

HP ALM Performance Center

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Quick Start

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The title page of this document contains the following identifying information:

- Software Version number, which indicates the software version.
- Document Release Date, which changes each time the document is updated.
- Software Release Date, which indicates the release date of this version of the software.

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This site requires that you register for an HP Passport and sign-in. To register for an HP Passport ID, go to:

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Or click the **New users - please register** link on the HP Passport login page.

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- Search for knowledge documents of interest
- Submit and track support cases and enhancement requests
- Download software patches
- Manage support contracts
- Look up HP support contacts
- Review information about available services
- Enter into discussions with other software customers
- Research and register for software training

Most of the support areas require that you register as an HP Passport user and sign in. Many also require a support contract. To register for an HP Passport ID, go to:

<http://h20229.www2.hp.com/passport-registration.html>

To find more information about access levels, go to:

http://h20230.www2.hp.com/new_access_levels.jsp

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Welcome to This Guide

Welcome to the HP ALM Performance Center Quick Start. ALM Performance Center is HP's Web-enabled global performance testing tool, designed to streamline the testing process and increase the test efficiency for multiple concurrent performance tests across multiple geographic locations.

This Quick Start is a self-paced guide designed to lead you through the process of creating, running, and analyzing a performance test, and to introduce you to the ALM Performance Center testing environment.

Note:

- ▶ This guide assumes that your ALM Performance Center environment has been fully installed and configured, and that a domain and project have been set up. For more information, contact your Performance Center administrator.
 - ▶ This Quick Start only describes how to work with the ALM features associated with performance testing. For a comprehensive guide to working with ALM, refer to the *HP Application Lifecycle Management Tutorial*.
-


How This Guide is Organized

This guide contains the following lessons:

Lesson	Description
Lesson 1: Introducing ALM Performance Center	Provides an overview of ALM Performance Center and the performance testing applications.
Lesson 2: Creating Vuser Scripts	Describes the steps involved in recording Vuser scripts using HP Virtual User Generator.
Lesson 3: Creating and Designing Performance Tests	Describes the steps involved in creating and designing performance tests.
Lesson 4: Running Performance Tests	Describes the steps that are necessary before running a performance test, and how to begin test execution.
Lesson 5: Post-Run Analysis and Trending	Describes how to analyze test run data using HP LoadRunner Analysis, and how to view performance improvements and regressions using the Trend Reports feature.
Lesson 6: Summary	Provides a summary of the testing process phases that are managed using ALM Performance Center.

ALM Help

ALM Help is an online help system that describes how to use ALM. You can access ALM Help in the following ways:

- ▶ In the main ALM window, select **Help > ALM Help I** to open the home page. The home page provides quick links to the main help topics.
- ▶ Click  in the ALM masthead to open the ALM Help to the topic that describes the current page.

ALM Help Guides

The ALM Help consists of the following guides and references, available online, in PDF format, or both. PDFs can be read and printed using Adobe Reader, which can be downloaded from the Adobe Web site (<http://www.adobe.com>).

Reference	Description
Using the ALM Help	Explains how to use ALM Help and how it is organized.
What's New?	Describes the newest features in the latest version of ALM. To access, select Help > What's New .
Movies	Short movies that demonstrate the main product features. To access, select Help > Movies .
Readme	Provides last-minute news and information about ALM.

HP Application Lifecycle Management (ALM) Guides

Guide	Description
HP ALM User Guide	Explains how to use ALM to organize and execute all phases of the application lifecycle management process. It describes how to specify releases, define requirements, plan tests, run tests, and track defects.
HP ALM Administrator Guide	Explains how to create and maintain projects using Site Administration, and how to customize projects using Project Customization.
HP ALM Lab Management Guide	Explains how to use Lab Management to manage lab resources used for functional and performance testing on remote hosts.
HP ALM Tutorial	A self-paced guide teaching you how to use ALM to manage the application lifecycle management process.
HP ALM Installation and Upgrade Guide	Describes the installation and configuration processes for setting up ALM Server, and the project upgrade process.

Guide	Description
HP ALM Lab Management Troubleshooting Guide	Provides information for troubleshooting problems while working with HP ALM Lab Management.
HP ALM External Authentication Configuration Guide	Describes the configuration needed to access ALM with external authentication.
HP ALM Business Views Microsoft Excel Add-in User Guide	Explains how to install and use the Business Views Microsoft Excel Add-in to create and configure business view Excel reports.
HP Business Process Testing User Guide	Explains how to use Business Process Testing to create business process tests.

HP ALM Performance Center Guides

Guide	Description
HP ALM Performance Center Quick Start	A self-paced guide giving the Performance Center user a high level overview of creating and running performance tests.
HP ALM Performance Center Guide	Explains to the Performance Center user how to create, schedule, run, and monitor performance tests. Explains to the Performance Center administrator how to configure and manage Performance Center projects.
HP ALM Performance Center Installation Guide	Describes the installation processes for setting up Performance Center Servers, Performance Center Hosts and other Performance Center components.
HP ALM Performance Center Troubleshooting Guide	Provides information for troubleshooting problems while working with HP ALM Performance Center.

HP ALM Best Practices Guides

Guide	Description
HP ALM Agile Testing Best Practices Guide	Provides best practices for implementing agile testing principles.
HP ALM Business Models Module Best Practices Guide	Provides best practices for working with the Business Models module.
HP ALM Database Best Practices Guide	Provides best practices for deploying ALM on database servers.
HP ALM Entities Sharing Best Practices Guide	Provides best practices for sharing entities.
HP ALM Project Planning and Tracking Best Practices Guide	Provides best practices for managing and tracking releases.
HP ALM Project Topology Best Practices Guide	Provides best practices for structuring projects.
HP ALM Upgrade Best Practices Guide	Provides methodologies for preparing and planning your ALM upgrade.
HP ALM Versioning and Baseline Best Practices Guide	Provides best practices for implementing version control and for creating baselines.
HP ALM Workflow Best Practices Guide	Provides best practices for implementing workflows.

HP ALM Performance Center Best Practices Guides

Guide	Description
HP Performance Center of Excellence Best Practices	Provides best practices for successfully building and operating Performance Centers of Excellence.
HP Performance Monitoring Best Practices	Provides best practices for monitoring the performance of applications under test.

HP ALM API References

Guide	Description
HP ALM Project Database Reference	Provides an online reference for the project database tables and fields.
HP ALM Open Test Architecture API Reference	Provides an online reference for the ALM COM-based API. You can use the ALM open test architecture to integrate your own configuration management, defect tracking, and home-grown testing tools with an ALM project.
HP ALM Site Administration API Reference	Provides an online reference for the Site Administration COM-based API. You can use the Site Administration API to enable your application to organize, manage, and maintain ALM users, projects, domains, connections, and site configuration parameters.
HP ALM REST API Reference	Provides an online reference for the ALM REST-based API. You can use the REST API to access and work with ALM data.
HP ALM COM Custom Test Type Developer Guide	Provides an online guide for creating your own testing tool and integrating it into the ALM environment using native COM development tools.
HP ALM .NET Custom Test Type Developer Guide	Provides an online guide for creating your own testing tool and integrating it into the ALM environment using a combination of DCOM and .NET classes.

HP ALM Performance Center API References

Guide	Description
ALM Performance Center REST API Reference	Provides an online reference for the ALM Performance Center REST-based API. You can use the REST API to execute actions to support automation and continuous integration.

Additional Online Resources

The following additional online resources are available from the ALM **Help** menu:

Part	Description
Troubleshooting & Knowledge Base	Opens the Troubleshooting page on the HP Software Support Web site where you can search the Self-solve knowledge base. Choose Help > Troubleshooting & Knowledge Base . The URL for this Web site is http://h20230.www2.hp.com/troubleshooting.jsp .
HP Software Support	<p>Opens the HP Software Support Web site. This site enables you to browse the Self-solve knowledge base. You can also post to and search user discussion forums, submit support requests, download patches and updated documentation, and more. Choose Help > HP Software Support. The URL for this Web site is www.hp.com/go/hpsoftwaresupport.</p> <p>Most of the support areas require that you register as an HP Passport user and sign in. Many also require a support contract.</p> <p>To find more information about access levels, go to: http://h20230.www2.hp.com/new_access_levels.jsp</p> <p>To register for an HP Passport user ID, go to: http://h20229.www2.hp.com/passport-registration.html</p>

Part	Description
HP Software Quality Center Website	Opens the HP Software Web site. This site provides you with the most up-to-date information on HP Software products. This includes new software releases, seminars and trade shows, customer support, and more. Choose Help > HP Software Web site . The URL for this Web site is www.hp.com/go/software .
HP Software Application Lifecycle Management Website	Opens the HP ALM Software Web site. This site provides you with the most up-to-date information on HP ALM. This includes new software releases, seminars and trade shows, customer support, and more. Choose Help > HP Software Application Lifecycle Management Website . The URL for this Web site is http://www8.hp.com/us/en/software-solutions/software.html?compURI=1172141#tab=TAB1 .
Add-ins	Opens the HP Application Lifecycle Management Add-ins Page, which offers integration and synchronization solutions with HP and third-party tools.
ALM Tools	Opens the Tools add-ins page, which offers integration and synchronization solutions with HP and third-party tools that are installed with ALM on the ALM Server.

HP ALM Extension Guides

Extensions provide added functionality to ALM. If you have a license for an ALM extension, you can utilize the added functionality by enabling the extension on a per project basis. For more details on enabling extensions, refer to the *HP Application Lifecycle Management Administrator Guide*.

To view the list of extensions available with ALM 12.00, or to download documentation for ALM extensions, visit the HP ALM Add-ins page, available from the HP Application Lifecycle Management Add-ins page (**Help > Add-ins**).

1

Introducing ALM Performance Center

This lesson provides a brief overview of HP ALM Performance Center, and of the applications that are involved in the testing process.

