HP ALM Performance Center

Software Version: 12.01

User and Administrator Guide

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Contents

Part 1: Performance Testing Basics

Chapter 1: HP ALM Performance Center Introduction

This chapter includes:

HP ALM Performance Center Overview

HP ALM Performance Center is a global cross-enterprise performance testing tool which enables you to manage multiple, concurrent performance testing projects across different geographic locations without any need to travel between the locations. Performance Center administers all your internal performance testing needs. With Performance Center, you manage all aspects of large-scale performance testing projects, including resource allocation and scheduling, from a centralized location accessible through the Web. Performance Center helps streamline the testing process, reduce resource costs, and increase operating efficiency.

Performance Center generates load on your Web server or application using HP's virtual user (Vuser) technology. Each Vuser follows a series of steps (for example, hyperlink steps, submit form steps, and so on) that you define in a Vuser script. You design Vuser scripts to emulate typical user activity in your application.

Vusers run on dedicated host machines. Each host machine runs many Vusers. When run concurrently, the Vusers create the same load as tens of thousands of individual human users. While Vusers run, Performance Center collects server response time data.

Performance Center analysis tools, which you access both during and after the performance test, provide you with a clear and concise picture of your application's performance under load.

Performance Center helps you pinpoint performance bottlenecks. It also allows you to determine the number of users your system can scale up to (this number is the "breaking point" after which your application's performance starts to degrade). This information gives clues as to what can be done to increase your application's load capacity.

In addition, the information provided by Performance Center helps you analyze how the load on your system affects the service level agreements (SLAs) or other performance thresholds that are important to your business.

Performance Center has the following system advantages:

- Performance Center's step-by-step process helps guide you through the performance testing procedure.

- Performance Center enables remote testing by anybody, from anywhere, at any time, eliminating the need to travel.

- Performance Center enables multiple concurrent tests, replacing serial testing with parallel testing.

- Performance Center enables remote management from anywhere through a Web server.

- Performance Center is a complete system for managing performance tests, scripts, and resources. Furthermore, Performance Center centralizes the testing environment, with no duplication of testing labs, keeping costs down and minimizing time.

- Performance Center enables you to take advantage of the power of the Web for supporting services such as remote consulting, online support, and so on.

For details on how to conduct a performance test, see "How to Conduct a Performance Test" below.

How to Conduct a Performance Test

This task describes how to conduct a performance test on your application.

> **Note:** To view a movie that demonstrates how to conduct a performance test, select **Help > Movies** in the ALM main window.

To learn more about performance testing, see "HP ALM Performance Center Overview" on the previous page.

This task includes the following steps:

- "Create and add test assets" below

- "Reserve a timeslot for performance testing" below

- "Design a performance test" below

- "Run, monitor, and view results of the performance test" below

1. Create and add test assets

    For details, see "How to Manage Testing Assets" on page 23.

2. Reserve a timeslot for performance testing

    For details, refer to the *HP Application Lifecycle Management User Guide*.

3. Design a performance test

    For details, see "How to Design a Performance Test" on page 63.

4. Run, monitor, and view results of the performance test

    For details, see "How to Manage a Performance Test Run" on page 200.

Part 2: Performance Testing Assets

Chapter 2: Testing Assets - Introduction

This chapter includes:

How to Manage Testing Assets

The following steps describe how to configure project settings and add testing assets.

> **Note:** This task is part of a higher-level task. For details, see "How to Conduct a Performance Test" on page 18.

This task includes the following steps:

- "Configure project settings" below

- "Create projects that contain virtualized services - optional" below

- "Upload VuGen scripts" below

- "Design topologies of your applications under test" below

- "Create monitor profiles to monitor your tests" below

Configure project settings

You can configure the monitors, runtime settings, timeout, general, and debug information options for all your Performance Center projects. For details, refer to the *HP ALM Lab Management Guide*.

Create projects that contain virtualized services - optional

You can create projects that contain virtualized services and integrate these services into your VuGen scripts. For details, see the *HP Service Virtualization User Guide*.

Upload VuGen scripts

After you create Vuser scripts using HP Virtual User Generator, you must upload them to ALM. For details, see "How to Upload VuGen Scripts" on page 25.

Design topologies of your applications under test

You can design topologies of your applications under test using the Topologies feature. For details, see "How to Design Topologies" on page 31.

Create monitor profiles to monitor your tests

To monitor server resources, you must configure the monitor settings for a test. These monitor settings can then be saved as monitor profiles that can be used by any performance test in your project. For details on creating monitor profiles, see "How to Create and Configure Monitor Profiles" on page 49.

Chapter 3: VuGen Script Management

This chapter includes:

Vuser Scripts

When you run a performance test, virtual users (Vusers) access your application concurrently in order to put load on your server. The actual steps that the Vusers perform when accessing your application are represented in a Vuser script. Each Vuser performs the actions recorded in one Vuser script.

You design Vuser scripts to emulate typical end-user activities on your application. For example, if you are testing performance on a Web site, the Vuser script emulates a real user accessing URLs, clicking links, submitting forms, and so on. When you create a performance test, you distribute your Vuser scripts among your Vusers.

For example, in the case of testing a Web site, you can specify that a portion of the Vusers run a Vuser script that emulates real users accessing your home page, a portion run a script that performs a search query, and a portion emulate the completion of an order form.

You obtain Vuser scripts by recording them using HP's Virtual User Generator (VuGen) and uploading them to ALM.

In addition to testing Web sites, Performance Center can be used to test performance of non-Web environments. For example, you can test WAP, Real, or Oracle NCA applications. For details of supported protocols, see the *HP Virtual User Generator User Guide*.

For details on how to upload VuGen scripts to ALM, see "How to Upload VuGen Scripts" below.

Mapping VuGen Parameters to AUT Parameters

When setting VuGen parameters in a Vuser script, you can define AUT environment parameters. AUT Environments allows users to make test execution more dynamic by parameterizing the environment data used for testing. Instead of defining and running several different scripts that use the same logic but need different AUT environment parameters, you can simply provide a specific AUT environment configuration that ALM inserts into your script at run-time. ALM will then use the parameter values you defined in the AUT environment configuration when deploying the environment and executing the test.

For more details on working with AUT environments, refer to the *HP Application Lifecycle Management User Guide*.

How to Upload VuGen Scripts

This task describes how to upload VuGen scripts to ALM.

> **Note:** This task is part of a higher-level task. For details, see "How to Manage Testing Assets" on page 23.

This task includes the following steps:

- "Prerequisites" below

- "Upload the VuGen scripts to ALM" below

1. Prerequisites

   Create scripts in VuGen. For details, see the *HP Virtual User Generator User Guide*.

   > **Note: Service Virtualization:**
   >
   > - If your test requires the service to be running while you record your business process, open HP Service Virtualization simultaneously and deploy the virtualized service. Record the script as usual.
   >
   > - Pointing calls to virtual services in the application under test covers two major scenarios:
   >
   >   ○ Application components that use the service are embedded in the code or in a configuration file. In this case, update the code in the application under test or update the configuration file to point to the new URL.
   >
   >   **Examples**:
   >
   >   A .NET Desktop application uses a web service, and the url is set using a constant: stringURL = http://hp.com
   >
   >   A service or back end component uses the web service and the URL is configured in the app.config file.
   >
   >   ○ The service is consumed by accessing UDDI or some other registry component (Systinet) and the URL is retrieved at run-time. In this case, update the end point URL in UDDI/Systinet.

2. Upload the VuGen scripts to ALM

   You can upload scripts in one of the following ways:

   - **Upload scripts from ALM / Performance Center:**

     ○ Save the VuGen scripts locally. The scripts must be saved in ZIP format and must include all the files in the test scripts folder.

     ○ On the ALM sidebar, under **Testing**, select **Test Plan**, click the **Upload VuGen Scripts** ⬆ button.
       Alternatively, in My Performance Center, select **Perspective> Test Plan**. Click the **Upload VuGen Scripts** ⬆ button.

○ Select a destination folder, scripts to upload, and upload options.

For user interface details, see "Upload VuGen Scripts Dialog Box" on the next page.

■ **Upload the scripts from VuGen to ALM.**

For details about uploading VuGen scripts from VuGen to ALM, see the section about saving VuGen scripts to ALM in the *HP Virtual User Generator User Guide*.

VuGen Script Management User Interface

This section includes:

Upload VuGen Scripts Dialog Box

This dialog box enables you to upload VuGen scripts to ALM.

To access	**ALM:**
	1. On the ALM sidebar, under **Testing**, select **Test Plan**.
	2. Click the **Upload VuGen Scripts** ⬆ button.
	My Performance Center:
	1. In My Performance Center, select **Perspective> Test Plan.**
	2. Click the **Upload VuGen Scripts** ⬆ button.
Important information	• The Upload VuGen Scripts dialog box is intended for uploading **VuGen scripts** only. The VuGen scripts must be saved locally, must be in ZIP format, and must include all the files in the test scripts folder.
	• You cannot upload QuickTest (UFT GUI Tests) or Service Test tests using the Upload VuGen Scripts dialog box. To upload QuickTest (UFT GUI Tests) or Service Test tests, see the relevant product's User Guide.

Relevant tasks	"How to Upload VuGen Scripts" on page 25
See also	"Vuser Scripts" on page 25

User interface elements are described below:

UI Elements	Description
Upload	Uploads the selected VuGen Scripts to the specified destination folder.
Select Folder	The destination folder for the uploaded scripts. **Note:** The folder name must not contain a forward slash (/). For more details, see "Troubleshooting and Limitations" below.
Select Scripts	Enables you to select up to five scripts. **Note:** The scripts must be saved locally, must be in ZIP format, and must include all the files in the test scripts folder.
If Script Exists	Action to take if the script already exists in the destination folder. ● **Auto Rename Script.** Automatically gives the script a different name. ● **Overwrite Existing Script.** Overwrites the existing script.
Upload Method	The method to use for uploading the script: ● **Upload All Files.** Uploads all the files contained in the .zip file. With this option the upload takes a long time. ● **Upload runtime files only.** Only the runtime files—that is the scripts, runtime settings, parameters, and so on—are uploaded.
Versioning > Keep checked out	For version enabled projects, keeps the uploaded scripts checked out. **Version Control:** When you upload a script, it is available only for your own use until you check it in. After you check the script in, other users can access the script as well.
Messages	Enables you to enter messages and comments about the script upload.

Troubleshooting and Limitations

This section describes troubleshooting and limitations for uploading VuGen scripts.

● If the name of the folder to which you are uploading VuGen scripts contains a forward slash (/) you cannot upload the scripts using the Upload VuGen Scripts dialog box. Either rename the folder so that it does not contain a forward slash (/) or upload the scripts from VuGen.

Chapter 4: Topologies

This chapter includes:

Topologies Overview

ALM Performance Center can articulate the topology of your application under test (AUT) and use it as an interface for defining performance monitors by integrating with HP SiteScope.

Using topologies, you can:

- Manage an inventory of application under test (AUT) hosts which are grouped into AUT host pools, similar to Performance Center hosts and host pools

- Visually understand the tested environment

- Configure monitors using best practice monitor templates

- Pinpoint runtime performance issues by highlighting a topology node's status based on the SiteScope monitor thresholds

The SiteScope user interface hosted in ALM Performance Center enables leveraging SiteScope functionality in a use-case oriented approach, without requiring additional monitor configuration on the ALM Performance Center side.

During runtime, the AUT schema with comprehensive SiteScope monitor data is displayed in different monitor graphs in the ALM Performance Center run screen and measurement names can be identified and filtered.

For details on designing topologies, see "How to Design Topologies" below.

How to Design Topologies

This section describes how to design a topology that graphically displays the logical components that make up your application under test (AUT) and the relationships between the components. This provides a useful method for managing your inventory of AUT hosts and enables topology-oriented monitoring and analysis.

> **Note:**
>
> - This task is part of a higher-level task. For details, see "How to Manage Testing Assets" on page 23.
>
> - Ensure that SiteScope is installed and configured to integrate with ALM Performance Center. For details, see the section about installing SiteScope in the *HP ALM Performance Center Installation Guide*.
>
> - After you have designed a topology you can select it for a performance test when you design the test.

- **Product Feature Movie.** To view a movie that demonstrates how to design topologies, select **Help > Movies** in the ALM main window.

Tip: For a use-case scenario related to this task, see "How to Design Topologies - Use-Case Scenario" on page 34.

To learn more about topologies, see "Topologies Overview" on the previous page.

This task includes the following steps:

- "Create an empty topology" below

- "Design the topology" below

- "Add the AUT hosts" on the next page

- "Configure the component properties" on the next page

- "Configure monitors on the components" on the next page

- "Results" on page 34

1. Create an empty topology

   a. On the ALM sidebar, under **Performance Center**, select **Topologies**.

   b. To create a topology folder, click the **New Folder** [icon] button, and enter the folder name.

   c. Click the **New Topology** [icon] button and enter the topology details. To add SiteScope monitors to the topology, specify the SiteScope server details.

      For details about the topology fields, see "Topologies Module Fields" on page 40.

2. Design the topology

   Note: The Topology Designer window opens automatically when you create a new topology. If the Topology Designer window did not open, right-click the topology and select **Design Topology**.

   In the Topology Designer window:

   a. From the palette on the left, select relevant nodes representing the components in your AUT and drag them onto the Topology canvas.

b. To connect two components, click one component (ensure that it is not selected) and drag the cursor to the other component.

3. **Add the AUT hosts**

   Define the machines that host the relevant components of the AUT.

   On the Topology Designer toolbar, click **New AUT Host** to define the machines hosting your AUT.

   > **Tip:** If you have an Excel file listing your AUT hosts, you can import the list of AUT hosts into ALM. For details, refer to the *HP ALM Lab Management Guide*.

   You can view the list of AUT hosts in the AUT Hosts tab on the left.
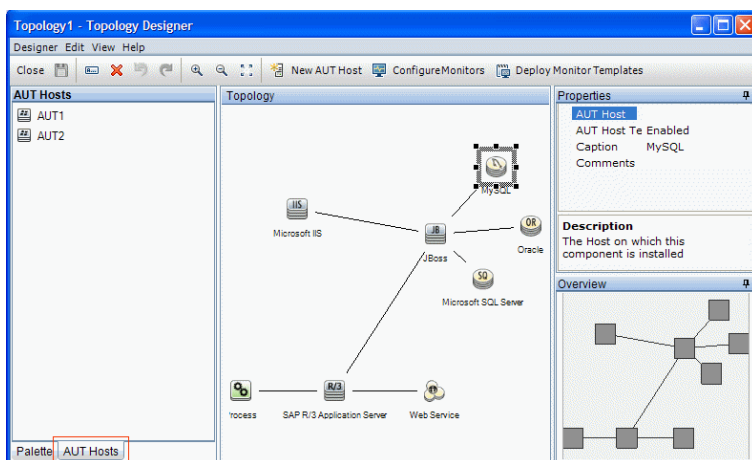
4. **Configure the component properties**

   Select a component and, in the **Properties** pane in the top right corner of the Topology Designer, enter the relevant properties for that component. For successful integration with SiteScope, ensure that you select the relevant AUT host, and that all of the relevant properties are accurate.

   > **Tip:** When you click a property, a description is displayed in the lower area of the Properties pane.

   Repeat this procedure for each of the relevant components.

5. **Configure monitors on the components**

   You can configure groups of monitors for the components on AUT hosts. Ensure that the AUT host details are accurate for each relevant component.

■ To deploy relevant system-defined monitors on specific components on your canvas, select the components, right-click the selection, and select **Deploy Monitor Templates**. Monitor groups are created in SiteScope for each selected component, and each group is automatically configured with relevant system-defined monitors.

■ To configure monitors for a component manually in SiteScope, right-click the component and select **Configure Monitors**. For more details about configuring monitors in SiteScope, see the *HP SiteScope User Guide*.

> **Note:** The AUT host defined in a component's properties is passed to SiteScope as a remote host and is inserted as the default monitored server for all monitors created for this component.

6. Results

   After you save the topology, you can select the designed topology for your performance test. For details, see "Performance Test Designer > Topology Tab" on page 46.

   During a test run, you can view the SiteScope monitor activity on the relevant components in your AUT. For details, see "Performance Test Run Page" on page 211.

How to Design Topologies - Use-Case Scenario

This use-case scenario describes how to design a topology that graphically displays the logical components that make up your application under test (AUT) and the relationships between the components.

> **Note:** For a task related to this use-case scenario, see "How to Design Topologies" on page 31.

This scenario includes the following steps:

- "Background" below

- "Create the topology and design the outline" on the next page

- "Add the AUT hosts" on page 36

- "Define the component properties" on page 37

- "Deploy the monitor templates" on page 38

- "Results" on page 38

1. Background

   John is a performance engineer working with HP Web Tours. He would like to design a

performance test for the application.

As a first step, he would like to model the application in ALM Performance Center so that he can keep track of the topology of his application under test. Using this model, he can benefit from the monitoring and online view features that the topology feature offers.

2. Create the topology and design the outline

a. On the ALM sidebar, under **Performance Center**, John selects **Topologies** to open the Topology module, and clicks the **New Topology** [*] button to create a new topology. He calls the topology **WebTours**, and enters the details of the SiteScope server with which the application will interact for monitoring purposes.
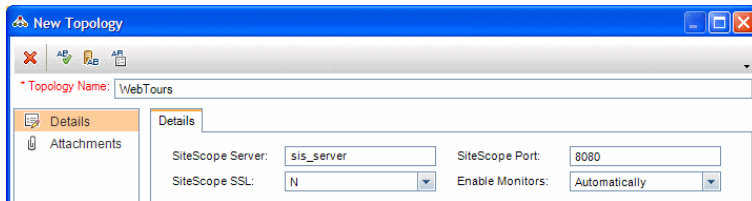
When John clicks **OK**, the Topology Designer window opens, displaying the Topology canvas which, at this stage, is empty.

b. John's Web Tours application comprises the following components: A Web server, an application server, and a database server. The user accesses the application through a client workstation.

In the Topology Designer window, from the palette in the left, John drags the nodes representing these components onto the Topology canvas, and changes their captions to names that are relevant to the components they represent.

John drags the following nodes:

Palette Category	Component	New Caption
Web Servers	Microsoft IIS	Web Server
Application	Microsoft ASP Server	Application Server
Database	Microsoft SQL Server	Database Server
Miscellaneous	Workstation	Client
Miscellaneous	User	User
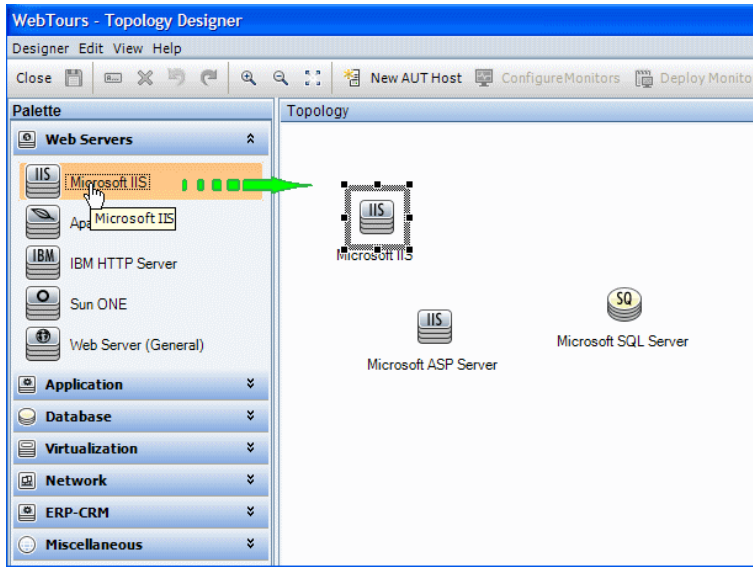
c. John connects the application server to the Web server by clicking the application server (ensuring that it is not selected) and dragging the cursor over to the Web server.

Similarly, he connects the application server to the database server, the client workstation to the Web server, and the user to the client.
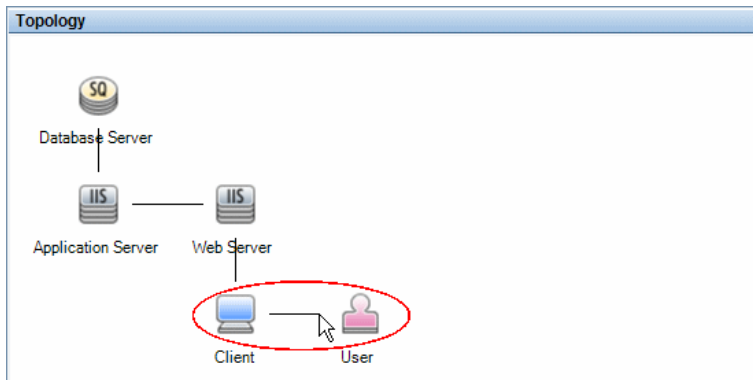
3. Add the AUT hosts

The AUT hosts are the physical machines that host the relevant components of the application under test.

On the Topology Designer toolbar, John clicks **New AUT Host**, and enters the name and details of the machine that hosts the database server:
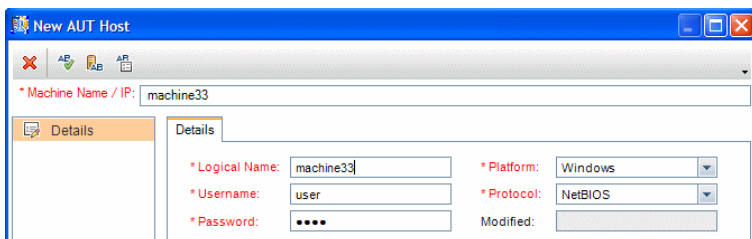
John then adds the AUT host that hosts both the application and Web servers.

Tip:

- Alternatively, if John had an Excel file listing the AUT hosts in his system, he could have imported the list of AUT hosts to ALM. For details, refer to the *HP ALM Lab Management Guide*.

- John can view the list of AUT hosts in the **AUT Hosts** tab by clicking **AUT Hosts** at the bottom of the Palette tab.

4. Define the component properties

For successful integration with SiteScope, John needs to ensure that the properties for each component are defined correctly.

John selects each component and, in the **Properties** pane in the top right corner of the Topology Designer window, he provides the relevant properties. The properties differ from one type of component to another.

Tip: A description for each property is displayed in the lower area of the Properties pane, and helps John to understand what information to provide for each property.

For example, for the database server, John selects **machine33** from the **AUT Host** drop-down list, and accepts the default values for all of the other properties. Then he provides the relevant details for the application and Web servers.
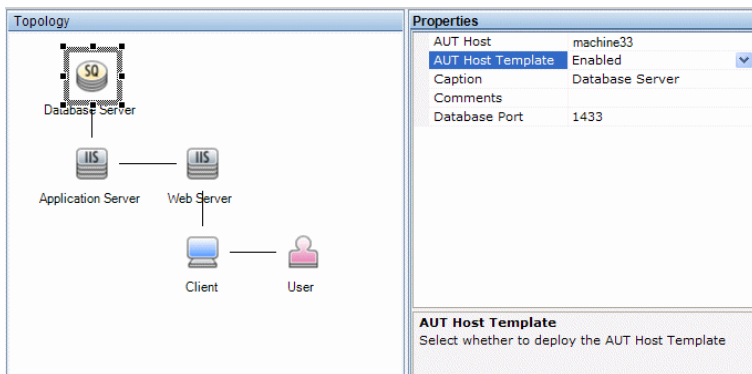
5. Deploy the monitor templates

John selects the three servers and clicks **Deploy Monitor Templates**. ALM creates a monitor group in SiteScope for each of the selected components, and deploys the relevant system-defined monitor templates for each component. Because the AUT Host Templates property is enabled, the templates for the actual AUT host are deployed as well.
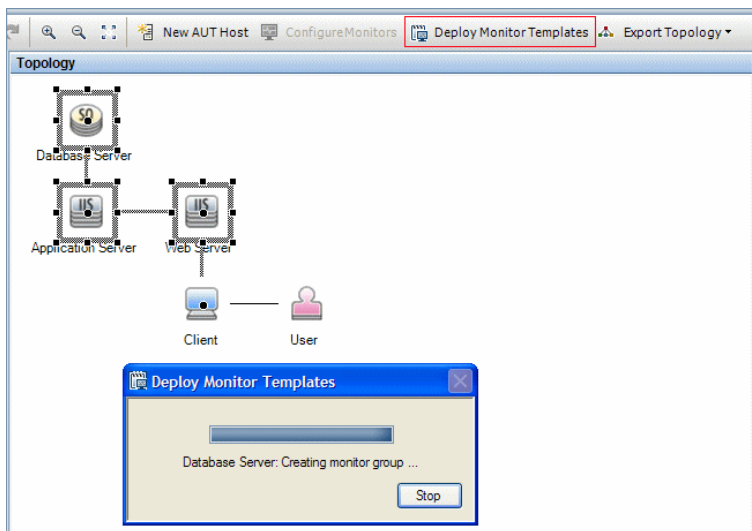
> **Tip:** If John wants to view or modify these monitors, he can do so by clicking **Configure Monitors** on the toolbar, which opens HP SiteScope and displays the monitor trees that were created for each component.

6. Results

John saves the topology and closes the Topology Designer window. He selects this topology when designing the performance test for the Web Tours application. When he runs the test, he can view the SiteScope monitor activity on the relevant components in the application in the Performance Test Run page.

Topologies User Interface

This section includes:

Topologies Module

This module lists the topologies that you have defined.

To access	On the ALM sidebar, under **Performance Center**, select **Topologies**.
Important information	After you have designed a topology for your performance test, you must associate it with your test. For details about associating a topology with a test, see "Performance Test Designer > Topology Tab" on page 46.
Relevant tasks	"How to Design Topologies" on page 31
See also	"Topologies Overview" on page 31

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
	New Topology Folder. Enables you to create a topology folder.
	New Topology. Enables you to create a new topology.
	Opens the Topology Designer window, enabling you to design topologies. For details, see "Topology Designer Window" on page 44.
	Delete. Enables you to delete the selected topologies.

UI Elements	Description
[cut/paste icons]	**Cut/Paste.** Enables you to cut and paste the selected topology from one topology folder to another.
[refresh icon]	**Refresh All.** Refreshes the page so that it displays the most up-to-date information.
[filter icon]	**Set Filter/Sort.** Enables you to filter and sort the topologies. Any currently applied filters or sorting orders are displayed below the toolbar. For more details, see the *HP Application Lifecycle Management User Guide*.
[attachment icon]	**Attachments.** Enables you to add attachments that provide additional information about the topology. For more details, see the *HP Application Lifecycle Management User Guide*.
<Topologies tree>	Located on the left side of the window, organizes and displays your topologies hierarchically.
Preview tab	Displays a preview of the topology selected in the Topology tree. • **Properties pane.** Displays general details about a node selected in the topology on the left. If an AUT host is configured on the node, the host's details are displayed as well. • **Overview pane.** Displays a full overview of the topology structure.
Details tab	Displays the details of the selected topology. For details, see "Topology Details Dialog Box" on page 42.
Attachments tab	Lists attachments that provide additional information about the currently selected topology. For details, see the *HP Application Lifecycle Management User Guide*.
Dependencies tab	Displays dependency relationships that exist between entities. For more information, see the *HP Application Lifecycle Management User Guide*.
History tab	Lists changes made to the selected topology. For more details, see the *HP Application Lifecycle Management User Guide*.

Topologies Module Fields

This section describes the Topologies module fields:

Field (A-Z)	Description
Created by	The user who created the topology.
Creation Date	The date and time the topology was created.

Field (A-Z)	Description
Enable Monitors	Always enables SiteScope monitors, or enables them automatically during monitor configuration and performance test runs.
Modified	The date and time the topology was last modified.
Modified by	The user who last modified the topology.
SiteScope Port	The port defined for SiteScope during installation of SiteScope. **Default value:** • Non-SSL: 8080 • SSL: 8443 For details, see the section about installing SiteScope for Performance Center in the *HP ALM Performance Center Installation Guide*.
SiteScope Server	The name of the SiteScope server.
SiteScope SSL	Indicates whether or not SiteScope uses SSL.
Topology Name	A name for the topology.

New Topology Dialog Box
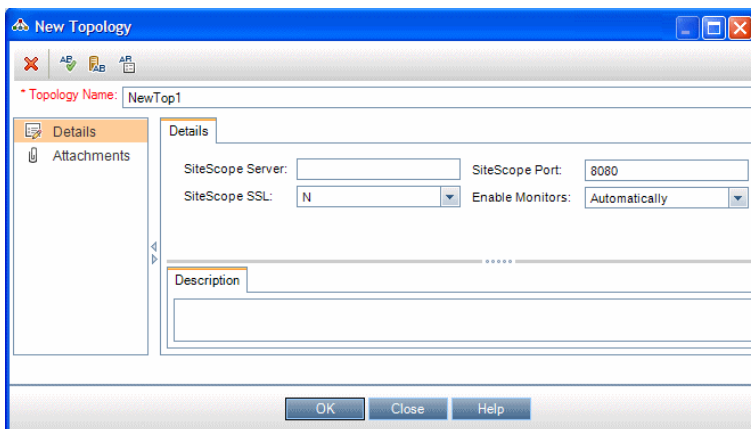
To access	On the ALM sidebar, under **Performance Center**, select **Topologies**. Click the **New Topology** button.

Relevant tasks	"How to Design Topologies" on page 31
See also	"Topologies Overview" on page 31

User interface elements are described below:

UI Elements	Description
![icon]	**Clear All Fields.** Clears the data.
![icon]	**Spell Check.** Checks the spelling for the selected word or text box.
![icon]	**Thesaurus.** Displays a synonym, antonym, or related word for the selected word.
![icon]	**Spelling Options.** Enables you to configure how to check the spelling.
Topology Name	The name of the topology.
Details	Enables you to enter the details of the selected topology. Required fields are marked with an asterisk (*) and are displayed in red. For details, see "Topologies Module Fields" on page 40.
Attachments	Lists attachments that provide additional information about the currently selected topology. For details, see *HP Application Lifecycle Management User Guide*.

Topology Details Dialog Box

This dialog box enables you to view topology details.

To access	1. On the ALM sidebar, under **Performance Center**, select **Topologies**.
	2. Select a topology in the Topology tree, and click the **Attachments** [📎] button. Then click **Details**.
Relevant tasks	"How to Design Topologies" on page 31
See also	"Topologies Overview" on page 31

User interface elements are described below:
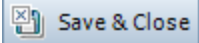
UI Elements	Description
[◁◁ ◁ ▷ ▷▷]	**First/Previous/Next/Last Entity.** Enables you to browse through the list of topologies.
[AB✓]	**Spell Check.** Checks the spelling for the selected word or text box.
[AB]	**Thesaurus.** Displays a synonym, antonym, or related word for the selected word.
[AB]	**Spelling Options.** Enables you to configure how to check the spelling.
Topology Name	The name of the topology.
Details	Displays the details of the selected topology. For more details, see "Topologies Module Fields" on page 40.
Attachments	Lists attachments that provide additional information about the currently selected topology. For details, see the *HP Application Lifecycle Management User Guide*.
Dependencies	Displays dependency relationships that exist between entities. For more information, see the *HP Application Lifecycle Management User Guide*.
History	Lists changes made to the selected topology. For more details, see the *HP Application Lifecycle Management User Guide*.
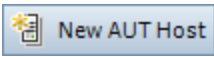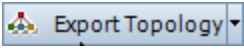
Topology Designer Window
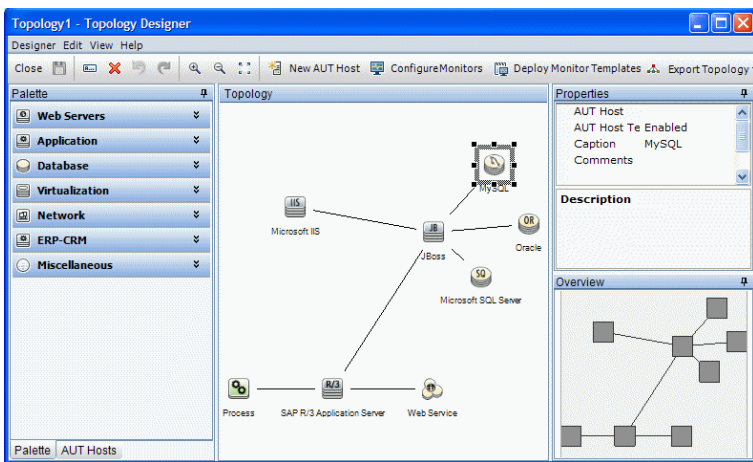
To access	On the ALM sidebar, under **Performance Center**, select **Topologies**. In the tree, select a topology, and click ![Design Topology] .
Important information	After you have designed a topology for your performance test, you must select it for your test. For more details, see "Performance Test Designer > Topology Tab" on page 46.
Relevant tasks	"How to Design Topologies" on page 31
See also	"Topologies Overview" on page 31

User interface elements are described below:

UI Elements	Description
![Close]	Enables you to close the Topology Designer window.
![Save & Close]	Enables you to save the topology and close the Topology Designer.
![Save icon]	**Save Topology.** Enables you to save your topology.
![Rename icon]	**Rename.** Enables you to rename the node selected on the canvas.
![Delete icon]	**Delete.** Enables you to delete the nodes selected on the canvas.
![Undo/Redo icons]	**Undo/Redo.** Enables you to undo or redo the previous action.

UI Elements	Description
Zoom icons	**Zoom into the canvas/Zoom out of the canvas.** Enables you to zoom in and out of the canvas.
Fit to screen icon	**Fit to screen.** Enables you to fit the whole topology design to the current screen size.
New AUT Host	Opens the New AUT Host dialog box, enabling you to add a new AUT host. For details, refer to the *HP ALM Lab Management Guide*. **Tip:** If you have a list of AUT hosts set up in an Excel file, you can import this list instead of adding the hosts one by one. For details, refer to the *HP ALM Lab Management Guide*.
ConfigureMonitors	Opens the Configure Monitors dialog box, enabling you to manually configure SiteScope monitors on the selected node. For details about creating SiteScope monitors, see the *HP SiteScope User Guide*. **Note:** When configuring monitors for these components in SiteScope, the value for **Monitor Run Settings > Frequency** should be changed to a more suitable value, such as 5 - 15 seconds.
Deploy Monitor Templates	Opens the Deploy Monitor Templates dialog box, enabling you to configure SiteScope monitors on the selected node automatically by deploying a template monitor set.
Export Topology	Enables you to export the whole area of the topology, or only the visible region of the topology to an image file.
Palette tab	Enables you to select components to add to the canvas. The palette includes various types of server categories, as well as a Miscellaneous category. This category includes nodes that are not necessarily AUT-specific but that complete the topology design, such as a user or a client workstation.
AUT Hosts tab	Displays all AUT hosts defined in the projects AUT host pool.
Topology canvas	Provides a canvas where you can lay out the topology by dragging components/server nodes and linking them to each other.
Properties pane	Enables you to define properties for the node selected on the canvas. The lower section of the Properties pane displays a description of the selected property.
Overview pane	Displays an overview of the topology's structure.

Performance Test Designer > Topology Tab

This tab enables you to select a topology for a performance test.

To access	1. On the ALM sidebar, under **Testing**, select **Test Plan**. 2. Right-click a performance test in the test plan tree and select **Edit Test**. 3. In the Performance Test Designer window, click the **Topology** tab.
Important information	You design topologies in the Topologies module. After you have designed topologies, you can select one of them for a performance test.
Relevant tasks	• "How to Design a Performance Test" on page 63 • "How to Design Topologies" on page 31
See also	"Topologies Overview" on page 31

User interface elements are described below:

UI Elements	Description
Select Topology	Opens the Topologies tree in the right pane, enabling you to select a topology for the test.
Remove Topology	Enables you to remove the selected topology.
🔍	**Zoom in**. Enables you to zoom into the displayed topology.
🔍	**Zoom out.** Enables you to zoom out of the displayed topology.

UI Elements	Description
	Fit to panel. Enables you to fit the topology to the size of the Topology pane.
Topologies tree	Opens when you click **Select Topology**, enabling you to select a topology for the test. Expand the Topologies tree, select a topology, and click to move it to the Topology pane on the left. To refresh the tree, click .
Topology pane	Displays the selected topology.

