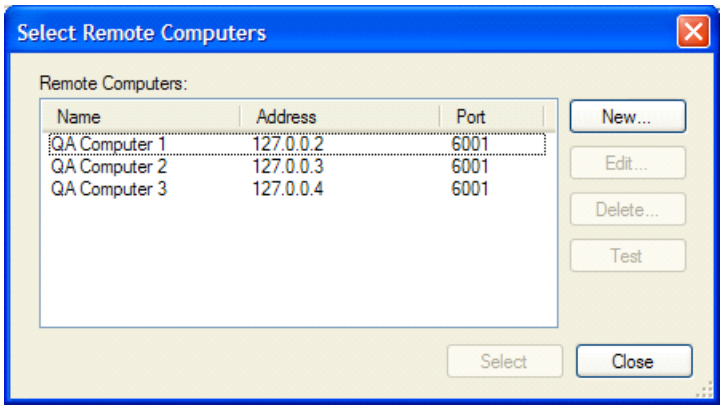
2. Enter the **Total number of virtual users** for your load test. This number cannot exceed the number of load test licenses available on the computer that starts the test.
3. You can include multiple scripts in a load test and divide the total number of virtual users between the scripts. For example, you can test how your application handles 400 users, 200 who upload small files, 100 who upload medium sized files, 50 who upload large files, and 50 who use other functionality of the site, such as searching for information or viewing already uploaded documents.
4. Select the **Scripts to run**.

- Click **Add** to add a load test script. The Select Scripts dialog box opens. Select the scripts you want to include in the load test and click the right arrow to add them to the Selected Scripts list. Click **Select** to close the dialog box.

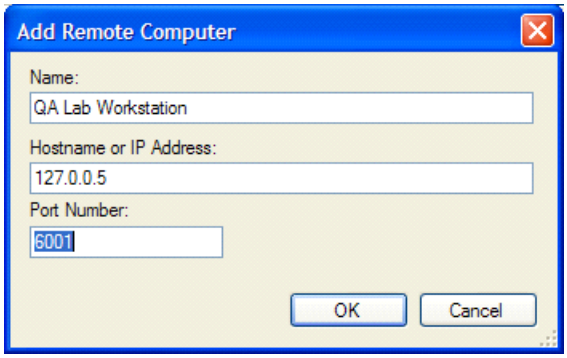


- Enter the number of **Virtual Users** or **Percent** of total virtual users to simulate for each script. The sum of these values must match the total number of virtual users for the load test.
- Click **Remove** to remove a script from the load test.

5. Select the **Computers to host virtual users**.
   - Click **Add** to add a remote computer to host virtual users. The Select Remote Computers dialog box opens. Select the remote computers you want to use and click **Select**.



- To add a new remote computer, click **New.** The Add Remote Computer dialog box opens. Enter the **Name** of the computer, the **Hostname or IP Address**, and the **Port Number**, and then click **OK**.



- Enter the number of **Virtual Users** or **Percent** of total virtual users to host on each computer. The sum of these values must match the total number of virtual users for the load test.
- Click **Remove** to remove a computer from the load test.

6. Select the **Browsers**.
   - Click **Add** to add a web browser. The Add Browser dialog box opens. Select the browser to use in the load test and then click **Select**.
   - Enter the number of **Virtual Users** or **Percent** of total virtual users to simulate using each browser. The sum of these values must match the total number of virtual users for the load test.
   - Click **Remove** to remove a browser from the load test.
7. In the **Scale startup to reach 100% load** field, enter the number of seconds it takes for the load test to reach 100 percent load.
8. Use this option to gradually apply load to the web application. This creates a more realistic testing scenario compared to having all the virtual users accessing the site instantaneously.
9. Select the load test **Duration**.
   - Select **Run each virtual user until the script completes** to stop the test when all the scripts finish running.
   - Select **Run the load test for a specific amount of time** to stop the test when a specified time limit is reached. If all your scripts complete before the time limit expires, they continue to run for the duration of the specified time.
10. Click **Run**.