Notes:

- ▶ The Quick Start describes how to run a performance test with a single host functioning as both a load generator and a Controller (C+LG). However, due to possible heavy load on the Controller and load generator hosts during a performance test, it is best practice to assign these functions to separate host machines.
- ▶ Ensure that the latest standalone versions of HP Virtual User Generator (VuGen) and HP LoadRunner Analysis are installed on your system.

In this lesson you will learn about:

- ▶ The ALM Performance Center Testing Process on page 16
- ▶ Performance Testing Applications on page 17

The ALM Performance Center Testing Process

Using ALM Performance Center, you create **performance tests** in which you define the events that occur during a testing session. During a test, ALM Performance Center replaces human users at physical machines with virtual users, or **Vusers**. These Vusers create load on your system by emulating actions of typical users in a repeatable and predictable manner.

Suppose you are testing a Web-based travel agency application that enables users to book flights online. Your goal as the performance tester is to determine how the application behaves when multiple users try to perform the same transaction at the same time. Using ALM Performance Center, you can run a test in which 1,000 Vusers, emulating 1,000 travel agents, would simultaneously try to book a flight on the application.

What is the testing process?

The testing process consists of the following basic processes:

- ▶ **Creating the script.** Capturing typical end-user business processes performed on your application.
- ▶ **Designing the performance test.** Setting up the test environment by defining events that occur during the testing session.
- ▶ **Preparing to run the performance test.** Adding the performance test to a test set and reserving a timeslot for the test.
- ▶ **Running the performance test.** Driving, managing, and monitoring the test.
- ▶ **Analyzing the results and viewing performance trends.** Analyzing the performance data generated during the test run, and viewing trending information which identifies performance improvements and regressions over time.

These processes are explained in more detail in the lessons that follow.

Performance Testing Applications

Each step in the testing process is carried out by one of the HP load testing tool components. The components are as follows:

Application	Description
HP Virtual User Generator (VuGen)	Creates the script and generates virtual users, or Vusers . VuGen does this by capturing actions that typical end-users would perform on your application, and then records these actions into automated Vuser scripts. These Vuser scripts form the foundation of a performance test.
HP ALM Performance Center	Provides the central console from which you build, manage, and monitor a test.
HP Analysis	Analyzes the performance test and provides graphs and reports with in-depth performance analysis information. Using these graphs and reports, you can pinpoint and identify the bottlenecks in your application and determine what changes need to be made to your system to improve its performance.

Sample Application - HP Tours

To illustrate the testing process, this Quick Start uses a sample Web-based travel agency application called HP Tours.

During the course of this Quick Start, you will go through the basic steps of creating, running, and analyzing a performance test. The test will emulate 10 travel agents simultaneously connecting to the HP Tours Web server and performing various flight reservation actions, for example logging on, searching for flights, purchasing flights, checking itineraries, and logging off.

2

Creating Vuser Scripts

This lesson explains the steps involved in recording Vuser scripts using HP Virtual User Generator.

In this lesson you will learn about:

- ▶ Recording Vuser Scripts on page 20

Recording Vuser Scripts

You record Vuser scripts using HP Virtual user Generator (VuGen). A Vuser script is a record of a typical end-user business process. VuGen works on a record-and-playback principle. As you walk through a business process on your application, VuGen records your actions into an automated script which later forms the foundation of the performance test.

This section includes:

- ▶ “How do I start recording user activity?” on page 20
- ▶ “How do I record a business process to create a script?” on page 22
- ▶ “How do I view my script?” on page 25
- ▶ “How do I save the script?” on page 27

How do I start recording user activity?

You begin by opening Vugen and creating a blank script.

1 Start VuGen.

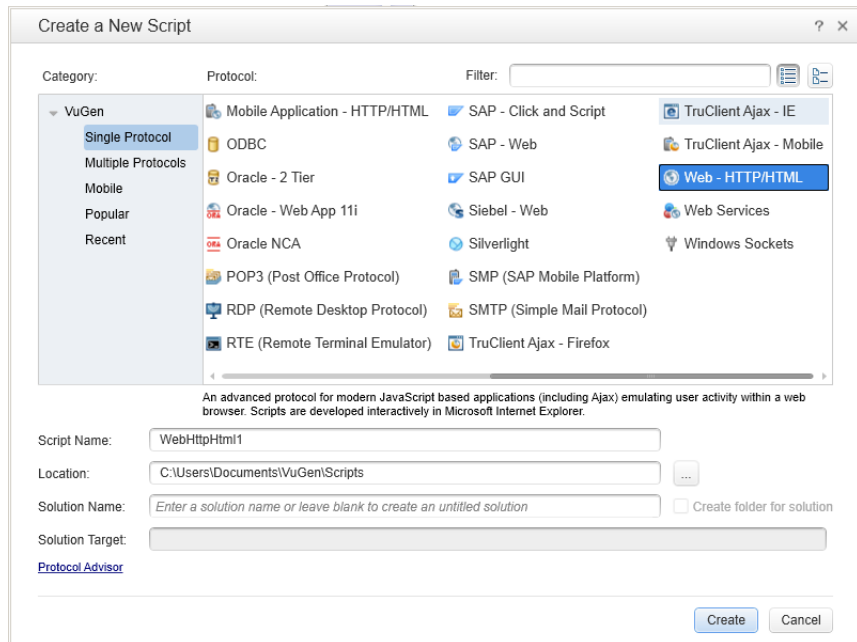
Select **Start > All Programs > HP Software > HP LoadRunner > Virtual User Generator** or double-click the **Virtual User Generator** shortcut icon on your desktop.



2 Create a blank Web script.



- a** On the VuGen Start Page, click the **Add New Script** button. The **Create a New Script** dialog box opens.



A protocol is the language that your client uses to communicate with the back end of the system. HP Tours is a Web-based application, so you will create a Web virtual user script.

- b** Make sure the **Category** type is **Single Protocol**. VuGen displays a list of the protocols that are available for a single-protocol script.
- c** From the list of available protocols, select **Web - HTTP/HTML** and click **Create**. VuGen creates a blank Vuser script and displays the script in the VuGen Editor.

How do I record a business process to create a script?

The next stage in creating user emulation is recording the events performed by a real user. In the previous section, you created an empty Web script. In this section, you will track the events of one passenger reserving a flight from Denver to Los Angeles and then check the itinerary.

1 Start recording on the HP Web Tours site.



- a Click **Record > Record** or click the **Record** button on the VuGen toolbar. The Start Recording dialog box opens.

Start Recording - [WebHttpHtml1] ? x

Fewer Options

Action selection:

Record into action: * Action

Recording mode:

Record: Web Browser

Application: * Microsoft Internet Explorer

URL address:

Settings:

Start recording: Immediately In delayed mode

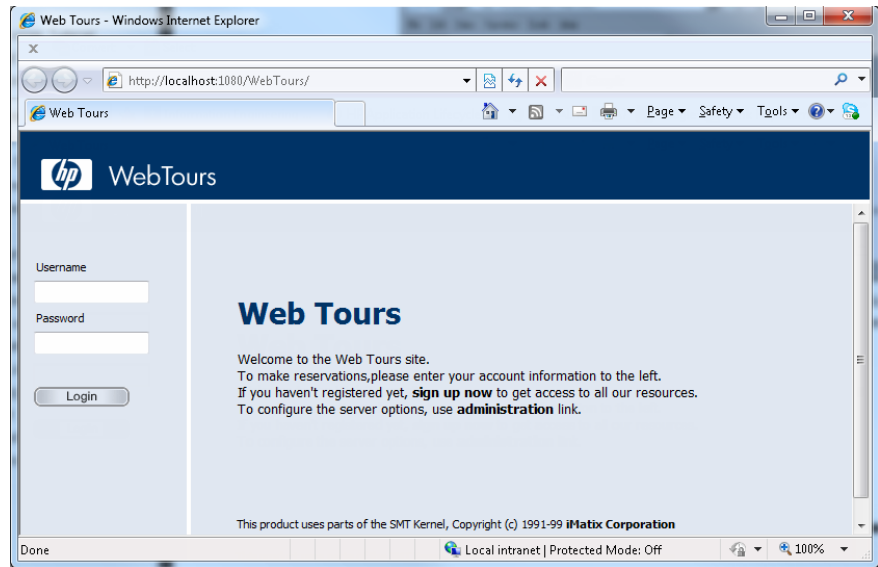
Working directory: * c:\Program Files (x86)\HP\Virtual User Generator\Bin

Recording Options

Start Recording Cancel

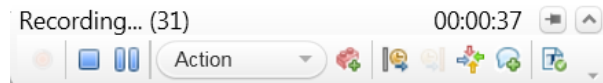
- b In the **Record into action** box, select **Action**.
- c In **Record**, select **Web Browser**.
- d In the **URL address** box, type `http://localhost:1080/WebTours`.
- e Keep all other default settings.

- f** Click **Start Recording**. A new web browser opens and displays the HP Web Tours site.



Note: If there is an error opening the site, make sure that the Web server is running. To start the server, select **Start > All Programs > HP LoadRunner > Samples > Web > Start Web Server**.

The floating Recording toolbar opens.



2 Log on to the HP Web Tours site.

- a** On the HP Web Tours home page, type the user credentials:
 - For the **Username** type jojo.
 - For the **Password** type bean.
- b** Click **Login**. A welcome page opens.

3 Enter flight details.

- a Click **Flights**. The Find Flight page opens.
- b Define the following flight criteria:
 - **Departure City**: Denver (default)
 - **Departure Date**: Keep the default, current date
 - **Arrival City**: Los Angeles
 - **Return Date**: Keep the default, tomorrow's date
- a Keep the rest of the default settings and click **Continue**. The search results appear.

4 Select a flight.

Click **Continue** to accept the default flight selection. The Payment Details page opens.