Chapter 5: Monitor Profiles

This chapter includes:

Monitor Profiles Overview

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

For details about creating monitor profiles, see "How to Create and Configure Monitor Profiles" below.

How to Create and Configure Monitor Profiles

This task describes how to create and configure a monitor profile.

> **Note:** This task is part of a higher-level task. For details, see "How to Manage Testing Assets" on page 23.

To learn more about monitor profiles, see "Monitor Profiles Overview" above.

This task includes the following steps:

- "Prerequisites" below

- "Create the monitor profile test resource type" on the next page

- "Add monitors to the monitor profile" on the next page

1. Prerequisites

   To use the following monitors, you must first install or configure monitoring components on the server machine. For task details about configuring the monitoring components, see the specific monitoring sections listed below.

   - **Citrix.** For task details, see "How to Set up the Citrix Monitoring Environment" on page 319.

   - **J2EE & .NET.** For task details, see "How to Enable and Configure J2EE/.NET Diagnostics" on page 161.

   - **Network Delay.** For task details, see "How to Set Up the Network Monitoring Environment" on page 286.

   - **Oracle.** For task details, see "How to Set Up the Oracle Monitoring Environment" on page 299.

   - **UNIX.** For task details, see "How to Set up the UNIX Monitoring Environment" on page 280.

2. Create the monitor profile test resource type

   You create test resources from the Test Resources module. For task details, see the *HP Application Lifecycle Management User Guide*.

3. Add monitors to the monitor profile

   a. In the Test Resources module, select a monitor profile, select the **Monitors Configuration** tab, and then click the **Add Monitor** button ▣. In the Add New Monitor page that opens, select the monitor that you want to run.

   b. In the Edit Monitor page, enter the required information and select the counters that you want to monitor. The Edit Monitor page varies depending on which monitor type you select:

      ○ For user interface details for Windows Resources, UNIX, Apache, MS IIS, MS ASP, Citrix, SQL, or Oracle, see "Edit Monitors Dialog Box" on page 53.

      ○ For SNMP monitor user interface details, see "Edit SNMP Monitors Dialog Box" on page 55.

      ○ For SiteScope monitor user interface details, see "Edit SiteScope Monitors Dialog Box" on page 55.

      ○ For Network Delay Time monitor user interface details, see "Edit Network Delay Time Monitors Dialog Box" on page 56.

Monitor Profiles User Interface

This section includes:

Monitors Configuration Page

This page enables you to add and edit monitors that are part of a monitor profile.

Monitor Profile: Mon1		
Monitor	Server	Counter
Windows Resources		
	pc11host1	
		% Processor Time (Processor _Total)
		% User Time (Processor _Total)
		% Privileged Time (Processor _Total)
	pc11host2	
		C2 Transitions/sec (Processor _Total)
		C3 Transitions/sec (Processor _Total)
		DPC Rate (Processor _Total)
		% User Time (Processor _Total)
		% Privileged Time (Processor _Total)
		% Processor Time (Processor _Total)
	pc11host3	
		% User Time (Processor 0)
		% Processor Time (Processor 0)
		% Privileged Time (Processor 0)
		Interrupts/sec (Processor 0)
		% DPC Time (Processor 0)
		% Interrupt Time (Processor 0)
		DPCs Queued/sec (Processor 0)
		DPC Rate (Processor 0)
		% Idle Time (Processor 0)

To access	Use one of the following: ● In the Test Resources module, select a monitor profile in the test resource tree and click the **Monitors Configuration** tab. ● In the Performance Test Designer, click the **Monitors** tab, and then click **View Selected**.
Relevant tasks	● "How to Create and Configure Monitor Profiles" on page 49. ● "How to Manage a Performance Test Run" on page 200.

User interface elements are described below:

UI Elements	Description
	Add Monitor. Opens the Add New Monitor page, enabling you to select which monitors to run in the monitor profile.
	Edit Monitor. Enables you to edit the selected monitor.
	Delete Selected Item. Deletes the selected item from the monitor profile.
	Refresh Monitor List. Refreshes the monitors list.
Counters	The counters that are being monitored.
Monitor	The name of the monitor.
Server	The server whose resources are being monitored.

Add New Monitors Page

This page enables you to select the monitor type to add to a monitor profile.

To access	Use one of the following: • In the Test Resources module, select a monitor profile in the test resource tree and click the **Monitors Configuration** tab. Then click the **Add Monitor** button . • In the Run-Time Monitors dialog box, click the **Add Monitor** button . For more information, see "Monitor Profile Content Dialog Box" on page 228.
Relevant tasks	• "How to Create and Configure Monitor Profiles" on page 49 • "How to Manage a Performance Test Run" on page 200

User interface elements are described below:

UI Elements	Description
• **Windows Resources** • **Unix Resources** • **Apache** • **MS IIS** • **MS ASP** • **Citrix Server** • **SQL Server** • **Oracle**	Enables you to select the specific counters for this monitor type. For more information, see "Edit Monitors Dialog Box" below.
SNMP	Opens the Edit Monitors Page, which enables you to select the specific counters that you want to monitor for this monitor type. For more information, see "Edit SNMP Monitors Dialog Box" on page 55.
SiteScope	Opens the Edit Monitors Page, which enables you to select the specific counters that you want to monitor for this monitor type. For more information, see "Edit SiteScope Monitors Dialog Box" on page 55.
Network Delay Time	Opens the Edit Monitors Page, which enables you to select the specific counters that you want to monitor for this monitor type. For more information, see "Edit Network Delay Time Monitors Dialog Box" on page 56.

Edit Monitors Dialog Box

This dialog box enables you to define the server whose resources you want to monitor, and to select the counters to monitor.

To access	In the Test Resources module, select a monitor profile in the test resource tree and click the **Monitors Configuration** tab. Click the **Add Monitor** ✳ button, and then select one of: Windows Resources, UNIX Resources, Apache, MS IIS, MS ASP, Citrix, SQL, Oracle.

Important information	This dialog box contains information relevant for the following monitor types: Windows Resources, UNIX Resources, Apache, MS IIS, MS Active Server Pages, Citrix, SQL, Oracle
Relevant tasks	"How to Create and Configure Monitor Profiles" on page 49

User interface elements are described below:

UI Elements	Description
Get Counters	Click to display a list of available counters.
Available Counters	A list of available counters for the selected monitor.
Password	The monitored server's password, if relevant.
Port	The port number of the Apache server. **Note:** To monitor an Apache server through a firewall, use the Web server port (by default, port 80). **Available for:** Apache
Selected Counters	A list of selected counters for the monitor.
Server	The name or IP address of the server whose resources you want to monitor.
URL (Apache only)	The Server statistics information URL. To verify the statistics information URL, try to view it through the browser using the following format: `http://<server_name/IP address>:<port_number>/server-status?auto` For example: `http://stimpy:80/server-status?auto`. **Format:** Enter the server statistics information URL, without the server name. **Default value:**`/server-status?auto` **Note:** The default port number and URL can vary from one server to another. Consult your Web server administrator. **Available for:** Apache
User Name	The monitored server's user name, if relevant.

Edit SNMP Monitors Dialog Box

This dialog box enables you to define the SNMP server whose resources you want to monitor, and to select the counters to monitor.

To access	In the Test Resources module, select a monitor profile in the test resource tree and click the **Monitors Configuration** tab. Click the **Add Monitor** ✳ button, and then select **SNMP**.
Relevant tasks	"How to Create and Configure Monitor Profiles" on page 49

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
Get Counters	Click to display a list of available counters.
\<choose counters area\>	Displays a list of available counters. **Default:** Displays all nodes of the SNMP objects in a tree-level hierarchy.
Concatenate SNMP Levels	For SNMP object nodes with ten or more levels, select to display the sub-levels as a single string, separated by periods (.).
Server	Enter the name or IP address of the server to monitor. **Note:** Performance Center connects to default SNMP port 161. To use a different port number, specify the machine name in the following format: `<server name>:<port number>`

Edit SiteScope Monitors Dialog Box

This dialog box enables you to define the SiteScope server whose resources you want to monitor, and to select the counters to monitor.

To access	In the Test Resources module, select a monitor profile in the test resource tree and click the **Monitors Configuration** tab. Click the **Add Monitor** ✳ button, and then select **SiteScope**.
Relevant tasks	"How to Create and Configure Monitor Profiles" on page 49

User interface elements are described below:

UI Elements	Description
Get Counters	Click to display a list of available counters.
Password	When **Use Account** is selected, enter the relevant password.
Port	The SiteScope port. **Default:** 8888
Server	The SiteScope server name.
Use Account	Select when SiteScope is working in secure mode, which requires authentication. Enter the SiteScope account name, user name and password in the corresponding fields.
Use HTTPS	Specify if you are using a secure HTTP connection.
User Name	When **Use Account** is selected, enter the relevant user name.

Edit Network Delay Time Monitors Dialog Box

This dialog box enables you to define the Network Delay Time server whose resources you want to monitor, and to select the counters to monitor.

To access	In the Test Resources module, select a monitor profile in the test resource tree and click the **Monitors Configuration** tab. Click the **Add Monitor** ✳ button, then select **Network Delay Time**.
Relevant tasks	

User interface elements are described below:

UI Elements	Description
Use Defaults	Uses the default values.
Destination Machine	The name of the machine at the final destination of the path you want to monitor. **Note:** If the destination machine is **localhost**, type the local machine's name and not **localhost**.

UI Elements	Description
Monitor Frequency	**Send next packet X milliseconds after receipt of previous packet.** Select the number of milliseconds the monitor should wait between receiving a packet and sending out the next packet. If you have a long, steady load test, you can increase the interval by several seconds. **Default:** 3000 milliseconds
Monitor Settings	• **Send Request Using X protocol.** Select the relevant protocol. It is recommended that you keep the default protocol. In Windows, the default is **TCP**, and in UNIX, the default is **UDP**. • **Send request to port X.** Enter the port number being used by the network path. • **Enable display of network nodes by DNS names.** Select to view the DNS name of each node along the network path, in addition to its IP address. Note that selecting this option decreases the speed of the Network monitor.
Monitoring Packet Retries	• **Wait Xseconds for packet to return before retrying.** Select the maximum number of seconds that the monitor should wait for a packet to return before it retries to send the packet. **Default:** 3 seconds. If your network is very large and loaded (an internet connection with a low capacity), increase the value by several seconds. If you have a small network (such as a LAN), decrease the value. • **Number of retries.** Select the number of times the Network monitor should try resending a packet to a node if the packet is not initially returned. **Default:** 0
Platform	The platform on which the machine runs.

UI Elements	Description
Source Machine	The name of the source machine from which you want the network path monitoring to begin. **Note:** To run the Network Delay Monitor when there are firewalls between the Performance Center Host machine and the source machine, type the server name or IP address of the source machine according to the format: <MI Listener machine>:<source machine local key> Where `source machine local key` is the unique key that you chose when configuring the Performance Center agent on the source machine. **Example** 12.12.12.3:vds For more information about working with firewalls in Performance Center, see the section about firewalls in the *HP ALM Performance Center Installation Guide*.
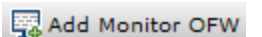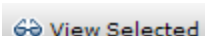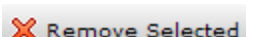
Performance Test Designer > Monitors Tab

This tab enables you to select monitor profiles and monitor-over-firewall agents to use in your performance test.

To access	1. On the ALM sidebar, under **Testing**, select **Test Plan**. 2. Right-click a performance test in the test plan tree and select **Edit Test**. 3. In the Performance Test Designer window, click the **Monitors** tab.
Important information	You must have monitor profiles defined before you can select them for the test.
Relevant tasks	• "How to Design a Performance Test" on page 63 • "How to Create and Configure Monitor Profiles" on page 49
See also	"Monitor Profiles Overview" on page 49

User interface elements are described below:

UI Elements	Description
Add Monitor Profile	Opens the Monitor Profiles tree in the right pane, enabling you to select a monitor profile for the test.
Add Monitor OFW	Opens the Monitors Over Firewall tree in the right pane, enabling you to select a monitor-over-firewall agent for the test.
View Selected	Opens a window that displays all of the measurements of the selected monitor profile.
Remove Selected	Removes the selected monitor profile or monitor-over-firewall agent from the test.
Associated Monitors grid	Displays the monitors and monitor-over-firewall agents selected for the test.
Monitor Profile Tree / Monitor Over Firewall Tree	Enables you to select a monitor profile or monitor-over-firewall agent for the test. Expand the Resources tree, select a monitor profile or monitor-over-firewall agent, and click ◁ to move it to the Associated Monitors grid on the left.

Part 3: Performance Test Design

Chapter 6: Performance Test Design - Introduction

This chapter includes:

Performance Test Design Overview

When you design a performance test you create the test, define a workload for the test and, if desired, associate a topology and monitor profiles which provide a diagram of the application under test.

You can also enable a diagnostics module to collect diagnostics data during the test run.

Service Virtualization: Your test can run simulated, virtualized services instead of actual services, for example, if the actual services involve additional costs or if the services are inaccessible at the time you run the performance test.

Performance Test Design Best Practices

Before you start with designing a performance test, it is recommended to:

- Create scripts for your test in the relevant application (VuGen scripts, QuickTest tests, Service Test tests), and upload them to ALM. For details, see the relevant User Guide.

- Design topologies of your application under test. For details, see "Topologies" on page 30.

- Configure the monitor machines or monitor-over-firewall agents that you want to use to monitor the test run, and define monitor profiles for these monitors. For details, see "Monitor Profiles" on page 48.

- To enable diagnostic modules to collect diagnostics data from the test run, you must set up the relevant diagnostics components (server/mediators). For details, refer to the *HP ALM Lab Management Guide*.

- To use simulated services during your test run instead of loading actual services, create your virtualized services in HP Service Virtualization Designer. For details on creating projects that contain virtualized services, see the *HP Service Virtualization User Guide*.

How to Design a Performance Test

This task describes how to design a performance test.

> **Note:** This task is part of a higher-level task. For details, see "How to Conduct a Performance Test" on page 18.

To learn more about performance test design, see "Performance Test Design Overview" above.

This task includes the following steps:

- "Prerequisites" below

- "Create a new performance test" below

- "Design a workload for the test" on the next page

- "Integrate virtualized services - Optional" on the next page

- "Select a topology for the test - Optional" on the next page

- "Select monitor profiles to monitor the test - Optional" on page 66

- "Enable and configure diagnostics - Optional" on page 66

- "Define service level agreements for the test - Optional" on page 66

- "Results" on page 66

1. Prerequisites

   - Make sure the relevant scripts/tests have been uploaded/saved to ALM. You can use VuGen scripts for performance testing, as well as QuickTest (UFT GUI Tests) and Service Test tests.

     ○ VuGen scripts: For details on uploading VuGen scripts, see "Upload VuGen Scripts Dialog Box" on page 28.

     ○ QuickTest tests: For details on saving QuickTest tests (UFT GUI Tests) to ALM, see the *HP Unified Functional Testing User Guide*.

     ○ Service Test tests: For details on saving Service Test tests (API Tests) to ALM, see the *HP Service Test User Guide* or the information about API testing in the *HP Unified Functional Testing User Guide*.

   - Under **Lab Resources**, select **Testing Hosts** and make sure that there is at least one Controller, one load generator, and one data processor in the host pool of your project. If not, contact your administrator to add them.

   - For optional pre-design best practices, see "Performance Test Design Best Practices" on the previous page.

2. Create a new performance test

   - **From ALM:** On the ALM sidebar, under **Testing,** select **Test Plan**. In the Test Plan Tree,

     select the **Subject** root folder, click **New Folder** , and rename the folder that is added to the tree. Right-click the new folder, and select **New Test**. Fill in the fields in the New Test dialog box. For details, see the *HP Application Lifecycle Management User Guide*. In particular, in the **Type** box, select **PERFORMANCE-TEST**.

- **From My Performance Center:** Select **Perspective> Test Plan.** In the Test Plan Tree,

  select the **Subject** root folder, click **New Folder** [icon] , and rename the folder that is added to

  the tree. Click **New Test** [icon] . Fill in the fields in the Create New Performance Test dialog
  box. For more details, see "Test Plan Page" on page 390.

3. Design a workload for the test

   Designing a workload involves creating Vuser groups, distributing Vusers among the Vuser
   groups, assigning hosts to the Vuser groups, and defining a run schedule for the test. For task
   details, see "How to Define a Performance Test Workload" on page 78.

   > **Note:** Non-English national characters are not supported in group names.

4. Integrate virtualized services - Optional

   Configure and integrate virtualized services into the performance test. For task details, see "How
   to Add Virtualized Services to Performance Tests" on page 104.

   You can start adding projects that contain virtualization services to your performance test from the
   Performance Test Designer at any point in the design process, but we recommend adding projects
   after you have added relevant scripts to the test.

5. Select a topology for the test - Optional

   > **Note:** Before you can select a topology for a test, you must design the topology. To design
   > topologies, see "How to Design Topologies" on page 31.

In the Performance Center Designer's **Topology** tab, click **Select Topology** and select a topology for the test. For user interface details, see "Performance Test Designer > Topology Tab" on page 46.

6. Select monitor profiles to monitor the test - Optional

> **Note:** Before you can select monitors for a test, you must configure monitor machines and create monitor profiles. For details, see "How to Create and Configure Monitor Profiles" on page 49.
>
> Similarly, you must define monitor-over-firewall agents in the system before you can select them to monitor a test.

In the Performance Center Designer's **Monitors** tab, click **Add Monitor Profile** or **Add Monitor OFW**. The respective tree opens on the right. Select a monitor, and drag and drop it into the left pane.

For user interface details, see "Performance Test Designer > Monitors Tab" on page 58.

7. Enable and configure diagnostics - Optional

Enable and configure diagnostic modules to collect diagnostics data from the test run.

- For ERP/CRM diagnostics, see "How to Enable and Configure ERP/CRM Diagnostics" on page 161.

- For J2EE/.NET diagnostics, see "How to Enable and Configure J2EE/.NET Diagnostics" on page 161.

8. Define service level agreements for the test - Optional

Define service level agreements to measure performance metrics against performance goals. For details, see "How to Define Service Level Agreements" on page 146.

9. Results

When you save the test, it goes through a validation process. The test is valid only if it contains no errors. The result of the validation is stated at the bottom of the Test Designer window.
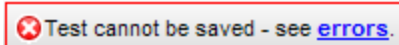
Click the link to open the Test Validation Results dialog box and view the details of the validation results. For user interface details, see "Test Validation Results Dialog Box" on page 74.

> **Note:** If you make changes to the test, and the test is linked to a timeslot, the timeslot is updated with these changes automatically.

Performance Test Design User Interface

This section includes:

Test Design / Summary / Preview Tab

The Test Design / Summary / Preview tabs display a detailed summary of a selected performance test.

Test Design Tab
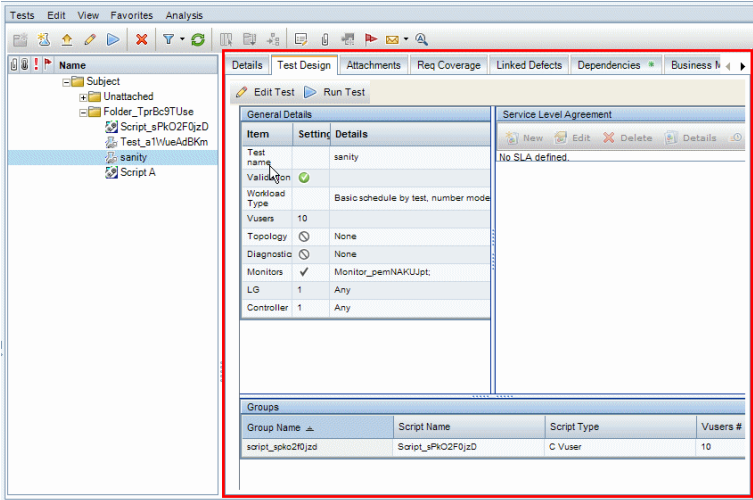
Summary Tab
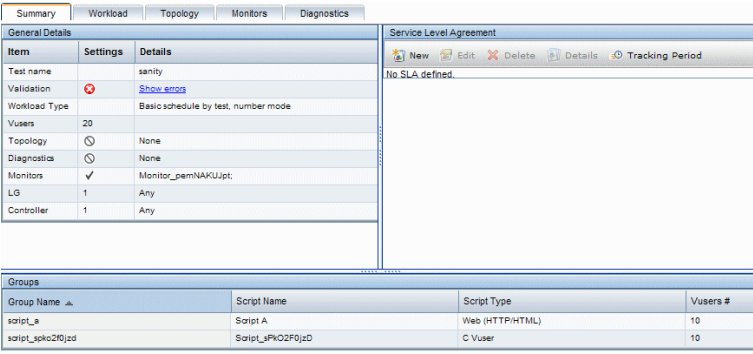
Preview Tab
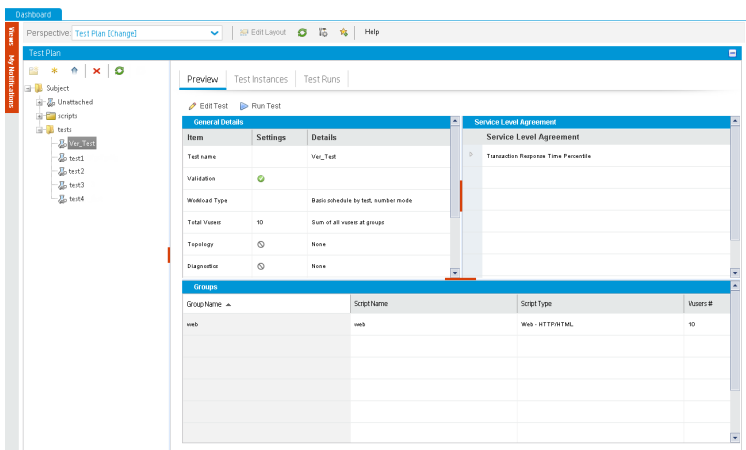
To access	**Test Design tab:**
	1. On the ALM sidebar, under **Testing**, select **Test Plan**.
	2. Select a performance test in the test plan tree and click the **Test Design** tab.
	Summary tab:
	1. On the ALM sidebar, under **Testing**, select **Test Plan**.
	2. Right-click a performance test in the test plan tree and select **Edit Test**.
	3. In the Performance Test Designer window, click the **Summary** tab.
	Preview tab:
	1. In My Performance Center, select **Perspective> Test Plan.**
	2. Click a performance test in the test plan tree.
See also	• "Performance Test Designer Window" on page 72
	• "Test Plan Page" on page 390
	• *HP Application Lifecycle Management User Guide*
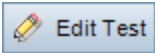
User interface elements are described below:

UI Elements	Description
Edit Test	Opens the Performance Test Designer window where you design performance tests. For details, see "Performance Test Designer Window" on page 72. **Not Available in:** Summary tab
Run Test	Enables you to run the test. For more details, see "Run Test Dialog Box" on page 220. **Not Available in:** Summary tab

General Details Pane

This pane displays general summary information about the test.

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description

\<Settings column icons>	• Indicates that there is an error in the test design.
	
	• Indicates that the test is valid and can run.
	
	• Indicates whether:
	
	  ▪ A topology is selected for the test
	
	  ▪ Monitors are selected for the test
	
	  ▪ Diagnostics are enabled for the test
	
	  ▪ IP Spoofing is enabled for the test

Test name	The name of the test.
Validation	Indicates whether the test is valid. If the test is not valid or there are notifications about the test, the **Details** column displays a link to the Test Validation Results dialog box which lists errors and messages related to the test. For details, see "Test Validation Results Dialog Box" on page 74.
Workload Type	The workload type selected for the test.
Vusers	The number of Vusers defined in the test.

UI Elements	Description
Topology	Indicates whether a topology is associated with the test, and if so, displays the relevant details.
Diagnostics	Indicates whether diagnostics are enabled for the test, and if so, displays the relevant details.
Monitors	Indicates whether monitor profiles are defined for the test, and if so, displays the relevant details.
IP Spoofer	Indicates whether IP spoofing is enabled for the test. For details, see "Test Options Dialog Box" on page 97.
Services Virtualization	Indicates whether service virtualization is on or off.
Controller/Load Generator	Displays the number of hosts selected for the test, and their properties.

Service Level Agreement Pane

This pane displays service level agreements (SLAs) that are defined for the test.

Important information	- You create, modify, and delete SLAs in the Summary tab. - In the Test Design tab you can only view a list of defined SLAs. - In the Preview tab you can only view a list of defined SLAs.
Relevant tasks	"How to Define Service Level Agreements" on page 146
See also	"Service Level Agreements Overview" on page 145

For user interface details, see "Service Level Agreement Pane" on page 151.

Groups Pane

This pane displays details about the Vuser groups defined in the test.

User interface elements are described below:

UI Elements	Description
Group Name	The name of the Vuser group.
Script Name	The name of the Vuser script associated with the Vuser group.
Script Type	The Vuser script type.

UI Elements	Description
Vusers #/%	The number/percentage of Vusers distributed to the Vuser group.

Performance Test Designer Window

This window enables you to define a performance test. Defining a performance test includes selecting scripts for the test, scheduling how many Vusers to run in each script and for how long to run them, choosing topologies and monitor profiles for the test, and enabling collection of diagnostics data for the test run.
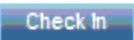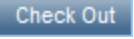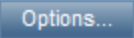
> **Version Control:** If your project is version-enabled:
>
> - To edit a test, you must check it out.
>
> - When you check out a test, only you can edit the test.
>
> - If the test is checked out by another user, you cannot check the test out as well. You can view the last checked in version in read-only mode.

To access	**From ALM:**
	1. On the ALM sidebar, under **Testing**, select **Test Plan**.
	2. Right-click a performance test in the test plan tree and select **Edit Test**.
	From My Performance Center:
	1. Select **Perspective> Test Plan**.
	2. Select a performance test in the test plan tree and click **Edit Test**.
Relevant tasks	"How to Design a Performance Test" on page 63
See also	• "Enabling and Configuring ERP/CRM and J2EE/.NET Diagnostics " on page 160
	• "Monitor Profiles" on page 48
	• "Topologies" on page 30
	• For version control enabled projects, see the *HP Application Lifecycle Management User Guide*.

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
Check In	Enables you to check in saved changes to a performance test to create a new, updated version available to other users. **Note:** Available for version control enabled projects only.
Check Out	Enables you to check out a performance test so that you can make changes to it. **Note:** Available for version control enabled projects only.
Undo Check Out	After checking out a test, this button enables you to undo the checkout and cancel your changes. **Note:** Available for version control enabled projects only.
Options...	Opens the Test Options dialog box, enabling you to set general Scheduler and testing options. For details, see "Test Options Dialog Box" on page 97.
Summary tab	Displays a summary of the test. For details, see "Test Design / Summary / Preview Tab" on page 68.

UI Elements	Description
Workload tab	Enables you to design a workload for the test. For details, see "Performance Test Designer > Workload Tab" on page 84.
Topology tab	Enables you to associate a topology with the test. For details, see "Performance Test Designer > Topology Tab" on page 46.
Monitors tab	Enables you to select monitors to monitor the test. For details, see "Performance Test Designer > Monitors Tab" on page 58.
Diagnostics tab	Enables you to select a diagnostics module to collect diagnostics data from the test. For details, see "Performance Test Designer > Diagnostics Tab" on page 163.
<Validation message>	When you save the test, this message displays the test validation result. If there are errors or messages, a link to the test validation results is displayed. ⊗ Test cannot be saved - see **errors**. For details, see "Test Validation Results Dialog Box" below.

Test Validation Results Dialog Box

This dialog box displays the validation results of your performance test.

To access	1. Use one of the following: ■ **From ALM:** On the ALM sidebar, under **Testing**, select **Test Plan**. Right-click a performance test in the test plan tree and select **Edit Test**. ■ **From My Performance Center:** Select **Perspective> Test Plan**. Select a performance test in the test plan tree and click **Edit Test**. 2. Use one of the following: ■ Click the validation link at the bottom of the Performance Test Designer window. ■ In the **Summary** tab, click the Validation link. **Note:** The validation link appears only if the test is invalid or there are messages about the test. If the test is valid and there are no messages, no validation link is displayed.
Important information	A performance test that is not valid cannot run.

Relevant tasks	"How to Design a Performance Test" on page 63
See also	"Test Design / Summary / Preview Tab" on page 68

User interface elements are described below:

UI Elements	Description
Level	The type of message: **Error** or **Warning**.
Details	Describes the error or warning.

Chapter 7: Defining Performance Test Workloads

This chapter includes:

Performance Test Workload Overview

When you create a performance test you need to define a workload for the test. Defining a workload involves selecting a type of workload for the test, creating Vuser groups that emulate groups of users running on the application, and configuring how they should behave during the test.

Workload Design Flow
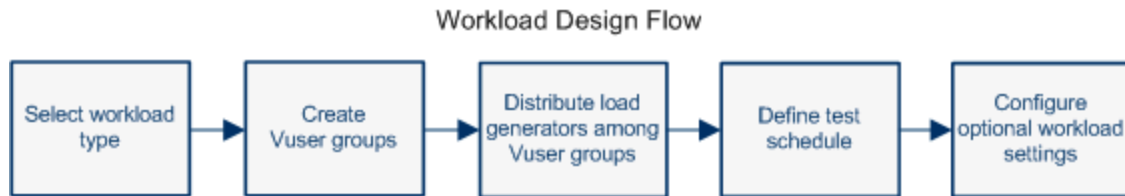
You select a workload depending on the type of schedule and schedule run mode you want to use to run your test, and depending on how you want to distribute the Vusers among the Vuser groups in your test.

For details on defining a workload for your performance test, see "How to Define a Performance Test Workload" on the next page.

This section also includes "Rendezvous Points" below.

Rendezvous Points

During a test run, you can instruct multiple Vusers to perform tasks simultaneously by using rendezvous points. A rendezvous point creates intense user load on the server, enabling you to measure server performance under load.

Suppose you want to measure the performance of an application when 10 Vusers perform a given task simultaneously. To make sure that multiple Vusers act simultaneously, you create a **rendezvous point** in the Vuser script. When Vusers arrive at a rendezvous point, they are held there by the Controller. The Controller releases the Vusers from the rendezvous either when the required number of Vusers arrives, or when a specified amount of time has passed.

For example, to test an online bank, you could create a test that contains two rendezvous points. The first rendezvous ensures that one thousand Vusers simultaneously deposit cash. The second rendezvous ensures that another thousand Vusers simultaneously withdraw cash. To measure how the server performs when only 500 Vusers deposit cash, you can set the release policy so that the Vusers are released when 500 Vusers arrive at the rendezvous.

You can configure rendezvous policies when defining the test workload. For task details, see "How to Define a Performance Test Workload" on the next page.

You can manually release Vusers waiting at a rendezvous point during a run. For task details, see "How to Manage a Performance Test Run" on page 200.

How to Define a Performance Test Workload

This task describes how to define a performance test workload.

> **Note:** This task is part of a higher-level task. For details, see "How to Design a Performance Test" on page 63.

To learn more about performance testing, see "Performance Test Workload Overview" on the previous page.

This task includes the following steps:

- "Prerequisite" below

- "Select a workload" below

- "Select a Controller" below

- "Create Vuser groups and distribute Vusers to the groups" on the next page

- "Distribute load generators among the Vuser groups " on the next page

- "Define a schedule for the performance test" on the next page

- "Configure test settings - Optional" on the next page

- "Define topology, monitoring, and diagnostics options" on page 81

1. Prerequisite

    Create a performance test. For details, see "How to Design a Performance Test" on page 63.

2. Select a workload

    a. **From ALM:** On the sidebar, under **Testing**, select **Test Plan**. Right-click a performance test in the test plan tree and select **Edit Test**. **From My Performance Center:** Select **Perspective> Test Plan**. Select a test and click **Edit Test**.

    b. In the Performance Test Designer window, click the **Workload** tab.

    c. Click the **Select Workload Type** button adjacent to the **Workload type** box, and select a type of workload for the test. The type of workload you choose determines the type of schedule by which the test will run, and how the Vusers will be distributed at runtime. For user interface details about the Workload Types dialog box, see "Workload Types Dialog Box" on page 93.

3. Select a Controller

Click the **Select Controller** button adjacent to the **Controller** box, and select a host to act as the Controller for the test. For user interface details about the Select Controller dialog box, see "Select Controller Dialog Box" on page 94.

4. Create Vuser groups and distribute Vusers to the groups

   a. In the Groups pane, select scripts from the Scripts Tree pane on the right to run in the test. If the Scripts Tree pane is not open, click the **Select Scripts** button.

   > **Tip:** You can select complete folders of scripts, or select multiple scripts while holding down the CTRL key on your keyboard.

   b. (Optional) For each selected script, a Vuser group is created in the Groups grid and is given, by default, the same name as the selected script. You can change the group name if desired.

   c. Distribute Vusers among the Vuser groups according to the Vuser distribution method you selected in the workload type. For details, see "How to Distribute Vusers Among Vuser Groups" on page 81.

   > **Note:** Non-English national characters are not supported in group names.

5. Distribute load generators among the Vuser groups

   Select a method by which to distribute the load generators among the Vuser groups, and specify which load generators to distribute to which groups.

   For details, see "How to Distribute Load Generators Among Vuser Groups" on page 116.

6. Define a schedule for the performance test

   Schedule how the Vuser groups are to run in the test. For details, see "How to Define a Schedule for the Performance Test" on page 131.

7. Configure test settings - Optional

   You can configure the following optional settings for your test:

Optional Test Setting	Description
Command line arguments	Sending command line arguments enables you to configure test settings without the need to manually define them in the UI. In the Groups pane, click the **Edit Command Line** button. For details, see **Edit Command Line** in the "Performance Test Designer > Workload Tab" on page 84.
Rendezvous Points	When you add Vuser groups to the test, their associated scripts are scanned for rendezvous points. To view and manage the rendezvous points, click the **View Rendezvous** button. For user interface details, see "Rendezvous Dialog Box" on page 95.
Runtime Settings Configuration	You can configure the runtime settings of uploaded Vuser scripts. Runtime settings are applied to Vusers when the script runs. To open the Runtime Settings dialog box, in the Groups pane toolbar, click the **Edit Runtime Settings** button. For user interface details, see "Edit Runtime Settings Dialog Box" on page 340.
Runtime Settings Duplication	You can copy runtime settings from one script in the test to other scripts of the same script type. In the Groups pane toolbar, click the **Duplicate Runtime Settings** button. For details, see **Duplicate Runtime Settings** in the "Performance Test Designer > Workload Tab" on page 84.
Network Virtualization	Network Virtualization enables you to emulate probable network effects over your network, thereby creating a more realistic performance test. To open the Network Virtualization Settings dialog box, in the Groups pane toolbar, select **Advanced > Newtwork Virtualization Settings**. For user interface details, see "Network Virtualization Settings Dialog Box" on page 254.
Services Virtualization	Instead of loading actual services, Service Virtualization enables you to use simulated services in your test run. To open HP Services Virtualization dialog box, in the Groups pane toolbar, select **Advanced > Services Virtualization**. For user interface details, see "HP Services Virtualization Dialog Box" on page 106.

Optional Test Setting	Description
PAL Reports	Enables you open a PAL production report. To open the Select PAL Report dialog box, select **Advanced > Open PAL Report**. For more details on PAL reports, see "PAL Reports Pane" on page 456
Analysis Template	Enables you to select a customized template for the analysis report of your performance test. To open the Analysis Template Options dialog box, select **Advanced > Analysis Template Options**. For user interface details, see "Analysis Template Options Dialog Box" on page 193
Terminal Services	When using manual load generator distribution, you can open terminal services sessions on the load generators, enabling you to run multiple GUI Vusers simultaneously on the same application. For details, see "Terminal Services Dialog Box" on page 180.

8. Define topology, monitoring, and diagnostics options

For task details, see "How to Design a Performance Test" on page 63.

How to Distribute Vusers Among Vuser Groups

This task describes how to distribute Vusers in a performance test among the Vuser groups. You distribute Vusers according to the Vuser distribution method you selected for the workload.

You can distribute the Vusers by number, by percentage (manually), or by percentage using the relative distribution method.