    A progress indicator opens and displays the run time, current load, and the number of errors and warnings returned during the load test. When the load test completes, a report is generated.

> **Note:** Load tests do not stop when scripts return errors or warnings. The load test report includes details about the errors and warnings encountered during the load test.

Running load tests from a command prompt

You can run load tests from a command prompt by using the QAWRunLoadTest command. Enter `QAWRunLoadTest /?` to view a list of commands.

```
QAWRunLoadTest.exe virtualusers [workspace] script[:numusers] [/remote
computername[:numusers]] [/useragent "useragentstring"[:numusers]]
[/scalestartup scaletime] [/runtocompletion | /runtime runseconds]
[/reportdir "path" | /reportfile "path" | /noreport]
```

Item	Description
virtualusers	Total number of virtual users to simulate.
workspace	Workspace file name that contains the scripts to run. Required if the load test script calls another script.
script	Script file name. Separate multiple scripts with spaces.
:numusers	Number of virtual users to assign to an item, such as a script, computer, or browser. If no value is specified, the total number of virtual users is evenly distributed among items.
/remote computername	Run scripts on the specified remote computer.
/useragent "useragentstring"	User agent or browser to use when running scripts. Internet Explorer 8 is used if no user agent is specified.
/scalestartup scaletime	Scale startup to reach 100% load in the specified number of seconds.
/runtocompletion	Allow each to script complete and then stop the test.
/runtime runseconds	Run the test using each virtual user for the specified number of seconds. If scripts end, they restart and run the remaining duration of the specified time.
/reportdir "path"	Directory path to save the run report in (e.g., C:\Documents and Settings\<username>\My Documents\QA Wizard Pro Workspaces\LoadTests\Load Test Reports).
/reportfile "path"	Directory path to save the run report in including file name (e.g., C:\Documents and Settings\<username>\My Documents\QA Wizard Pro Workspaces\LoadTests\LoadTestReports\Load Test 8-9-2010 11_23_08 AM.qawreport).
/noreport	Disable report generation.
/Dvariable="value"	Set repository variable and value to override a default value.