5 Enter payment information and book flight.

- a In the **Credit Card** box enter 12345678.
- b In the **Exp Date** box enter 01/14 in the **Exp Date** box.
- c Click **Continue**. The Invoice page opens, displaying your invoice.

6 Check the itinerary.

In the left pane, click **itinerary**. The Itinerary page opens displaying the itinerary for flight you booked above.

7 Log off the HP Web Tours Site

In the left pane, click **Sign Off**.

8 Stop recording.



Click the **Stop** button on the floating toolbar to stop the recording process.

VuGen generates the required code and inserts the code into the Vuser script.

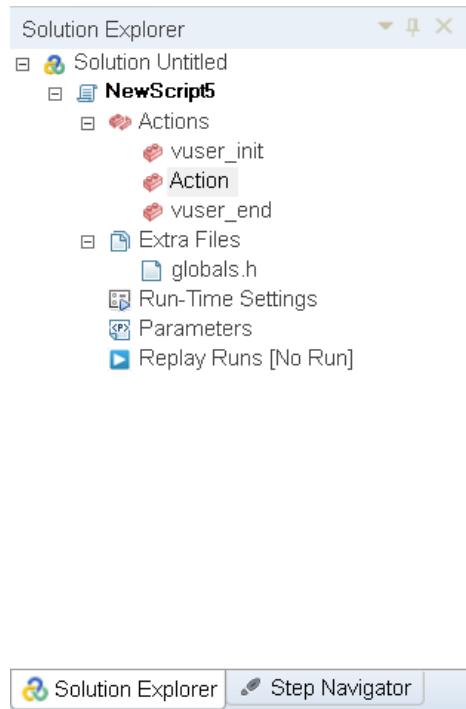
If the Design Studio opens, click **Close** to close the Design Studio.

How do I view my script?

You have now recorded a travel agent logging in, booking a flight, checking the itinerary, and logging off. VuGen recorded your steps from the moment you clicked the **Start Recording** button to the moment you clicked the **Stop Recording** button. You can now use VuGen to view the script.

1 Display the Solution Explorer tab.

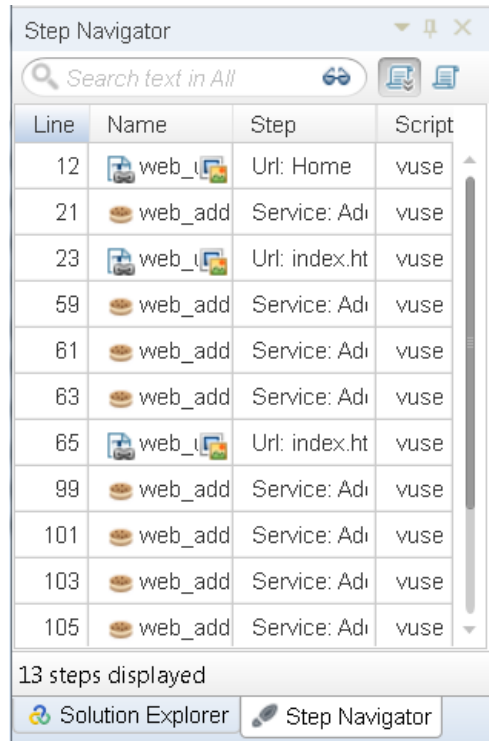
On the left side pane, make sure the **Solution Explorer** tab is selected.



This tab provides you structured access to the various parts of a Vuser script, as well as to a number of files that are associated with the Vuser script.

2 Display the Step Navigator tab.

Click the **Step Navigator** tab.

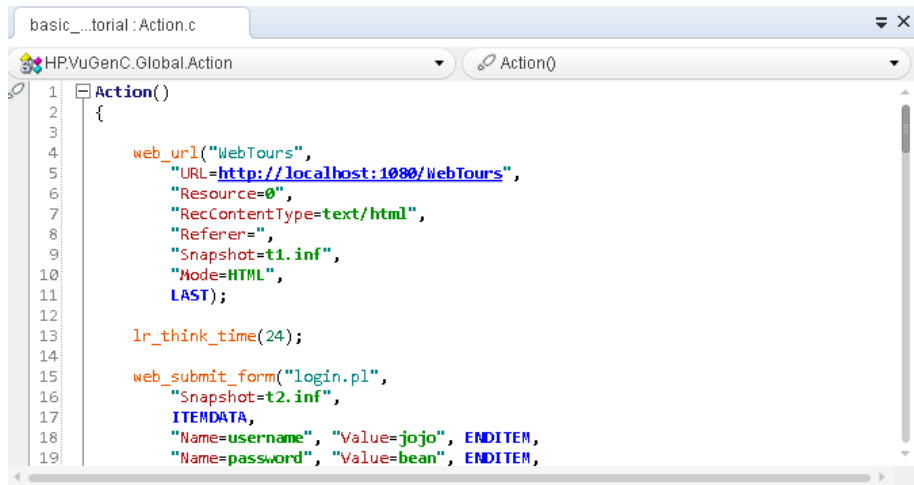


The Step Navigator displays an icon-based view of the script that lists the actions of the Vuser as steps. For each action you performed during recording, VuGen generated a corresponding step in the Step Navigator.

The Step Navigator displays a snapshot icon to indicate that a specific step contains a snapshot.

3 View a step in the VuGen Editor.

Double-click any step in the Step Navigator to display the corresponding function in the VuGen Editor. The Editor displays a text-based view of the script.



```

basic_tutorial : Action.c
HPVuGenC.Global.Action Action()
1 Action()
2 {
3
4     web_url("WebTours",
5         "URL=http://localhost:1080/WebTours",
6         "Resource=0",
7         "RecContentType=text/html",
8         "Referer=",
9         "Snapshot=t1.inf",
10        "Mode=HTML",
11        LAST);
12
13    lr_think_time(24);
14
15    web_submit_form("login.pl",
16        "Snapshot=t2.inf",
17        ITEMDATA,
18        "Name=username", "Value=jojo", ENDITEM,
19        "Name=password", "Value=bean", ENDITEM,

```

In the Editor, the actions of the Vuser are listed as API functions. VuGen uses color-coding to show the functions and their argument values in the script. You can type C or API functions, as well as control flow statements, directly into the script.

How do I save the script?

Select **File > Save Script As** and save the script locally on your desktop. For example, type Scripts. The script file should be zipped. After you have created your performance test, you will upload the script to ALM Performance Center.

3

Creating and Designing Performance Tests

This lesson explains how to manage test assets in ALM, and the steps involved in creating and designing a performance test.

Note: Some steps in the following lesson can be performed from ALM or from Performance Center. In this lesson, you will perform these steps from ALM. For more details, see the "Personalizing Performance Center" section in the *HP ALM Performance Center Guide*.

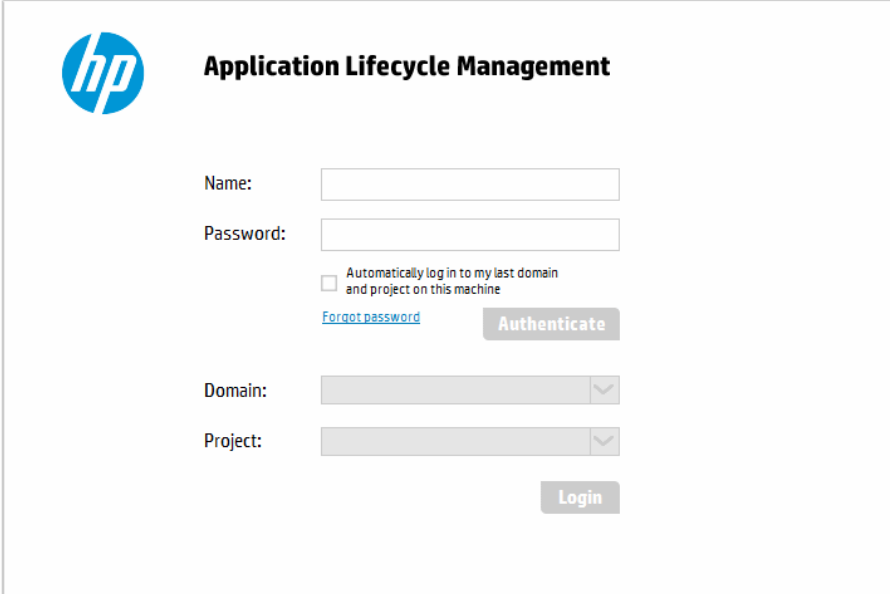
In this lesson you will learn about:

- Logging in to ALM on page 30
- Adding Vuser Scripts to ALM on page 31
- Monitoring Performance Tests on page 36
- Creating Performance Tests on page 38
- Designing Performance Tests on page 39

Logging in to ALM

You log into ALM as follows:

- 1 In your Web browser, enter the ALM URL. the ALM Login window opens.



The screenshot shows the HP Application Lifecycle Management (ALM) login interface. At the top left is the HP logo. To its right is the text "Application Lifecycle Management". Below this, there are two text input fields: "Name:" and "Password:". Under the "Password:" field is a checkbox with the text "Automatically log in to my last domain and project on this machine". To the left of the checkbox is a small square icon. Below the checkbox is a blue link that says "Forgot password". To the right of the checkbox and link is a grey button labeled "Authenticate". Below the "Authenticate" button are two dropdown menus: "Domain:" and "Project:". Below the "Project:" dropdown is a grey button labeled "Login".

Note: If ALM was configured for external authentication, the Name and Password fields do not appear in this window. Skip to step 3.

- 2 Type your username and password, and click **Authenticate**.
- 3 Select the required **Domain** and **Project** and click **Login**.

Adding Vuser Scripts to ALM

The first step in your test design process is to add your Vuser script to ALM. Adding the script involves two steps: Creating a scripts folder, and uploading the script to the folder.

How do I upload the Vuser Script?