> **Note:**
>
> - In workloads with group schedules, you can distribute Vusers by number only.
>
> - This task is part of a higher-level task. For details, see "How to Define a Performance Test Workload" on page 78.

This task describes how to:

- "Distribute Vusers by number" on the next page

- "Distribute Vusers by percentage" on the next page

- "Distribute Vusers by percentage using relative distribution" on page 83

Distribute Vusers by number

Note: This procedure assumes that you selected **By number** when you selected the workload for the test. For user interface details, see "Workload Types Dialog Box" on page 93.

- **Basic schedule**: In the Performance Test Designer window, in the Groups grid, select a group, and in the **Vusers** column, enter the number of Vusers to allocate to that group.
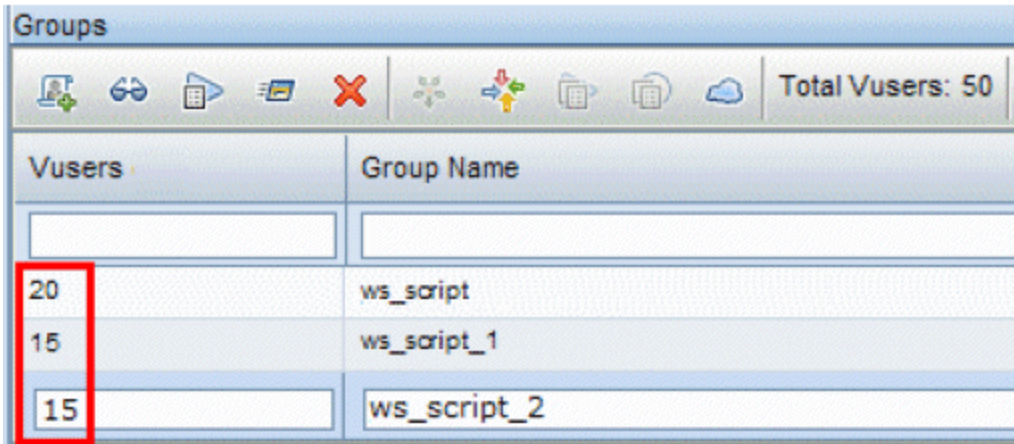
- **Real-world schedule:** You define the number of Vusers when you define the test schedule. For details, see "How to Define a Schedule for the Performance Test" on page 131.

  For both run modes, the total number of the Vusers assigned to all the Vuser Groups is displayed in the Groups pane toolbar.
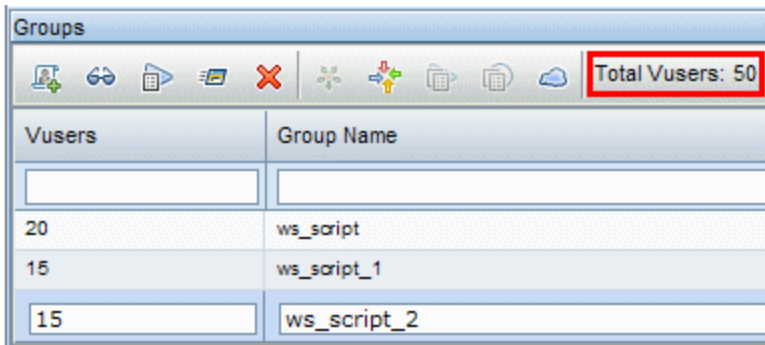
Distribute Vusers by percentage

Note: This procedure assumes that you selected **By percentage** when you selected the workload for the test. For user interface details, see "Workload Types Dialog Box" on page 93.

1. In the Performance Test Designer window, in the Groups grid, in the **Vusers-100%** column for each group, enter the percentage of the total number of Vusers to allocate to the group.

> **Note:** The total of all the groups' percentages must be exactly 100% for the test to be valid.

2. Allocate a total number of Vusers to run in the test:

- **Basic mode:** In the Groups pane, enter the number of Vusers in the **Total Vusers** box.

- **Real-world mode:** You define the number of Vusers when you define the test schedule. For details, see "How to Define a Schedule for the Performance Test" on page 131.

Distribute Vusers by percentage using relative distribution

In the Performance Test Designer window, in the Groups grid, click the **Relative Distribution** button to define a ratio by which to distribute the Vusers from each group. For user interface details, see **Relative Distribution** in the "Performance Test Designer > Workload Tab" on the next page.

Defining Performance Test Workloads User Interface

This section includes:

Performance Test Designer > Workload Tab

This tab enables you to define a workload for the test. You select a Controller for the test, scripts to run in the test, and load generators on which to run the Vusers. You also define a run schedule for the test.

To access	**From ALM:**
	1. On the ALM sidebar, under **Testing**, select **Test Plan**.
	2. Select a performance test in the test plan tree and click **Edit Test**.
	3. In the Performance Test Designer window, click the **Workload** tab.
	From My Performance Center:
	1. Select **Perspective> Test Plan**.
	2. Select a performance test in the test plan tree and click **Edit Test**.
	3. In the Performance Test Designer window, click the **Workload** tab.
Relevant tasks	"How to Define a Performance Test Workload" on page 78
See also	See "Groups Pane" on the next page for details about:
	• View Script dialog box
	• Edit Command dialog box
	• Relative Distribution dialog box
	• Duplicate Runtime Settings dialog box
	• Duplicate Scheduler Settings dialog box
	• Analysis Template Options dialog box

Workload Tab Common Area

User interface elements are described below:

UI Elements	Description
Workload Type	Displays the workload type for the test. Click [...] to open the Workload Types dialog box and select a type of workload for the test.
	For details, see "Workload Types Dialog Box" on page 93.

UI Elements	Description
Controller	Displays the Controller selected for the test. Click [...] to open the Select Controller dialog box and select a Controller for the test. For details, see "Select Controller Dialog Box" on page 94.

Groups Pane

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
Select Scripts	**Select Scripts.** Opens the Scripts Tree pane, enabling you to select scripts to run in your test. For details, see "Scripts Tree pane" on page 92.
👁	**View Script.** Opens the script selected in the Groups grid in a read-only window. **Versioning:** • As long as a script is checked in, the same version is displayed for all users. • If you have checked out the script, the script displayed is your own private copy of the script. If you make changes to the script, other users will not be able to see your changes until you check the script back in. Similarly, if other users check in changes to this script, you will not be able to see them as long as you have the script checked out. • If another user checks out the script, you will still see the latest checked-in version.
▷	**Edit Runtime Settings.** Opens the Runtime Settings dialog box for the selected script, enabling you to configure its runtime settings. To use the default settings, click **Use Defaults**. Vuser scripts have individual runtime setting defaults for VuGen and the Controller, to support the debugging environment of VuGen and the performance testing environment of the Controller. For more information, see "Runtime Settings Configuration" on page 334.

UI Elements	Description

	Edit Command Line. Opens the Command Line dialog box, enabling you to pass arguments to instruct the Controller how to behave. By passing arguments in the command line, you configure test settings without the need to manually define them in the user interface.
	
	• **Command line.** Type the name and value of the parameter you want to send using the format, **<Parameter_Name> <value>**.
	
	Note: For information about the command line parsing functions, or for details about including arguments on a command line, see the *HP LoadRunner Online Function Reference*, provided with HP Virtual User Generator.
	
	• **<Command line options>.** Select whether to:
	
	   ■ Apply the command line to the current script only
	
	   ■ Apply the command line to all the scripts in the test
	
	   ■ Add the command line to all the scripts in the test
	
	Note: You cannot pass arguments to Service Test tests.

	Delete Group. Deletes the selected Vuser group.

UI Elements	Description
	Relative Distribution. Opens the Relative Distribution dialog box, enabling you to provide a ratio by which ALM calculates the percentage of Vusers to distribute to each Vuser group. ● **Ratio.** The part of total number of Vusers to distribute to the corresponding Vuser group. ● **Group Name.** The name of the Vuser group. **Example:** To distribute 200 Vusers among the groups at a ratio of 1:1:3, type 1 for **group1**, 1 for **group2**, and 3 for **group3**. 20% of the Vusers are assigned to group1, 20% to group2, and 60% to group3. That is, 40 Vusers are assigned to group1, 40 Vusers to group2, and 120 Vusers to group3. <table><tr><th>Ratio</th><th>Group Name</th></tr><tr><td>1</td><td>group1</td></tr><tr><td>1</td><td>group2</td></tr><tr><td>3</td><td>group3</td></tr></table> **Note:** Enabled in percentage mode only.
	View Rendezvous. Opens the Rendezvous dialog box, enabling you to enable or disable rendezvous points, and set policies for how to treat Vusers when they arrive at a rendezvous point. For details, see "Rendezvous Dialog Box" on page 95.
	Duplicate Runtime Settings. Opens the Duplicate Runtime Settings dialog box, enabling you to select a source script, and copy its runtime settings to one or more scripts of the same type. **Note:** The source and destination scripts must be of the same script type.
	Duplicate Scheduler Settings. Opens the Duplicate Scheduler Settings dialog box, enabling you to select a source Vuser group, and copy its schedule settings to one or more Vuser group in the test. For details, see the instructions on how to copy group schedules in "How to Define a Schedule for the Performance Test" on page 131 **Available for:** Schedules by group only.

UI Elements	Description
Total Vusers	Displays the total number of Vusers distributed to all of the Vuser groups participating in the test. For details, see "How to Distribute Vusers Among Vuser Groups" on page 81.
LG Distribution	Enables you to select a method for assigning load generators to the Vuser groups in the test. • **Assign all to each group.** All of the automatch load generators are distributed to all of the participating Vuser groups. • **Assign manually.** Load generators are distributed manually. For details, see "Load Generator Distribution Overview" on page 115.
LG	Displays the number of automatch load generators selected for the test. **Note:** Available only if **Assign all to each group** is selected in the **LG Distribution** box.
	Automatch Load Generator Properties. Opens the Automatch Load Generator Properties dialog box, enabling you to specify properties for automatch load generators. For details, see "Automatch Load Generators Properties Dialog Box" on page 125.
	Assign Load Generators to Multiple Groups. Opens the Assign Load Generators to Multiple Groups dialog box, enabling you to assign one or more load generators—automatch or specific—to multiple Vuser groups at once. You can also use this dialog box to remove one or more load generators from multiple Vuser groups at once. For details, see "Assign Load Generators to Multiple Groups Dialog Box" on page 119. **Available for:** The **Assign manually** load generator distribution method. See "LG Distribution" above.
Advanced > Network Virtualization Settings	Opens the Network Virtualization Settings dialog box, enabling you to emulate probable Network Virtualization effects over your network, thereby creating a more realistic performance test. For details, see "Network Virtualization Settings Dialog Box" on page 254.

UI Elements	Description
Advanced > Services Virtualization	Opens the Configure Service Virtualization dialog box, enabling you to integrate virtualized services into your performance test. For user interface details, see "HP Services Virtualization Dialog Box" on page 106. For details on creating projects that contain virtualized services, see the *HP Service Virtualization User Guide*. For task details on using virtualized services in performance tests, see "How to Add Virtualized Services to Performance Tests" on page 104.
Advanced > Open PAL Report	Opens the Select PAL Report dialog box, enabling you to select a PAL production report. For more details on PAL reports, see "PAL Reports Pane" on page 456.
Advanced > Analysis Template Options	Opens the Analysis Template Options dialog box, enabling you to select a customized template for the analysis report of your performance test. For task details on using customized analysis templates, see "How to Customize Analysis Templates" on page 189.
<grid filters>	Located under each column name. Displays the filter that is currently applied to a column. If the filter box is empty, no filter is currently applied to the column. Type directly into the box and press ENTER to apply the filter.

UI Elements	Description
Groups grid	Displays the Vuser groups participating in the test. ● **Vusers.** (By Number mode) The number of Vusers distributed to the Vuser group. **Default:** 10 Vusers ● **Group Name.** The name of the Vuser group. ● **Script Name.** The name of the Vuser script associated with the Vuser group. When the group is selected, the script name turns into a link. To select a different script, click the script name and select a script. ● **Load Generators.** The load generators assigned to the Vuser group. ● **Script Type.** The Vuser script type. ● **Tag.** A tag for the Vuser group. Tagging enables categorization and easy identification of Vuser groups. **Examples:** ▪ If you have finished configuring runtime and Scheduler settings for the group, you could tag the group Done. For a group that is not yet done, you could tag TODO. ▪ Groups running against the Defects or Requirements modules, could be tagged DEF or REQ.

UI Elements	Description
Scripts Tree pane	Opens on the right when you click the **Select Scripts** button. Lists all the VuGen scripts, UFT GUI tests, and UFT API tests that have been uploaded to the project.
	Note: HP Unified Functional Testing (UFT) comprises the product formerly known as HP QuickTest Professional and the product known as HP Service Test.
	• Functionality provided by QuickTest is now known as GUI testing in UFT.
	• Functionality provided by Service Test is also known as API testing in UFT.
	Drag and drop one or more scripts from the tree into the Groups pane or select the scripts and click .
	Tip: You can select whole folders of scripts, or select multiple scripts while holding down the CTRL key on your keyboard.
	After selecting a script, the Scripts Tree pane closes by default.
	• To keep the Scripts Tree open, click the **Dock** button.
	• To enable the Scripts Tree to close automatically, click the **Undock** button.

Global Scheduler Pane

The Global Scheduler pane enables you to define a run schedule for your test. For details, see "Global Scheduler Pane" on page 136.
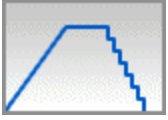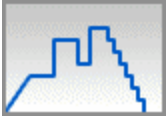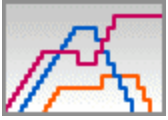
Workload Types Dialog Box

This dialog box enables you to select a type of workload for the performance test. The type of workload you choose determines the type of schedule by which the test will run, and how the Vusers will be distributed at runtime.

To access	1. In the Performance Test Designer window, click the **Workload** tab.
	2. Next to the **Workload type** box, click **Select Workload Type** ... .
Important information	If you change the workload, Scheduler settings are lost.
Relevant tasks	"How to Define a Performance Test Workload" on page 78
See also	• "Performance Test Workload Overview" on page 77
	• "Scheduling Performance Tests Overview" on page 129

User interface elements are described below:

UI Elements	Description
	Basic schedule, by test. Select this workload type to configure all the Vuser groups to run together on the same test schedule, in the basic run mode. Vusers can be distributed: ● **By number.** The Vusers are distributed by number. ● **By percentage.** The Vusers are distributed by percentage.
	Basic schedule by group. Select this workload type to configure each Vuser group to run on its own test schedule, in the basic run mode. In group schedules, Vusers are always distributed by number.
	Real-world schedule, by test. Select this workload type to configure all the Vuser groups to run together on the same test schedule, in the real-world run mode. Vusers can be distributed: ● **By number.** The Vusers are distributed by number. ● **By percentage.** The Vusers are distributed by percentage.
	Real-world schedule, by group. Select this workload type to configure each Vuser group to run on its own test schedule, in the real-world run mode. In group schedules, Vusers are always distributed by number.

Select Controller Dialog Box

This dialog box enables you to select a Controller for the performance test.

To access	1. In the Performance Test Designer window, click the **Workload** tab. 2. Next to the **Controller** box, click .
Important information	● You select only one Controller for a performance test. ● Due to possible heavy load on the Controller and load generator hosts during a performance test, if you select a C+LG host for Controller functionality, it is best practice not to assign it as a load generator as well.
Relevant tasks	"How to Define a Performance Test Workload" on page 78
See also	"Performance Test Workload Overview" on page 77

User interface elements are described below:

UI Elements	Description
Automatch: Dedicated Controller	At runtime, an available Controller host in the host pool of the project is allocated for the test run, and is dedicated for Controller functionality. Because it is a dedicated Controller, it cannot be allocated as a load generator as well.
	For details about host allocation, see the *HP Application Lifecycle Management User Guide*.
Specific	Select this option if you want a specific Controller host. The grid lists the specific Controller hosts available in the project's host pool.
	Note: If a host is marked with a red asterisk (*), it is already assigned to a Vuser group as a load generator. Due to possible heavy load on the Controller and load generator hosts during a performance test, if a host is assigned to a Vuser group, it is best practice not to select it as a Controller as well.

Rendezvous Dialog Box

This dialog box enables you to enable/disable rendezvous points defined in the Vuser scripts and to set rendezvous policies that determine how the Controller handles Vusers at a rendezvous point.
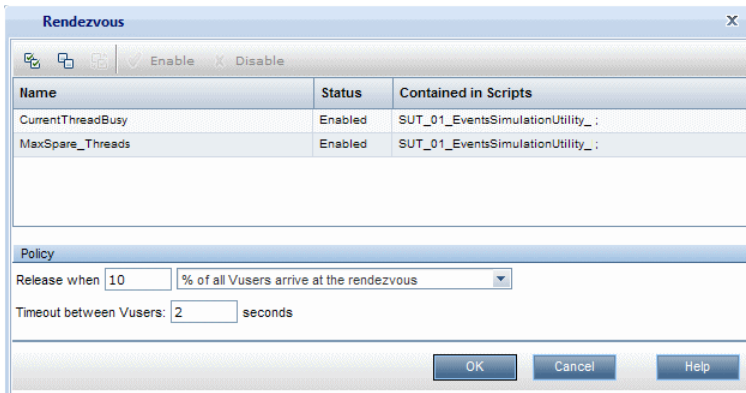
To access	**During the test design phase:** In the **Workload** tab, click **View Rendezvous** . **During the test run:** On the Performance Test Run page, click **Rendezvous** .

Important information	Rendezvous points are inserted in the Vuser script when creating the script in VuGen. For information, see the *HP Virtual User Generator User Guide*.
	Rendezvous points cause multiple Vusers to perform tasks at exactly the same time, thereby creating intense user load on the server. Enabling rendezvous points enables you to check your system's response under specific load.
	For each rendezvous point, you can set **Policy** attributes. During the test run, you can manipulate the Vuser behavior at the rendezvous points.
Relevant tasks	• "How to Define a Performance Test Workload" on page 78.
	• "How to Manage a Performance Test Run" on page 200
See also	"Rendezvous Points" on page 77

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
	Select all. Selects all the rendezvous points in the grid.
	Select none. Clears all the selected rendezvous points in the grid.
	Switch between selected/non selected. Inverts the current selection of rendezvous points.
	That is, the non-selected rendezvous points are selected, and the selected rendezvous points are cleared.
✓ **Enable** / ✗ **Disable**	Enables/Disables the selected rendezvous point. Enabling or disabling a rendezvous point influences the level of server load.
Release	Releases the Vusers at the selected rendezvous points.
	Available from: Performance Test Run page only
<Rendezvous grid>	Displays the details about the rendezvous points in the scripts:
	• **Name.** The name of the rendezvous point as given in the VuGen script.
	• **Status.** The status of the rendezvous point: **Enabled** or **Disabled**.
	• **Contained in Scripts.** The names of the scripts in which the rendezvous point was defined.
	You select a rendezvous point by clicking it.

UI Elements	Description

Policy	Enables you to determine how the Controller handles Vusers at a rendezvous point. You set the following policy attributes for each rendezvous:
	
	• **Release when.** Sets how many Vusers are released from a rendezvous point at a time.
	
	   ■ **X% of all Vusers arrive at the rendezvous.** Releases the Vusers only when the specified percentage of all Vusers have arrived at the rendezvous point.
	
	      Note: This option interferes with the scheduling of the test. If you select this option, your test will not run as scheduled.
	
	   ■ **X% of all running Vusers arrive at the rendezvous.** Releases the Vusers only when the specified percentage of all Vusers running in the test have arrived at the rendezvous point.
	
	   ■ **X Vusers arrive at the rendezvous.** Releases the Vusers only when the specified number of Vusers have arrived at the rendezvous point.
	
	• **Timeout between Vusers.** The timeout value (in seconds). After each Vuser arrives at the rendezvous point, the Controller waits up to the maximum timeout period specified for the next Vuser to arrive. If the next Vuser does not arrive within the timeout period, the Controller releases all the waiting Vusers from the rendezvous. Each time a new Vuser arrives, the timer is reset to zero. You set a timeout for each rendezvous point.

Test Options Dialog Box

This dialog box enables you to set general Scheduler and testing options.

To access	1. In the Performance Test Designer window, click the **Workload** tab. 2. In the lower-right area of the Performance Test Designer window, click Options... .
Important information	This is accessible only when the Workload tab is displayed.
Relevant tasks	• "How to Define a Schedule for the Performance Test" on page 131 • "How to Enable IP Spoofing in ALM" on page 183
See also	"Performance Test Workload Overview" on page 77

User interface elements are described below:

UI Elements	Description
Enable Scheduler	Enables the Scheduler so that you can run the test according to a user-defined schedule. To define a schedule, this option must be selected. • **Stop test when Scheduler ends and Vusers are inactive.** Automatically stops the test when the test schedule has stopped and all the Vusers are in any of the following inactive states: **Down**, **Pass**, **Fail**, **Error**, or **Stop**. • **Start the Scheduler after a delay of HH:MM:SS.** Enables you to specify when, after the Run Test command has been issued, the Scheduler should start running the schedule. If this option is not selected, the schedule starts to run as soon as the test starts running. • **Wait for all groups to initialize.** Instructs the Scheduler to wait until all the Vusers in all the Vuser groups have finished initializing before starting to run any of the groups. **Note:** If you select this option, if any of the Vuser groups' Initialize action is **Initialize each Vuser just before it runs**, the Scheduler automatically changes this setting to **Initialize all Vusers simultaneously**. • **Pause Scheduler at test start.** Pauses the Scheduler at the start of a test run, enabling you make changes to the test design just before the test is about to run. You can then restart the Scheduler manually.
Enable IP Spoofer	After you define multiple IP addresses, and before you run the test, select this option to enable IP spoofing. **Note:** You must enable IP spoofing before running a test. For details about multiple IP addressing, see "Multiple IP Addresses" on page 182.
Set maximum number of concurrent Vusers	The maximum number of concurrent Vusers allowed for this test.

Chapter 8: Integrating Virtualized Services

This chapter includes:

Integrating Virtualized Services Overview

As part of your performance test, you may want to test applications that depend on other services which are a part of your business scenario. Instead of loading actual services, you can use simulated services in your test run. The virtualized services are a simulation of actual services.

To facilitate performance testing business processes that contain services that are not available, Performance Center integrates with HP Service Virtualization.

Using simulated services in your test is helpful if using actual services involves an additional cost or requires the service of an application that is under development or inaccessible at the time when you run your performance test.

Example

Your business process might include a service that is in development or incurs a cost, such as processing a credit card through a third-party vendor. By using a virtual service, you can replace actual services with simulated services that mirror both the data model and the performance model.

For details on creating projects that contain virtualized services, see the *HP Service Virtualization User Guide*.

The workflow below explains how HP Service Virtualization integrates with Performance Center processes:
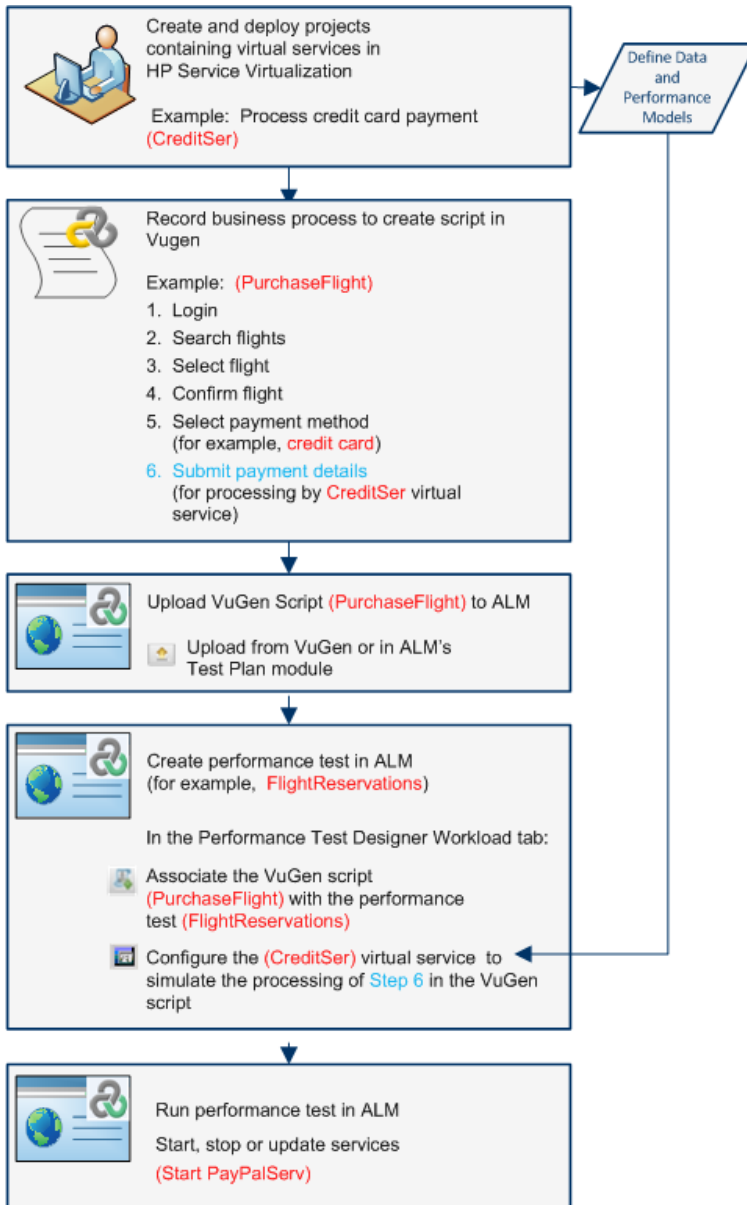
For task details, see "How to Add Virtualized Services to Performance Tests" on page 104.

This section includes:

- "Service Virtualization Monitoring" on the next page

- "Service Virtualization Locking" on page 104

Service Virtualization Monitoring

The HP Service Virtualization monitors enable you to analyze the status and performance of the simulated services during the performance test run. For example, you may integrate a payment process service containing the following operations into your script:

Type	Example Name	Example Description
Service	CreditServ	Process online credit card payments
Operation	CreditServ.PurchaseRequest	Cardholder requests product/service
Operation	CreditServ.AuthorizationRequest	Merchant request authorization for payment
Operation	CreditServ.AuthorizationApproval	Credit card company authorizes or denies payment

The online monitors measure the overall behavior of the service and each operation. The flowchart illustrates using a service and operations for credit card payment.
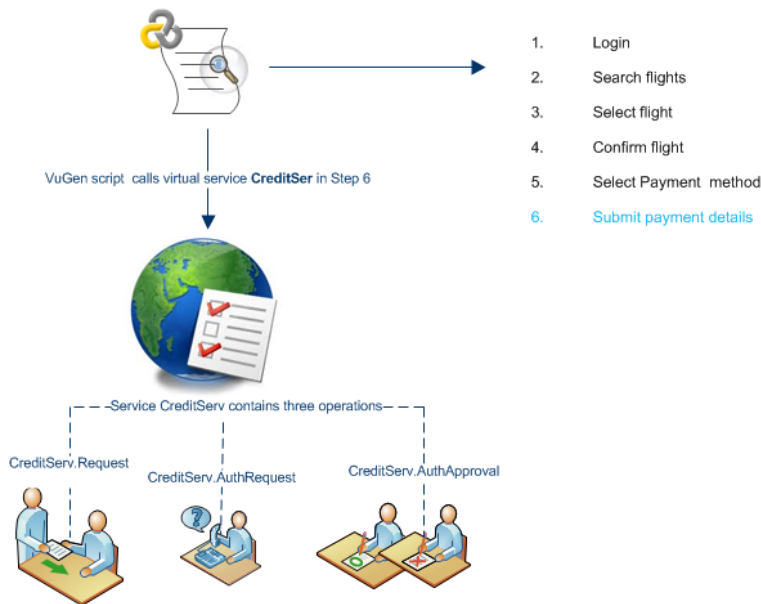
In addition to the Run-Time monitor graphs available in Performance Center, the following graph(s) are useful for working with and analyzing service virtualization integration.

You can view the following Run-Time monitor graphs during a test run:

- "Operations Graph" on page 268

- "Services Graph" on page 269

Service Virtualization Locking

When your performance test contains virtualized services, those services are automatically locked and cannot be used by other users while the test is running. Virtualized services may be locked by you or other users for editing, simulation, deployment.

- If your test includes a service that has been locked by another user, start run will fail and an error message will appear in the ALM Test Runs module's event log for the specific run.

- If your test is running and you update the test to include a service that has been locked by another user, the test will continuing running, however an error message will appear in the Online Screen's Messages tab as an error. There will also be an error notification in the Summary.

How to Add Virtualized Services to Performance Tests

The task describes how to configure virtual services to run when designing a performance test.

This task includes the following steps:

- "Prerequisites " below

- "Configure service virtualization" below

- "Add projects and services" on the next page

- "Select the services to simulate" on the next page

- "Check service deployment" on the next page

- "Enter credentials for monitoring the SV server" on the next page

1. Prerequisites

   - Create your virtualized services in HP Service Virtualization Designer. For details on creating projects that contain virtualized services, see the *HP Service Virtualization User Guide*.

   - In VuGen, create or record a script. Upload the script either from VuGen or from within ALM. For details on uploading VuGen scripts to ALM, see "How to Upload VuGen Scripts" on page 25.

2. Configure service virtualization

In the Performance Test Designer Workload tab toolbar, select **Advanced > Service Virtualization**. The HP Services Virtualization dialog box opens.

This dialog box enables you to add projects, remove projects, and check the deployment of services. For user interface details, see "HP Services Virtualization Dialog Box" on the next page.

3. Add projects and services

To add projects and their corresponding services, click **Add Project** and search and select for the relevant project containing the simulated services you want to run with your performance test. For user interface details, see "Add Project Dialog Box" on page 109.

4. Select the services to simulate

Expand ▷ a project. Check the **Simulate** checkbox of each virtualized service you want to run, and provide the relevant data model and performance model information.

5. Check service deployment

Click the **Check Deployment** button to determine if the services are deployed correctly on the SV server specified in the URL. Under Messages, click **More Details**. The Deployment Check Results dialog box opens. For user interface details, see "Deployment Check Results Dialog Box" on page 110.

⊘ indicates that the service is deployed on the specified server.

⊗ indicates that the service is not deployed on the specified server.

> **Note:** The virtualized service must be deployed on the simulation server to be able to configure the service and run it as part of your performance test in Performance Center.

6. Enter credentials for monitoring the SV server

Click the **Server Credentials** button to enter the credentials for monitoring the SV server in the Server Credentials dialog box. For user interface details, see "Server Credentials Dialog Box" on page 111.

Integrating Virtualized Services User Interface

This section includes:

HP Services Virtualization Dialog Box

This dialog box provides integration with HP Service Virtualization designer. This integration allows you to test services with virtualized services instead of real-time services.

To access	In the Performance Test Designer's Workload tab toolbar, select **Advanced > Services Virtualization** .
Important information	If you make changes to the services virtualization configuration during run time, both the original and modified configurations are saved in the **wlrun.log** file on the Load Testing Server (LTS) machine. **For developers:** Pointing calls to virtual services in the application under test cover two major scenarios: 1. Application components that use the service are embedded in the code or in a configuration file. In this case, you will need to update the code in the application under test or update the configuration file to point to the new URL. **Examples** .NET Desktop application uses a web service, and the url is set using a constant: `stringURL = http://hp.com` Service or back end component uses the web service and the URL is configured in the app.config file. 2. Service is consumed by accessing UDDI or some other registry component (Systinet) and the URL is retrieved at run-time. In this case, you will need to update the end point URL in UDDI/Systinet.
Relevant tasks	"How to Add Virtualized Services to Performance Tests" on page 104

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Element	Description
Add Project	Opens the Add Project dialog box, allowing you to specify or browse for a HP Service Virtualization project. Project files have a **.zip** or **.vproj** extension. For user interface details, see "Add Project Dialog Box" on page 109.
Delete Project	Removes the selected project and its services from the list. **Note:** Performance tests that are currently running the virtualized services in the deleted project keep running the virtualized services; Deleting the project unlocks the corresponding services so others can edit them.
Check Deployment	Checks if the virtual service was deployed (started) on the virtualization server specified in **Server URL**. For user interface details, see "Deployment Check Results Dialog Box" on page 110.
Server Credentials	Opens the Server Credentials dialog box, which enables you to configure SV server credentials used for monitoring the SV servers and virtual services deployed on them. Credentials include server login and password. For user interface details, see "Server Credentials Dialog Box" on page 111.
Project Name	The name of the HP Service Virtualization project containing the virtual service.
Simulation Server	The address of the SV server on which the selected service is deployed. **Formats:** `http:<server>:6080/management` - for standalone SV servers `http:<server>:7080/management` - for embedded SV servers (available only if the SV Designer is open)
Deployed	An indicator showing the deployment status of the project: • ⃠ . Click the **Check Deployment** button to check the status. • ✓ . Successfully deployed. • ✗ . Unsuccessfully deployed.

\<virtualized services\>	A list of the virtualized services showing the following information:
	
	• **Simulate**. When checked, includes the virtual service when executing the performance test. When cleared, the service switches to pass-through mode by the test.
	
	• **Service Name**. The name of the virtual service to use during performance test execution.
	
	• **Data Model**. The data model to associate with the virtual service.
	
	• **Performance Model**. The performance model to associate with the virtual service.
	
	• **Deployed**. An indicator showing the deployment status of the virtual service:
	
	    ■ ⊘. Click the **Deploy Check** button to check the status.
	
	    ■ ✓. Successfully deployed.
	
	    ■ ✗. Unsuccessfully deployed.

Messages	Displays messages about the virtual services, such as: **Last Deployment Check**. Date on which the last deployment check occurred. **More details**. Opens the Deployment Check Results dialog box, enabling you to determine if the services are deployed correctly on the SV server specified in the URL. For user interface details, see "Deployment Check Results Dialog Box" on page 110.

Add Project Dialog Box

This dialog box enables you to add projects that contain virtualized services to your performance test.
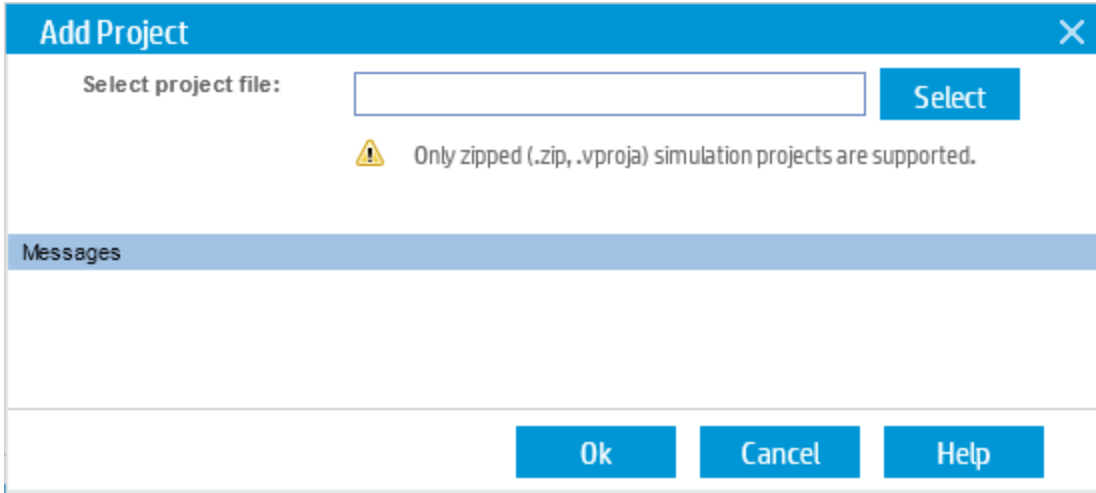
To access	In the Services Virtualization dialog box, click **Add Project**.
Relevant tasks	"How to Add Virtualized Services to Performance Tests" on page 104
See also	• "Integrating Virtualized Services Overview" on page 101 • "HP Services Virtualization Dialog Box" on page 106

User interface elements are described below:

UI Element	Description
Select Project File	Name of the project file. Project files have a **.zip** or a **.vproj** extension.
Select	Enables you to browse for, and select, a project. **Note:** If the project file is password protected, enter password in the Password Required dialog box.
Remove	Removes a selected a project file.
Messages	Displays messages about the project file, such as error messages.