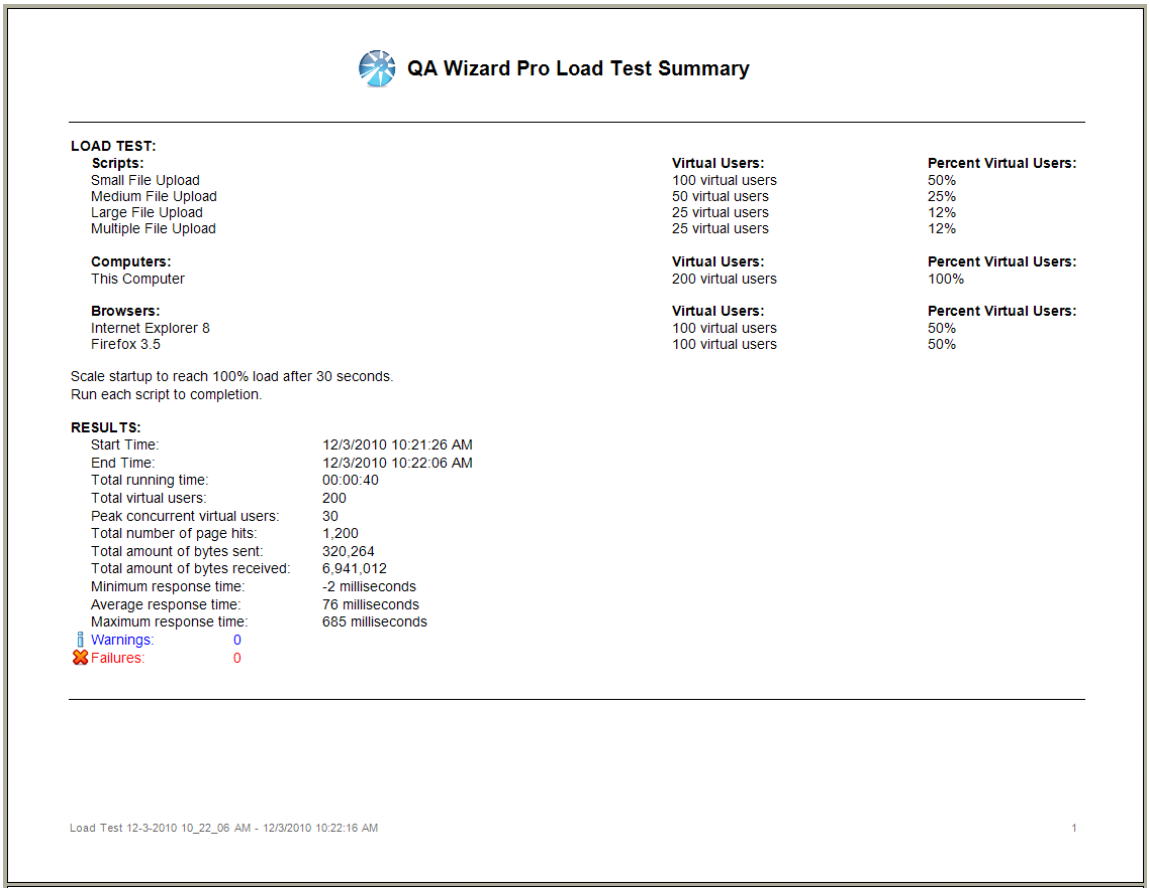
Load Testing Results

When your load tests finish running, QA Wizard Pro generates and saves the results as a report, which includes information on how well the server performed during the load test. The load test report file is named Load Test followed by the date and time the load test ran. For example, Load Test 6-17-2010 1_05_17 PM.

Viewing, exporting, and printing load test reports

1. Choose **View > Reports**.
2. Double-click a load test report in the Load Test Reports folder in the Reports pane.

   The load test report opens and displays an overview of the results, details about errors and warnings encountered during the test, and graphs of the virtual users, response times, page hits, bytes transferred, and number of errors.



QA Wizard Pro Load Test Summary

LOAD TEST:

Scripts:	**Virtual Users:**	**Percent Virtual Users:**
Small File Upload	100 virtual users	50%
Medium File Upload	50 virtual users	25%
Large File Upload	25 virtual users	12%
Multiple File Upload	25 virtual users	12%
Computers:	**Virtual Users:**	**Percent Virtual Users:**
This Computer	200 virtual users	100%
Browsers:	**Virtual Users:**	**Percent Virtual Users:**
Internet Explorer 8	100 virtual users	50%
Firefox 3.5	100 virtual users	50%

Scale startup to reach 100% load after 30 seconds.
Run each script to completion.

RESULTS:

Start Time:	12/3/2010 10:21:26 AM
End Time:	12/3/2010 10:22:06 AM
Total running time:	00:00:40
Total virtual users:	200
Peak concurrent virtual users:	30
Total number of page hits:	1,200
Total amount of bytes sent:	320,264
Total amount of bytes received:	6,941,012
Minimum response time:	-2 milliseconds
Average response time:	76 milliseconds
Maximum response time:	685 milliseconds
Warnings:	0
Failures:	0

Load Test 12-3-2010 10_22_06 AM - 12/3/2010 10:22:16 AM 1

3. Click **Export Graph Data** in the report to save the graphs as a .csv file. You can open this file in Microsoft Excel and create additional graphs or edit the data as necessary.
4. Choose **File > Print** to print the load test report.

Load Testing Conclusions

The information you gathered by running the load test can be used to improve and enhance your web application. For example, if the load testing revealed that your web server slowed down when 100 users uploaded a large file at the same time, you can take steps to improve the performance on the server or network and then re-run the load tests to verify that the problem is resolved.

Links to other resources

You can view the following resources for more information on QA Wizard Pro and load testing.

- **QA Wizard Pro Resource Center** - http://www.seapine.com/qawevaltools.php
- **QA Wizard Pro Blog** - http://blogs.seapine.com/category/products/qawizardpro/
- **Knowledgebase** - http://www.seapine.com/kb/categories/QA+Wizard+Pro/