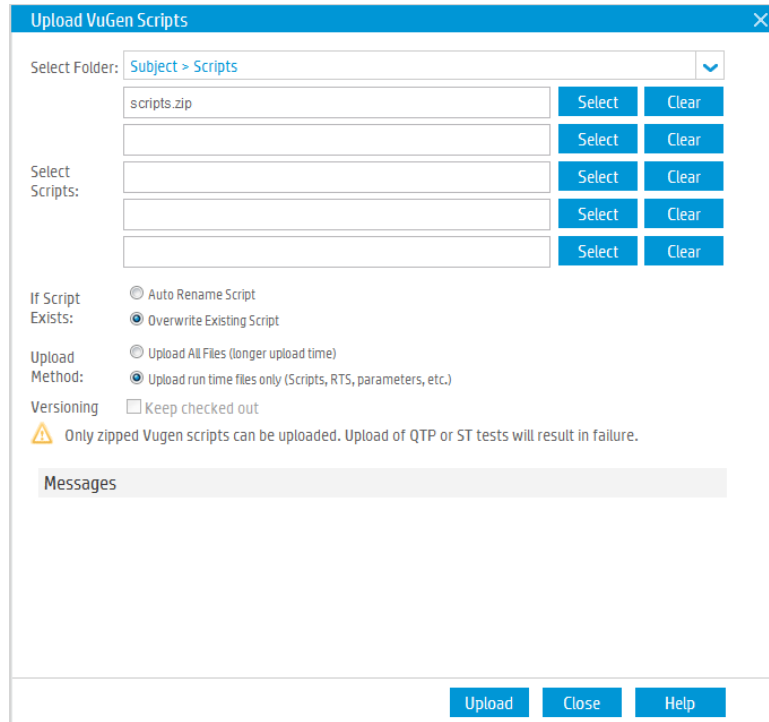
You can upload the Vuser script to from within ALM, or directly from VuGen.

Uploading scripts from within ALM

You upload the script from within ALM, from the Test Plan module, as follows:

- 1** Make sure the script is saved locally and is zipped.
- 2** On the ALM sidebar, under **Testing**, select **Test Plan**.
- 3** **Create a script folder.**
 - a** Select **Subject**.
 - b** Click the **New Folder** button, and specify a name for the folder, for example, **Scripts**.
 - c** Click **OK** to add the folder.

- 4 On the module toolbar, click the **Upload VuGen Script** button. The Upload VuGen Scripts dialog box opens.



- 5 In the **Select Folder** box, select the scripts folder you created above.
- 6 Click one of the **Select** buttons and navigate to the location of the zipped script file.
- 7 Click **Upload** to upload the script.

Uploading scripts directly from Vugen

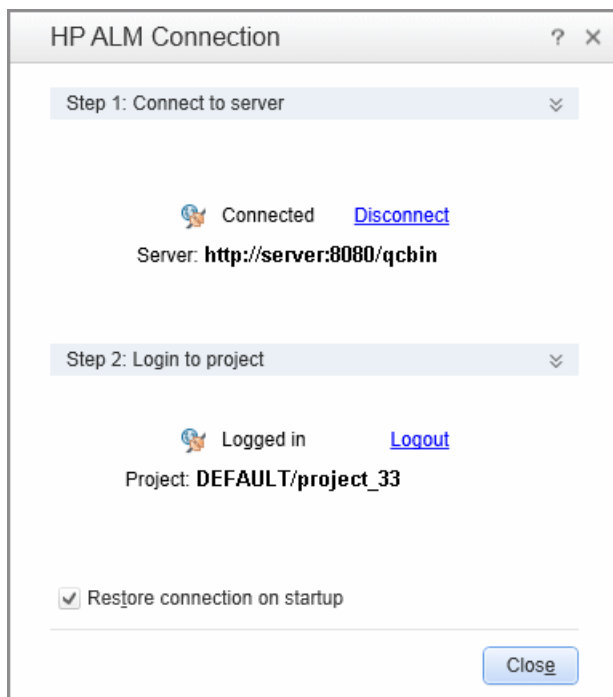
You upload the script from within Vugen using the HP ALM Connection dialog box.

- 1 Create a folder for the script.
- 2 In VuGen, select **ALM > HP ALM Connection**. The HP ALM Connection dialog box opens.

The screenshot shows the 'HP ALM Connection' dialog box. It has a title bar with a question mark and a close button. The dialog is divided into two sections: 'Step 1: Connect to server' and 'Step 2: Login to project'. Step 1 includes a 'Server URL' dropdown, 'User name' and 'Password' text boxes, and a 'Connect' button. Step 2 includes 'Domain' and 'Project' dropdowns and a 'Login' button. At the bottom, there is a checkbox for 'Restore connection on startup' and a 'Close' button.

- 3 Enter the ALM Performance Center URL, and click **Connect**.
- 4 Enter your ALM Performance Center **username** and **password**, then click **Connect**.

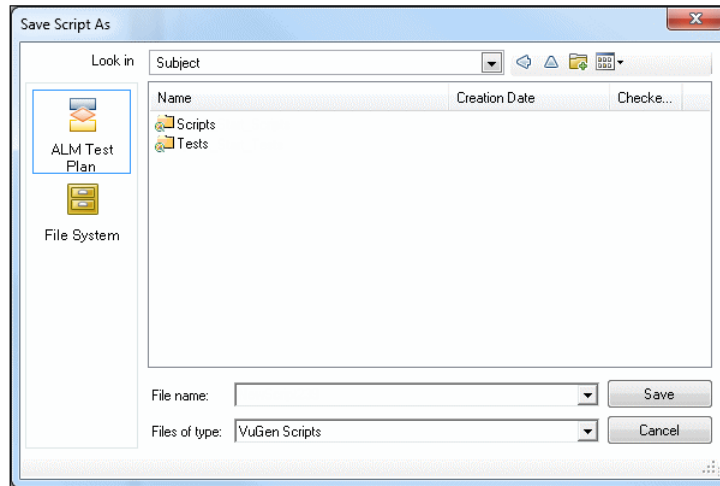
5 Select your domain and project, then click **Login**.



6 Click **Close**.

7 In VuGen, select **File > Save Script As**. The Save Script dialog box opens.

- 8 Select **ALM Test Plan**, and then select your scripts folder as the location to save the script to.



- 9 Click **Save**. The Upload Script dialog box opens.
- 10 Accept the default setting.

Monitoring Performance Tests

You monitor performance test execution using the ALM Performance Center online monitors.

For example, you use the System Resource monitors to monitor a machine's system resource usage during a performance test and identify server performance bottlenecks.

A primary factor in a transaction's response time is its system resource usage. Using the ALM Performance Center resource monitors, you can monitor the Windows Resource usage on a machine during a test run, and determine why a bottleneck occurred on a particular machine.

What is a monitor profile?

To monitor server resources during the test, you select the type of monitors to run and the servers whose resources you want to monitor. You then add the measurements to monitor for each server. These monitor settings can be saved as a monitor profile which can be used by any performance test in your project.

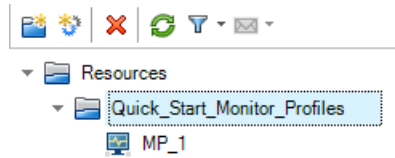
The following section will show you how to create a monitor profile and how add a Windows Resource Monitor to it.

How do I create a monitor profile?

You create and configure monitor profile as follows:

- 1** On the ALM sidebar, under **Testing**, select **Test Resources**.
- 2** Create a folder for the monitor profile.
- 3** Select the folder, and click the **New Resource** button. The New Resource dialog box opens.
- 4** Enter the required information, and make sure that in the **Type** box, you select **Monitor Profile**.

5 Click **OK** to add the monitor profile to the folder. For example:



6 Select the monitor profile, and in the right pane, select the **Monitors Configuration** tab.

7 Click the **Add Monitor** button. The Add New Monitor dialog box opens.

8 Select Windows Resources. The Edit Monitor dialog box opens, enabling you to select the Windows Resources counters you want to monitor.

9 Enter the desired information, and click **Save**. The monitor is added to your monitor profile.

You will add the monitor profile to the test as part of the test design process.

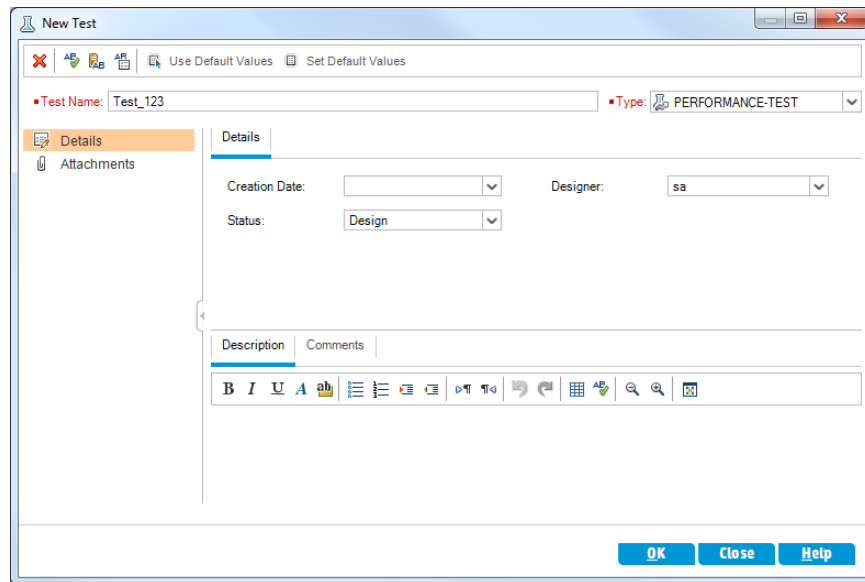
Creating Performance Tests

To create a test, you begin by creating a test folder, and then creating the test and adding it to the folder. In the next section, you will learn how to design the test in the Test Designer.