Deployment Check Results Dialog Box

This dialog box enables you to check if the projects and their virtualized services are deployed on the server at the specified URL address.
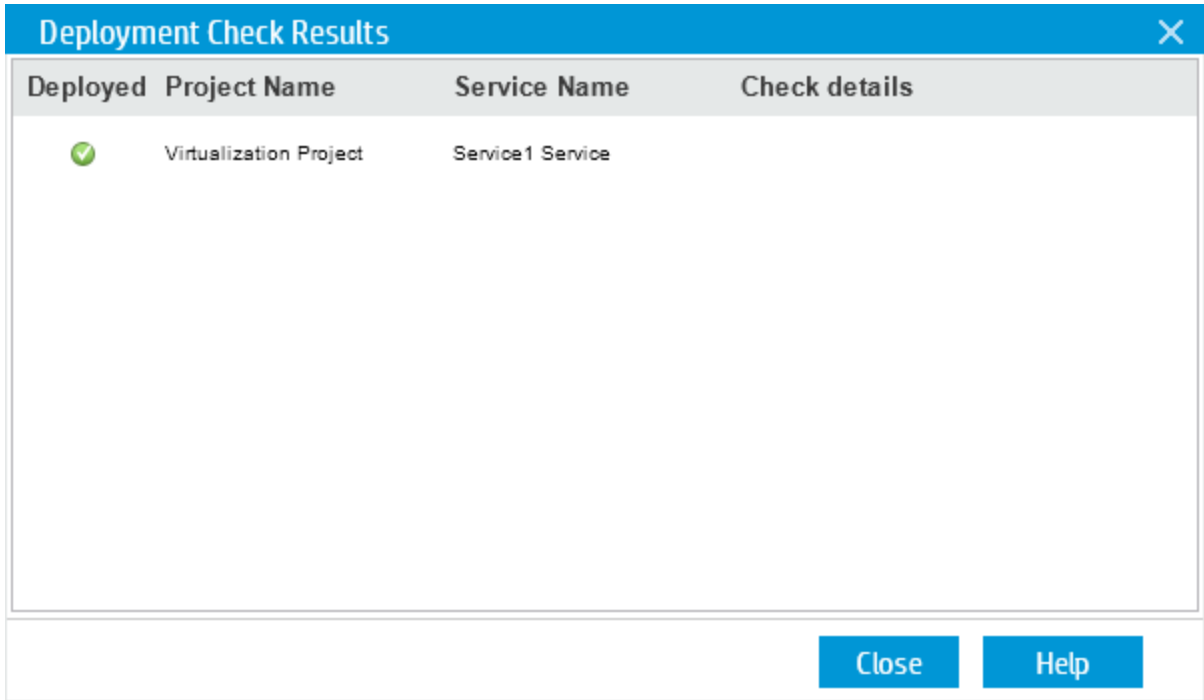
To access	In the HP Services Virtualization dialog box, click **Check Deployment**. Under Messages, click **More details**.
Important information	The deployment check verifies that a service with the same ID exists on the specified server.
Relevant tasks	"How to Add Virtualized Services to Performance Tests" on page 104
See also	"Integrating Virtualized Services Overview" on page 101 "HP Services Virtualization Dialog Box" on page 106

User interface elements are described below:

UI Element	Description

Deployed	Indicates whether the virtualization service is deployed correctly on the specified server.
	• ⊘ Status is unknown. Click **Deploy Check** to check the status.
	• ✅ Successfully deployed.
	• ❌ Unsuccessfully deployed.
Project Name	Displays the name of the project containing the virtualization service.
Service name	Displays the name of the virtualization service.
Check details	Displays the results of the check.
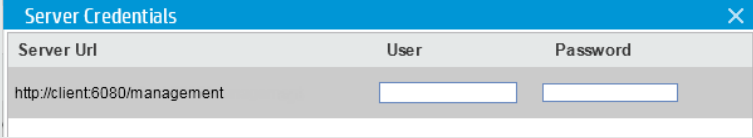
Server Credentials Dialog Box

This dialog box enables you to configure login information for the SV server.
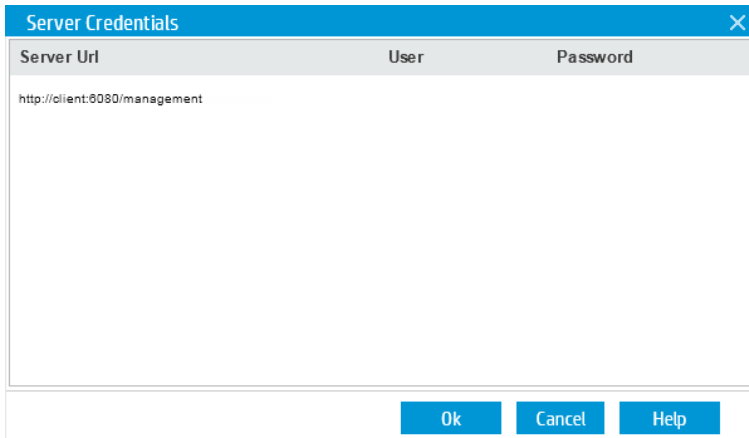
To access	In the HP Services Virtualization dialog box, click the **Server Credentials** button .
Important information	This dialog box only lists the servers that are defined in the HP Services Virtualization dialog box's **Simulation Server** column.
Relevant tasks	"How to Add Virtualized Services to Performance Tests" on page 104
See also	• "Integrating Virtualized Services Overview" on page 101
	• "HP Services Virtualization Dialog Box" on page 106

User interface elements are described below:

UI Element	Description
Server Url	Displays the URL for the server.
User	Displays the user name for the server. To edit, click the URL to display the **User** and **Password** text boxes. **Example**
Password	Displays the password for the server. To edit, click the server URL to display the **User** and **Password** text boxes.

Chapter 9: Load Generator Distribution

This chapter includes:

Load Generator Distribution Overview

Load generators are Performance Center hosts on which Vusers run during a test run.

This section includes:

- "Load Generator Types" below

- "Load Generator Distribution Methods" below

- "Load Generator Attribute Customization" on the next page

Load Generator Types

There are two types of load generators:

Type	Description
Specific load generator	An actual load generator. For example, machine **host1**, located in London.
Automatch load generator	A load generator placeholder, for example **LG1**. When you assign an automatch load generator to a Vuser group, you are not assigning a specific load generator to the group, but rather a placeholder for a load generator with specific properties. At runtime, specific load generators in the host pool of the project that have the same properties as the automatch load generators, are allocated in place of the automatch load generators.

Load Generator Distribution Methods

When you design a performance test, you specify how to distribute load generators among the Vuser groups participating in the test. You can automatically assign all load generators to each Vuser group, or you can manually select which load generators to assign to which group.

Use the following methods to distribute load generators:

Method	Description
Automatic load generator distribution	When you select the automatic load generator distribution method, during the test design phase **all of the automatch load generators** in the test are distributed **to all of the participating Vuser groups**.
	At runtime, specific load generators in the project's host pool that have the same properties as the automatch load generators, are allocated in place of the automatch load generators.

Method	Description
Manual Load Generator Distribution	Using the manual distribution method, you can assign specific load generators to Vuser groups. If you are not particular about which load generators should be used for the test, you can assign automatch load generators to the groups. At the initialization stage of the test run, the automatch load generators are automatically replaced with specific load generators from the project's host pool that match the automatch load generators' properties. Manual distribution enables you to distribute your load generators among Vuser groups, without overloading any one load generator.

Load Generator Attribute Customization

You can customize load generator attributes. For details about how to customize host attributes, see the *HP Application Lifecycle Management Administrator Guide*.

When customizing load generator attributes, consider the following:

- Create attributes that represent properties about your hosts that will help tell one host apart from another host when using them for performance testing.

- Because you can select multiple attributes for your host, you can define an unlimited number of host attributes. They do not need to be related.

- Host attributes can refer to anything. For example, **Host Memory - High**, **Spanish environment**, **Very slow machine**.

How to Distribute Load Generators Among Vuser Groups

This task describes how to distribute load generators automatically and manually among Vuser groups participating in the performance test.

> **Note:** This task is part of a higher-level task. For details, see "How to Define a Performance Test Workload" on page 78.

To learn more about load generator distribution, see "Load Generator Distribution Overview" on the previous page.

This task includes the following steps:

- "Prerequisites" on the next page

- "Select a load generator distribution method" on the next page

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1. Prerequisites

   Add Vuser groups to participate in the test. For details, see "How to Define a Performance Test Workload" on page 78 on "How to Define a Performance Test Workload" on page 78.

2. Select a load generator distribution method

   On the Groups pane toolbar, in the **LG Distribution** box, select one of the following options:

   - **Assign all to each group.** Assigns all the load generators automatically to each Vuser group.

   - **Assign manually.** Enables you to assign load generators manually to the Vuser groups.
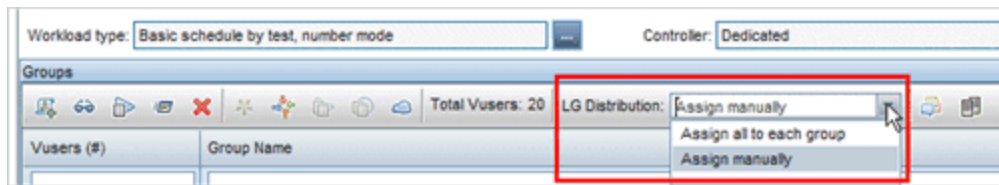
3. Specify the load generators to use in the test

   - If you selected **Assign all to each group** above, the **LG** box is displayed to the right of the **LG Distribution** box.

     Type the number of load generators to use in the test and press ENTER. The automatch load generators are distributed to each of the Vuser groups and are displayed in the **Load Generators** column.
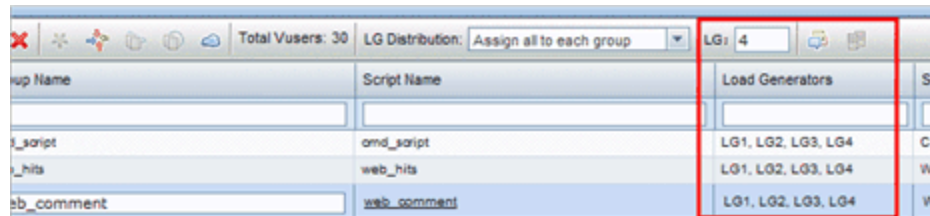
   - If you selected **Assign manually** above:

     - To select the same load generators for multiple groups at once, click the **Assign Load Generators to Multiple Groups** button. In the dialog box that opens, select automatch and/or specific load generators to multiple groups

       Similarly, you can remove load generators that have been assigned to the groups.

For user interface details, see "Assign Load Generators to Multiple Groups Dialog Box" on the next page.

○ To select load generators for a specific group only, you can use the link that appears in the **Load Generators** column of a selected group. Click the link and select automatch and/or specific load generators to assign to the group.
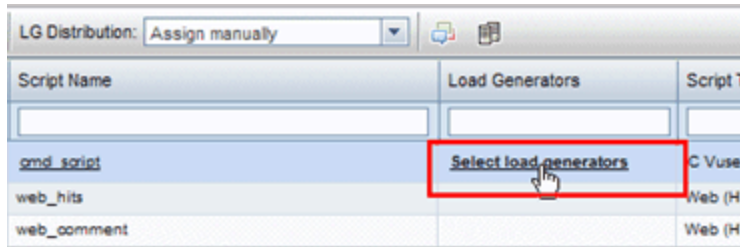
For user interface details, see "Select Load Generators Dialog Box " on page 122.

4. **Select properties for the automatch load generators - optional**

You can select properties for the automatch load generators that are assigned to Vuser groups in your test. Properties include a location and other attributes. At runtime, each automatch load generator is matched up with an available specific load generator (in the host pool of the project) with the same properties.

To select properties for automatch load generators, click the **Configure Automatch Load Generator Properties** button, select one or more automatch load generators, and enter a location and/or attributes.

For user interface details, see "Automatch Load Generators Properties Dialog Box" on page 125.

Note: If no properties are specified, the automatch load generator is matched up with any load generator in the project's host pool.

Load Generators User Interface

This section includes:
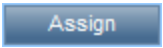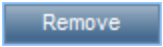
Assign Load Generators to Multiple Groups Dialog Box

This dialog box enables you to assign one or more load generators—automatch or specific—to multiple Vuser groups at once. You can also use this dialog box to remove one or more load generators from multiple Vuser groups at once.

To access	1. In the Performance Test Designer window, click the **Workload** tab. 2. From the **LG Distribution** drop-down list, select **Assign manually**. 3. Click **Assign Load Generators to Multiple Groups** ⊞ .
Important information	This dialog box is available only when using the **manual** load generator distribution method.
Relevant tasks	• "How to Define a Performance Test Workload" on page 78 • "How to Distribute Load Generators Among Vuser Groups" on page 116

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
`0` `Add LGs`	Enables you to add more automatch load generators for the test. Enter the number of load generators in the adjacent box and click **Add LGs**.
`Assign`	Assigns the selected load generators to the selected Vuser groups.
`Remove`	Removes the selected load generators from the selected Vuser groups.
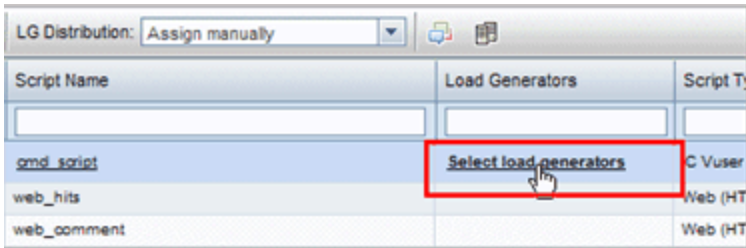
UI Elements	Description
Automatch tab	Enables you to select automatch load generators to assign to Vuser groups in the test, or to remove assigned automatch load generators from the Vuser groups. • **Name.** The name of the automatch load generator. By default, these are named **LG1**, **LG2**, and so on. • **Properties.** The properties by which the automatch load generator is matched up with a specific load generator in the host pool of the project at runtime. **Any** is displayed by default. This means that the automatch load generator can be matched up with any load generator in the project's host pool at runtime. To specify properties for an automatch load generator, click the corresponding link in this column to open the Automatch Load Generator Properties dialog box. For details, see "Automatch Load Generators Properties Dialog Box" on page 125. **Tip:** To select all the load generators in the list, select the check box in the check box column heading.

UI Elements	Description
Specific tab	Enables you to select load generators from the project's host pool to assign to the Vuser groups in the test, or to remove them from the Vuser groups.
	• **Name.** The name of the load generator.
	• **State.** The state of the load generator: **Operational**; **Non-operational**; **Unavailable**
	Note: Assigned load generators must be operational during runtime.
	• **Location.** The location of the load generator.
	• **Purpose.** The purpose of the load generator. **Controller**, **Load Generator**, **Data Processor**, or a combination of these.
	▪ Only the hosts in the pool with at least a **Load Generator** purpose are displayed.
	▪ QuickTest tests (UFT GUI Tests) cannot run on a load generator that has been selected as the Controller of the performance test.
	▪ If a load generator is marked with an asterisk (*), this indicates that the load generator host has been selected as the Controller. It is recommended not to use a Controller host as a load generator as well.
	Tip: To select all the load generators in the list, select the check box in the check box column heading.
<Select Load Generators pane>	Enables you to select load generators to assign to the Vuser groups in the test, or to remove them from the Vuser groups.
	• Click the **Automatch** tab to select automatch load generators.
	• Click the **Specific** tab to select specific load generators.

UI Elements	Description
Select Groups pane	Enables you to select the Vuser groups to which the selected load generators are to be assigned, or from which they are to be removed. • **Name.** The name of the Vuser group. • **Assigned Load Generators.** The load generators currently assigned to the Vuser group. **Tip:** To select all the Vuser groups, select the check box in the check box column heading.

Select Load Generators Dialog Box

This dialog box enables you to assign one or more load generators—automatch or specific—to a Vuser group.

To access	1. In the Performance Test Designer window, click the **Workload** tab. 2. From the **LG Distribution** drop-down list, select **Assign manually**. 3. Select a Vuser group in the Groups pane and click the link in the Load Generators column.
Important information	This dialog box is available only when using the **manual** load generator distribution method.
Relevant tasks	• "How to Define a Performance Test Workload" on page 78 • "How to Distribute Load Generators Among Vuser Groups" on page 116 • "How to Create a Terminal Session" on page 175
See also	"Load Generator Distribution Overview" on page 115

User interface elements are described below:

UI Elements	Description
0 Add LGs	Enables you to add more automatch load generators for the test. Enter the number of load generators in the adjacent box and click **Add LGs**. **Available from:** Automatch tab only
(icon)	**Terminal Services.** Enables you to configure terminal services sessions on the selected load generator. For details, see "Configuring Terminal Sessions" on page 174. **Available:** For load generators
Automatch tab	Enables you to select automatch load generators to assign to the selected Vuser group. • **Name.** The name of the automatch load generator. By default, these are named **LG1**, **LG2**, and so on. • **Properties.** The properties by which the automatch load generator is matched up with a specific load generator at runtime. **Any** is displayed by default. This means that the automatch load generator can be matched up with any load generator at runtime. To specify properties for a particular automatch load generator, click the corresponding **Any** link in the Properties column to open the Automatch Load Generator Properties dialog box. For details, see "Automatch Load Generators Properties Dialog Box" on page 125. • **Virtual Locations.** The name of the virtual location. Click the **Select virtual location** link to open the Select Virtual Location dialog box. **Tip:** To select all the load generators in the list, select the check box in the check box column heading.

UI Elements	Description
Specific tab	Enables you to assign load generators from the host pool of the project to the selected Vuser group. • **Name.** The name of the load generator. • **State.** The state of the load generator: **Operational**, **Non-operational**, **Unavailable**. > **Note:** Assigned load generators must be operational during runtime. • **Location.** The location of the load generator. • **Virtual Locations.** The name of the virtual location. Click the **Select virtual location** link to open the Select Virtual Location dialog box. • **Purpose.** The purpose of the load generator, that is, **Controller**, **Load Generator**, **Data Processor**, or a combination of these. > ▪ Only the hosts in the pool with at least a **Load Generator** purpose are displayed. > > ▪ You can run QuickTest tests (UFT GUI Tests) only on load generators that are not also assigned as the Controller for the performance test. > > ▪ If a load generator is marked with an asterisk (*), this indicates that the load generator host has been selected as the Controller. It is recommended not to use a Controller host as a load generator as well. > **Tip:** To select all the load generators in the list, select the check box in the check box column heading.

Automatch Load Generators Properties Dialog Box

This dialog box enables you to define properties for an automatch load generator. Properties include a location, and other host attributes. At runtime, a specific load generator in the host pool of the project Wmatching these properties is assigned to the Vuser group.

Automatch Load Generators Properties Dialog Box: Available only when using the Assign Manually load generator distribution method.
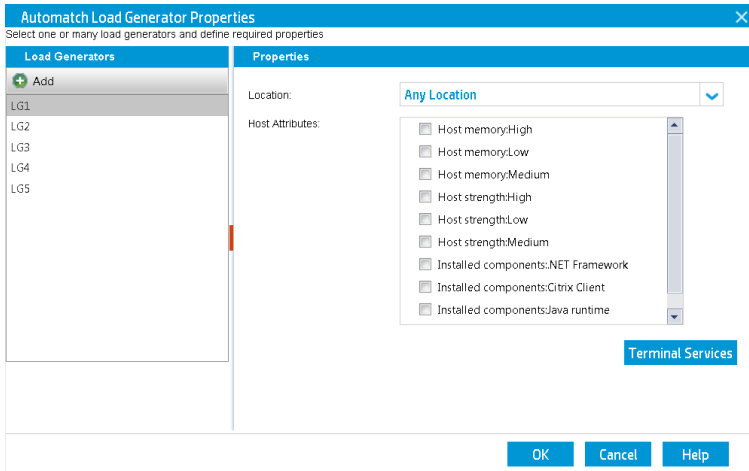
Automatch Load Generators Properties Dialog Box: Available only when using the Assign All to Each Group load generator distribution method.
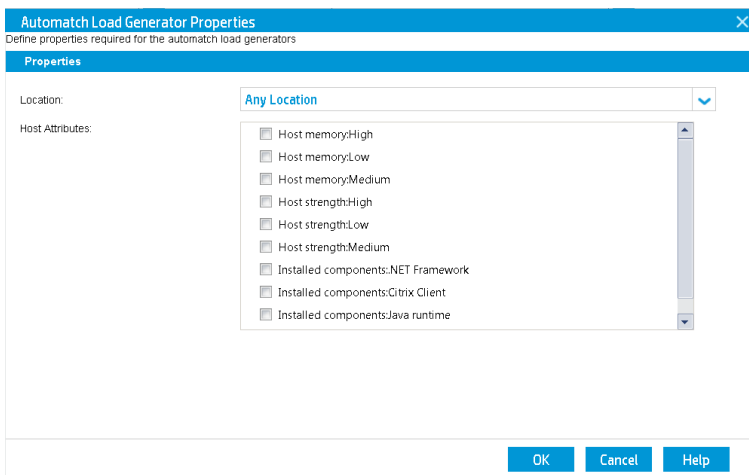
Automatch Load Generators Properties Dialog Box: Available only when working with HP Network Virtualization and using the Assign All to Each Group load generator distribution method.

To access	**ALM:**
	1. On the ALM sidebar, under **Testing**, select **Test Plan**.
	2. Right-click a performance test in the test plan tree and select **Edit Test**.
	3. In the Performance Test Designer window, click the **Workload** tab.
	4. On the Groups pane tool bar, click **Configure Automatch Load Generators Properties** .
	Performance Test:
	1. In My Performance Center, select **Perspective** > **Test Plan**.
	2. Select a performance test in the test plan tree and click **Edit Test**.
	3. In the Performance Test Designer window, click the **Workload** tab.
	4. On the Groups pane tool bar, click **Configure Automatch Load Generators Properties** .
Relevant tasks	• "How to Distribute Load Generators Among Vuser Groups" on page 116
	• "How to Create a Terminal Session" on page 175

User interface elements are described below:

UI Elements	Description
Add (button)	Enables you to add additional automatch load generators for the test. **Available:** When the **Assign Manually** load generator distribution method is selected.
Terminal Services (button)	Enables you to configure terminal services sessions on the selected load generator. For details, see "Configuring Terminal Sessions" on page 174. **Available:** When the **Assign Manually** load generator distribution method is selected.
Load Generators pane	Lists the available automatch load generators.
Location	Select a load generator location for the selected load generators.
Host Attributes	Select attributes for the selected load generators. **Tip:** The list of attributes can be customized. For details, see "Load Generator Distribution Overview" on page 115. **Example:** You want a Vuser group to use a load generator that is located in London and has medium strength and memory. Under **Location**, select **London**, and in the **Host Attributes** list, select **Host memory: Medium** and **Host strength: Medium**. At runtime, the system tries to assign a specific load generator with these properties to the Vuser group.
Virtual Location	Select a load generator virtual location for the selected load generators. **Available:** When working with HP Network Virtualization and using the **Assign All to Each Group** load generator distribution method. For more details on working with HP Network Virtualization, see "How to Integrate Network Virtualization into a Performance Test" on page 246.

Chapter 10: Scheduling Performance Tests

This chapter includes:

Scheduling Performance Tests Overview

You use the Scheduler to create a schedule that distributes load in a performance test in a controlled manner.

Using the Scheduler, you can:

- Set the time at which the test should begin running, and specify how long the Scheduler should wait after the Run Test command is issued, and before running Vusers.

- Stipulate:

  - How to initialize the Vusers in the test

  - How many Vusers to start/stop within a given time period

  - How often to start running the Vusers—simultaneously or gradually

  For details, see "Global Scheduler Actions" on page 138.

- Limit the run duration of the Vusers or Vuser groups within the test by specifying the amount of time the Vusers or Vuser groups should be in the running state.

- Set a test to run according to the runtime settings defined for the enabled Vuser groups, or set the Vuser groups to run over and over again until the schedule settings instruct them to stop running.

To define a performance test schedule, see "How to Define a Schedule for the Performance Test" on page 131.

This section also includes:

- "Types of Test Schedules " below

- "Schedule Run Modes" on the next page

Types of Test Schedules

When you design a performance test, you can define a schedule according to which the participating Vuser groups should run in the test.

You can schedule all the groups to run together on one schedule, or you can define a separate schedule for each Vuser group.

Scheduling By Test

When you schedule **by test**, all the Vuser groups participate in the test run simultaneously. That is, the schedule is applied to all the Vuser groups concurrently, and each action is applied proportionally to all

the Vusers groups.

For example, take a test that includes three participating Vuser groups as follows:

Group Name	Number of Vusers
Group1	10
Group2	20
Group3	30
Total	**60**

When scheduling by test, if the scheduler instructs 30 Vusers to start running when it starts the test run, a proportional number of Vusers starts running from each group as follows:

Group Name	Number of Vusers
Group1	5
Group2	10
Group3	15
Total	**30**

Note: The same principle applies when the test is in percentage mode.

Scheduling By Vuser Group

Note: For tests in Vuser group (number) mode only.

When you schedule **by Vuser group**, each Vuser group participating in the test runs on its own separate schedule. That is, for each Vuser group, you can specify when to start running the Vuser group, how many Vusers in the group to start and stop running within specified time intervals, and how long the group should continue running.

Group schedules can run separately, or all at the same time.

Schedule Run Modes

You can schedule a test to run according to the run-time settings defined for the Vuser groups, or you can let the groups run over and over again until the test schedule instructs them to stop running.

You can schedule a test to run in one of the following run modes:

- **Real-world run mode.** The test runs according to a user-defined group of actions that simulate a real-world schedule of events. Vuser groups run according to the iterations defined in their run-time

settings, but you can define how many Vusers to run at a time, how long Vusers should continue to run, and how many Vusers to stop running at a time.

- **Basic run mode.** All enabled Vuser groups run together on one schedule, each according to its own run-time settings. You can schedule how many Vusers to start running at a time, and how long they should run before stopping.

The following table illustrates how the given schedule types run in real-world versus basic run mode:

Schedule by	Run Mode - Real World	Run Mode - Basic
Test	All participating Vuser groups run together on one schedule. The test runs according to a user-defined group of actions that emulates a true-to-life schedule of events. You can schedule Vusers to start and stop running numerous times during the test, and specify how long to keep them in their running or stopped state.	All participating Vuser groups run together on one schedule, each according to its own run-time settings. You schedule when to start running all the Vusers, specify how long they should run, and then specify how to stop running all the Vusers.
Group (Not applicable when the test is in Percentage mode)	Each participating Vuser group runs according to its own defined schedule that emulates a true-to-life schedule of events for that Vuser group. You can schedule Vusers in the groups to start and stop running numerous times during the test, and specify how long to keep them in their running or stopped state.	Each participating Vuser group runs according to its own schedule, each according to its own run-time settings. For each Vuser group, you schedule when to start running the Vuser group, how to start running all the Vusers in the group, specify how long the Vusers should run, and then specify how to stop running all the Vusers in the group.

How to Define a Schedule for the Performance Test

This task describes how to define a schedule for a performance test.

> **Note:** This task is part of a higher-level task. For details, see "How to Define a Performance Test Workload" on page 78.

This task includes the following steps:

- "Prerequisites" on the next page

- "Define a set of scheduler actions" on the next page

- "Group schedules only: Copy a Vuser group's scheduler settings to other groups - optional" on the

-

1. Prerequisites

   - Open **Performance Test Designer > Workload** tab, under the **Groups** section, make sure the test contains scripts.

   - The Scheduler must be enabled. Click the **Options** button located at the bottom of the Workload tab. In the Test Options dialog box, ensure that **Enable Scheduler** is selected. For user interface details, see "Test Options Dialog Box" on page 97.

2. Define a set of scheduler actions

   The Global Schedule grid displays the default scheduler actions that correspond to the workload type selected in the **Workload type** box.

   In real-world schedules, you can add more scheduler actions, and edit or delete existing actions.

   In basic schedules, you can edit the existing scheduler actions.

   - For details about the scheduler actions, see "Global Scheduler Actions" on page 138.

   - For details about how to add actions (real-world schedules only), see "How to Add Actions to a Test Schedule" on the next page.

   - For details about how to edit actions, see "How to Edit Scheduler Actions" on page 134.

3. Group schedules only: Copy a Vuser group's scheduler settings to other groups - optional

   When scheduling **by Vuser group**, you can copy a Vuser group's scheduler settings to other Vuser groups.

   > **Note:**
   >
   > - Scheduler settings copied include the scheduler run mode (basic or real-world) and the set of defined scheduler actions.
   >
   > - This option is disabled for global schedules.

   a. On the Groups grid toolbar, click the **Duplicate Scheduler Settings** button.

   b. Select the source group whose settings you want to copy, and select one or more target

groups.

    c. Click **Apply**. The source group's scheduler settings are copied to the target groups.

4. **Schedule a start time for the test - optional**

Click the **Options** button located at the bottom of the Workload tab. Select **Start the Scheduler after a Delay of**, and enter the amount of time after which to start running the test.

How to Add Actions to a Test Schedule

This task describes how to add actions to a real-world test schedule.

> **Note:** You can add actions to a **real-world schedule** only.

This task includes the following steps:

- "Add an action to the schedule from the Global Scheduler grid" below

- "Add an action by splitting one action into two actions" on the next page

Add an action to the schedule from the Global Scheduler grid

> **Note:** A new action is always added **after** the action selected in the Global scheduler grid.

1. In the Global scheduler grid, select an action after which to insert the new action, and click the **New scheduler action** button's down arrow.

2. Select the type of action to add.

> **Note:** You can add a **Start Vusers**, **Stop Vusers**, or **Duration** action. For details about each type of action, see "Global Scheduler Actions" on page 138.

3. In the **Properties** column, specify the action's properties.

- If you are adding a Start Vusers or Stop Vusers action, enter the number of Vusers to start/stop running, and select how to start/stop running the Vusers: **simultaneously** or **gradually**.

  If you selected **gradually**, enter the number of Vusers to start/stop at a time, and a time interval.

- If you are adding a Duration action, select how long to run the action.

Click **Apply change** to save the action settings.

4. When you have finished adding actions to the schedule, click **Save** at the bottom of the Workload tab.

> **Note:** If you navigate away from the Performance Test Designer window without clicking **Save**, changes applied to the schedule are not saved.

Add an action by splitting one action into two actions

You can add **Start Vusers**, **Duration**, and **Stop Vusers** actions from the Global Scheduler grid or from the graph by splitting an action into two halves of the original action.

To split an action in two:

1. Select the action in the grid, or the line in the graph that represents the action that you want to split.

> **Tip:** Selecting the action in the Global Scheduler grid highlights the corresponding line in the graph.

2. Click the **Split selected action** button . The selected action/line splits in two. In the Global scheduler grid, the original action splits into two equivalent actions, each representing half of the original action.

> **Example**
>
> - Splitting a Duration action of 5 minutes results in two Duration actions of 2.5 minutes each.
>
> - Splitting a Start Vusers action that starts 20 Vusers results in two Start Vusers actions, each starting 10 Vusers.

3. (Optional) Edit each of the actions. For details, see "How to Edit Scheduler Actions" below.

How to Edit Scheduler Actions

This task describes how to edit scheduler actions. You can edit all types of actions. For details about each action type, see "Global Scheduler Actions" on page 138.

To edit a scheduler action:

1. In the Actions grid, select the action that you want to edit. The **Properties** column becomes editable.

2. Modify the action settings and click **Apply change** .

3. When you have finished editing the actions, click **Save**.

Note: If you navigate away from the Performance Test Designer window without clicking **Save**, changes applied to the schedule are not saved.

Scheduling Performance Tests User Interface

This section includes:

Global Scheduler Pane
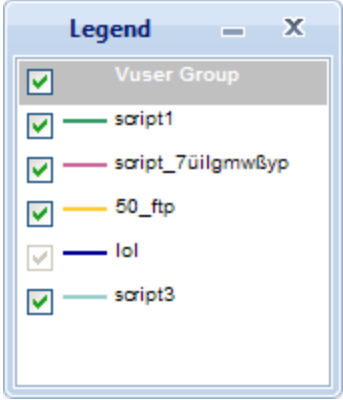
This pane enables you to define a schedule for running your performance test.

To access	In the Performance Test Designer window, click the **Workload** tab.
Important information	If scripts in your test contain rendezvous points, the test will not run as scheduled because the rendezvous points interfere with the schedule. For details, see "Rendezvous Points" on page 77.
Relevant tasks	"How to Define a Schedule for the Performance Test" on page 131
See also	• "Scheduling Performance Tests Overview" on page 129 • "Global Scheduler Actions" on page 138

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
New	**New scheduler action.** Enables you to add an action to the test schedule. The new action is added **after** the action selected in the grid. You can add Start Vuser, Duration, and Stop Vuser actions only. For details, see "Global Scheduler Actions" on page 138. **Available from:** Real-world schedule only
	Delete selected action. Deletes the selected action.
	Split selected action. Splits the selected action into two identical halves of the original action.
	Apply change. Enables you to apply modifications made to the actions in the schedule graph.

UI Elements	Description
	Hide/Show Legend. Hides/Shows the graph legend. **Note for group schedules only:** When the legend is showing, the group selected in the grid's title bar is read-only in the legend. To view/hide one or more of the other Vuser groups, select/clear the check boxes next to the Vuser groups respectively.
Scheduled Vusers	Displays a total of the Vusers scheduled to run in the test. **Note:** - When the test is in number mode and you are defining a basic schedule, the number of scheduled Vusers is updated when you modify the number of Vusers in the Vuser groups. You can change the number of Vusers in a selected group: **In the Groups grid:** Select the group and change the number of Vusers **In the Global Scheduler grid:** Select the group in the grid's title bar and change the number of Vusers in the **Start Vusers** action. - In real-world schedules, the total number of Vusers is the sum of all the Vusers defined in the Start Vusers actions.
<Global Scheduler grid>	Lists the scheduled actions. Initially the grid displays default actions that correspond to the schedule type you selected for your workload. For details, see "Workload Types Dialog Box" on page 93. For all schedules, some of the actions can be modified. In real-world schedules, you can also add and delete actions, enabling you to simulate a more true-to-life schedule by which to run your test.

UI Elements	Description
<Schedule graph>	Provides a graphical representation of the actions listed in the Global Scheduler grid. In real-world schedules, you can add new actions from the graph by splitting an action into two identical halves.
<Title bar>	Displays the type of schedule and the number of scheduled Vusers, depending in the type of workload is selected for the test: • **Global Schedule.** Displayed when the schedule is a schedule by test. • **Group Schedule for <group>.** Displayed for group schedules. Displays the name of the group whose schedule is displayed in the Global Scheduler grid.
Messages	Displays alert messages.

Global Scheduler Actions

A performance test schedule contains a sequence of actions that instruct the test when to start running a Vuser group, how to initialize Vusers, when to start and stop running Vusers, and how long to run an action.

The following sections describe the available scheduler actions.

- "Start Group" below

- "Initialize " on the next page

- "Start Vusers" on page 140

- "Duration" on page 141

- "Stop Vusers" on page 141

Start Group

The Start Group action defines when to start running a Vuser group. By default, the **Start Group** action appears as the first action in the Global Scheduler grid when you select a workload of type: **by group**.

Options	Description
Start immediately	The Scheduler starts running the selected Vuser group as soon as the test starts running. Resulting action: **Start immediately after the test begins.**

Options	Description
Start with delay	After the test starts running, the Scheduler waits the specified time (in hours, minutes, and seconds) before it starts running the selected Vuser group. Resulting action: Start **(HH:MM:SS) after the test begins.**
Start when group	The Scheduler starts running the selected Vuser group immediately after the Vuser group specified in this option has finished running. Resulting action: **Start when group <group name> finishes.**

> **Note:**
>
> - The **Start Group** action is available for group schedules only.
>
> - The **Start Group** action is always followed by the **Initialize** action.
>
> - The **Start Group** action cannot be deleted.

Initialize

The **Initialize** action instructs the Scheduler to prepare the Vusers so that they are in the **Ready** state and can run. By default, the **Initialize** action appears in the Global Scheduler grid for all types of schedules.