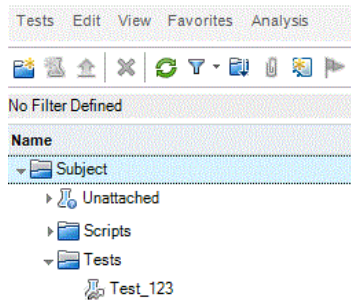
How do I create a performance test?

You create the test as follows:

- 1 On the ALM sidebar, under **Testing**, select **Test Plan**.
- 2 Select **Subject**. Click the **New Folder** button, and specify a name for the folder, for example, **Tests**. Click **OK** to add the folder.
- 3 Select the folder, and click the **New Test** button. The New Test dialog box opens.
- 4 Enter the required information, and make sure that in the **Type** box, you select **Performance Test**. For example:



5 Click **OK** to add the test to your test folder. For example:



Designing Performance Tests

You design your performance test in the Performance Test Designer.

How do I open the Performance Test Designer?

You open the test designer as follows:

- 1 On the ALM sidebar, under **Testing**, select **Test Plan**.
- 2 Select the test you created above, and click the **Edit Test** button on the toolbar. The Test Designer opens.
- 3 If a message box opens, click **Show Test Designer** to open the Test Designer.

How do I design the performance test?

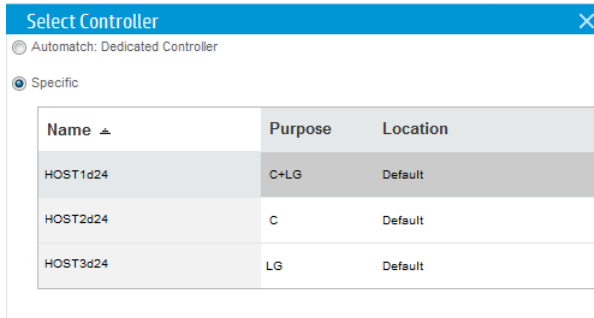
From the **Workload** tab in the Performance Test Designer, you perform the basic test design steps. You design the test as follows:

- 1 **Select a workload type for the test.**

When the Performance Test Designer opens, you will be prompted to select a workload type for the test. Accept the default, **Basic Schedule, by test, by number**.

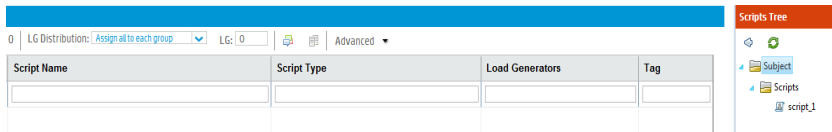
2 Assign a Controller to the test.

- a Click the browse button adjacent to the **Controller** box. The Select Controller dialog box opens.
- b Select **Specific**.
- c From the list that appears, select the host machine that has been assigned the Controller and load generator (C+LG) purpose.



3 Add Vuser scripts.

- a If the Scripts Tree pane is not displayed on the right, click the **Select Scripts** button on the toolbar to open it. The Scripts Tree displays the script that you uploaded previously to ALM.

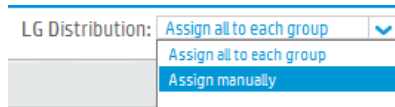


- b In the Scripts Tree, select the script and click the left arrow to add it to the test. The script appears in the Groups pane.

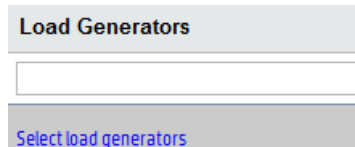
Vusers	Group Name	Script Name	Script Type	Load Generators	Tag
10	script_1	script_1	Web - HTTPHTML		

4 Add load generators.

- a On the Groups pane toolbar, in the **LG Distribution** box, click the arrow and select **Assign manually**.

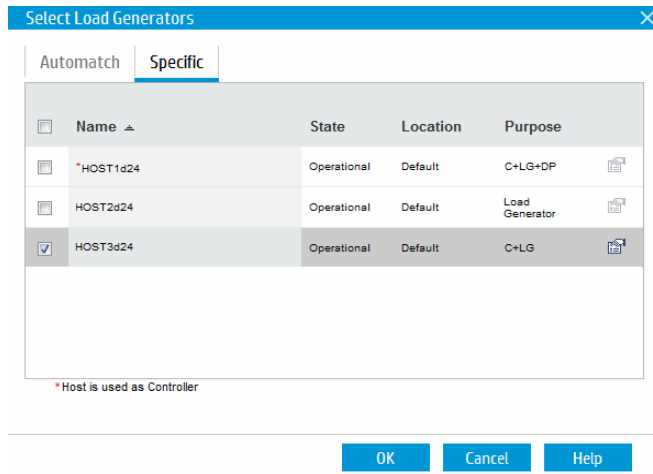


- b In the Groups Pane, in the **Load Generators** column, click the **Select load generators** link.



The Select Load Generators dialog box opens.

- c Select the **Specific** tab, and from the list that appears, select the host machine that has been assigned the Controller and load generator (C+LG) purpose.



5 Configure the schedule settings.

A schedule defines the actions of the Vusers for the performance test run, for example the behavior of 10 Vusers emulating 10 travel agents simultaneously logging on to HP Tours, booking flights, checking itineraries, and so on.

Because typical users do not perform the same action simultaneously, the Scheduler allows you to schedule a performance test according to a more realistic portrayal of typical user behavior.

Define the schedule as follows:

In the lower area of the **Workload** tab, in the **Global Schedule** pane, click in each of the schedule actions in the Actions grid and define them as follows:

► Initialize.

Initialize	Initialize	all Vusers simultaneou	▼	Wait for	00:00:00	(HH:MM:SS) after initialization
------------	------------	------------------------	---	----------	----------	---------------------------------

► Start Vusers.

Start Vusers	Start All Vusers	gradually	▼	2	Vusers every	00:00:30	(HH:MM:SS)
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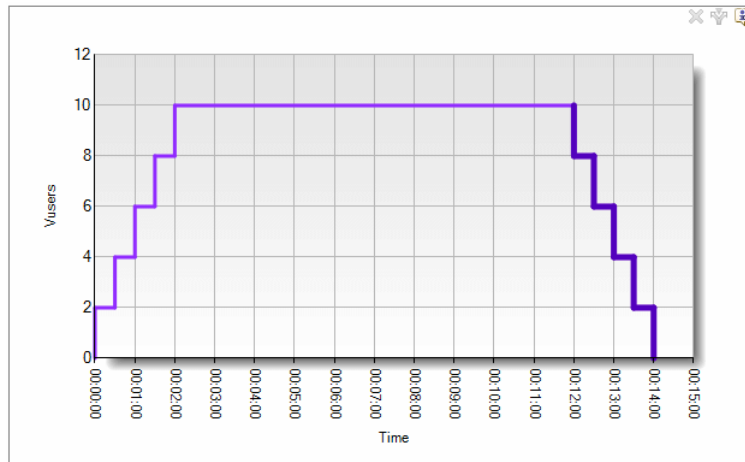
► Duration.

Duration	Run	for	▼	00.00:10:00	(dd.HH:MM:SS)
----------	-----	-----	---	-------------	---------------

► Stop Vusers.

Stop Vusers	Stop All Vusers	gradually	▼	2	Vusers every	00:00:30	(HH:MM:SS)
-------------	-----------------	-----------	---	---	--------------	----------	------------

The schedule graph displays a graphical representation of the defined schedule. The lines in the graph correspond to the actions defined in the Actions grid.



How do I add the monitor profile to the test?

You add the monitor profile to the test as follows:

- 1** In the Performance Test Designer, select the **Monitors** tab.
- 2** On the toolbar, click **Add Monitor Profile**. The Monitor Profiles pane opens on the right, displaying the available monitor profiles.
- 3** In the Monitor Profiles Tree, select the monitor profile and click the left arrow to add it to the test.

How do I save the test?

Click **Save** at the bottom of the page to save the test settings. Then click **Close** to Close the Performance Test Designer.

4

Running Performance Tests

This lesson explains the steps that are necessary before you run the performance test, and how to begin test execution.

Note: Some steps in the following lesson can be performed from ALM or from Performance Center. In this lesson, you will perform these steps from ALM. For more details, see the "Personalizing Performance Center" section in the *HP ALM Performance Center Guide*.

In this lesson you will learn about:

- Creating Test Sets on page 46
- Reserving Timeslots on page 48
- Running Performance Tests on page 49

Creating Test Sets

The next step in the performance testing process is the creation of a performance test set.

What is a test set?

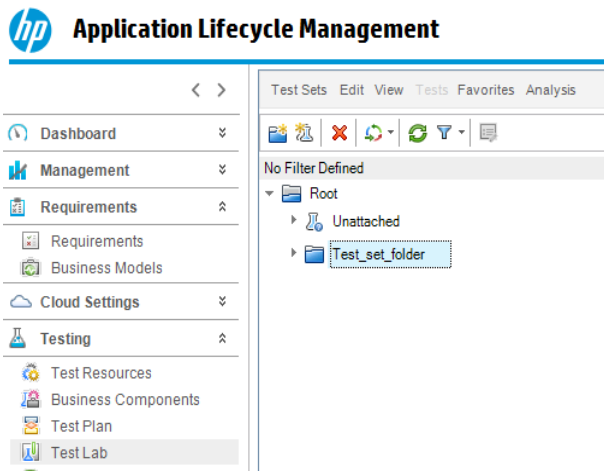
After you design the performance test in the Test Plan module, you organize the test execution by creating a test set in the Test Lab module and adding an instance of the test to the test set. The purpose of a test set is to enable you to group together tests that were created for similar goals.

How do I create a test set?

You create the test set and add the test to it as follows:

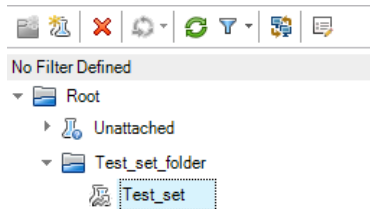
1 Create the test set.

- a On the ALM sidebar, under **Testing**, select **Test Lab**.
- b Click the **New Folder** button, and specify a name for the Test Set folder, for example, `Test_set_folder`.
- c Click **OK** to add the folder.



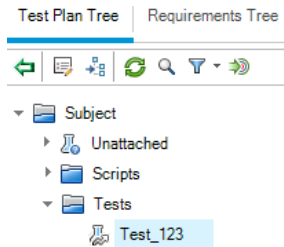
- d Select the folder you created above, and click the **New Test Set** button. The New Test Set dialog box opens.

- e Enter the required information, and make sure that in the **Type** box, you select **Performance**.
- f Click **OK**. The test set is added to the Test Set Folder.

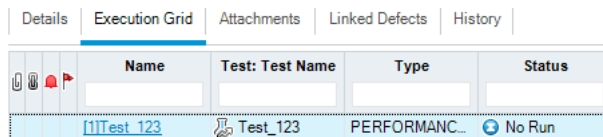


2 Add the performance test to the test set.

- a Select the test set you just created, and in the right pane, click the **Execution Grid** tab.
- b Above the Execution Grid tab name, click the **Select Tests** button. The Test Plan tree appears on the right, enabling you to locate your Test Plan folder and performance test.



- c In the **Test Plan Tree**, select the script and click the **Add Test to Test Set** button to add it to the Execution Grid tab.



- d Click the close button to close the **Test Plan Tree**.

Reserving Timeslots

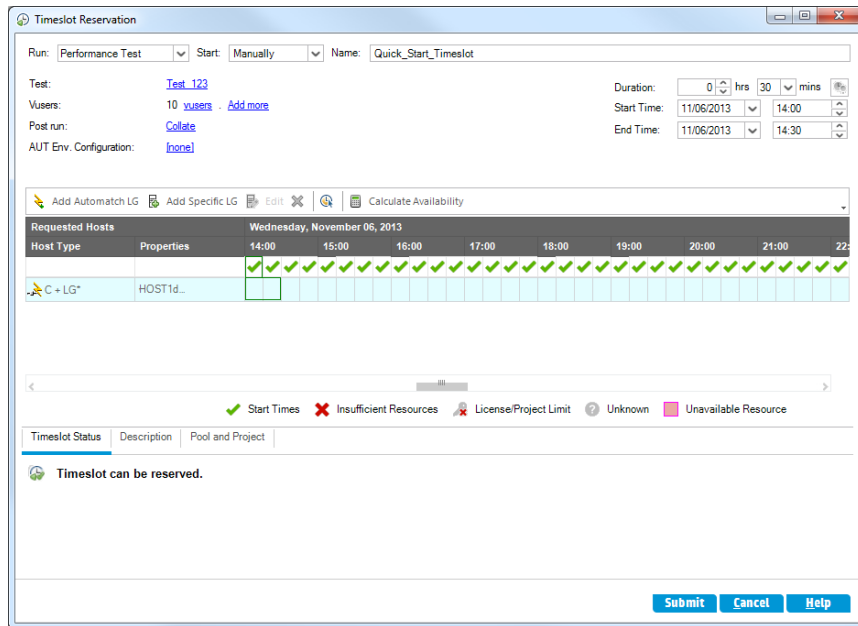
Before you run the test, you reserve a timeslot to ensure that the resources needed will be available for the duration of the test.

How do I reserve a timeslot?

You reserve a timeslot as follows:

- 1** On the ALM sidebar, under **Testing**, select **Timeslots**.
- 2** Click the **New Timeslot** button. The Timeslot Reservation dialog box opens.
- 3** Define the following information:
 - **Run.** Choose **Performance Test**.
 - **Start.** Choose **Manually** as the method for executing tests. The timeslot reservation reserves testing resources only.
 - **Name.** Enter a name for the timeslot.
 - **Select a test instance.** Navigate to the test set you created above, and select the test to link it to the timeslot. The number of Vusers and hosts that were defined as part of the test design process are automatically displayed.
 - **Duration.** Set the start time, and enter a duration for the test.
 - **Post-Run.** Select **Collate and Analyze**.

- 4 Click **Calculate Availability**. The availability of the requested resources during the selected timeslot is calculated. The results of this calculation are displayed in the Timeslot Status tab and graphically on the time chart.



Note: If the timeslot cannot be reserved, reselect your resources or adjust the start time, taking into account the reasons displayed in the Timeslot Status tab.

- 5 When you find a valid timeslot, click **Submit** to save the timeslot.

Running Performance Tests

Now that you have designed the performance test, added an instance of the test to a test set, and reserved a timeslot for the test, you are ready to run the test and observe how your application performs under load.

How do I run the performance test?

You run the performance test as follows:

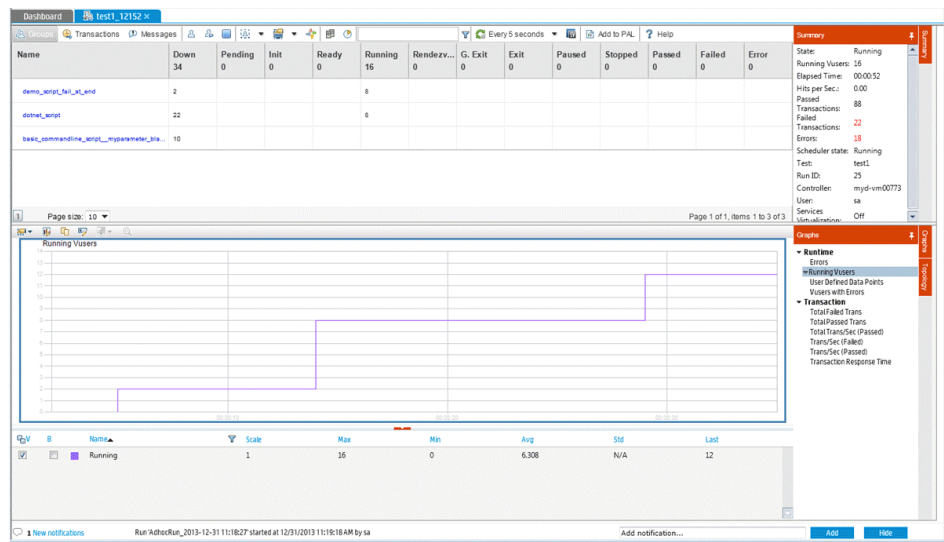
- 1 On the ALM sidebar, under **Testing**, select **Test Lab**.
- 2 Select your test in the left pane.
- 3 Click the **Execution Grid** tab.
- 4 Select the test in the Execution Grid tab, and click the **Run Test** button. The Run Performance Test dialog box opens, and the timeslot you created above is displayed in the select timeslot grid.

Note: If no timeslot was reserved from the Timeslots module, the Run Performance Test dialog box lists alternative timeslots.

- 5 Select a timeslot in the grid, and click **Run**. ALM Performance Center begins the performance test execution process, and the Performance Test Run page enabling you to manage and monitor the test as it runs.

What does the Performance Test Run page display?

The Performance Test Run page is the control center from which the test run is managed and monitored.



The Performance Test Run page displays the following:

Pane	Description
Performance Test Details	<p>The Performance Test Details Pane at the top of the page provides three views:</p> <ul style="list-style-type: none"> ▶ Groups View. This is the view displayed in the above image. The Groups view displays the statuses of the Vusers in each Vuser group in the performance test. ▶ Transactions View. The Transactions view displays how many transactions have been executed successfully or unsuccessfully. ▶ Messages View. The Messages view displays error, warning, debug, and output messages that are sent to the Controller by the Vusers and load generators during a test run.
Summary	The Summary pane displays a synopsis of the running performance test.
Online Graphs	The online monitor graphs display performance measurements for those resources being monitored in the test. This enables you to monitor how the application under test is performing in real time and identify where potential bottlenecks exist.
Topology	Displays any defined topologies for the test.

5

Post-Run Analysis and Trending

This lesson explains how to analyze test run data using HP LoadRunner Analysis, and how to view performance improvements and regressions using the Trend Report feature.

In this lesson you will learn about:

- ▶ Analyzing Performance Test Run Results on page 54
- ▶ Viewing Performance Improvements and Regressions on page 63

Analyzing Performance Test Run Results

Now that you have completed running the performance test, you use HP LoadRunner Analysis to analyze the performance data generated during the test run. Analysis gathers the performance data into detailed graphs and reports. Using these graphs and reports, you can pinpoint and identify the bottlenecks in the application, and determine what changes need to be made to the system to improve its performance.

How do I view Analysis information?

To provide for more interesting results, a sample analysis session is provided, which is based on a performance test similar to the one you ran.

To open the sample Analysis session:



- 1** Select **Start > All Programs > HP Software > HP LoadRunner > Analysis** or double-click the **Analysis** shortcut icon on your desktop.
- 2** Select **File > Open**. The Open Existing Analysis Session File dialog box opens.
- 3** Navigate to the *<Analysis Standalone Installation>* \ **Tutorial** folder.
- 4** Select **analysis_session** and click **Open**. Analysis opens the session file in the Analysis window.

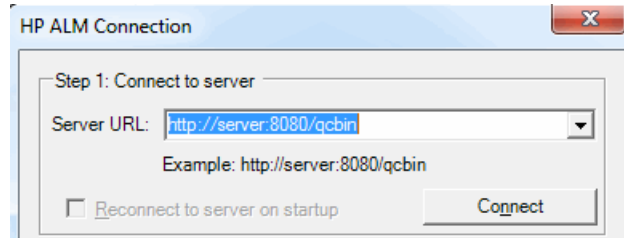
The data contained in this sample session is examined in more detail in the sections that follow.

To open the Analysis session for the test you ran:

To view Analysis data for your actual performance test, you perform the following steps:

1 Connect Analysis to ALM Performance Center.

- a** In Analysis, select **Tools > HP ALM Connection**. The HP ALM Connection dialog box opens.