Options	Description
Initialize all Vusers simultaneously	The Scheduler initializes all the Vusers in the test or selected Vuser group together, and waits the specified amount of time before running them. Resulting action: **Initialize all Vusers simultaneously** **Wait for** `<00:00:00>` **(HH:MM:SS) after initialization**
Initialize gradually	The Scheduler initializes the specified number of Vusers gradually, according to the specified time interval (in hours, minutes, and seconds), and waits the specified amount of time before running them. Resulting action: **Initialize <X> Vusers every (HH:MM:SS)** **Wait for (HH:MM:SS) after initialization.**

Options	Description
Initialize each Vuser just before it runs	The Scheduler initializes each Vuser in the test or selected Vuser group just before it starts running. Resulting action: **Initialize each Vuser just before it runs.** **Note:** This option is not available for Group schedules when **Wait for all groups to initialize** is selected. See **"Wait for all groups to initialize"** on "Test Options Dialog Box" on page 97.

Note: The **Initialize** action cannot be deleted.

Start Vusers

The Start Vusers action instructs the Scheduler to start running the Vusers.

Options	Description
Start All Vusers: Simultaneously	The Scheduler runs all the Vusers in the test simultaneously.
Start X Vusers: gradually Y Vusers: every <hh:mm:ss> (HH:MM:SS)	The Scheduler runs the specified number of Vusers (X) gradually. That is, the Scheduler runs Y Vusers, and waits the specified time (in hours, minutes, and seconds) before running another Y Vusers. Resulting action: **Start X Vusers: Y Vusers every <hh:mm:ss> (HH:MM:SS)**

Note:

- The Scheduler starts running Vusers only when they have reached the **Ready** state.

- In a basic schedule, the Scheduler always runs **all** the Vusers, whether simultaneously or gradually. In a real-world schedule, you can select how many Vusers to start running at a time.

- While a test is running, you can add Vuser groups/scripts to the test and enable them. When starting the Vusers gradually, if you add a Vuser group after all the Vusers in the test have started running, the new group will start running immediately.

Duration

The Duration action instructs the Scheduler to continue running the test in the current state, for the specified amount of time.

Options	Description
Run until complete	The test runs until all the Vusers have finished running. Resulting action: **Run until completion**
Run for	The test runs in its current state for the specified amount of time (in days, hours, minutes, and seconds) before continuing with the next action. **Default:** 5 minutes **Maximum definable duration period:** 99.23:59:59 dd.HH:MM:SS. Resulting action: **Run for <dd.hh:mm:ss> (dd.HH:MM:SS)**
Run indefinitely	The test runs indefinitely. Resulting action: **Run indefinitely** **Available for:** Basic schedule only

Note:

- In a real-world schedule, if a Duration action is not followed by another action, the test continues to run indefinitely.

- In a real-world schedule, to avoid unexpected behavior during the test run, add a Duration action between consecutive Start Vusers and Stop Vusers actions.

- In a basic schedule, a **Run for** Duration action is always followed by a Stop Vuser action.

Stop Vusers

The Stop Vusers action instructs the Scheduler to stop the running Vusers.

Options	Description
Stop All Vusers: Simultaneously	The Scheduler stops all the running Vusers at once.

Options	Description
Stop All/X Vuser: gradually	The Scheduler stops the specified number of Vusers (**All** or **X**) gradually. That is, the Scheduler stops Y Vusers, and waits the specified time (in hours, minutes, and seconds) before stopping another Y Vusers. Resulting action: **Stop <X> Vuser: <Y> Vusers every <hh:mm:ss> (HH:MM:SS)**

Note:

- A basic schedule that has a **Run for** Duration action, is always followed by a Stop Vuser action that stops all the Vusers, simultaneously or gradually.

- In a real-world schedule, to avoid unexpected behavior during the test run, add a Duration action between consecutive Start Vusers and Stop Vusers actions.

- In a real-world schedule, if no action is specified after a **Run for** Duration action, the Vusers continue to run indefinitely—that is, the schedule continues to run indefinitely.

- When scheduling by group, if Group A is scheduled to run indefinitely, and Group B is scheduled to run after Group A, then Group A must be stopped manually before Group B can start running.

Chapter 11: Service Level Agreements

This chapter includes:

Service Level Agreements Overview

Service level agreements (SLAs) are specific goals that you define for your performance test. After a test run, HP LoadRunner Analysis compares these goals against performance related data that was gathered and stored during the course of the run, and determines whether the SLA passed or failed.

Depending on the measurements that you are evaluating for your goal, ALM determines the SLA status in one of the following ways:

SLA Type	Description
SLA status determined at time intervals over a timeline	Analysis displays SLA statuses at set time intervals over a timeline within the test run. At each time interval in the timeline—for example, every 10 seconds—Analysis checks to see if the measurement's performance deviated from the threshold defined in the SLA. Measurements that can be evaluated in this way: ● **Average Transaction Response Time** ● **Errors per Second**
SLA status determined over the whole run	Analysis displays a single SLA status for the whole test run. Measurements that can be evaluated in this way: ● **Transaction Response Time - Percentile** ● **Total Hits per run** ● **Average Hits (hits/second) per run** ● **Total Throughput (bytes) per run** ● **Average Throughput (bytes/second) per run**

Note:

● You can define and edit SLAs in ALM or in HP LoadRunner Analysis.

● For details about viewing post-run SLA statuses in ALM Performance Center, see "SLA Report" on page 238.

● For details about viewing post-run SLA statuses in Analysis reports, see the *HP LoadRunner Analysis User Guide.*

Tracking Period

When you define service level agreements (SLAs) for measurements that are evaluated over a timeline, Analysis determines SLA statuses at specified time intervals within that timeline. The frequency of the time intervals is called the **tracking period**.

An internally-calculated tracking period is defined by default. You can change this tracking period by defining a value which Analysis plugs into a built-in algorithm to calculate the tracking period. For details, see "Tracking Period Dialog Box" on page 159.

How to Define Service Level Agreements

This task describes how to define service level agreements (SLAs).

You can define service level agreements (SLAs) which measure performance test goals over time intervals during a test run, or over a whole performance test run. To learn more, see "Service Level Agreements Overview" on the previous page and the *HP LoadRunner Analysis User Guide*.

> **Note:** This task is part of a higher-level task. For details, see "How to Design a Performance Test" on page 63.

> **Tip:** For a use-case scenario related to this task, see "How to Define Service Level Agreements - Use-Case Scenario" on page 148.

This task includes the following steps:

- "Prerequisites" below

- "Run through the SLA wizard" on the next page

- "Define a tracking period - optional" on the next page

- "Results" on the next page

1. Prerequisites

   Create a performance test. For details, see "How to Design a Performance Test" on page 63.

   > **Note:** To define Average Transaction Response Time or Transaction Response Time Percentile SLAs, your performance test must include a script that contains at least one transaction.

2. Run through the SLA wizard

In the Performance Test Designer, click the **Summary** tab. In the **Service Level Agreement** pane, click **New** to open the Service Level Agreement wizard. For user interface details, see "Service Level Agreement Wizard" on page 152.

a. Select a measurement for the SLA.

b. If you are defining an SLA for Transaction Response Time (Average/ Percentile), select the transactions to include in your goal.

c. (Optional) When evaluating SLA statuses over a timeline, select a load criterion to take into account and define appropriate load value ranges for the load criterion.

d. Set thresholds for the measurements.

   ○ If the values of **Transaction Response Time (Average/Percentile)** or **Errors per Second** exceed the defined thresholds, Analysis will produce a **Failed** SLA status.

   ○ If the values of **Total Hits**, **Average Hits per Second**, **Total Throughput**, or **Average Throughput** are lower than the defined threshold, Analysis will produce a **Failed** SLA status.

3. Define a tracking period - optional

For measurements whose SLA statuses are determined over time intervals, you need to define the frequency of the time intervals, known as the **tracking period**. For details, see "Tracking Period" on the previous page.

For user interface details, see "Tracking Period Dialog Box" on page 159.

4. Results

During post test run analysis, HP LoadRunner Analysis compares the data collected from the test run against the settings defined in the SLAs, and determines SLA statuses which are included in the default Summary Report and the SLA Report.

For more information, see "Results/Last Run Results Tab" on page 207.

See also the *HP LoadRunner Analysis User Guide*.

How to Define Service Level Agreements - Use-Case Scenario

This use-case scenario describes how to define a service level agreement (SLA) for Average Transaction Response Time.

Note: For a task related to this scenario, see "How to Define Service Level Agreements" on page 146.

This use-case scenario includes the following steps:

- "Background" below

- "Start the SLA wizard" below

- "Select the measurement for the SLA" below

- "Select the transactions to evaluate in your goal" below

- "Select a load criterion and define appropriate ranges of load - optional" on the next page

- "Set thresholds" on the next page

- "Define a tracking period - optional" on the next page

- "Results" on page 150

1. Background

   The administrator of HP Web Tours would like to know when the average transaction response time for booking a flight and searching for a flight exceeds a certain value. Assume that your performance test includes a script that includes the following transactions: **book_flight** and **search_flight**.

2. Start the SLA wizard

   In the Service Level Agreement pane, click **New** to start the Service Level Agreement wizard. Click **Next**.

3. Select the measurement for the SLA

   On the Measurement page, select **Transaction Response Time**, and from the drop-down list, select **Average**.

4. Select the transactions to evaluate in your goal

   On the Transactions page, select the transactions to be evaluated: **book_flight** and **search_**

flight.

5. Select a load criterion and define appropriate ranges of load - optional

   On the Load criteria page, select the load criterion to take into account when evaluating the average transaction response time.

   In this case, to see the effect that various quantities of Vusers running on the system has on the average transaction response time of each transaction, in the **Load Criterion** box, select **Running Vusers**.

   Then set the value ranges for the running Vusers:

   Consider less than 20 Vusers to be a light load, 20 – 50 Vusers an average load, and 50 Vusers or more a heavy load. Enter these values in the Load Values boxes.

   > **Note:**
   >
   > ▪ You can set up to three in-between ranges.
   >
   > ▪ Valid load value ranges are consecutive—there are no gaps in the range—and span all values from zero to infinity.

6. Set thresholds

   On the Thresholds page, you define the acceptable average transaction response times for the transactions, taking into account the defined load criterion.

   In this case, define the same threshold values for both transactions as follows: for a light load, a reasonable average response time can be up to 5 seconds, for an average load, up to 10 seconds, and for a heavy load, up to 15 seconds.

   > **Tip:** To define the same thresholds for all the transactions, enter the values in the **Apply to all transactions** boxes above the table, and click the **Apply to all** button.

7. Define a tracking period - optional

   When SLA statuses for a measurement are determined at time intervals over a timeline, the frequency of the time intervals is determined by the **tracking period**.

   This step is optional because an internally-calculated tracking period of at least 5 seconds is defined by default. You can change the tracking period in the Tracking Period dialog box:

   a. In the Service Level Agreement pane, click the **Tracking Period** button.

   b. Select **Tracking period of at least X seconds**, and select a tracking period. The time intervals are calculated by Analysis according to a built-in algorithm and as a function of the

value you enter here.

> **Example:**
>
> If you select a tracking period of 10, and the aggregation granularity for the performance test (defined in Analysis) is 6, then the tracking period is set to the nearest multiple of 6 that is greater than or equal to 10, that is, Tracking Period = 12.

For details, see "Tracking Period" on page 146.

For user interface details, see "Tracking Period Dialog Box" on page 159.

8. Results

When analyzing your test run, Analysis applies your SLA settings to the default Summary Report and the report is updated to include all the relevant SLA information.

For example, it displays the worst performing transactions in terms of defined SLAs, how specific transactions performed over set time intervals, and overall SLA statuses.

For more information, see the *HP LoadRunner Analysis User Guide*.

Service Level Agreement User Interface
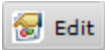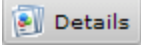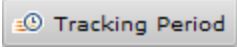
This section includes:

Service Level Agreement Pane

This pane lists all the service level agreements (SLAs) defined for the performance test.

To access	In the Performance Test Designer window, click the **Summary** tab.
Relevant Tasks	• "How to Design a Performance Test" on page 63 • "How to Define Service Level Agreements" on page 146
See also	"Service Level Agreements Overview" on page 145

User interface elements are described below:

UI Elements	Description
New	Starts the Service Level Agreement wizard where you can define new goals for the performance test.
Edit	Opens the Service Level Agreement wizard where you can modify the goals defined in the SLA.
Delete	Deletes the selected SLA.
Details	Opens the SLA Details dialog box which displays a summary of the details of the selected SLA.
Tracking Period	Opens the Tracking Period dialog box where you can adjust the tracking period for measurements that are evaluated per time interval over a timeline. For conceptual information, see "Tracking Period" on page 146. For user interface details, see "Tracking Period Dialog Box" on page 159.
Service Level Agreement list	Lists the SLAs defined for the performance test.

Service Level Agreement Wizard

This wizard enables you to define service level agreements (SLAs). SLAs enable you to define performance targets or goals for your performance test. During a test run, ALM measures performance and collects data. This data is compared against thresholds defined in the SLAs.

To access	**To view a list of defined SLAs:** ● **From ALM:**On the ALM sidebar, under **Testing**, select **Test Plan**, and select a test in the tree. Click the **Test Design** tab. The Service Level Agreement pane lists the defined SLAs. ● **From My Performance Center:** Select the **Test Plan** perspective. Select a test in the tree. The Service Level Agreement pane lists the defined SLAs. **To define SLAs:** 1. Select a test in the tree, and click **Edit Test**. 2. In the Performance Test Designer window, click the **Summary** tab. 3. In the Service Level Agreement pane, click .
Important information	You can define SLAs in the Performance Test Designer only.
Relevant tasks	"How to Define Service Level Agreements" on page 146
Wizard map	This wizard contains: **Introduction** > "Measurement Page" on the next page > "Transactions Page" on page 154 > "Load Criteria Page" on page 155 > "Thresholds Page " on page 156 > "Summary Page" on page 158
See also	"Service Level Agreements Overview" on page 145

User interface elements are described below:

UI Elements	Description
Skip this page next time	When this option is selected, the SLA wizard starts on the Measurements page. For details, see "Measurement Page" on the next page. To view the Introduction page again, on the Measurement page click **Back** and clear the **Skip this page next time** option.

Measurement Page

This wizard page enables you to select a measurement for the SLA. Some measurements are measured at time intervals over a timeline, and others are measured over the whole test run.

Important information	General information about this wizard is available here: "Service Level Agreement Wizard" on the previous page.
Wizard map	The "Service Level Agreement Wizard" on the previous page contains: Introduction > "Measurement Page" above > "Transactions Page" on the next page > "Load Criteria Page" on page 155 > "Thresholds Page " on page 156 > "Summary Page" on page 158
See also	"Service Level Agreements Overview" on page 145

User interface elements are described below:

UI Elements	Description
Transaction Response Time	• **Percentile.** Measures the percentage of transactions whose transaction response time falls below a specific threshold. The SLA is measured over the whole run. • **Average.** Measures whether the average transaction response time of the transactions over a specified time interval exceeds the defined threshold. **Note:** Transaction Response Time SLAs can be defined only when at least one of the scripts participating in the test includes a transaction.
Errors per Second	Measures whether the errors per second over a specified time interval exceed the defined threshold.
Total Hits	Measures whether the total number of hits over the whole test run reach the defined threshold.
Average Hits per Second	Measures whether the average hits per seconds over the whole test run reach the defined threshold.
Total Throughput	Measures whether the total throughput over the whole test run reaches the defined threshold.
Average Throughput	Measures whether the average throughput over the whole test run reaches the defined threshold.

Transactions Page

This wizard page enables you to include transactions critical to your test in the evaluation.

Important information	• General information about this wizard is available here: "Service Level Agreement Wizard" on page 152. • The Transaction page is displayed only when at least one of the scripts participating in the test includes a transaction.
Wizard map	The "Service Level Agreement Wizard" on page 152 contains: Introduction > "Measurement Page" on the previous page > "Transactions Page" above > "Load Criteria Page" on the next page > "Thresholds Page " on page 156 > "Summary Page" on page 158
See also	"Service Level Agreements Overview" on page 145

User interface elements are described below:

UI Elements	Description
Available Transactions	Lists the transactions in the scripts participating in the test. To move a script to the **Selected Transaction** list, double-click it. **Note:** You must select at least one transaction for evaluation.
Selected Transactions	Lists the transactions in the scripts that have been selected for the SLA. To remove a script from this list, double-click it. **Note:** At least one transaction must be listed.

Load Criteria Page

This wizard page enables you to select a load criterion for your goal and define appropriate load value ranges. For example, you can define the SLA to show the behavior of errors per second when there are less than 5 running Vusers, when there are between 5 and 10 running Vusers, and when there are 10 or more running Vusers.

Important information	• General information about this wizard is available here: "Service Level Agreement Wizard" on page 152.
	• This page is available only when defining the **Average Transaction Response Time** or **Errors per Second** SLAs.
	• In the next wizard step (Thresholds page), you will set different thresholds for each of these load value ranges.
Wizard map	The "Service Level Agreement Wizard" on page 152 contains:
	Introduction > "Measurement Page" on page 153 > "Transactions Page" on the previous page > Load Criteria Page >"Thresholds Page " on the next page > "Summary Page" on page 158
See also	"Service Level Agreements Overview" on page 145

User interface elements are described below:

UI Elements	Description
Measurement	The measurement selected for the SLA.
Load Criterion	The load criterion to consider when evaluating the goal.
	• **None.** Does not consider any load criterion.
	• **Running Vusers.** Considers the impact of the running Vusers.
	• **Throughput.** Considers the impact of throughput.
	• **Hits per Second.** Considers the impact of the hits per second.
	For Average Transaction Response Time, you can also select:
	• **Transactions per second**. Considers the impact of the transactions per second.
	• **Transactions per second (passed).** Considers the impact of the transactions per second that passed the evaluation.
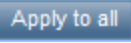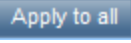
UI Elements	Description
Load Values	Values of load to consider when evaluating the goal. Value ranges must be consecutive, spanning all values from zero to infinity. • **Less than.** The lower range is always from 0 up to, but not including, the value entered here. > **Example:** > > If you enter 5, the lower range is between 0 and 5, but does not include 5. • **Between.** The in-between ranges include the lower value of the range, but not the upper value. > **Example:** > > If you enter 5 and 10, the range is from 5 and up to, but not including, 10. > **Note:** You can set up to three in-between ranges. • **Greater than.** The upper range is from the value entered here, and higher. > **Example:** > > If you enter 10, the upper range is from 10 and up.

Thresholds Page

This wizard page enables you to define thresholds for the selected measurement.

Important information	General information about this wizard is available here: "Service Level Agreement Wizard" on page 152.
Wizard map	The "Service Level Agreement Wizard" on page 152 contains: Introduction > "Measurement Page" on page 153 > "Transactions Page" on page 154 > "Load Criteria Page" on the previous page > "Thresholds Page " above > "Summary Page" on page 158
See also	"Service Level Agreements Overview" on page 145

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
Measurement	The measurement selected for the SLA.
Percentile	Percentage of transactions to measure against the configured threshold. **Available for the following measurement:** Transaction Response Time Percentile
Apply to all transactions	Enables you to define a threshold or a set of thresholds for all of the listed transactions. Click [Apply to all] to apply the thresholds to all of the listed transactions simultaneously. **Note:** Threshold values for the transactions do not have to be the same. You can assign different values for each transaction. **Available for the following measurement:** Average Transaction Response Time
Provide a threshold value for all transactions	Enables you to define one threshold for all of the listed transactions. Click [Apply to all] to apply the value to all of the listed transactions simultaneously. **Note:** The threshold values for the transactions do not have to be the same. You can assign different values for each transaction. **Available for the following measurements:** Transaction Response Time Percentile

UI Elements	Description
Threshold/<Threshold table>	The minimum/maximum threshold value for the selected measurement. ● **Transaction Response Time Percentile**: If the resulting value over the whole run exceeds the defined threshold values, the SLA produces a **Failed** status. ● **Average Transaction Response Time** and **Errors per Second**: If the resulting value over the specified time interval exceeds the threshold values, the SLA produces a **Failed** status for that time interval. ● **Average/Total Throughput** and **Average Hits per Second/Total Hits**: If the resulting value over the whole run is lower than the threshold value, the SLA produces a **Failed** status. **Note:** ● **Transaction Response Time Percentile** and **Average Transaction Response Time:** When more than one transaction is selected, all of the transactions are listed in a table enabling you to define thresholds for each transaction separately. ● **Average Transaction Response Time** and **Errors per Second**: When a load criterion is selected, the table displays the load value ranges, enabling you to define thresholds per range of load values. For details, see "Load Criteria Page" on page 155.

Summary Page

This wizard page displays a summary of the SLA you defined and enables you to define more SLAs.

Important information	General information about this wizard is available here: "Service Level Agreement Wizard" on page 152.
Wizard map	The "Service Level Agreement Wizard" on page 152 contains: Introduction > "Measurement Page" on page 153 > "Transactions Page" on page 154 > "Load Criteria Page" on page 155 > "Thresholds Page " on page 156 > "Summary Page" above
See also	"Service Level Agreements Overview" on page 145

User interface elements are described below:

UI Elements	Description
Define another service level agreement	Enables you to define another SLA while still in the SLA wizard. If this option is selected, clicking **Finish** takes you directly to the page where you can select a measurement for another SLA.

Tracking Period Dialog Box

This dialog box enables you to set a tracking period for service level agreements.

To access	1. In the Performance Test Designer, click the **Summary** tab. 2. In the **Service Level Agreement** pane, click the **Tracking Period** button.
Important information	For measurements evaluated over a timeline, Analysis determines SLA statuses at specified time intervals within that timeline. These time intervals are known as the tracking period.
Relevant tasks	"How to Define Service Level Agreements" on page 146
See also	"Service Level Agreements Overview" on page 145

User interface elements are described below:

UI Elements	Description
Internally calculated tracking period	Analysis automatically sets a tracking period over which SLA statuses are determined. **Minimum tracking period:** 5 seconds
Tracking period of at least <xx> seconds	Analysis sets the tracking period as close as possible to the value specified here. **Minimum tracking period:** 5 seconds **Example:** Assume that you select a tracking period of X=10, and assume that the aggregation granularity for the performance test is 6. The tracking period is set to the nearest multiple of 6 that is greater than or equal to 10. That is, Tracking Period = 12. For this option, Analysis uses the following formula: **Tracking Period = Max(5 seconds, m(Aggregation Granularity))** where **m** is a multiple of the performance test's aggregation granularity such that **m (Aggregation Granularity)** is greater than or equal to X.

Chapter 12: Enabling and Configuring ERP/CRM and J2EE/.NET Diagnostics

This chapter includes:

How to Enable and Configure ERP/CRM Diagnostics

This task describes how to configure the ERP/CRM Diagnostics modules to communicate with the Mediator, and how to define the servers that you want to monitor in order to generate diagnostics data.

To learn more about ERP/CRM diagnostics, refer to the *HP ALM Lab Management Guide*.

> **Note:** This task is part of a higher-level task. For details, see "How to Design a Performance Test" on page 63.

1. Prerequisites

   ■ Make sure that the ERP/CRM Mediator is installed and configured. If this is not the case, consult the administrator for help.

   ■ Make sure that the performance test is not already running.

2. Manually define transactions in the Vuser script

   To ensure that valid diagnostics data are generated, manually define the transactions in the Vuser script rather than using automatic transactions. Make sure to disable the following options in the Run-Time Settings' **General > Miscellaneous** node: **Define each action as a transaction** and **Define each step as a transaction**.

3. Enable the diagnostics module

   From ALM: On the ALM sidebar, under **Testing**, select **Test Lab**. Then select the desired performance test, and select **Test Design > Edit Test > Diagnostics** tab.

   From My Performance Center: In My Performance Center, select **Perspective> Test Plan.** Select a performance test in the test plan tree and click **Edit Test** . Click the **Diagnostics** tab.

   For user interface details, see "Performance Test Designer > Diagnostics Tab" on page 163.

How to Enable and Configure J2EE/.NET Diagnostics

This step describes how to capture J2EE/.NET diagnostics metrics in a performance test, and how to select the probes that are included in the test.

To learn more about J2EE/.NET diagnostics, refer to the *HP ALM Lab Management Guide*.

> **Note:** This task is part of a higher-level task. For details, see "How to Design a Performance Test" on page 63.

Enable J2EE/.NET diagnostics from the Diagnostics Tab

From ALM: On the ALM sidebar, under **Testing**, select **Test Plan**. Then select the desired performance test, and select **Test Design > Edit Test > Diagnostics** tab.

From My Performance Center: In My Performance Center, select **Perspective> Test Plan.** Select a performance test in the test plan tree and click **Edit Test** . Click the **Diagnostics** tab.

For user interface details, see "Performance Test Designer > Diagnostics Tab" on the next page.

How to View Diagnostics Results

You view results for ERP/CRM as well as J2EE/.NET diagnostics in HP LoadRunner Analysis.

1. Open Analysis

    a. Navigate to **<HP Performance Center Host directory> Applications > Analysis**.

    b. Open the desired results file from the following location:

    <LTS installation>\orchidtmp\Results\<Domain Name+Project Name>\Run_<Run number>\res<Run number>\res<Run number>.lrr

2. View results in the Analysis diagnostics graphs

    You can use the Analysis diagnostics graphs and reports to view the performance data and drill down to pinpoint problem areas in any layer of the application.

    For information about specific diagnostics graphs, see the *HP LoadRunner Analysis User Guide*.

Diagnostics User Interface

This section includes:

Performance Test Designer > Diagnostics Tab

This tab enables you to enable and define the ERP/CRM and J2EE/.NET diagnostics modules for a performance test.

To access	**From ALM:**
	1. On the ALM sidebar, under **Testing**, select **Test Plan**.
	2. Right-click a performance test in the test plan tree and select **Edit Test**.
	3. In the Performance Test Designer window, click the **Diagnostics** tab**.**
	From My Performance Center:
	1. Select **Perspective> Test Plan**.
	2. Select a performance test in the test plan tree and click **Edit Test**.
	3. In the Performance Test Designer window, click the **Diagnostics** tab**.**
Important information	• The contents of the tab are disabled while the performance test is running. You must enable and configure the diagnostics modules before running the test.
	• The settings that you configure are per performance test. All scripts in the performance test run under the same diagnostics configuration.
Relevant tasks	• "How to Enable and Configure ERP/CRM Diagnostics" on page 161
	• "How to Enable and Configure J2EE/.NET Diagnostics" on page 161

User interface elements are described below:

UI Elements	Description
Configure	Click the 🔧 button to configure each diagnostics type.
Enable the following Diagnostics for X% of all relevant Vusers in the test	Specify the percentage of Vusers for which you want to collect diagnostics data. This value determines how many of the transactions on the application server are reported to the Controller. Reducing this percentage will reduce the overhead on the application server for Web Page and J2EE & .NET Diagnostics. **Example:** If you enter a sampling value of 25% and run 12 Vusers in **group1**, 8 Vusers in **group2**, and 1 Vuser in **group3**, diagnostics data will be collected for 3 Vusers in **group1**, 2 Vusers in **group2**, and 1 Vuser in **group3**. **Note:** The minimum percentage of Vuser sampling allowed is 1%, or 1 Vuser per group, whichever is more. The maximum percentage allowed is the lowest of the **Max. Vuser Sampling** values of all the selected diagnostics types.
Max Vuser Sampling	The maximum percentage of the amount of Vusers specified in the **Enable the following Diagnostics for X% ...** that can be collected.

J2EE/.NET Configuration Dialog Box

This dialog box enables you to set up the J2EE/.NET diagnostics module.

To access	**From ALM:**
	1. On the ALM sidebar, under **Testing**, select **Test Plan**.
	2. Right-click a performance test in the test plan tree and select **Edit Test**.
	3. In the Performance Test Designer window, click the **Diagnostics** tab**.**
	4. Select **Enable the following diagnostics for X% of all relevant Vusers in the test**.
	5. Select **Enable** by J2EE/.NET Application Diagnostics, then click the **Configure** button .
	From My Performance Center:
	1. Select **Perspective> Test Plan**.
	2. Select a performance test in the test plan tree and click **Edit Test**.
	3. In the Performance Test Designer window, click the **Diagnostics** tab**.**
	4. Select **Enable the following diagnostics for X% of all relevant Vusers in the test**.
	5. Select **Enable** by J2EE/.NET Application Diagnostics, then click the **Configure** button .
Important information	The dialog box is read only while the performance test is running.
Relevant tasks	"How to Enable and Configure J2EE/.NET Diagnostics" on page 161
See also	J2EE & .NET Diagnostics Graphs in the *HP LoadRunner Analysis User Guide*.

User interface elements are described below:
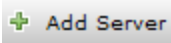
UI Elements	Description
Monitor server requests	Select to capture a percentage of server requests which occur outside the context of any Vuser transaction. For more information, see *HP ALM Lab Management Guide*. **Note:** • The server requests will be captured at the same percentage that was selected for the percentage of Vusers in the Diagnostics Distribution dialog box. • Enabling this option imposes an additional overhead on the probe.
Select Probes Table	• ☐. Selects a probe for monitoring. At least one probe must be selected. • **Name.** The name of the probe. • **Group.** The probe group. • **Host Name.** The host the probe is running on (or the application server on which the probe is installed). • **Status.** The probe's status. Either Available or Not Available. **Note:** If you upgraded your Diagnostics installation, probes from existing performance tests may appear with a red status. Clear any probes that appear in red.
There is a firewall between the Mediator and the Controller. Use the MI Listener for collating results.	Select if the Diagnostics server (or a Diagnostics server in Mediator mode in a distributed environment) is located behind a firewall. **Note:** If there is a firewall between the Controller and the Diagnostics Server involved in a load test, you must configure the Controller and the Diagnostics Server to use the MI Listener to enable the transfer of the offline analysis file. For more information, refer to the *HP Diagnostics Installation and Configuration Guide*.
Troubleshoot diagnostics for J2EE/.NET connectivity	Click to open the HP Diagnostics System Health Monitor to enable you to investigate any connectivity issues between the Diagnostics components.

Oracle 11i Configuration Dialog Box

This dialog box enables you to set up the Oracle 11i Diagnostics module to communicate with the Mediator.

To access	1. Select **Testing > Test Plan**, then select the desired test. 2. Select **Test Design > Edit Test > Diagnostics** tab. 3. Select **Enable the following diagnostics for X% of all relevant Vusers in the test**. 4. Select **Enable** by Oracle 11i Diagnostics, then click the Configure button 🔧 .
Relevant tasks	"How to Enable and Configure ERP/CRM Diagnostics" on page 161
See also	• "Oracle 11i Server Configuration Dialog Box" on the next page • Oracle 11i Diagnostics Graphs in the *HP LoadRunner Analysis User Guide*

User interface elements are described below:

UI Elements	Description
✚ Add Server	Opens the Oracle 11i Server Configuration dialog box where you can add Oracle 11i servers and enter server information. For more information, see "Oracle 11i Server Configuration Dialog Box" on the next page.
Test Mediator	Tests the connections between the Oracle 11i Diagnostics module and the Mediator. **Note:** This does not check the connections to the Oracle servers.
Edit Server	Enables you to edit the server details.
Name	The name of the Mediator used to collect and process the Oracle 11i diagnostics data. Only one Mediator is supported for each diagnostics module.
Servers Table	• **Server.** The name of the Oracle server. • **Platform.** The platform of the Oracle server. • **Log Directory**. The directory where the Oracle trace files (*.trc) are written.

Oracle 11i Server Configuration Dialog Box

This dialog box enables you to add Oracle 11i servers and to add server information.

To access	In the Oracle 11i Configuration dialog box, click **Add Server**.
Relevant tasks	"How to Enable and Configure ERP/CRM Diagnostics" on page 161
See also	"Oracle 11i Configuration Dialog Box" on the previous page

User interface elements are described below:

UI Elements	Description
Domain	The Oracle server domain.
Log Directory	A location where the Oracle application saves the trace files. The trace files can be saved in a shared directory on the Oracle server or in a separate folder.
Password/Passphrase	The user password or passphrase.
Platform	The Oracle server platform.
Private Key File	The name of the file where the Private Key is stored. This can be found on the Mediator. If you specify the file name only (without a path), the configuration automatically looks for the file in the Mediator's **<Mediator Root>\bin** directory.
Server	The name of the Oracle server.
Use Secure Shell	Select if you are working with a Secure Shell connection.
User Name	The user name of the server where trace files are stored. **Note:** For Windows platforms, the user should have administrator privileges.

SAP Configuration Dialog Box

This dialog box enables you to add SAP servers and to add server information.

To access	1. Select **Testing > Test Plan**, then select the desired test. 2. Select **Test Design > Edit Test > Diagnostics** tab. 3. Select **Enable the following diagnostics for X% of all relevant Vusers in the test**. 4. Select **Enable** by SAP Diagnostics, then click the **Configure** button 🔧.
Relevant tasks	"How to Enable and Configure ERP/CRM Diagnostics" on page 161
See also	SAP Diagnostics Graphs in the *HP LoadRunner Analysis User Guide*

User interface elements are described below:
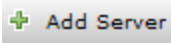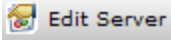
UI Elements	Description
Validate	Validates the connection to the SAP server. When you click **Validate**, the Controller produces a report of all the servers that are available for diagnostics through the Server Host.
Client Number	The client number of the selected user.
Name	The name of the Mediator used to collect and process the SAP diagnostics data. Only one Mediator is supported for each diagnostics module. **Note:** If you are using a Mediator that is over a firewall, enter the local machine key of the Mediator instead of the Mediator machine name.
Server Host Name	The name of the SAP server.
System Router string	Optional. Enter the system router string of the SAP server.
System number	The system number of the SAP server.
User Name	The user's unique name for logging onto the SAP server.
User Password	The user's password for logging onto the SAP server.

Siebel Configuration Dialog Box

This dialog box enables you to set up the Siebel Diagnostics module to communicate with the Mediator.

To access	1. Select **Testing > Test Plan**, then select the desired test. 2. Select **Test Design > Edit Test > Diagnostics** tab. 3. Select **Enable the following diagnostics for X% of all relevant Vusers in the test**. 4. Select **Enable** by Siebel Application Diagnostics, then click the **Configure** button 🔧 .
Relevant tasks	"How to Enable and Configure ERP/CRM Diagnostics" on page 161
See also	• "Siebel DB Server Configuration Dialog Box" on page 172 • Siebel Diagnostics Graphs in the *HP LoadRunner Analysis User Guide* • Siebel DB Diagnostics Graphs in the *HP LoadRunner Analysis User Guide*

User interface elements are described below:
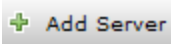
UI Elements	Description
➕ Add Server	Opens the Siebel Server Configuration dialog box where you can add Siebel servers and enter server information. For more information, see "Siebel Server Configuration Dialog Box" on page 172.
Test Mediator	Tests the connections between the Siebel Diagnostics module and the Mediator. **Note:** This does not check the connections to the Siebel servers.
Edit Server	Enables you to edit the server details.
Name	The name of the Mediator used to collect and process the Siebel diagnostics data. Only one Mediator is supported for each diagnostics module.
Servers Table	• **Server Name.** The name of the Siebel server. • **Platform.** The platform of the Siebel server. • **Log Directory**. The Siebel server directory where Siebel log files (*.SARM) are written.

Siebel DB Configuration Dialog Box

This dialog box enables you to add Siebel DB servers and to add server information.

To access	1. Select **Testing > Test Plan**, then select the desired test. 2. Select **Test Design > Edit Test > Diagnostics** tab. 3. Select **Enable the following diagnostics for X% of all relevant Vusers in the test**. 4. Select **Enable** by Siebel Database Diagnostics, then click the **Configure** button 🔧.
Relevant tasks	"How to Enable and Configure ERP/CRM Diagnostics" on page 161
See also	• "Siebel DB Server Configuration Dialog Box" on the next page • Siebel DB Diagnostics Graphs in the *HP LoadRunner Analysis User Guide*

User interface elements are described below:

UI Elements	Description
+ Add Server	Opens the Siebel DB Server Configuration dialog box where you can add Siebel DB servers and enter server information. For more information, see "Siebel DB Server Configuration Dialog Box" on the next page.
Test Mediator	Tests the connections between the Siebel DB Diagnostics module and the Mediator. **Note:** This does not check the connections to the Siebel servers.
Edit Server	Enables you to edit the server details.
Name	The name of the Mediator used to collect and process the Siebel diagnostics data. Only one Mediator is supported for each diagnostics module.
Servers Table	• **Server Name.** The name of the Siebel server. • **Platform.** The platform of the Siebel server. • **Log Directory**. The Siebel server directory where Siebel log files (*.SARM) are written.

Siebel DB Server Configuration Dialog Box

This dialog box enables you to add Siebel DB servers and add server information.

To access	In the Siebel DB Configuration dialog box, click **Add Server**.
Relevant tasks	"How to Enable and Configure ERP/CRM Diagnostics" on page 161
See also	"Siebel DB Configuration Dialog Box" on the previous page

User interface elements are described below:

UI Elements (A-Z)	Description
Domain	The Siebel server domain.
Log Directory	A location where the Siebel application saves the trace files. The trace files can be saved in a shared directory on the Siebel server or in a separate folder.
Password/Passphrase	The user password or passphrase.
Platform	The Siebel server platform.
Private Key File	The name of the file where the Private Key is stored. This can be found on the Mediator. If you specify the file name only (without a path), the configuration automatically looks for the file in the Mediator's **<Mediator Root>\bin** directory.
Server Name	The name of the Siebel server.
Use Secure Shell	Select if you are working with a Secure Shell connection.
User Name	The user name of the server where trace files are stored. **Note:** For Windows platforms, the user should have administrator privileges.

Siebel Server Configuration Dialog Box

This dialog box enables you to add Siebel servers and enter server information.

To access	In the Siebel Configuration dialog box, click **Add Server**.
Relevant tasks	"How to Enable and Configure ERP/CRM Diagnostics" on page 161
See also	"Siebel Configuration Dialog Box" on page 170

User interface elements are described below:

UI Elements	Description
Domain	The Siebel server domain.
Log Directory	A location where the Siebel application saves the trace files. The trace files can be saved in a shared directory on the Siebel server or in a separate folder.
Password/Passphrase	The user password or passphrase.
Platform	The Siebel server platform.
Private Key File	The name of the file where the Private Key is stored. This can be found on the Mediator. If you specify the file name only (without a path), the configuration automatically looks for the file in the Mediator's **<Mediator Root>\bin** directory.
Server ID	The Siebel server ID.
Server Name	The name of the Siebel server.
Server Type	The Siebel server type.
Use Secure Shell	Select if you are working with a Secure Shell connection.
User Name	The user name of the server where trace files are stored. **Note:** For Windows platforms, the user should have administrator privileges.

Chapter 13: Configuring Terminal Sessions

This section includes:

Terminal Sessions Overview

Using Performance Center's terminal sessions, you can run multiple load generators simultaneously in your performance test on a terminal server. Performance Center allows you to create a new terminal session, or connect to an existing session.

Using terminal sessions enables you to overcome the limitation of being able to run only a single GUI Vuser on a Windows-based load generator. GUI Vusers, which operate graphical user interface (GUI) applications, are defined in a GUI Vuser script. You create GUI Vuser scripts using HP's QuickTest Professional (HP Unified Functional Testing). By opening a terminal server session for each GUI Vuser, you can run multiple GUI Vusers on the same application.

You select the number of terminals to be used in your performance test (provided that you have sufficient terminal sessions running), and the maximum number of Vusers that can be run per terminal. The maximum number of Vusers depends on the Vuser type used in the script. For GUI Vusers, the maximum is one Vuser for each terminal session. Performance Center then evenly distributes the number of Vusers among the client sessions.

For details on how to create or connect to a terminal session, see "How to Create a Terminal Session" below.

How to Create a Terminal Session

This task describes how to create a new terminal session.

To learn about terminal sessions, see "Terminal Sessions Overview" above.

> **Note:**
>
> - You can enable terminal sessions when configuring performance tests with manual load generator distribution only.
>
> - The Terminal Services Manager does not support terminal sessions connected over a firewall. To configure terminal sessions over a firewall, see "How to Configure a Terminal Session over a Firewall" on page 178.

1. Prerequisites
   - Ensure that a load generator host is installed on the terminal server machine.

     > **Note:** You cannot use terminal sessions on Linux load generators.

   - Ensure that the Remote Desktop Connection client software is installed on the Controller machine.

2. Configure the Performance Center agent on the load generator machine

   a. Select **Start > All Programs > HP Performance Center Host > Advanced Settings > Performance Center Agent Configuration**. The Agent Configuration dialog box opens.

   b. Select **Enable Terminal Services** and click **OK**.

   c. When prompted to restart the agent, click **OK**.

3. Check the Terminal Services logon settings

   Ensure that the correct terminal services settings are selected for the Remote Desktop Connection client.

   To configure the correct Terminal Server logon settings:

   a. On the load generator machine, select **Start > Programs > Administrative Tools > Terminal Services Configuration.** The Terminal Services Configuration dialog box opens**.** Right-click **RDP-TCP**, and select **Properties** to open the RDP-TCP Properties dialog box.

   b. Click the **Logon Settings** tab.

   c. Make sure that **Use client-provided logon settings** is selected and that **Always prompt for password** is not selected.

4. Add the load generator to the system

   Use the New Host dialog box to add the load generator the system. For user interface details, refer to the *HP ALM Lab Management Guide*.

5. Configure the terminal session

   You configure the terminal session from the Terminal Services dialog box. For user interface details, see "Terminal Services Dialog Box" on page 180.

How to Connect to a Terminal Session

This task describes how to connect to an existing terminal session.

To learn about terminal sessions, see "Terminal Sessions Overview" on the previous page.

> **Note:**
>
> - You can enable terminal sessions when configuring performance tests with manual load generator distribution only.
>
> - The Terminal Services Manager does not support terminal sessions over a firewall. To

> configure terminal sessions over a firewall, see "How to Configure a Terminal Session over a Firewall" on the next page.

1. Prerequisites

   - Ensure that a load generator host is installed on the terminal server machine.

     > **Note:** You cannot use terminal sessions on Linux load generators.

   - Ensure that the Remote Desktop Connection client software is installed on the Controller machine.

2. Run the Performance Center agent as a process

   a. On the load generator machine, run **<Performance Center Host installation>\launch_service\bin\Magentconfig.exe**. The Agent Runtime Settings dialog box opens.

   b. Select **Manual log in to this machine**.

     > **Note:** You must run the Performance Center agent as a process for each terminal session that you are running.

3. Configure the Performance Center agent on the load generator

   a. Select **Start > All Programs > Performance Center Host > Advanced Settings > Performance Center Agent Configuration**. The Agent Configuration dialog box opens.

   b. Select **Enable Terminal Services** and click **OK**.

   c. When prompted to restart the agent, click **OK**.

4. Add the load generator to the system

   Use the New Host dialog box to add the load generator to the system. For user interface details, refer to the *HP ALM Lab Management Guide*.

5. Launch a terminal session from the Controller

   > **Note:** You must open a terminal session for each terminal that you want to run Vusers on during the performance test.

   a. Select **Start > All Programs > Accessories > Communication > Remote Desktop Connection,** or select **Start > Run** and run the **mstsc** command. The Remote Desktop Connection dialog box opens.

b. Click **Options**.

c. In the **General** tab, enter the name or IP address of a terminal server, or select a terminal server from the list of available servers.

d. Enter you user name, password, and domain name (if required) for login onto the terminal server.

e. Click **Connect** to open a Terminal Client window.

6. Configure the terminal session

You configure the terminal session from the Terminal Services dialog box. For user interface details, see "Terminal Services Dialog Box" on page 180.

How to Configure a Terminal Session over a Firewall

This task describes how to configure a terminal session on a load generator that is located over a firewall.

1. Open the load generator machine console.

2. If the Performance Center Agent is not running as a process, run **<load generator host installation>\launch_service\bin\magentproc.exe**.

3. Configure the Performance Center Agent on the console:

a. Select **Enable Firewall Agent**, click **Settings**. In the **Local Machine Key** field, enter a virtual load generator name, for example, `machine_ofw`.

b. Select **Enable Terminal Services**, and click **OK**.

4. Create one or more terminal sessions on the load generator console machine.

Consider the following:

■ For each terminal session, run the agent configuration as above. For each session, specify a different Local Machine Key name, for example, `machine_ofw_1`, `machine _ofw_2`, etc.

■ If you stop the agent on a terminal session, you must reconfigure the settings for that particular session before restarting the agent.

■ When selecting the load generator for the scenario in the Controller, select the local machine key for each individual virtual load generator used.

Terminal Sessions User Interface

This section includes:

Terminal Services Dialog Box

This dialog box enables you to configure terminal sessions.

To access	Use one of the following:
	• In the **Select Load Generators** dialog box, select a load generator and click the **Terminal Services** button [icon] . For more information, see "Select Load Generators Dialog Box " on page 122.
	• In the Automatch Load Generators Properties dialog box, select a load generator then click **Terminal Services**. For more information, see "Automatch Load Generators Properties Dialog Box" on page 125.
	• During Runtime, on the Performance Test Run page, click the **Load Generators** [icon] button. Then click **Terminal Sessions Settings**.
Important information	During runtime, you can set or change terminal services settings only when the load generator is non-operational.
Relevant tasks	"How to Create a Terminal Session" on page 175

User interface elements are described below:

UI Elements	Description
Enable Terminal Services	Applies the settings to the load generator running on the terminal server.
Number of Terminal Services to open on Load Generator	Enter the number of terminals in your performance test. **Note:** You must open a terminal session for each terminal on which you want to run Vusers during the performance test.
Maximum number of Vusers to run in a Terminal Service	Enter the maximum number of Vusers that you want to run in a terminal session. **Note:** The maximum number of Vusers depends on the Vuser type used in the script. For GUI Vusers, the maximum is one Vuser for each terminal session.
Create new Terminal Services sessions	Enables the Controller to launch terminal sessions automatically using the Remote Desktop Connection.

UI Elements	Description
Connect to existing Terminal Services session	Enables a connection to an existing terminal session.

Performance Center Agent Runtime Settings Dialog Box

This dialog box enables you to run the Performance Center Agent as a service, or as a process.

User interface elements are described below:

UI Elements	Description
Allow virtual users to run on this machine without user login	Select to run the Performance Center Agent as a service. You must enter your user credentials. **Note:** This is the default selection.
Manual log in to this machine	Select to run the Performance Center Agent as a process. This enables you to run multiple GUI Vusers on the same load generator.

Chapter 14: Multiple IP Addresses

This chapter includes:

Multiple IP Addresses Overview

Application servers and network devices use IP addresses to identify clients. The application server often caches information about clients coming from the same machine. Network routers try to cache source and destination information to optimize throughput. If many users have the same IP address, both the server and the routers try to optimize. Since Vusers on the same load generator have the same IP address, server and router optimizations do not reflect real-world situations.

The Multiple IP Addresses feature enables Vusers running on a single load generator to be identified by many IP addresses. The server and router recognize the Vusers as coming from different load generators and as a result, the testing environment is more realistic.

This feature can be implemented on Windows and Linux platforms with the following protocols:

DNS, IMAP, Oracle NCA, Oracle Web Applications 11i, POP3, RTE, SAP-Web, Siebel-Web, SMTP, Web (HTTP/HTML), Web Services, and Windows Sockets.

How to Enable IP Spoofing in ALM

The following steps describe how to add IP addresses to a load generator to enable IP Spoofing.

This task includes the following steps:

- "Create multiple IP addresses on the load generator. " below

- "Update the server's routing table with the new addresses." below

- "Enable the Multiple IP Addresses feature from ALM" on the next page

1. Create multiple IP addresses on the load generator.

   - **Windows:** Run the IP Wizard to create multiple IP addresses. For details on running the IP Wizard, see "IP Wizard" on page 185.

     The new IP addresses are added to the load generator once and are used for all performance tests. After running the wizard, restart the load generator machine.

   - **Linux:** Manually configure the new IP addresses for Linux load generators. For details, see "How to Configure Multiple IP Addresses on Linux" on page 185.

2. Update the server's routing table with the new addresses.

   Once the client machine has new IP addresses, the server needs the addresses in its routing table, so that it can recognize the route back to the client. If the server and client share the same netmask, IP class, and network, the server's routing table does not require modification.

> **Note:** If there is a router between the client and server machines, the server needs to recognize the path via the router. Make sure to add the following to the server routing table:
>
> - A route from the Web server to the router,
>
> - Routes from the router to all of the IP addresses on the load generator.

Update the Web server routing table as follows:

a. Edit the batch file that appears in the IP Wizard Summary page. An example **.bat** file is shown below.

```
REM This is a bat file to add IP addresses to the routing table of a
server
REM Replace [CLIENT_IP] with the IP of this machine that the server
already recognizes
REM This script should be executed on the server machine

route ADD 192.168.1.50 MASK 255.255.255.255 [CLIENT_IP] METRIC 1
route ADD 192.168.1.51 MASK 255.255.255.255 [CLIENT_IP] METRIC 1
route ADD 192.168.1.52 MASK 255.255.255.255 [CLIENT_IP] METRIC 1
route ADD 192.168.1.53 MASK 255.255.255.255 [CLIENT_IP] METRIC 1
route ADD 192.168.1.54 MASK 255.255.255.255 [CLIENT_IP] METRIC 1
```

b. For each occurrence of **[CLIENT_IP],** insert your IP address instead.

c. Run the batch file on the server machine.

3. **Enable the Multiple IP Addresses feature from ALM**

After you define multiple IP addresses, you set an option to tell the Controller to use this feature.

a. On the ALM sidebar, under **Testing**, select **Test Plan**. In the tree, right-click a performance test. Select **Edit Test**. In the Performance Test Designer window, click the Workload tab and click the **Options** button at the bottom of the window. Select **Enable IP Spoofer**.

> **Note:** You must select this option before running a performance test.

b. Specify how the Controller should allocate the IP addresses: per process or per thread. For details, see the Controller's general run option settings described in *HP ALM Lab Management Guide*.

How to Configure Multiple IP Addresses on Linux

The following section describe how to manually configure multiple IP addresses on the Linux load generator.

1. To define multiple IP addresses for a single Ethernet card, you need IP Aliasing compiled into the kernel. To do this, use the **ifconfig** command: /sbin/ifconfig eth0:0 x.x.x.x netmask 255.255.x.x up

2. Substitute the new IP address for x.x.x.x, and insert the correct information for subnet mask. Place this command in the **rc.local** file so that it executes upon boot.

IP Wizard

This wizard enables you to create and save new IP addresses on Windows machines.

To access	Use one of the following:
	• **Start > Program Files > Performance Center Host > Tools > IP Wizard**
	• From the Performance Center Host's **\bin** directory, run **ipwizard.exe**.
Important information	• The IP wizard resides on each load generator.
	• The new addresses can be a range of addresses defined by the Internet Assignment Numbers Authority. They are for internal use only, and cannot connect to the Internet. This range of addresses is the default used by the IP Wizard.
	• The IP Wizard only works on machines with a fixed IP, not on machines with a DHCP.
	• Before any of the changes made can take effect, you must restart the machine after you run the wizard, and the Web server's routing table may need to be updated.
Relevant tasks	"How to Enable IP Spoofing in ALM" on page 183

IP Wizard Welcome - Step 1 of 3

User interface elements are described below:

UI Elements	Description
Create new settings	Enables you to define new IP settings on the load generator.

UI Elements	Description
Load previous settings from file	Enables you to use an existing file with IP address settings.
Restore Original Settings	Restores original settings.

IP Wizard - Step 2 of 3 - Optional

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
<Web Server Address box>	If you have more than one network card, enables you to choose the card to use for IP addresses. This step enables the IP Wizard to check the server's routing table to see if it requires updating after new IP addresses are added to the load generator. For details, see "How to Enable IP Spoofing in ALM" on page 183.

IP Wizard - Step 3 of 3 - Optional

User interface elements are described below:

UI Elements	Description
Add...	Opens the Add dialog box, enabling you to add a new IP address. • **Private Address Spaces.** The class that represents the correct submask for the machine's IP addresses. • **From IP.** Adds IP addresses starting with this number. • **Submask.** IP addresses include two components, a **netid** and **hostid**. The submask determines where the netid portion of the address stops and where the hostid begins. • **Number to add.** The number of IP addresses to add. • **Verify that new IP addresses are not already in use.** Instructs the IP Wizard to check the new addresses. The IP Wizard adds only the addresses that are not already in use.
Remove	Removes a selected IP Address.
IP Address	The IP addresses on the load generator machine.

UI Elements	Description
Subnet Mask	The submasks of the IP addresses on the load generator machine.
Number of IPs added	The number of IP addresses added to the load generator machine.

IP Wizard - Summary

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
\<Summary area\>	Displays a summary of the operations performed by the IP Wizard. Take note of the location of the batch file (**.bat**). This is used to update the routing table if necessary. See "How to Enable IP Spoofing in ALM" on page 183.
Reboot now to update routing tables	If you updated the routing table, rebooting initializes the Windows device drivers with the new addresses.

Chapter 15: Customizing Analysis Templates

This chapter includes:

Analysis Templates Overview

You can customize your analysis reports using templates. In HP LoadRunner Analysis, you create the customized templates. You then import the templates to ALM and access the specific template you want for each test in Performance Center.

How to Customize Analysis Templates

This task describes how to customize analysis templates.

You can customize analysis templates to display your performance test run reports in a format that is suitable to your needs. To learn more, see "Analysis Templates Overview" above and the *HP LoadRunner Analysis User Guide*.

> **Note:** This task is part of a higher-level task. For details, see "How to Design a Performance Test" on page 63.

This task includes the following steps:

- "Create a customized analysis template" below

- "Create a zip file with the customized analysis template" below

- "Upload the file to ALM" below

- "Apply the customized analysis template to the report of your performance test" below

1. **Create a customized analysis template**

   In LoadRunner, create a customized analysis template. For user interface details, see the *HP LoadRunner Analysis User Guide*.

2. **Create a zip file with the customized analysis template**

   After creating a local copy of the customized analysis template, zip the folder containing the customized analysis template. Make sure the folder contains a .tem file.

3. **Upload the file to ALM**

   Upload the customized analysis template zip file to the Test Resources module in ALM.

   For more information, see "Upload Analysis Template Dialog Box" on page 192

4. **Apply the customized analysis template to the report of your performance test**

Apply the customized analysis template to the analysis report of your performance test.

For more information, see "Analysis Template Options Dialog Box" on page 193.

> **Note:**
>
> - During the test run, the analysis template is logically bound to the run entity by its ID.
>
> - Editing a test after it has run and changing to another analysis template only impacts future runs. Prior runs still use the previous analysis template.
>
> - If the customized analysis template is not found, the default analysis template is used.

Analysis Template User Interface

This section includes:

Create New Analysis Template Dialog Box

This dialog box enables you to create a new analysis template..

To access	**My Performance Center:**
	1. In My Performance Center, select **Perspective> Test Resources.**
	2. Click the ✳ Create New Analysis Template button.
Relevant tasks	"How to Customize Analysis Templates" on page 189
See also	"Test Resources Page" on page 403

User interface elements are described below:

UI Elements	Description
Name	The name of the new analysis template.
Analysis Template Folder	The folder of the new analysis template. **Note:** The folder name must not contain a forward slash (/). For more details, see "Troubleshooting and Limitations" on page 29.
Description	Enables you to enter a description of the new analysis template.
Messages	Enables you to enter messages and comments about the new analysis template.

Upload Analysis Template Dialog Box

This dialog box enables you to upload analysis template files to ALM.

To access	**ALM:**
	1. On the ALM sidebar, under **Testing**, select **Test Resources**.
	2. Select an existing, or create a new, Analysis Template resource.
	3. In the Analysis Template tab, click the **Upload Analysis Template Content** ⬆ button.
	My Performance Center:
	1. In My Performance Center, select **Perspective> Test Resources.**
	2. Select an existing, or create a new, Analysis Template resource.
	3. Click the **Upload New Analysis Template File** ⬆ button.
Important information	The template file must be saved locally, must be in ZIP format, and must include at least one .tem file.
Relevant tasks	"How to Customize Analysis Templates" on page 189
See also	"Test Resources Page" on page 403

User interface elements are described below:

UI Elements	Description
Upload	Uploads the selected analysis template zip file to the specified Analysis Template resource.
Select	The analysis template zip file.

UI Elements	Description
Clear	Clears the selected analysis template zip file.
Messages	Enables you to enter messages and comments about the analysis template upload.

Analysis Template Options Dialog Box

This dialog box enables you to apply an analysis template to a selected performance test run report.

To access	**ALM:**
	1. On the ALM sidebar, under **Testing**, select **Test Plan**.
	2. Right-click a performance test in the test plan tree and select **Edit Test**.
	3. From the Advanced menu, select **Analysis Template Options**.
	My Performance Center:
	1. In My Performance Center, select **Perspective> Test Plan.**
	2. Select a performance test in the test plan tree and click **Edit Test**.
	3. In the Performance Test Designer window, click the **Workload** tab.
	4. From the Advanced menu, select **Analysis Template Options**.
Relevant tasks	"How to Define a Performance Test Workload" on page 78
See also	"Performance Test Designer > Workload Tab" on page 84

User interface elements are described below:

UI Elements	Description
Use default Analysis Template	Selecting this option uses the default analysis template for the selected performance test report.
Use Analysis Template resource	Select this option to select a customized analysis template for the selected performance test report.

Part 4: Performance Testing Execution

Chapter 16: Performance Test Execution Introduction

This chapter includes:

Running Performance Tests Overview

After planning, designing and scheduling your performance test, you run it to create load on your application and to test its performance.

This section includes:

- "Performance Test Execution Flow" below

- "Monitoring Performance Test Execution" below

- "Analyzing Performance Test Results" on the next page

Performance Test Execution Flow

The following table explains the various stages of the test run flow.

Run stage	Description
Start of run	At the start of the run, the Controller checks the test configuration information, invokes the applications that were selected to run with the test, and then distributes each Vuser script to its designated load generator. When the Vusers are ready, they start running their scripts.
During run	During the run, you can see a synopsis of the test and can also drill down to see which Vuser actions are causing the application problems.
	Service Virtualization: During the run, specified virtualized services run instead of the actual services. You can update services during the test run.
	The online graphs display performance data collected by the monitors. You use this information to isolate potential problem areas in your system.
End of run	The test run ends when all the Vusers have completed their scripts, when the duration runs out, or when you terminate it.

Monitoring Performance Test Execution

Online monitors enable you to monitor performance test execution. During a test run, you can view graphs that display information about the load that Vusers generate on your Web server and other applications. ALM Performance Center displays this data in real-time during test execution.

At the conclusion of the performance test, you can use HP LoadRunner Analysis to view a summary and graphs of the data collected from these monitors during the test run. For detailed information on the available graphs, see the *HP LoadRunner Analysis User Guide*.

For a list of supported monitor types, see "Monitor Types" on page 262.

Analyzing Performance Test Results

HP LoadRunner Analysis lets you analyze performance test data off-line, from any computer on which Analysis is installed. You use Analysis to generate various graph views, merge graphs, drill down within graphs, change zoom level and granularity, and so forth.

Analysis integrates with ALM Performance Center to let you analyze data collected during a performance test run. You can download raw results and sessions for analysis on a local machine. After analyzing the data, you can upload the analysis data (HTML and Rich reports) to Performance Center to share the results with other users.

For Analysis to access an ALM project, your version of Analysis must be properly configured, and be connected to ALM Performance Center.

For information about how to work with ALM Performance Center from within Analysis, see the *HP LoadRunner Analysis User Guide*.

For details about running performance tests, see "How to Manage a Performance Test Run" below.

How to Manage a Performance Test Run

This task describes the workflow for running a performance test, and the available options for managing the test run.

> **Note:**
>
> - **Version Control:** If your project is version-enabled: If you have checked out your test or related scripts, the checked-out versions are used. If another user has checked out the test or scripts and you want to run the test or script, the last checked-in version is used.
>
> - **Product Feature Movie.** To view a movie that demonstrates the performance testing lifecycle, select **Help > Movies** in the ALM main window.

To learn more about running performance tests, see "Running Performance Tests Overview" on the previous page.

This task includes the following steps:

- "Prerequisite" on the next page

- "Begin test execution" on the next page

- "Manage Vusers during the test run - Optional" on the next page

- "Manage virtualized services during the test run - Optional" on the next page

- "Manage runtime monitors, monitor over firewall machines, and load generators during the test run " on the next page

- "Manually stop the test run and collate run results - Optional" on the next page

- "View test results and manage result files" on the next page

- "Analyze test run results" on the next page

- "View performance improvements and regressions" on the next page

1. **Prerequisite**

   Make sure that the performance test you want to run is valid. For more information, see "How to Design a Performance Test" on page 63.

2. **Begin test execution**

   a. In the Test Lab module, create a test set that includes an instance of the performance test you want to run. For information on working with test sets, see the *HP Application Lifecycle Management User Guide*.

   b. In the Execution Grid tab, right-click the test you want to run, and select **Run Test**. The Run Performance Test dialog box opens, enabling you to select a timeslot for the test run. For user interface details, see "Run Test Dialog Box" on page 220.

   c. Select an available timeslot and click **Run**. The Initializing Run page opens. The Initializing Run page displays the performance test initialization steps performed by ALM Performance Center, and the status for each step. If each step is completed successfully, the performance test starts running and the Performance Test Run page opens.

      ○ For Initializing Run page user interface details, see "Initializing Run Page" on page 209.

      ○ For Performance Test Run page user interface details, see "Performance Test Run Page" on page 211.

3. **Manage Vusers during the test run - Optional**

   You can override the defined schedules and manually control the behavior of Vusers during a performance test run.

   For task details, see "How to Manage Vusers During a Test Run" on page 203.

4. **Manage virtualized services during the test run - Optional**

   You can stop, start, update, and load virtualized services during your performance test run.

   For task details, see "How to Manage Virtualized Services During a Test Run" on page 204.

5. **Manage runtime monitors, monitor over firewall machines, and load generators**

during the test run

You can perform actions related to the status and management of runtime monitors, monitor over firewall machines, and load generators during a performance test run.

For task details, see "How to Manage Monitoring and Load Generator Information During a Test Run" on page 205.

6. Manually stop the test run and collate run results - Optional

You can manually stop a test run, for example, if you want to delay data collection and analysis until a more convenient time.

- **To stop the test run gradually.** On the Performance Test Run page, click the **Stop Run**

  button ▣ . The Stop Run dialog box opens, which prompts you to select a post-run collation option. Select an option, then click **Stop**. All Vusers in the test move to the **Gradual Exiting** state. For user interface details, see "Stop Run Dialog Box" on page 224.

- **To stop the test run immediately.** After clicking the **Stop** button in the Stop Run dialog box,

  the **Stop Run** button on the Performance Test Run page changes to **Stop Now** ▣ . Click the button to stop all Vusers immediately.

7. View test results and manage result files

- **View test results.** For task details, see the *HP Application Lifecycle Management User Guide*.

- **Managing test run result and session files.** You view and manage result files generated by the test run in the Test Lab module's Results tab. For user interface details, see "Results/Last Run Results Tab" on page 207.

8. Analyze test run results

You use HP LoadRunner Analysis to analyze test run data off-line, from any computer on which Analysis is installed. For information on how to access your ALM Project from Analysis, see the *HP LoadRunner Analysis User Guide*.

If there are SLAs defined for the performance test, you can calculate SLA results, and view these results in the Analysis Summary report and SLA report which can be accessed from the test run's Result tab. For details, see "Results/Last Run Results Tab" on page 207.

9. View performance improvements and regressions

You can use the Trend Reports feature to view improvements or regressions in performance across several test runs. For more information, see "Trending" on page 414.

How to Manage Vusers During a Test Run

The following steps describe runtime options for managing the behavior of Vusers during a performance test run.

> **Note:** This task is part of a higher level task. For more information, see "How to Manage a Performance Test Run" on page 200.

This task includes the following steps:

- "View details of individual Vusers" below

- "Run Vusers" below

- "Add/Edit Vuser groups" below

- "View Vuser scripts" on the next page

- "Manually release Vusers from a Rendezvous" on the next page

1. View details of individual Vusers

   You can view status details of individual Vusers, and run/stop a single Vuser currently in the **down/run** state, irrespective of its defined schedules.

   On the Performance Test Run page, click the **Vusers Details** button [icon]. The Vusers dialog box opens, enabling you to run or stop individual Vusers. For user interface details, see "Vusers Dialog Box" on page 232.

2. Run Vusers

   You can initialize, run, or stop any number of Vusers irrespective of their defined schedules. In addition, you can add new Vusers to the performance test.

   On the Performance Test Run page, click the **Run Vusers** button [icon]. The Run Vusers dialog box opens, enabling you to run additional Vusers. For user interface details, see "Run Vusers Dialog Box" on page 234.

3. Add/Edit Vuser groups

   You can add Vuser groups, or you can modify existing groups during the test run.

   To open the Add/Edit Vuser Group dialog box:

   - **To add a group.** On the Performance Test Run page, click the **Design Groups and Scheduler** button [icon] . Then select **Add Groups.** The Add/Edit Vuser Group dialog box

opens, enabling you to add a Vuser group.

- **To edit a group.** On the Performance Test Run page, on the Groups pane, place the mouse cursor over the name of the group you want to edit. Click the down arrow that appears adjacent to the name, and select **Edit Group**. The Edit Group dialog box opens, enabling you to edit the group's details.

   For user interface details, see "Add Group Dialog Box" on page 235.

4. View Vuser scripts

   On the Performance Test Run page, on the Groups pane, place the mouse cursor over a group name. Click the down arrow that appears adjacent to the name, and select **View Script**. The View Script dialog box opens up, enabling you to view the code for each action in the script.

5. Manually release Vusers from a Rendezvous

   You can manually release Vusers from a rendezvous before the Controller releases them.

   On the Performance Test Run page, click the **View Rendezvous** button 🔀 . The Rendezvous Policy dialog box opens. For user interface details, see "Rendezvous Dialog Box" on page 95.

How to Manage Virtualized Services During a Test Run

The following task describes runtime options for managing the behavior of virtualized services during a performance test run.

> **Note:** This task is part of a higher level task. For more information, see "How to Manage a Performance Test Run" on page 200.

Manage virtualized services

You can stop, start, update, and load virtualized services during your performance test run.

The following describes how to update services during your performance test run.

1. In the Performance Test Run Page's Summary, click ⬛ in the toolbar to open the Service Simulation dialog box.

2. In the **Service Simulation** dialog box, click the **Simulate** checkbox of the service you want to stop, start, or update (for example, change its data model).

3. Click **Add Project** to load the additional project containing the virutalized services to run with your performance test.

> **Tip:** You can also click **Remove Project** to remove the project.

How to Manage Monitoring and Load Generator Information During a Test Run

The following steps describe runtime options for managing monitor profile, monitor-over-firewall, and load generator information during a performance test run.

> **Note:** This task is part of a higher level task. For more information, see "How to Manage a Performance Test Run" on page 200.

This task includes the following steps:

- "Manage Runtime Monitors" below

- "Edit Monitor Over Firewall Information" below

- "Manage Load Generators" below

Manage Runtime Monitors

You can add, edit, or remove currently running monitors during a performance test run.

On the Performance Test Run page, click the **Monitors** button , and select **Run Time Monitors**. The Monitor Profile content dialog box opens. For user interface details, see "Monitor Profile Content Dialog Box" on page 228.

Edit Monitor Over Firewall Information

You can change the status of a monitor over firewall machine during a performance test run.

On the Performance Test Run page, click the **Monitors** button , and select **Monitors Over Firewall**. The Monitors Over Firewall dialog box opens. For user interface details, see "Monitor Over Firewall Dialog Box" on page 231.

Manage Load Generators

You can perform the following actions with load generators during a performance test run: View status and machine utilization, connect and disconnect load generators, add load generators to the test, and configure terminal sessions.

On the Performance Test Run page, click the **Load Generators** button . The Load Generators dialog box opens. For user interface details, see "Load Generators Dialog Box" on page 229.

Performance Test Execution User Interface

This section includes:

Results/Last Run Results Tab

This tab enables you to manage results related actions for individual test runs.

To access	• **Results tab.** On the ALM sidebar, under **Testing**, select **Test Runs**. The Results tab is available in the Information Panel in the Test Runs tab.
	• **Last Run Results tab.** On the ALM sidebar, under **Testing**, select **Test Lab**. In the left pane select a test set, then select the **Execution Grid** tab in the right pane. The Last Run Results tab is displayed in the area below.
Important information	• **Results tab.** Displays information for the selected test run in the Test Instance Runs tab.
	• **Last Run Results tab.** Displays information for the last test run of the selected test in the Execution Grid tab.
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
	Collate Results. Collates results of test runs that have not yet been collated.
	Note:
	• If a test is running on the Controller that will perform the collating, ALM Performance Center issues an alert. Click **OK** to proceed with collating the results, or **Cancel** to defer the action until later.
	• Should the Collate Results process encounter an error, the Collate Errors dialog box appears, displaying details of the error. To analyze the partially collated results, select **Analyze partially collated results**. Note that analyzing partially collated results is an irreversible operation.

UI Elements	Description
	Recover Results. Enables you to recover and collate the results of a failed test run. **Note:** • Only enabled when the test run is in the **Failed** state. • Enables you to collate results only up to the point where the test failed.
	Analyze Results. Analyzes results for the selected test run. ALM Performance Center generates analysis data and deletes the temporary results from the load generators and the Controller. **Note:** Only enabled when the test run state is **Before Creating Analysis Data**.
	Recalculate SLA. Opens the Calculate SLA dialog box. For details, see "Calculate Service Level Agreement Dialog Box" on page 239. **Note:** This feature is available only if SLAs were defined during the performance test design phase. For more information about SLAs, see "Service Level Agreements" on page 144.
	Show HTML Report. Opens an HTML version of the Analysis Summary report, which analyzes the data collected during the performance test run. The report provides general information about the performance test, lists statistics about the test run, and provides links to graphs containing test run data. For more details regarding the summary report, see the *HP LoadRunner Analysis User Guide.*
	SLA Report. Opens the SLA Report for the selected test run. For details, see "SLA Report" on page 238. **Note:** This feature is available only if SLAs were defined during the performance test design phase. Fore more information about SLAs, see "Service Level Agreements" on page 144.
	Download File. Enables you to download the selected file in the grid.
	Upload File. Enables you to upload a file to the Results tab.
	Delete File. Deletes the selected result file.

UI Elements	Description
	Stop Operation. Stops the current action. **Note:** Appears to the right of the progress bar.
<grid>	Contains a table that displays all available result files. These results include the Analysis session files, raw results, a topology snapshot (if a topology is defined for the test), among others.
<progress bar>	Displays the progress of the current action.
Description	A description of the result file.
ID	The result file ID.
Modified	The date the result file was last modified.
Modified by	The user who last modified the result file.
Name	The name of the result file.
State	Displays the current state of the selected test runs.
Type	The type of result file. • **Results.zip.** Contains the Analysis session files that are automatically generated by ALM Performance Center. The file can be deleted or replaced by uploading a different one.

Initializing Run Page

The Initializing Run page displays the performance test initialization steps performed by ALM Performance Center and the status for each step.
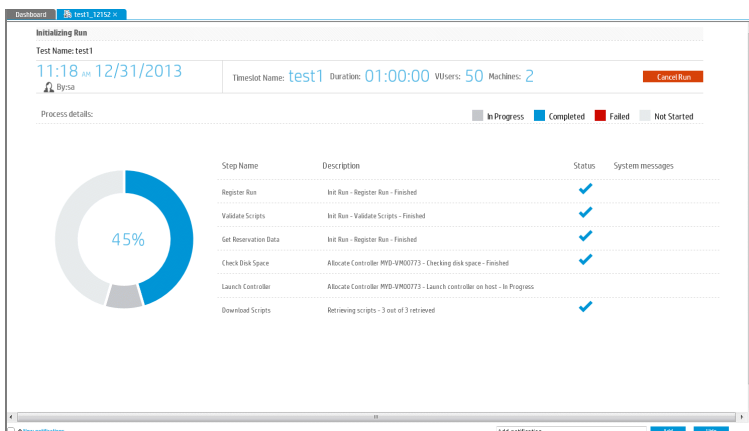
To access	In the Run Performance Center dialog box, click **Run**. For details, see "Run Test Dialog Box" on page 220.
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below:

UI Elements	Description
Test Name	The name of the test.
<Run Date and Time>	The date and time of the test run.
By	The user responsible for running the test.
Timeslot Name	The name of the test run timeslot.
Duration	The time that the test takes to run.
Vusers	The number of Vusers reserved for the timeslot.
Machines	The number of hosts requested for this test.
<Progress Chart>	Displays test initialization steps progress in percentage.
Step Name	Displays the step name. For explanations about the action ALMPerformance Center performs for each step, see Initialization Steps below.
Description	A detailed description of the current status of the step.
Status	Displays whether the step passed or failed.
System Messages	Displays error messages generated when a step fails. These error messages can also be viewed from the Event Log. For details about the event log, refer to the *HP ALM Lab Management Guide*.