- b** Enter the ALM Platform URL, for example, `http://server:8080/qcbin`, and click **Connect**.
- c** Under Step 2: Authenticate User Information, enter your ALM user credentials, and click **Authenticate**.

- d Select your domain and project and click **Login**. The dialog box should look as follows:

The screenshot shows a dialog box titled "HP ALM Connection" with a close button (X) in the top right corner. The dialog is divided into three sections:

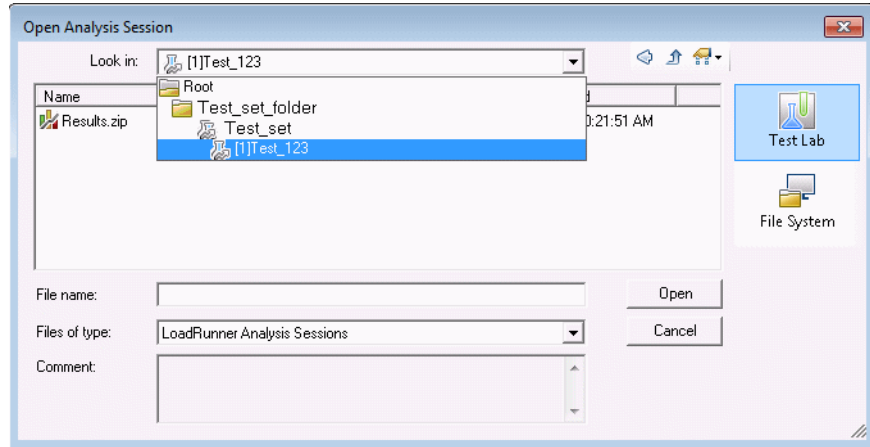
- Step 1: Connect to server**
 - Server URL: (dropdown menu)
 - Example: http://server:8080/qcbin
 - Reconnect to server on startup
 - Disconnect button
- Step 2: Authenticate user information**
 - User name:
 - Password:
 - Authenticate on startup
 - Change User button
- Step 3: Login to project**
 - Domain: (dropdown menu)
 - Project: (dropdown menu)
 - Login to project on startup
 - Login button

At the bottom of the dialog are two buttons: OK and Help.

- e Click **Close**.

2 Open the Analysis session file for your performance test.

- a** Select **File > Open**. The Open Analysis Session dialog box opens.
- b** Select **Test Lab**. The test sets in the project are displayed.
- c** Navigate to the **Results.zip** file for the instance of your performance test that you want to analyze.



- d** Double-click the **Results.zip** file. The analysis session file is downloaded from ALM Performance Center and is opened in Analysis.

Did I reach my goals?

Analysis opens displaying the Summary Report. The Summary Report provides general information about the performance test run. In the **Statistics Summary** of the report, you can see how many Vusers ran in the test and view other statistics such as the total/average throughput, and the total/average hits. The **Transaction Summary** of the report lists a summary of the behavior of each transaction.

How can I view the graphs?

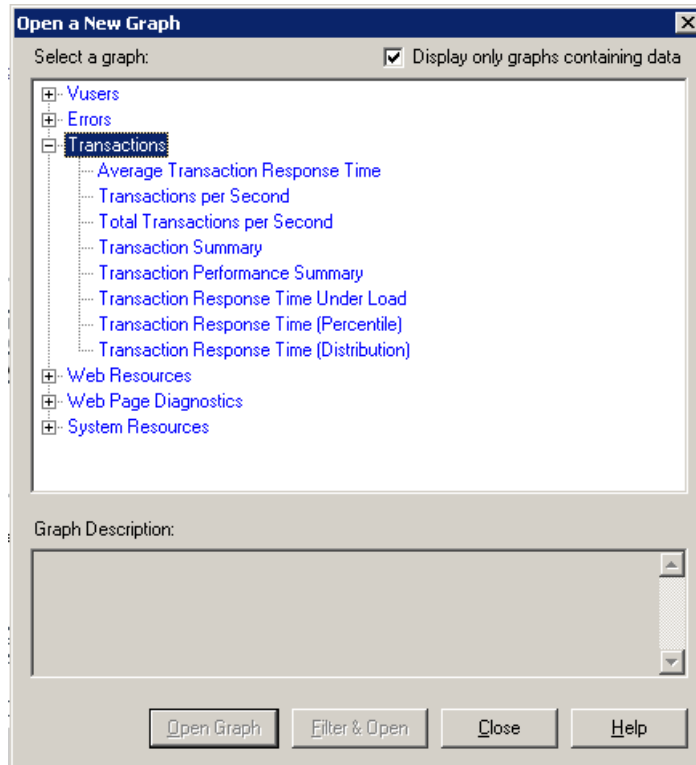
The **graph tree** in the left pane of the Analysis window shows the graphs that are open for viewing. From the graph tree, you can choose to open new graphs and remove graphs that you no longer want to view. The graphs are displayed in the **graph viewing area** in the right pane of the Analysis window. You can view data from the selected graphs in the **graph legend** in the lower pane of the window.

As an example, we will now analyze the Average Transaction Response Time graph. Using this graph, you can view the behavior of the problematic transactions during each second of the performance test run. In this section, you view the behavior of the **check_itinerary** transaction.

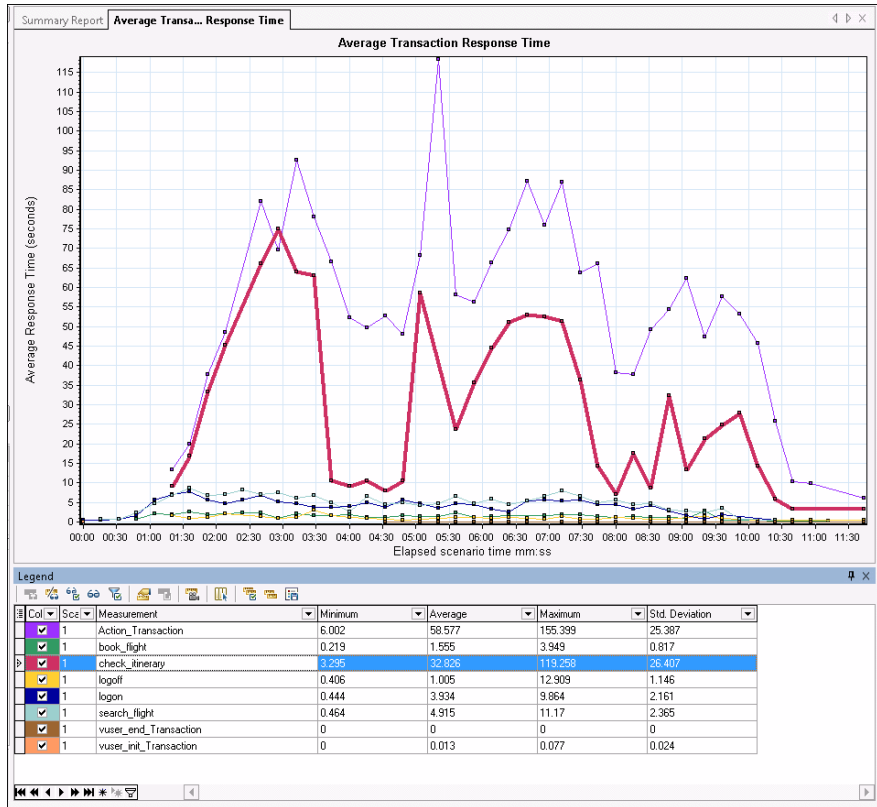
To open and analyze the Average Transaction Response Time graph:



- 1 Click the **Add New Graph** button. The Open a New Graph dialog box opens.

2 Under Transactions, select Average Transaction Response Time.

- 3 Click **Open Graph**. The Average Transaction Response Time graph opens in the graph viewing area.



- 4 In the legend, click **check_itinerary**. The **check_itinerary** transaction is highlighted in the graph and in the legend below the graph.

Notice how the average response time of the **check_itinerary** transaction fluctuates greatly compared to the other transactions at the bottom of the graph, which follow a more or less stable average response time.

How can I compare data from different graphs?

You can join two graphs together to see the effect of one graph's data upon another graph's data. This is called **correlating two graphs**. For example, you can correlate the Running Vusers graph with the Average Transaction Response Time graph to see the effect of a large number of Vusers on the average response time of the transactions.



1 Click the **Add New Graph** button. The Open a New Graph dialog box opens.

2 Under **Vusers**, select **Running Vusers**.

3 Click **Open Graph**. The Running Vusers graph opens in the graph viewing area.

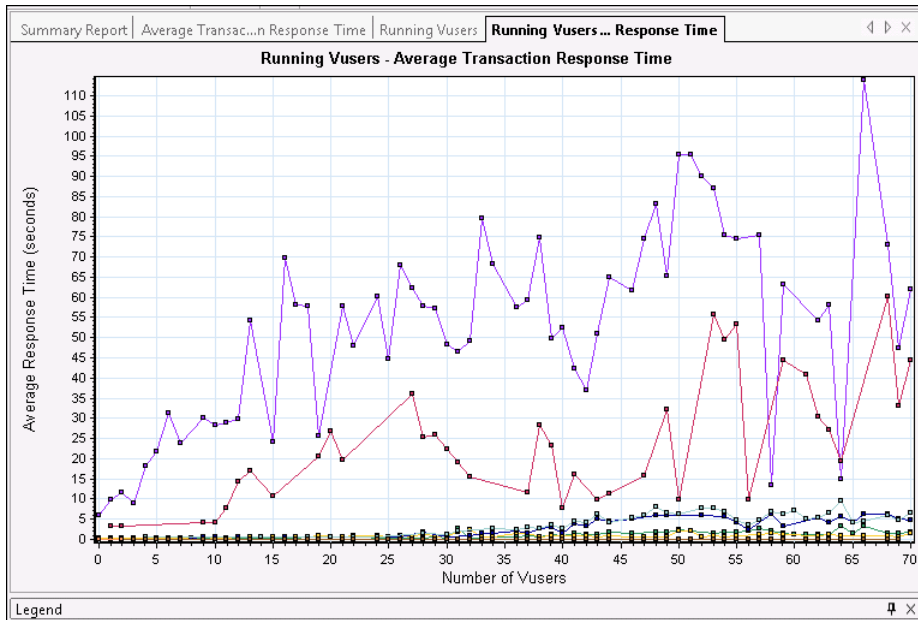


4 Select the **Running Vusers** graph and click the **Merge Graphs** button.

5 From the **Select graph to merge with** list, select **Average Transaction Response Time**.

6 In the **Select type of merge** area, select **Correlate**, and click **OK**.

The Running Vusers and Average Transaction Response Time graphs are now represented by one graph which opens in the graph viewing area.



Another Analysis tool, **Auto Correlate**, merges all graphs containing data that could have had an effect on a given transaction. Correlations of the transaction with each element are displayed, allowing you to deduce which elements had the greatest effect on the given transaction.

How can I sort graph data?

You can filter graph data to show fewer transactions for a specific segment of the performance test, and you can sort graph data to show the data in more relevant ways. For example, you can filter the Average Transaction Response Time graph to display only the **check_itinerary** transaction.

- 1 Click **Average Transaction Response Time** in the graph tree to open the graph.
- 2 Select the graph and click the **Set Filter/Group by** button.
- 3 In the **Transaction Name** value box, select **check_itinerary** and click **OK**.



The filtered graph displays only the **check_itinerary** transaction and hides all the other transactions.

How can I publish my findings?

You can publish the findings from your analysis session in an HTML or Microsoft Word report. The HTML report can be opened and viewed in any browser. The Word report is more comprehensive than the HTML report, enabling you to include general information about the performance test and to format the report to include your company's name, logo, and the author's details.

For more information about analyzing performance test results, refer to the *HP LoadRunner Analysis User Guide*.

Viewing Performance Improvements and Regressions

A trend report is an ALM Performance Center feature that allows you to view changes in performance from one performance test to another, or across several performance tests. By analyzing these changes, you can easily identify improvements or regressions in the measurement's performance.

For example, if you would like to analyze the performance trend of the average transaction response time measurement of **Transaction X**, then the trend report would display the changes in the response time from one test to the next, clearly indicating whether this measurement improved (where the response time decreased) or regressed (where it increased).

What steps are involved in working with trend reports?

The process of creating and viewing a trend report involves the following steps:

- ▶ **Step 1 - Creating the trend report.** Creating the basic trend report by defining its name, description and selecting a template.
- ▶ **Step 2 - Adding test runs to the trend report.** Extracting test run data from Analysis to the trend report.

- **Step 3 - Viewing trend report data.** Opening the trend view and analyzing the trending information.

We will now discuss these steps in more detail.

Creating the Trend Report

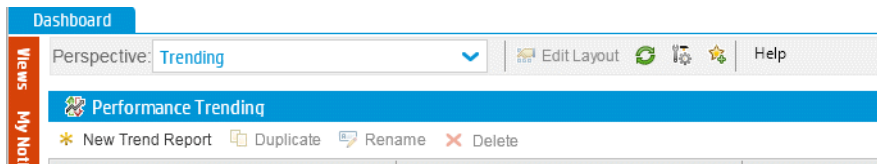
You create the trend report from the main Trend Reports page.

Note: Some steps in the following lesson can be performed from ALM or from Performance Center. In this lesson, you will perform these steps from ALM. For more details, see the "Personalizing Performance Center" section in the *HP ALM Performance Center Guide*.

To create the trend report:

1 Open the main Performance Trending page.

- a On the ALM sidebar, under **Testing**, select **Test Runs**.
- b Click the **Performance Trending** button. The **My Performance Center** application opens, displaying the Performance Trending page.



2 Open the Trend Report Creation page.



On the Performance Trending page, click the **New Trend Report** button. The Create New Trend Report page opens.

3 Define the General Details and Content and Layout settings.

- a In the Create New Trend Report page, define the following information:
 - In the **General Details** pane, enter a name and description for the trend report.
 - In the **Contents and Layout** pane, select the **Transaction Trends** template.
- b Click **Create** to create the trend report. The Select Test Runs to Trend Report dialog box superimposes on the Trend Overview tab.

4 Add Performance Test Runs to the Trend Report.

From the **Project**, **Test Set** and **Test** lists respectively, select the performance test that you want to trend. All analyzed instances of the performance test appear in the table.

Select Test Runs to Trend Report

Project: Test Set: Test:

Run ID	Run Name	Time Range	Exec Date	Duration	Max VUsers	Total Transactions Passed	Total Errors
3	Test2	Complete	6/24/2012 12:00:00 AM	55	20	4330570	0
4	Test2	Complete	6/24/2012 12:00:00 AM	2	20	2369831	0
5	Test2	Complete	6/24/2012 12:00:00 AM	6	20	10245981	0
6	Test2	Complete	6/24/2012 12:00:00 AM	1	20	937852	0
7	Test2	Complete	6/22/2012 12:00:00 AM	1	20	1639578	0
8	Test2	Complete	6/22/2012 12:00:00 AM	1	20	1832282	0
9	Test2	Complete	6/24/2010 12:00:00 AM	3	20	5499186	0
10	Test2	Complete	6/22/2010 12:00:00 AM	1	20	1758173	0
11	Test2	Complete	6/22/2010 12:00:00 AM	1	20	1217866	0
12	Test2	Complete	6/22/2010 12:00:00 AM	3	20	4920640	0

Use CTRL + left mouse click to select multiple runs

Note: only analyzed test runs will appear in the table above. Adding runs to the report may take several minutes

Add Help Cancel

Select those analyzed instances of the test that you want to add to the trend report, and click **Add**. Performance Center uploads the test runs from Analysis and adds them to the trend report. The trend report opens displaying the Trend Overview tab.

Notes:

- ▶ To add test runs to the trend report, there must be a data processor in your project's host pool. For details, contact the Administrator.
- ▶ The process whereby ALM Performance Center extracts the performance test data from Analysis is very labor intensive on the data processor and may take anywhere from several minutes to over an hour. We recommend that you use a data processor dedicated for this purpose.

Viewing Trend Report Data

In the following section, we will look at trending information for the average transaction response time measurement only.

To view trending information:

On the trend report, click the **Performance** tab.

In the trend view that opens, you will see a table that displays the transactions that were present in the test run, as well as the average transaction response times for each selected instance of the test run.

By comparing these average transaction response time figures, you can identify if the performance of the transaction improved or regressed from one test run to the next.

The following example illustrates this point.

Transaction Response Time(Compare to baseline)					
Name	Type	Average			
		6/24/2012 (3[Base])	6/24/2012 (4)	6/24/2012 (5)	6/24/2012 (6)
All	TRT	4.567	1.22 (-73.29%)	2.32 (-49.2%)	12.455 (+172.72%)
TRX_01	TRT	2.045	4.073 (+99.17%)	2.035 (-0.49%)	1.05 (-48.66%)
TRX_02	TRT	1.045	2.07 (+98.09%)	1.015 (-2.87%)	1.051 (+0.57%)
TRX_03	TRT	3.053	3.067 (+0.46%)	2.009 (-34.2%)	2.654 (-13.07%)
TRX_04	TRT	6.055	6.868 (+13.43%)	5.011 (-17.24%)	7.05 (+16.43%)

In the trend view shown above, four transactions (**TRX_01**, **TRX_02**, **TRX_03**, and **TRX_04**) are displayed and their average Transaction Response Time measurement is being trended from four performance test runs: **3**, **4**, **5**, and **6**.

Test run **3** has been automatically defined as the baseline run, (as indicated by the word **Base** in brackets). This means that the average transaction response times contained in the other tests are compared to test run **3** only.

In test run **3**, the average transaction response time for **TRX_01** was **2.045**. The average transaction response time for the same transaction in test run **4** was **4.073**, which represents a slower response time and therefore a regression in the performance of this measurement. The percentage difference between the two figures is displayed in parenthesis, in this case **+99.17%**.

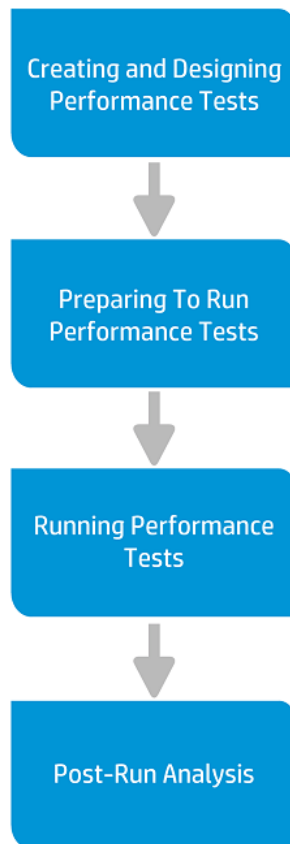
Lesson 5 • Post-Run Analysis and Trending

In test run **6**, the average transaction response time for **TRX_01** was **1.05**, which represents a faster response time than test run **3**, and therefore a performance improvement. The percentage difference between the two figures is displayed in parenthesis, in this case **-48.66%**.

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Summary

ALM Performance Center enables you to manage the following phases of the testing process: Creating and designing performance tests, preparing to run performance tests, running performance tests, and post-run analysis.



Phase	Description
Creating and Designing Performance Tests	Setting up the test environment by defining events that occur during the testing session.
Preparing to Run Performance Tests	Adding the performance test to a test set and reserving a timeslot for the test.
Running Performance Tests	Driving, managing, and monitoring the test.
Post-Run Analysis	Analyzing the performance data generated during the test run.