Initialization Steps

The Initialization steps are described below:

Step	Description
RegisterRun	Performance Center initializes the run process.
ValidateScripts	Performance Center checks that the selected scripts' Run Logic runtime settings are in sync with the scripts' state.

Step	Description
GetReservationData	Performance Center checks the required resource information from the selected timeslot.
CheckDiskSpace	Performance Center checks that there is enough disk space on the Controller.
LaunchController	Performance Center initializes the Controller so that other testing entities, such as load generators and scripts can connect to it.

If there is a problem launching the Controller, Performance Center automatically attempts to find an alternative Controller. This attempt appears as an additional initialization step.

If no alternative Controller is available, the step fails. |
| **DownloadScripts** | Performance Center downloads the required Vuser scripts. |

Performance Test Run Page

The Performance Test Run page displays a detailed overview of the running performance test, and enables you to perform all runtime test run actions.
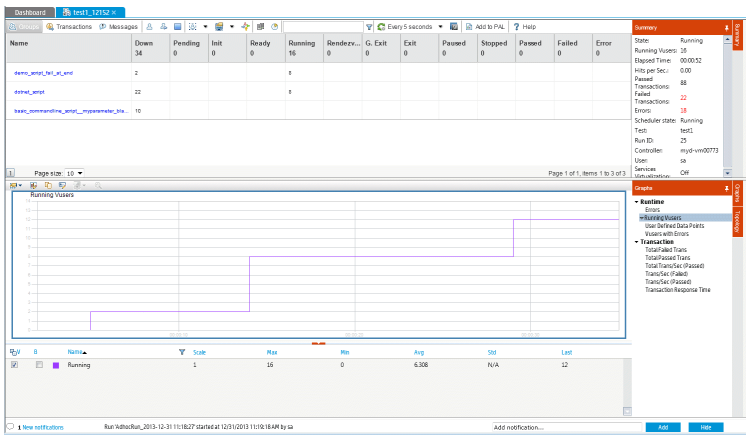
To access	The Performance Test Run page opens as a tab in My Performance Center automatically when a performance test starts, or when you join a running test from My Performance Center.
Relevant tasks	"How to Manage a Performance Test Run" on page 200

Performance Test Details Pane - Toolbar Buttons

The Performance Test Details pane displays details on the running test.

To access	The pane is located in the upper area of the Performance Test Details page.

User interface elements are described below:

UI Elements	Description
Groups	Displays the Performance Test Run page Details pane Groups view. For more information, see "Performance Test Details Pane - Groups View" on page 214
Transactions	Displays the Performance Test Run page Details pane Transactions view. For more information, see "Performance Test Details Pane - Transactions View" on page 215.
Messages	Displays the Performance Test Run page Details pane Messages view. For more information, see "Performance Test Details Pane - Messages View" on page 215.
	Vusers Details. Displays specific details for each Vuser in the performance test, and enables you to run or stop individual Vusers irrespective of their defined schedules. For user interface details, see "Vusers Dialog Box" on page 232.
	Run Vusers. Enables you to run additional Vusers during the course of a performance test. That is, you can run Vusers that are not included in the test's original defined schedule. For user interface details, see "Run Vusers Dialog Box" on page 234.
	Stop Run/Stop Run Now. Enables you to stop a running performance test. • **Stop Run.** Stops the test gradually by moving all running Vusers to the Gradual Exiting state. For user interface details, see "Stop Run Dialog Box" on page 224. • **Stop Run Now.** Enabled only after you click the **Stop Run** button. Enables you to stop the Vusers immediately.

UI Elements	Description
	Design Groups and Scheduler. Click the arrow adjacent to the button for the following options: • **Add Group.** Enables you to add a Vuser group to a running performance test, or to edit Vuser group settings during a test run. For user interface details, see "Add Group Dialog Box" on page 235. • **Edit Scheduler.** Enables you to edit the scheduler during a test run. For user interface details, see "Edit Scheduler Dialog Box" on page 227.
	Monitors. Click the arrow adjacent to the button for the following options: • **Runtime Monitors.** Displays a list of monitors which are currently running during a performance test, and enables you to add, edit, and remove monitors during the run. For user interface details, see "Monitor Profile Content Dialog Box" on page 228. • **Monitor Over Firewall Agent.** Enables you to change the status of a monitor over firewall machine. For user interface details, see "Monitor Over Firewall Dialog Box" on page 231.
	View Rendezvous. Enables you to enable/disable rendezvous points defined in the Vuser scripts and to set rendezvous policies that determine how the Controller handles Vusers at a rendezvous point. For user interface details, see "Rendezvous Dialog Box" on page 95.
	Load Generators. Enables you to manage the load generator in the performance test. For user interface details, see "Load Generators Dialog Box" on page 229.
	Timeslot Duration. Enables you to extend or shorten the duration of the performance test. For user interface details, see "Timeslot Duration Dialog Box" on page 224.
	Filter Items. Enables you to filter the information being displayed.
Every 5 seconds ▼	**Refresh Frequency.** Enables you set the refresh frequency of the page.
	Services Virtualization. Opens the Configure Services Virtualization Dialog Box. For user interface details, see see "HP Services Virtualization Dialog Box" on page 106.
Add to PAL	**Add to PAL.** Opens the Select PAL Report dialog box, enabling you to add the test run data to a selected PAL report. The test run data is displayed in the Data Sources Tab. For more details, see "Data Sources Tab" on page 463.

Performance Test Details Pane - Groups View

The Groups view of the Details pane displays the statuses of the Vusers in the performance test.

To access	In the Performance Test Run page, in the Details pane, click **Groups**. **Note:** Displayed by default.

User interface elements are described below:

UI Elements	Description
Down	The number of Vusers that are down.
Error	The number of Vusers for which a problem occurred.
Exiting (displayed as Exit)	The number of Vusers that have finished running, or have been stopped, and are exiting now.
Failed	The number of Vusers that have finished running. The script failed.
Gradual Exiting (displayed as G. Exit)	The number of Vusers that are finishing their current iteration before exiting.
Init	The number of Vusers that are being initialized on the host machine.
Name	The Vuser group name.
Passed	The number of Vusers that have finished running. The script passed.
Paused	The number of Vusers that have been paused.
Pending	The number of Vusers that are ready to be initialized and are waiting for an available load generator, or are transferring files to the load generator. The Vusers run when the conditions set in their scheduling attributes are met.
Ready	The number of Vusers that have already performed the **init** section of the script and are ready to run.
Rendezvous (displayed as Rendez)	The number of Vusers that have arrived at the rendezvous and are waiting to be released.
Running	The number of Vusers that are running. The Vuser script is being executed on a host machine.
Stopped	The number of Vusers that have been stopped manually.

Performance Test Details Pane - Transactions View

The Transactions view of the Details pane displays how many transactions have been executed successfully or unsuccessfully.

To access	In the Performance Test Run page, in the Details pane, click **Transactions**.

User interface elements are described below:

UI Elements	Description
Failed	The number of times the transaction failed.
Name	The transaction name.
Pass	The number of times the transaction passed.
Stopped	The number of times the transaction stopped.
Success Rate %	The transactions success rate percentage.
TPS	The number of times per second the transaction has run.

Performance Test Details Pane - Messages View

The Messages view of the Details pane displays error, warning, debug, and output messages that are sent to the Controller by the Vusers and load generators during a test run.

To access	In the Performance Test Run page, in the Details pane, click **Messages**.
Important information	To view details of specific messages, click the number for the message type to open the Output Details dialog box. For user interface details, see "Output Details Dialog Box" on page 225.

User interface elements are described below:

UI Elements	Description
Script Name	The name of the script that generated the message.
Total Debug	Sent only if the debugging feature is enabled in the Controller. To enable the feature, select **Tools > Performance Center Controller Options > Debug Information**.
Total Errors	The total number of error messages received. Error messages usually indicate that the script failed.

UI Elements	Description
Total Messages	The total number of messages received.
Total Output	The total number of output messages received from the Vuser script.
Total Warnings	The total number of warning messages received. Warning messages indicate that the Vuser encountered a problem, but the test continued to run.

Summary Pane

The Summary pane displays a synopsis of the running performance test.

To access	Displayed in the upper left corner of the Performance Test Run page.

User interface elements are described below:

UI Elements	Description
Controller	The Controller being used in the test.
Elapsed Time	The amount of time since the test began running.
Errors	The number of Vuser errors that occurred during the test run.
Failed Transactions	The number of completed, unsuccessful transactions performed during the test run.
Hits per Sec	How many hits (HTTP requests) there have been to the Web server by Vusers during each second of the test run.
Passed Transactions	The number of completed, successful transactions performed during the test run.
Run ID	The run ID.
Running Vusers	The number of Vusers currently running in the test.
Scheduler State	The current state of the scheduler.
State	The current run state.
Test	The name of the test.
User	The name of the user who is running the test.
Services Virtualization	Whether services virtualization is on or off.

Online Graphs Pane

The online monitor graphs are used to display performance measurements for those resources being monitored in a performance test.

To access	Displayed in the lower section of the Performance Test Run page.

User interface elements are described below:

UI Elements	Description
	# Graphs. Enables you to select the number of graphs being displayed.

	Graph Configuration. Opens the Graph Configuration dialog box which enables you to configure the graphs display. The following options are available:
	
	• **Granularity.** The interval of the test displayed in the graph.
	
	• **Time Display.** The time displayed on the x-axis.
	
	   ■ **Relative to Load Test start.** Displays the amount of time that has elapsed since the beginning of the test (in hours, minutes, and seconds).
	
	   ■ **Controller clock.** Displays the time on the Controller clock.
	
	   ■ **None.** No clock or time is displayed.
	
	• **Scale.** Select the desired scale:
	
	   ■ **Automatic.** Each measurement in the graph is displayed in the scale that best suits it.
	
	   ■ **None.** Each measurement's true values are displayed in the graph.
	
	• **Line Style.** Select the desired line style:
	
	   ■ **With markers.** Lines in the graph are marked with dots.
	
	   ■ **Without markers.** Lines in the graph are smooth.
	
	• **Apply to all visible graphs.** Applies the changes to all displayed graphs.

	Duplicate Graph. Enables you to duplicate a graph.
	Rename Graph. Enables you to rename a graph.

UI Elements	Description
⊕	**Diagnostics Transaction Breakdown.** Opens HP Diagnostics, displaying the Transactions view, which displays performance metrics and drilldown options for the relevant transaction. For more information about interpreting data in the Diagnostics Transactions view, see the section that describes the transaction views in the *HP Diagnostics User Guide*. **Note:** • Only enabled if your system is configured to work with HP Diagnostics. • To ensure that you can view Diagnostics data during a performance test run, in the Java Settings' Java Control Panel, click the **Network Settings** button and select **Direct Connection**.
<graph legend>	Displays details about graph. The following information is displayed. • **V.** Selects the measurement to be displayed on the graph. • **B.** Displays the measurement in bold. • **<color>.** Enables you to select in which color the measurement appears in the graph. • **Name.** The measurement name. • **Scale.** The graph scale. • **Max.** The measurement's maximum value. • **Min.** The measurement's minimum value. • **Avg.** The measurement's average value. • **Std.** The measurement's standard deviation. • **Last.** The measurement's last value.
Graphs	Displays a tree which lists all the configured online monitors graphs.

Graph Selection Tab

This tab displays a tree which lists all the configured online monitors graphs, and enables you to select which graphs to display in the Online Graphs pane.

To access	Click the **Graphs** tab, on the right of the Online Graphs pane.

User interface elements are described below:

UI Elements	Description
\<Online graphs tree\>	Displays a list of the configured online monitors. Select a monitor to display its graph in the Online Graphs pane.

Topology Tab

This tab displays the topology selected for the performance test, enabling you to track the SiteScope monitor status on each component of your AUT.

To access	Click the **Topology** tab, on the right of the Online Graphs pane.
Important information	• To ensure that SiteScope monitoring data can be displayed for the topology, ensure that the relevant SiteScope server is up and running and that connectivity has been established. • After the test run, a snapshot of the topology is included among the run result files. For details, see "Results/Last Run Results Tab" on page 207.
See also	"Topologies Overview" on page 31
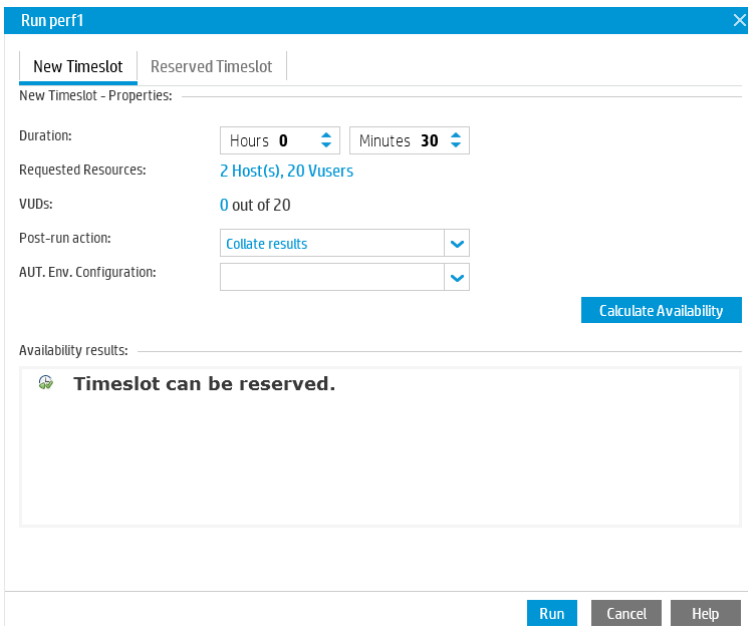
User interface elements are described below:

UI Elements	Description
	Zoom in/out. Enables you to zoom in and out of the topology tab.
	Fit to screen. Enables you to fit the whole topology to the current screen size.
	Edit monitor. Opens HP SiteScope, enabling you to edit the monitors defined on the component selected in the Topology tab. **Note:** During a test run, you can only edit monitors that were defined on the components when designing the topology. You cannot add new monitors during the test run.

UI Elements	Description
<Topology display area>	Displays the topology selected for the test. If monitors are defined on a component in the topology, the following icons may appear: • ![green check]. Indicates that all of the monitors on the component are working successfully. • ![red x]. Indicates that there is an error with at least one of the monitors on the component. • ![gray]. Indicates that at least one of the monitors on the component is not working or not receiving data. • ![warning]. Indicates a warning on at least one of the monitors on the component.

Run Test Dialog Box

This dialog box enables you to run performance tests.

To access	**From ALM:** Select a test set and click the **Execution Grid** tab. Select a performance test and click **Run Test**. **From My Performance Center:** Use one of the following: • Select **Perspective** > **Test Plan**. Click a performance test in the test plan tree. In the Preview or Test Instance tab, click **Run Test**. • Select **Perspective** > **Test Lab**. In the Performance Test Set pane, select a performance test and click **Run Test**. • Select **Perspective** > **PAL**. In the PAL Flow pane, click **Design and run load test** or **Tune load test**. Select a performance test and click **Run Test**.
Relevant tasks	• "How to Manage a Performance Test Run" on page 200 • "How to Work with PAL" on page 447

New Tab

Enables you to create a new timeslot. If the current resources are insufficient for the selected test, you will be unable to reserve a timeslot to run the test.

User interface elements are described below:

UI Element	Description
Duration	The amount of time, in hours and minutes, that you need the resources reserved.
Requested Resources	The resources being requested for this test.
VUDs	Requests VUDs Vusers for the test rather than regular Vusers. For details about VUDs, refer to the *HP ALM Lab Management Guide*.

UI Element	Description
Post Run Action	The action to be taken when the test run is complete. • **Do not collate results.** Frees the machines immediately after the performance test ends. When the run has finished, the run results are left on the load generators. You can analyze the results at a later stage from the Results. • **Collate results.** When the run has finished, the run results are collected from all the load generators. This is recommended because collation of results takes only a few minutes, and can prevent loss of or inaccessibility to results in case any of your load generators becomes unavailable. • **Collate and analyze results.** When the run has finished, the run results are collected and analyzed. Data analysis requires some time, depending on the size of the results file. If there is no timeslot available to include the data analysis, select the Collate option instead, and run late Analysis when a data processor becomes available. You run late Analysis from the Results tab. For user interface details, see "Results/Last Run Results Tab" on page 207.
AUT Env. Configuration	You can only use a deployed environment. For details, refer to the *HP Application Lifecycle Management User Guide*.
Calculate Availability	Calculates the availability of the resources required for running the test and checks whether a new timeslot can be created.
Availability results	Displays the results of the availability verification. If your timeslot cannot be reserved, the reason will be displayed.
Run	Uses the hosts reserved by the selected timeslot and runs the test. The Performance Center Dashboard opens displaying the Performance Test Run page. For details, see "Performance Test Run Page" on page 211.

Reserved Tab

Enables you to run a test in a reserved manual timeslot that has been assigned to your test or has not been assigned to any test. If there are no timeslots available, you will be unable to schedule your test.

User interface elements are described below:

UI Element	Description
ID	The ID of the run created in the context of the timeslot.
Created By	The user who reserved the timeslot.
Start Time	The date and time that the timeslot is due to start or started.
Duration	The duration of the timeslot.
Vusers	The number of Vusers reserved for the timeslot.

UI Element	Description
Hosts	The number of hosts (including Controller) requested for the timeslot.
Remark	Indicates a timeslot remark. Includes the following values: • **New.** Indicates a new timeslot that can be created especially for this run. • **Recommended.** Displayed when the test you are about to run is linked (without Autostart) to the timeslot. When the timeslot was reserved, all the resources needed for this test were reserved. It is therefore recommended to use this timeslot rather than creating a new one. • **Update Required**. Indicates that the timeslot can offer some of the resources needed for the test but you need to update the timeslot to include all the other required resources too. The resource requiring the update is marked with an asterisk (*). **Note:** Even if you reserved a timeslot in the Timeslots module, it may not appear in the grid. Some possible reasons include: • The timeslot is not open yet. • The timeslot is running (it was configured to start automatically instead of manually). • The timeslot does not have the required resources, and due to concurrent timeslots, it cannot be updated with more resources. • The timeslot was not configured with a duration long enough to run the selected test entity, and it cannot be prolonged. • The timeslot was linked to another test by mistake.
Name	The name of the timeslot.
Duration	The amount of time, in hours and minutes, that you need the resources reserved.
Requested Resources	The resources being requested for this test.
VUDs	Requests VUDs Vusers for the test rather than regular Vusers. For details about VUDs, refer to the *HP ALM Lab Management Guide*.

UI Element	Description
Post Run Action	The action to be taken when the test run is complete. • **Do not collate results.** Frees the machines immediately after the performance test ends. When the run has finished, the run results are left on the load generators. You can analyze the results at a later stage from the Results. • **Collate results.** When the run has finished, the run results are collected from all the load generators. This is recommended because collation of results takes only a few minutes, and can prevent loss of or inaccessibility to results in case any of your load generators becomes unavailable. • **Collate and analyze results.** When the run has finished, the run results are collected and analyzed. Data analysis requires some time, depending on the size of the results file. If there is no timeslot available to include the data analysis, select the Collate option instead, and run late Analysis when a data processor becomes available. You run late Analysis from the Results tab. For user interface details, see "Results/Last Run Results Tab" on page 207.
AUT Env. Configuration	You can only use a deployed environment. For details, refer to the *HP Application Lifecycle Management User Guide*.

Timeslot Duration Dialog Box

This page enables you to extend or shorten the current timeslot.

To access	During runtime, on the Performance Test Run page, click the **Timeslot Duration** button 🕐 .
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below:
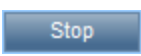
UI Elements	Description
Refresh	Refreshes the **Timeslot Remaining Time** information.
Prolong Timeslot by X minutes	Prolongs the timeslot duration by the selected number of minutes.
Shorten Timeslot by X minutes	Shortens the timeslot duration by the selected number of minutes.

Stop Run Dialog Box

This page enables you to stop a running performance test and to select a post-run collation option.

To access	During a test run, on the Performance Center Dashboard's Performance Test Run page, click the **Stop Run** button [button] .
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below:

UI Elements (A-Z)	Description
[Stop]	Moves all running Vusers to the **Gradual Exiting** state.
Collate and analyze results	ALM Performance Center collates the run data from the load generators and generates analysis data. After data is collated, ALM Performance Center automatically deletes the temporary results from the load generators and controllers. You can display the results using analysis tools such as graphs and reports, or download the results for analysis on a local machine. This option takes the most time.
Collate results	ALM Performance Center collates the run data from the load generators. After data is collated, ALM Performance Center automatically deletes the temporary results from the load generators. You can download the raw results from the Results tab, or manually analyze results at a later point from the Results tab. **Note:** This is the default setting.
Do not collate results	Frees the machines immediately after the test ends. You can collate and analyze results at a later point from the Results tab.
Free current timeslot	Frees the current timeslot once the test has stopped.

Output Details Dialog Box

This dialog box enables you to view details of messages that are received during a test run.

To access	On the Performance Test Run page, in the Details pane, click **Messages**. Then in the grid, click the number of messages for the message type whose details you want to view. For more details about the Messages view of the Details pane, see "Performance Test Run Page" on page 211.
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below:

UI Elements	Description
Vuser Log	Opens the Vuser activity log, which enables you to view a list of messages per individual Vuser. The log contains the following information: • **Activity log for Vuser.** The selected Vuser whose ID is being displayed. • **Refresh.** Enables you to refresh the log. • **Download log.** Enables you to download the log. • **Log Message area.** Displays a list of all messages received for the selected Vuser. • **Snapshot.** Generates a snapshot (a graphical representation of the Web page) of the point in the test run where an error occurred. Before using this feature, you must install the Snapshot Viewer on your desktop, and enable the **Show Snapshot on Error** option in the script's runtime settings. For more information on the runtime settings, see "Script Runtime Settings" on page 336.
Refresh	Enables you to refresh the dialog box information.
Clear All Messages	Clears all messages.
Filtered By	Indicates the filter in use. To change the filter, click the drop-down arrow.
Script	The name of the script.
Action	The action in the script where the message was generated.
Code	The message code.
Host	The host that generated the message.

UI Elements	Description
Iteration	The iteration during which the message was generated.
Line	The line in the script where the message was generated.
Message	The received message.
Script	The script that generated the message.
Time	The time the message was generated.
Type	The type of message. The possible message types are: • **Notify.** Provides runtime information. • **Error.** Usually indicates that the script failed. • **Warning.** Indicates that the Vuser encountered a problem, but that the test continued to run. • **Debug.** Sent only if the debugging feature is enabled in the Controller. To enable the feature, select **Tools > Performance Center Controller Options > Debug Information**.
Vuser	The Vuser which generated the message.

Edit Scheduler Dialog Box
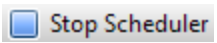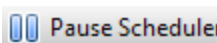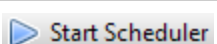
This dialog box enables you to edit scheduler settings during a performance test run.
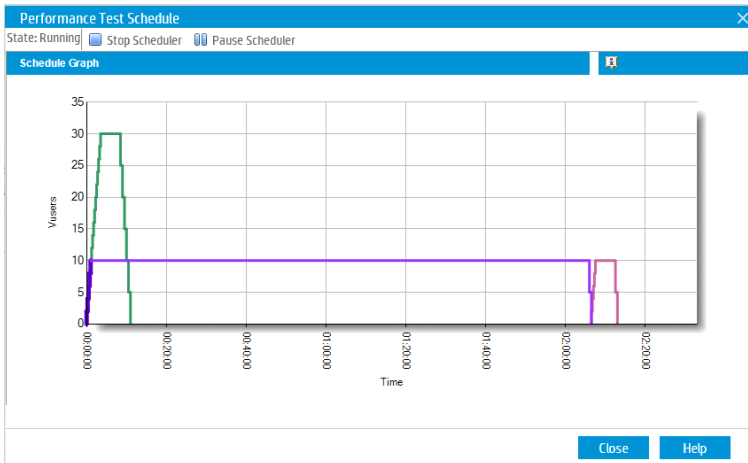
To access	On the Performance Test Run page, click the **Design Groups and Scheduler** button ⊞ .Then select **Edit Scheduler**.

Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
Stop Scheduler	Stops the scheduler and enables it for editing.
Pause Scheduler	Pauses the scheduler.
Start Scheduler	Restarts the scheduler after editing.
<edit scheduler section>	Enables you to edit a defined schedule. For more information, see "Global Scheduler Actions" on page 138.
Global/Groups Schedule	Displays whether the current schedule has been defined **by test** or **by group**. ● **Start Time.** Enter a delay time for the scheduler to restart after editing. To restart the scheduler immediately, leave this setting blank. ● **Wait.** (Groups schedule only) Select to initialize all Vuser groups together. ● **Group.** (Groups schedule only) Select individual groups to display and edit their schedules.
Schedule Graph	Provides a graphical representation of the defined schedule actions.
State	Displays the current scheduler status.

Monitor Profile Content Dialog Box

This dialog box displays a list of monitors which are currently running during a performance test, and enables you to add, edit, and remove monitors during the run.

The monitors that are displayed are a combination of the monitors from all the monitor profiles that were associated to the test, as well as a set of 'host' monitors which are added automatically to every test for each host which is used in the test.

To access	On the Performance Test Run page, click the **Monitors** button , and select **Runtime Monitors**.
Important information	● Monitors which are defined as part of a monitor profile but fail to run do not appear in the list of monitors. ● Default host monitors cannot be modified during runtime.
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below:

UI Elements	Description
✳	**Add Monitor.** Click to add a monitor to the performance test. For more information about monitors, see "Add New Monitors Page" on page 52.
🖥	**Edit Monitor.** Click to edit the selected monitor. The relevant monitor type page opens, enabling you to edit the monitor information.
✖	**Delete Selected Item.** Deletes the selected monitor.
🔄	**Refresh Monitors List.** Refreshes the monitors list.
⬆	**Check Out.** Opens the Check Out dialog box, enabling you to check out selected entities. For details, see the *HP Application Lifecycle Management User Guide*. **Available for**: Version-control-enabled projects only
⬇	**Check In.** Opens the Check In dialog box, enabling you to check in selected entities. For details, see the *HP Application Lifecycle Management User Guide*. **Available for**: Version-control-enabled projects only
🖥	**Undo Check Out.** Cancels the check out of selected entities and discards changes. To undo checkouts for entities checked out by other users, you must have the appropriate user permissions. For more information, refer to the *HP Application Lifecycle Management Administrator Guide*. When you undo a checkout, any changes you made to non-versioned fields while the entity was checked out are not cancelled and the new values remain. For details, see the *HP Application Lifecycle Management User Guide*. **Available for**: Version-control-enabled projects only

Load Generators Dialog Box

This dialog box enables you to view load generator status and machine utilization, connect and disconnect load generators, add load generators to the test, and to configure terminal sessions.

To access	On the Performance Test Run page, click the **Load Generators** 📧 button.
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below:

UI Elements	Description
	Select All. Selects all displayed load generators.
	Deselect All. Deselects all displayed load generators.
	Invert Selection. Inverts the current selection of load generators. That is, the non-selected load generators are selected, and the selected load generators are cleared.
	Disconnect. Disconnects the selected load generator for the performance test.
	Connect. Connects the selected load generator for the performance test.
	Add Load Generators. Opens the Add Load Generators dialog box, which enables you to add load generators to the test. For user interface details, see "Add Load Generators Dialog Box " on the next page.
	Terminal Session Settings. Opens the Terminal Services dialog box, which enables you to configure terminal sessions for the load generator. For user interface details, see "Terminal Services Dialog Box" on page 180.
	Refresh. Refreshes the information displayed in the Load Generators dialog box.
Name	The load generator name.
Details	Load generator details.
Platform	The platform on which the load generator is running.
Status	The current status of the load generator. The possible statuses are: • **Active.** The load generator is connected. • **Busy.** The load generator is running Vusers. • **Disconnecting.** The load generator is disconnecting. • **Down.** The load generator is not connected. • **Failed.** A connection with the load generator could not be established. • **Ready.** The load generator is connected.

Add Load Generators Dialog Box

This dialog box enables you to add load generators to a running performance test.

To access	In the Load Generators dialog box, click the **Add Load Generators** button ![icon].
Relevant tasks	"How to Manage a Performance Test Run" on page 200
See also	"Load Generator Distribution " on page 114

User interface elements are described below:

UI Elements	Description
Add X Automatch Load Generators	Enables you to add a specified number of automatch load generators.
Add Specific Load Generators	Enables you to add specific load generators. The load generator table lists the specific load generators which are available, displaying the following information for each load generator: • **Name.** The load generator name. • **State.** The current state of the load generator: **Operational**, **Non-Operational**, or **Unavailable**. • **Purpose.** The purpose of the load generator, that is, **Controller**, **Load Generator**, **Data Processor**, or a combination of these. • **Location.** The location of the load generator. • **Host Attributes.** Select attributes for the load generator.

Monitor Over Firewall Dialog Box

This dialog box enables you to change the status of a monitor over firewall machine during a test run.

To access	On the Performance Test Run page, click the **Monitors** button ![icon] , and select **Monitor Over Firewall**.
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below:

UI Elements	Description
	Select All. Selects all displayed monitor over firewall machines.
	Deselect All. Deselects all displayed monitor over firewall machines.
	Invert Selection. Inverts the current selection of monitor over firewall machines. That is, the non-selected machines are selected, and the selected machines are cleared.
	Disconnect. Disconnects the selected monitor over firewall machine for the performance test.
	Connect. Connects the selected monitor over firewall machine for the performance test.
	Refresh. Refreshes the information displayed in the monitor over firewall agent dialog box.

Vusers Dialog Box

This dialog box displays specific details for each Vuser in the performance test, and enables you to run or stop individual Vusers irrespective of their defined schedules.

To access	During Runtime, on the Performance Center Dashboard's Performance Test Run page, click the **Vusers Details** button .
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below:

UI Elements	Description
	Select All. Selects all displayed Vusers.
	Deselect All. Deselects all selected Vusers.
	Invert Selection. Inverts the current selection of Vusers. That is, the non-selected Vusers are selected, and the selected Vusers are cleared.
	Run Selected Vusers. Runs the selected Vusers.
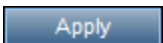
UI Elements	Description
▐▐	**Pause Selected Vusers.** Pauses the selected Vusers.
▢	**Stop Selected Vusers Gradually.** Stops the selected Vusers gradually. The Vusers complete the current iteration before stopping.
⬤	**Stop Selected Vusers Immediately.** Stops the selected Vusers immediately.
↺	**Reset Selected Vusers.** Resets the selected Vusers to the Down state.
▤	**Show Selected Vusers Log.** Opens the Vuser Activity Log, which displays runtime information for the selected Vuser. The log displays the following information: • **Activity log for Vuser.** The selected Vuser. • **Refresh.** Refreshes the information displayed in the log. • **Download log.** Enables you to download the log. • **Close.** Closes the log. • **Log Message.** Displays the logged Vuser messages. • **Show snapshot.** Generates a snapshot of the point where an error occurred in a test run. Before using this feature, you must install the snapshot viewer on your desktop, and enable the **Snapshot on Error** option in the Runtime Settings for the Vuser script. For more information on configuring the runtime settings, see "Script Runtime Settings" on page 336.
⟳	**Refresh.** Refreshes the information displayed in the dialog box.
Elapsed Time	The amount of time the Vuser has been running.
Group	Filters displayed Vusers by Vuser group.
ID	The Vuser's ID.
Load Generator	Filters displayed Vusers by load generators.
Status	Filters displayed Vusers by their current status.

Run Vusers Dialog Box

This dialog box enables you to initialize, run, or stop any number of Vusers irrespective of their defined schedules. In addition, you can add new Vusers or VUDs to the performance test.

To access	On the Performance Test Run page, click the **Vuser Details** button .
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below:

UI Elements	Description
Distribution Mode: 👤	**by Vusers.** The Vusers being given an instruction are distributed according to Vuser groups.
Distribution Mode: 📋	**by Load Generator.** The Vusers being given an instruction are distributed according to load generators.
Vuser By: 123	**by Number.** Enables you to give an instruction to a specific number of Vusers per Vuser group/load generator.
Vuser By: %	**by Percentage.** Enables you to give an instruction to a specific number of Vusers, which are then distributed among the Vuser groups/load generators according to a percentage which you define. **Example:** If you choose to run an additional **200** Vusers, among three Vuser groups, **A**, **B**, and **C**, and you define the percentage distribution as **A = 75%**, **B = 20%**, and **C = 5%**, then the Vusers would be distributed as follows: **A.** 150 Vusers **B.** 40 Vusers **C.** 10 Vusers **Note:** When selecting this method, you enter the number of Vusers to run in the box adjacent to the **by Percentage** button.
123	Enter the number of Vusers per Vuser group/load generator.
%	Enter the percentage distribution per Vuser group/load generator.
Apply	Performs the selected instruction.
Group	Lists the Vuser groups in the test.
Load Generator	Lists the load generators in the test.

UI Elements	Description
Perform the following Action	Give the desired instruction to the defined number of Vusers. The possible actions are: • **Add new Vusers to Down state.** Add the desired number of Vusers to the **Down** state. • **Add new VUDs to Down state.** Add the desired number of VUDs to the **Down** state. • **Initialize Vusers from Down.** Initializes the desired number of Vusers currently in the **Down** state. • **Run Vusers from Down.** Runs the desired number of Vusers currently in the **Down** state. • **Run Vusers from Ready.** Runs the desired number of Vusers currently in the **Ready** state. • **Stop Vusers.** Moves the desired number of Vusers from the **Run** state to the **Gradual Exiting** state. • **Reset Vusers.** Moves the desired number of Vusers from the **Stopped** state to the **Down** state. **Note:** You cannot perform an action on more Vusers than are currently in a particular state. For example, if you define **10** Vusers and select **Initialize Vusers from Down**, but there are only **five** Vusers in the Down state, *only* those five Vusers are initialized.

Add Group Dialog Box

This dialog box enables you to add a Vuser group to a running performance test, or to edit Vuser group settings during a test run.

To access	• **When adding a Vuser group.** On Performance Test Run page, click the Design Groups and Scheduler button ⬚ . Then select **Add Groups**. • **When editing a Vuser group.** On the Performance Test Run page, on the Groups pane, place the mouse cursor over the name of the group you want to edit. Click the downward arrow that appears adjacent to the name, and select **Edit Group**.
Important information	To edit a Vuser group, all Vusers must be in the **inactive** state.

Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below:

UI Elements (A-Z)	Description
Run Time Settings	Enables you to view and change the runtime settings for the Vuser script.
View Script	Opens the script in VuGen.
Command Line	Type the name and value of the parameter you want to send using the format, **<Parameter_Name> <value>**.
	For information about the command line parsing functions, or for details about including arguments on a command line, see the *HP LoadRunner Online Function Reference*, provided with HP Virtual User Generator.
Group Name	The name of the Vuser group.
Load Generators	The load generators on which the group is running.
Protocol	The Vuser script's protocol.
Script	The name of the Vuser script.
Vusers	The number of Vusers assigned to the group.
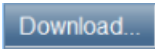
View Script Dialog Box

This dialog box enables you view the code for each action in a running Vuser script.
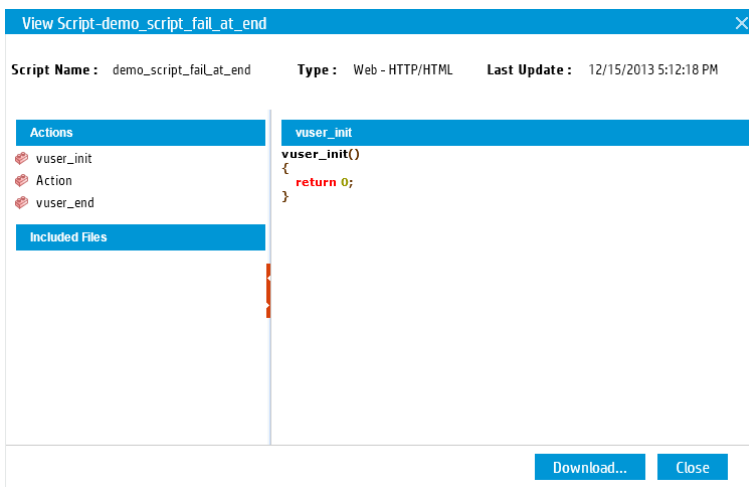
To access	On the Performance Test Run page, on the Groups pane, place the mouse cursor over the name of a group. Click the downward arrow that appears adjacent to the name, and select **View Script**.
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below:

UI Elements	Description
Download...	Enables you to download the script.
Script Name	The script's name.
Type	The script type.
Last Update	The last updated date and time.
Actions	Lists the actions included in the script. Click on an action to view its code in the right pane.
Included files	Displays files included in the script.

SLA Report

This report displays the post-run SLA statuses of the SLA goals defined for the performance test.

To access	**From ALM:**
	On the ALM sidebar, under **Testing**, select **Test Lab**. Select the **Test Runs** tab. Use one of the following:
	• In the information panel, in the **Results** tab, click the **SLA Report** button.
	• In the left pane select a test set. Select the **Execution Grid** tab in the right pane. In the area below, in the **Last Run Results** tab, click the **SLA Report** button.
	From My Performance Center:
	Use one of the following:
	• Select **Perspective** > **Test Plan**. Click a performance test in the test plan tree. Click the **Test Run** tab.
	• Select **Perspective** > **Test Lab** or select **Perspective** > **Test Runs**.
	• Select **Perspective** > **PAL**. In the PAL Flow pane, click **Export Data to Production**.
Important information	The SLA report is available only if SLAs were defined prior to running the performance test.
Relevant tasks	"Running Performance Tests Overview" on page 199
See also	"Service Level Agreements Overview" on page 145

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
	Export to Excel. Enables you to export the selected section of the SLA report to an Excel file.
	Export to PDF. Enables you to export the selected section of the SLA report to a .pdf file.
	Export to CSV. Enables you to export the selected section of the SLA report to a .csv file.
	Export to Word. Enables you to export the selected section of the SLA report to a Word file.
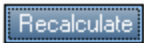
UI Elements	Description
\<Test run details\>	The details of the performance test run to which the SLA report data relates are displayed at the top of the report.
\<SLA grids\>	The results for each SLA are displayed in separate grids. **Tip:** Each set of results can be exported to Excel, Word, PDF, and CSV format.
\<SLA status indicators\>	. Indicates a failed SLA status. . Indicates a passed SLA status. . Indicates that there is no data about the SLA status.

Calculate Service Level Agreement Dialog Box

This dialog box enables you to change the test time range included in the Service Level Agreement (SLA).

To access	**From ALM:** On the ALM sidebar, under **Testing**, select **Test Lab**. Select the **Test Runs** tab. In the information panel, in the **Results** tab, click the **Recalculate SLA Report** button. **From My Performance Center:** Use one of the following: • Select **Perspective** > **Test Plan**. Click a performance test in the test plan tree. Click the **Test Run** tab. • Select **Perspective** > **Test Lab** or select **Perspective** > **Test Runs**. • Select **Perspective** > **PAL**. In the PAL Flow pane, click **Export Data to Production**.
Important information	The Recalculate SLA button is available only if SLAs were defined for the performance test.
Relevant tasks	"Running Performance Tests Overview" on page 199
See also	"Service Level Agreements Overview" on page 145

User interface elements are described below:

UI Elements	Description
Recalculate	Recalculates the SLA according to the defined information.
Calculate SLA for whole run duration	Calculates the SLA over the whole test run.
Calculate SLA for part of run duration	Calculates the SLA over part of the test run. Enter the desired **Start Time** and **End Time** over which to calculate the SLA.

Chapter 17: Network Virtualization

This chapter includes:

Network Virtualization Overview

HP ALM Performance Center integrates with HP Network Virtualization to help you test point-to-point performance of network-deployed products under production conditions. By installing HP Network Virtualization, you can introduce highly probable network effects such as latency, packet loss, and link settings. As a result, your test scenario runs in an environment that more reliably and accurately represents the real-world conditions experienced by end users.

HP Network Virtualization includes a global library of network conditions from cities around the world. Because the network parameters are provided by HP Network Virtualization, you do not need to manually enter this information.

The following table presents the most typical effects that you can configure:

Effect	Description
Latency	The time, in milliseconds, that it takes an IP packet to cross the network. This is usually affected by geographical distance, the available bandwidth, the network load on the route between the two ends, and whether this is a terrestrial link.
Packet Loss	The chance of losing IP packets while data travels through a network. Packets can get lost due to link faults or due to extreme network load.
Bandwidth	The capacity of your network to transfer data.

You can create more meaningful results by configuring several load generators or groups of Vusers with a unique set of network effects, and by giving each set a unique location path. For example, you could define a location from **New York** to **London** and another one from **Los Angeles** to **New York**.

After running a performance test, view the results in the Performance Test Run page or the LoadRunner Analysis. For details on the Performance Test Run page, see "Performance Test Run Page" on page 211. For details on viewing results in Analysis, see the *HP LoadRunner Analysis User Guide*.

For details on how to integrate Network Virtualization into your performance test, see "How to Integrate Network Virtualization into a Performance Test" on page 246.

This section also includes:

- "Defining Virtual Locations" below

- "Excluding Machines from Network Virtualization" on the next page

- "Viewing Network Virtualization Graphs" on the next page

- "Workflow for Working with Network Virtualization" on the next page

Defining Virtual Locations

From within Performance Center, HP Network Virtualization enables you to define different network

locations and conditions for virtualizing in the test environment, so each end user geography and the unique conditions associated with each can be accurately represented. For example, you can define end point locations in **London** and **New York** and emulate the network path between those two cities. You add locations in the Network Virtualization Settings dialog box. You can define global virtualization settings or configure the settings for each of the locations separately. For details, see "Network Virtualization Settings Dialog Box" on page 254.

Excluding Machines from Network Virtualization

In some situations, you may need to exclude certain machines from the network virtualization as they could inappropriately affect the emulation. When a machine is excluded from network virtualization, network traffic to that machine does not suffer any network effects and is not included in the network virtualization results.

The following machines are excluded by default:

- The Controller machine or the MI Listener and proxy server

- The Diagnostics Commander server

- The Performance Center server

- The SiteScope server (configured to monitor Performance Center servers and hosts)

In addition to the machines that are excluded by default, consider excluding the following machines:

- In a Multi-protocol performance test that includes a Web server and a database server, where information from the database server is not required as a part of the performance test, exclude the database server

- All deployment and software upgrade servers

- Where you run and store scripts on a shared network drive

Viewing Network Virtualization Graphs

Network Virtualization starts and stops automatically as you start and stop the performance test. Network Virtualization monitors are assigned automatically when the performance test run starts and metrics are automatically collected during the performance test run. You can view the network virtualization metrics during the performance test run in the Performance Test Run page. For details on the Performance Test Run page, see "Performance Test Run Page" on page 211.

You can also view the results in LoadRunner Analysis. For more details on viewing results in Analysis, see the *HP LoadRunner Analysis User Guide*.

Workflow for Working with Network Virtualization

The following workflow shows how to integrate Network Virtualization into a performance test

Install
HP Network Virtualization

Edit Network Virtualization Settings
in Performance Center

Select a Mode:

Per Group
Per Load Generator

Configure the
Global Network Virtualization
Settings

Define Virtual Locations

Assign Locations per Group
or per Load Generator

Run the Performance Test

View Graphs
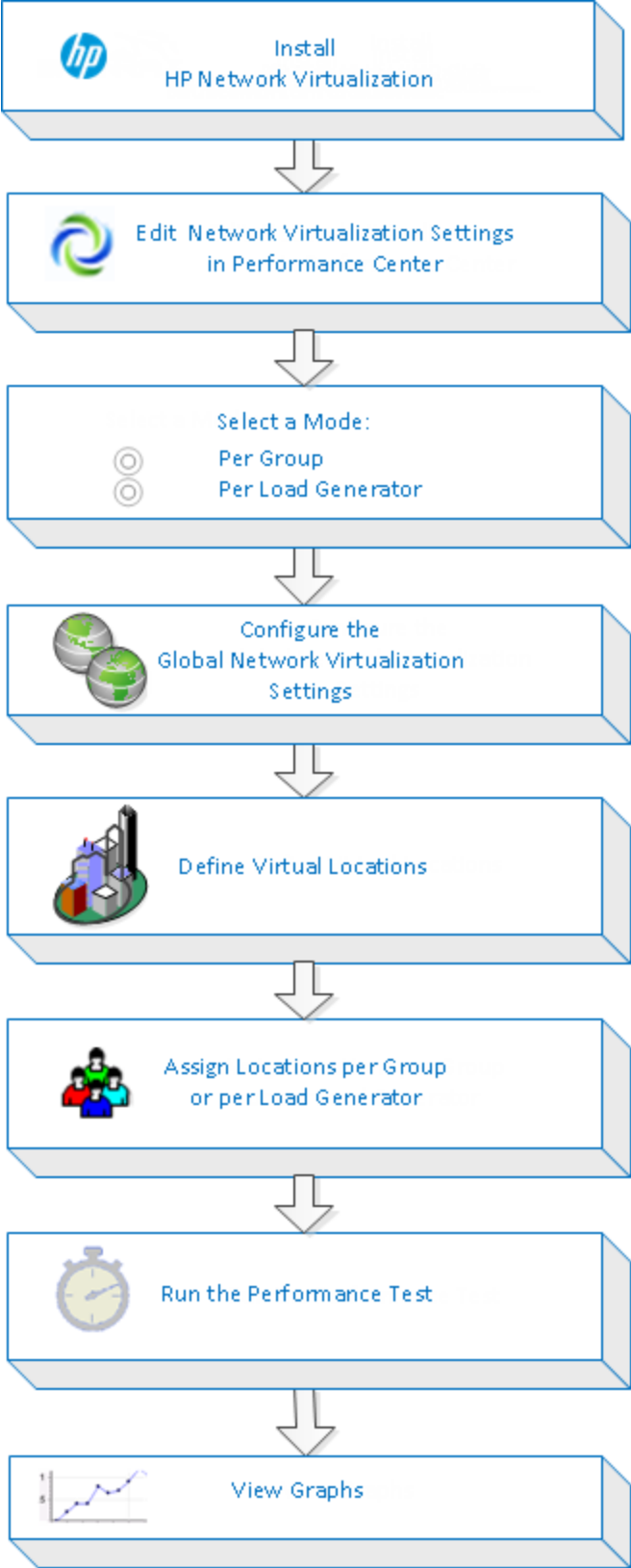
How to Integrate Network Virtualization into a Performance Test

This following describes how to integrate Network Virtualization into your performance test and how to view the metrics in Analysis.

To learn more about Network Virtualization, see "Network Virtualization Overview" on page 243.

This task includes the following steps:

- "Prerequisites" below

- "Open network virtualization " below

- "Enable network virtualization and choose a virtualization method" on the next page

- "Set the global network virtualization settings" on the next page

- "Add virtual locations" on the next page

- "For network virtualization per Group - Define the settings for each group" on page 248

- "For network virtualization per Load Generator - Define the settings for each load generator" on page 248

- "For network virtualization per Load Generator - Define the same settings for all load generators" on page 248

- "Run the performance test" on page 249

- "View the graphs" on page 249

1. Prerequisites
   - Make sure that you have HP Network Virtualization installed on the following machines:
     - the Performance Center server
     - the load generators
     - the Controller
   - Make sure that you have a properly designed performance test. For more information, see "How to Define a Performance Test Workload" on page 78.

2. Open network virtualization
   a. **Open Performance Test Designer window > Workload tab.** In the Performance Test

Designer window, click the **Workload** tab. For user interface details, see "Performance Test Designer > Workload Tab" on page 84.

    b. **Open network virtualization.** In the **Workload** tab, select **Advanced > Network Virtualization Settings**. The Network Virtualization Settings dialog box opens. For user interface details, see "Network Virtualization Settings Dialog Box" on page 254.

3. Enable network virtualization and choose a virtualization method

    a. **Enable Network Virtualization.** In the Network Virtualization Settings dialog box, select **Enable Network Virtualization**.

    b. **Select a method.** Select **Per Group** or **Per Load Generator**.

    Use the default **Per Group** to perform network virtualization per Vuser group. This option enables you to emulate multiple virtual locations on the same load generator. It makes it easier to switch between load generators used in your performance test.

    Use **Per Load Generator** to perform network virtualization per load generator, where each machine can only emulate a single location.

4. Set the global network virtualization settings

    a. Click **Global Settings** to define the global options for all network virtualizations. This opens the interface to HP Network Virtualization.

    b. Indicate if you want to allow packet capture and which recording method to use, **cyclic** or **non-cyclic**. It is recommended that you do not enable packet capture as this requires a larger memory allocation and may affect performance.

    c. In the **IP Filter** section,specify any machines that you may want to exclude from network virtualization for all locations. For details on which machines to exclude, see "Network Virtualization Overview" on page 243.

5. Add virtual locations

    a. In the **Add new virtual location** field, type a location name.

> **Note:** For location names, only use English letters. You cannot use the following characters: \ / : " ? ' < > | * % ^ , ! { } ( ) ; = #

    b. Click **Add**. This opens the interface to HP Network Virtualization.

    c. In the Shunra NV **Virtualization** tab, select a definition mode such as **Import from library** or **Custom**. If you select **Import from library**, Shunra NV automatically uses its built-in settings for the location you select. If you select **Custom**, you need to manually specify the network effects to apply to the location, such as latency, loss, and client bandwidth.

Manage virtual locations. In the Network Virtualization Virtual Locations pane, you can add, modify, duplicate, or delete a virtual location. You can also import locations from other tests.

d. In the Shunra NV **Options** tab's **Bandwidth allocation** section, select **Share bandwidth between all users** unless you are testing mobile applications.

e. In the **Options** tab's **IP Filter** box,specify any machines that you may want to exclude from network virtualization for this location. For details on which machines to exclude, see "Network Virtualization Overview" on page 243.

f. Click **OK** to close the Shunra NV interface. The location is added to the Network Virtualization Settings dialog box. To enable the location, select the check box.

g. Repeat the above steps for each location.

6. For network virtualization per Group - Define the settings for each group

a. **Select virtual location.** In the Performance Test Designer window > Workload tab, under the **Virtual Location** column, click the **Select virtual location** link. The Virtual Location dialog box opens.

b. Select a virtual location.

7. For network virtualization per Load Generator - Define the settings for each load generator

a. In the Performance Test Designer window > Workload tab, in the **LG Distribution** box, select **Assign manually**.

> **Note:** For more details on LG distribution methods, see "Performance Test Designer > Workload Tab" on page 84.

b. Under the **Load Generator** column, click the **Select Load Generator** link. The Select Load Generators dialog box opens. For user interface details, see "Select Load Generators Dialog Box " on page 122.

c. **Assign one or more load generators.** Select the **Automatch** or **Specific** tab. Select one or more load generators.

d. **Select virtual location.** Under the **Virtual Locations** column, click the **Select Virtual Location** link for each selected load generator. The Select Virtual Location dialog box opens. Select a virtual location.

8. For network virtualization per Load Generator - Define the same settings for all load generators

a. In the Performance Test Designer window > Workload tab, in the **LG Distribution** box,

select **Assign all to each group**.

b. In the **LG** box, specify the number of automatch load generators for the test.

c. Click the **Configure Load Generators Properties** button [icon]. The Automatch Load Generators Properties dialog box opens. For user interface details, see "Automatch Load Generators Properties Dialog Box" on page 125.

9. Run the performance test

Run the test to check its performance. For more details on running a performance test, see "How to Manage a Performance Test Run" on page 200.

10. View the graphs

Network virtualization metrics are automatically collected during the performance test run. You can view all the network virtualization metrics in the Performance Test Run Page or the LoadRunner Analysis.

For more details on the Performance Test Run page, see "Performance Test Run Page" on page 211. For more details on viewing results in Analysis, see the *HP LoadRunner Analysis User Guide*.

Network Virtualization Graphs

Average Latency Graph

This graph shows the average recorded time required for a packet of data to travel from the indicated source point to the required destination, measured in milliseconds.
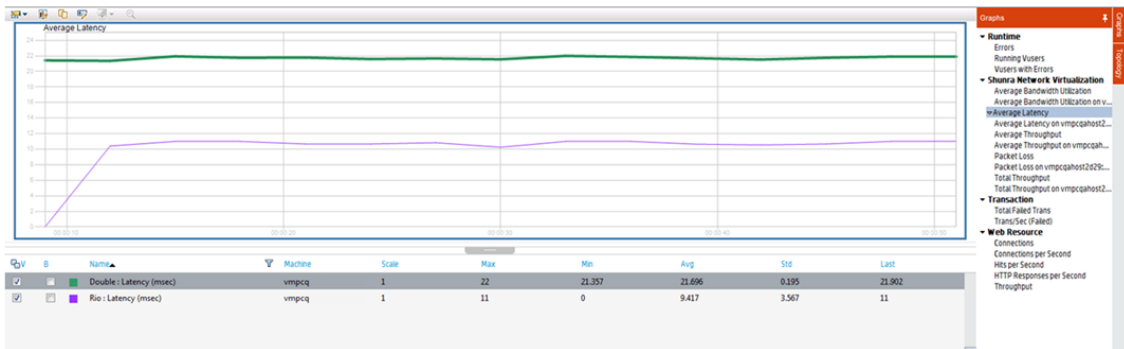
Purpose	Helps you evaluate the time required for a packet of data to travel over the network.
X-axis	Elapsed time since the start of the run.

Y-axis	The average latency—the time in milliseconds required for a packet of data to reach its destination.
See also	• "Network Virtualization Overview" on page 243 • "Performance Test Run Page" on page 211

Packet Loss Graph

This graph shows packets lost during the last second of the test run. Packet loss occurs when data packets fail to reach their destination. It can result from gateway overload, signal degradation, channel congestion, or faulty hardware.
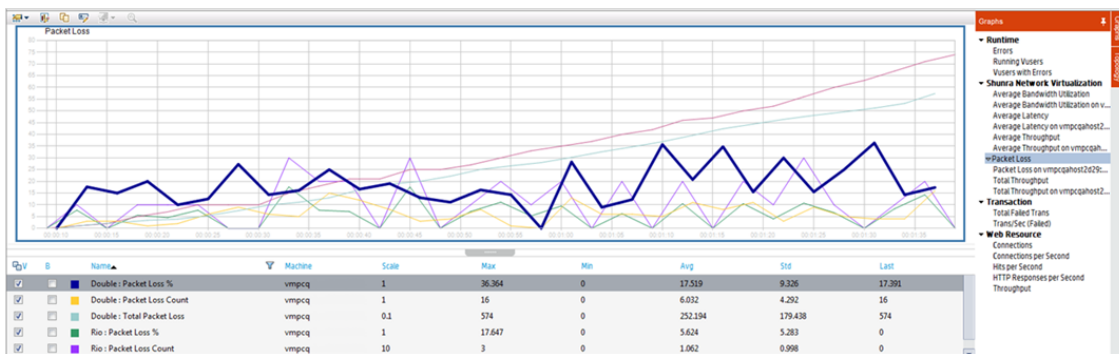
Purpose	Helps you understand how many data packets were lost over a specific time interval.
X-axis	Elapsed time since the start of the run.
Y-axis	Includes the following measurements: • The percentage of lost packets from all packets that were sent. • The number of data packets that were lost over 60 seconds. • The total number of packets that were lost.
See also	• "Network Virtualization Overview" on page 243 • "Performance Test Run Page" on page 211

Average Bandwidth Utilization Graph

This graph shows the average bandwidth utilized by a virtual user or a virtualized location from the maximum available bandwidth allocated for it during the last second, measured in percentages.
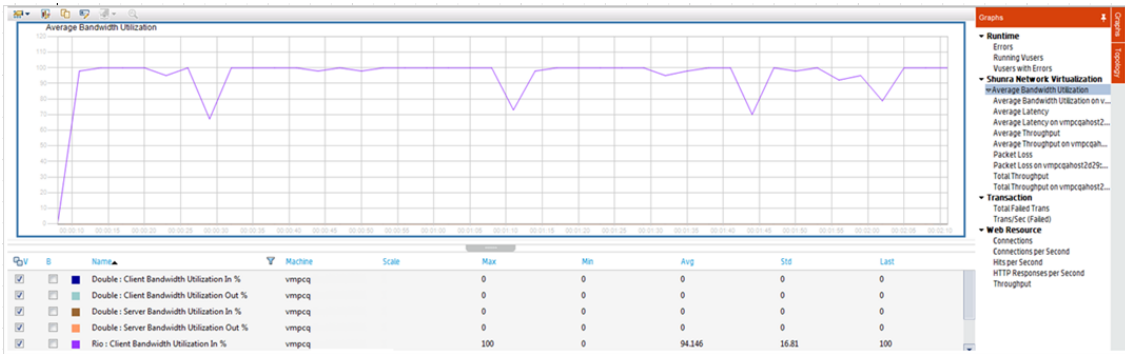
Purpose	Helps you evaluate the bandwidth used over your network.
X-axis	Elapsed time since the start of the run.
Y-axis	The percentage of bandwidth utilization.
See also	• "Network Virtualization Overview" on page 243 • "Performance Test Run Page" on page 211

Average Throughput Graph

This graph shows the average data traffic passing to or from the virtualized location, measured in kilobytes per second (kbps).
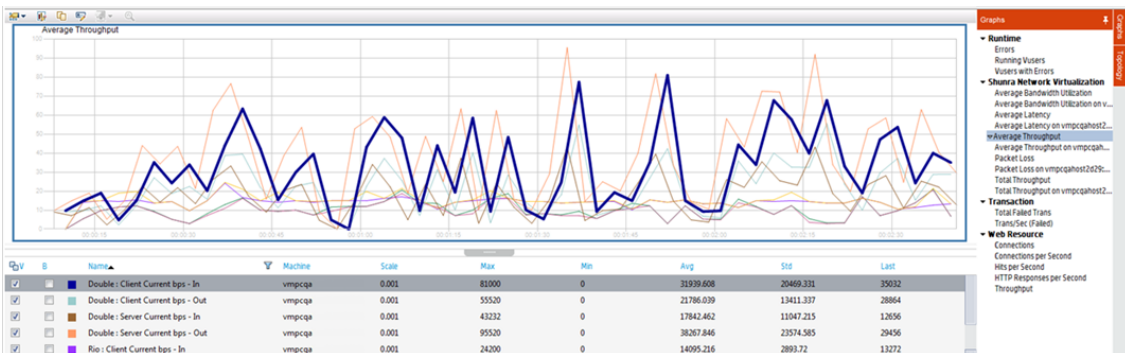
Purpose	Helps you evaluate the amount of load Vusers generate, in terms of server and client throughput. The graph shows metrics for input and output traffic for both the server and client machines. Use the legend below the graph to determine the line color for each metric.
X-axis	Elapsed time since the start of the run.

Y-axis	The rate of data passing to and from the virtual location, in kbps for the following metrics per group or load generator:
	• Input to the client machine
	• Output from the client machine
	• Input to the server machine
	• Output from the server machine
See also	• "Total Throughput Graph" below
	• "Network Virtualization Overview" on page 243
	• "Performance Test Run Page" on page 211

Total Throughput Graph

Displays the total data traffic passing to or from the virtualized location, measured in kilobytes.
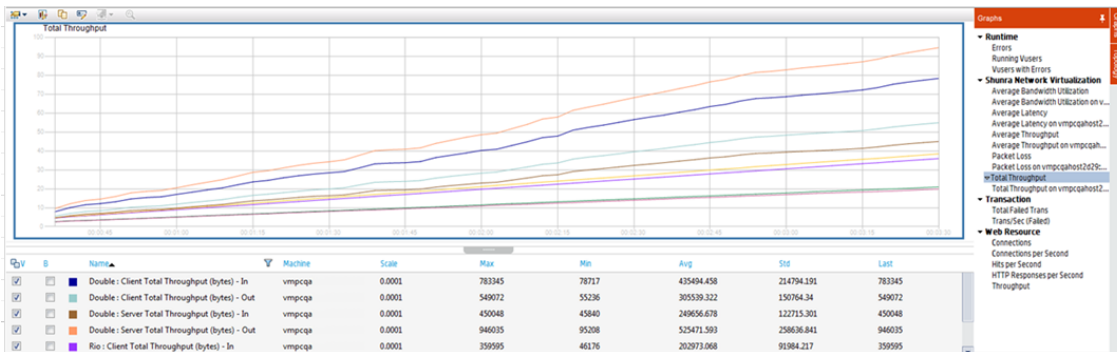
Purpose	Helps you evaluate the total amount of load that Vusers generate while running a scenario with network virtualization.
	The graph shows metrics for input and output traffic for both the server and client machines. The legend below the graph indicates the line color for each of these metrics.
X-axis	Elapsed time since the start of the run.
Y-axis	Throughput of the server, in kilobytes per second (Kbps).
See also	• "Average Throughput Graph" on the previous page
	• "Network Virtualization Overview" on page 243
	• "Performance Test Run Page" on page 211

Network Virtualization User Interface

This section includes:
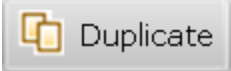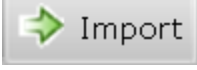
Network Virtualization Settings Dialog Box

This dialog box enables you to configure your network virtualization settings.

To access	**From ALM:**
	1. On the ALM sidebar, under **Testing**, select **Test Plan**.
	2. Select a performance test in the test plan tree and click **Edit Test**.
	3. In the Performance Test Designer window, click the **Workload** tab.
	4. Select **Advanced>Network Virtualization Settings**.
	From My Performance Center:
	1. Select **Perspective> Test Plan**.
	2. Select a performance test in the test plan tree and click **Edit Test**.
	3. In the Performance Test Designer window, click the **Workload** tab.
	4. Select **Advanced>Network Virtualization Settings**.
Important information	To access this dialog box, you must have HP Network Virtualization installed on your machine.
Relevant tasks	"How to Integrate Network Virtualization into a Performance Test" on page 246

User interface elements are described below:

UI Elements	Description
Enable Network Virtualization	Enables Network Virtualization per one of the following: • **Per Group.** Assigns network virtualization locations per Vuser group. (Default) • **Per Load Generator.** Assigns network virtualization locations per load generator. Each machine can only emulate a single location.
Global Settings	Opens the HP Network Virtualization interface for defining the global setting for the virtualization. For more details on global settings, see "How to Integrate Network Virtualization into a Performance Test" on page 246.
Rename	Enables you to modify the virtual location name and description.

UI Elements	Description
Edit Location	Opens the HP Network Virtualization interface for editing the location. For details, see the relevant third party software documentation.
Duplicate	Duplicates the virtual location.
Delete	Deletes the selected virtual location from the Virtual Locations list and any associated groups or load generators.
Import	Opens the Import Virtual Locations dialog box enabling you to import virtual locations from another test. For details, see "Import Virtual Locations Dialog Box" on the next page.
Location Name	Indicates the virtual location name.
Description	The description of the virtual location.
Add new virtual location	Enables you to add a new virtual location. Type the location name and click **Add**. Opens the HP Network Virtualization interface for setting the virtualization properties and location options. For more details on adding virtual locations, see "How to Integrate Network Virtualization into a Performance Test" on page 246.

Import Virtual Locations Dialog Box

This dialog box enables you to import virtual locations from another test.

To access	**From ALM:** 1. On the ALM sidebar, under **Testing**, select **Test Plan**. 2. Select a performance test in the test plan tree and click **Edit Test**. 3. In the Performance Test Designer window, click the **Workload** tab. 4. Select **Advanced>Network Virtualization Settings**. 5. Click the **Import** button. **From My Performance Center:** 1. Select **Perspective> Test Plan**. 2. Select a performance test in the test plan tree and click **Edit Test**. 3. In the Performance Test Designer window, click the **Workload** tab. 4. Select **Advanced>Network Virtualization Settings**. 5. Click the **Import** button.
Important information	To access this dialog box, you must have HP Network Virtualization installed on your machine.
Relevant tasks	"How to Integrate Network Virtualization into a Performance Test" on page 246

User interface elements are described below:

UI Elements	Description
Test Set	A list of available test sets from which to select tests with virtual locations.
ID	The ID number of the test.
Name	The name of the test.
Responsible	The user responsible for the test.
Last Modified	The date on which the test was last modified.
Virtual Locations Preview pane	Displays the location names included in a selected test.

Limitations for Network Virtualization

- Network virtualization integration does not comply with accepted Internationalization (I18N) conventions.

- The network virtualization software may consume large amounts of memory, since the technology delays traffic and captures traffic for later analysis. To verify that the load generator machine has sufficient memory, compare the load generator memory consumption with and without the virtualization.

- Network virtualization software integration is not supported for the Linux platform.

- You cannot run a scenario on the same load generator from two different Controller machines if they both have network virtualization enabled.

Part 5: Online Monitoring

Chapter 18: Working with ALM Performance Center Online Monitors

This chapter includes:

Monitoring Process Overview

Before monitoring a performance test, you need to set up and configure the ALM Performance Center monitoring components. Each monitor has different configuration requirements that are explained in the specific monitoring chapters. The following diagram illustrates the ALM Performance Center monitoring process.
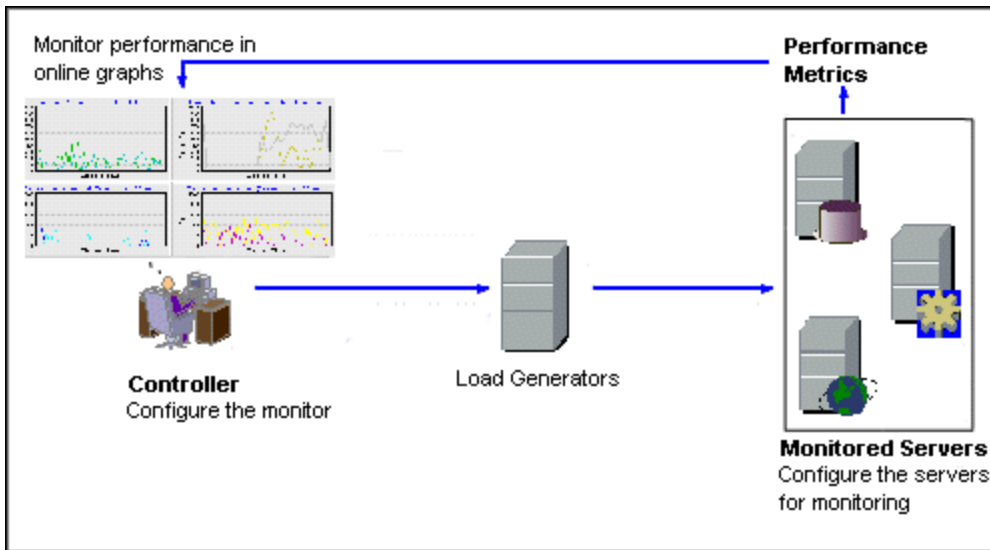
Before monitoring a server, perform the following steps:

- Configure the monitoring environment on the server machine (if necessary).

- Configure the monitor on the Controller machine.

For details, see "How to Set Up the Monitoring Environment – Workflow" below.

How to Set Up the Monitoring Environment – Workflow

This task describes how to set up the ALM Performance Center online monitoring environment. You specify the machines and measurements that the Controller will monitor during performance test execution in the ALM Test Resources module. During performance test execution, the collected measurement data appears in the online graphs.

1. Configure the monitoring environment on the server machine

   To use the following monitors, you must first install or configure monitoring components on the

server machine. For details about configuring the monitoring components, see the specific monitoring sections.

- "How to Set up the Citrix Monitoring Environment" on page 319

- "How to Set Up the IBM WebSphere MQ Monitor" on page 327

- "How to Enable and Configure J2EE/.NET Diagnostics" on page 161

- "How to Set Up the Network Monitoring Environment" on page 286

- "How to Set Up the Oracle Monitoring Environment" on page 299

- "How to Set up the UNIX Monitoring Environment" on page 280

2. **Configure the monitors on the Controller**

   To obtain performance data for a monitor, you need to configure the monitor (from the Controller), and indicate which statistics and measurements you want to monitor.

   - For information about selecting the servers to monitor and selecting the measurements to monitor, see "How to Create and Configure Monitor Profiles" on page 49.

   - For details about each monitor's default measurements, refer to the relevant reference section for the monitor.

Monitor Types

All of the monitors allow you to view a summary of the collected data at the conclusion of the performance test. Using LoadRunner Analysis, you can generate a graph for any of the monitors. For more information, see the *HP LoadRunner Analysis User Guide*.

The online monitors are divided into the following categories:

Monitor Type	Description
Run-Time Monitors	Display the number and status of Vusers participating in the scenario, as well as the number and types of errors that the Vusers generate. For more information, see "Run-Time and Transaction Monitoring" on page 266.
Transaction Monitors	Display the transaction rate and response times. For more information, see "Run-Time and Transaction Monitoring" on page 266.
Web Resource Monitors	Provide information about the number of Web connections, throughput volume, HTTP responses, server retries, and downloaded pages at the Web servers during performance test run. For more information, see "Web Resource Monitors" on page 272.

Monitor Type	Description
System Resource Monitors	Measure the Windows, Linux, Server, and SNMP resources used during a performance test run. For more information, see "System Resource Monitoring " on page 278.
Network Monitors	Displays information about the network delays on your system. For more information, see "Network Delay Monitoring" on page 284.
Firewall Monitor	Measures statistics related to the firewall servers during the scenario run.
Web Server Resource Monitors	Measure statistics related to the Microsoft IIS and Apache Web servers during the performance test run. For more information, see "Web Server Resource Monitoring" on page 292.
Web Application Server Resource Monitors	Measure statistics related to the Microsoft ASP application servers during the performance test run. For more information, see "Web Application Server Resource Monitoring" on page 296.
Database Server Resource Monitors	Measure statistics related to the SQL server, and Oracle databases during the performance test run. For more information, see "Database Resource Monitoring" on page 298.
Network Virtualization Monitors	Measure statistics related to network virtualization, such as Packet Loss and Latency. For information, see "Network Virtualization Graphs" on page 249.
Service Virtualization Monitors	Measure statistics related to HP Service Virtualization, per operation and service. For information, see "Service Virtualization Monitoring" on page 103.
SiteScope Monitor	Use the SiteScope monitor and its counters to measure resources. For information, see the documentation provided with SiteScope.
Flex Monitors	Measure statistics related to Flex RTMP connections and throughput, as well as buffering time. For details, see "Flex Monitoring" on page 306.
Streaming Media Monitors	Measure statistics related to the RealPlayer Client and Media Player Client servers during the scenario run. For more information, see "Streaming Media Monitoring" on page 310.
ERP/CRM Server Resource Monitors	Measure statistics related to Siebel Server Manager during the performance test run. For more information, see "ERP/CRM Server Resource Monitoring" on page 314.

Monitor Type	Description
J2EE & .NET Diagnostics Monitors	Provide information to trace, time, and troubleshoot individual transactions through J2EE Web, application, and database servers. For more information, see the *HP Diagnostics User Guide*.
Application Deployment Solutions Monitors	Measures statistics related to the Citrix MetaFrame XP server during a performance run. For more information, see "Application Deployment Solution Monitoring " on page 318.
Middleware Performance Monitors	Measure statistics related to the IBM WebSphere MQ servers during a scenario run. For more information, see "Middleware Performance Monitoring " on page 326.
Infrastructure Resources Monitor	Displays information about network client data points during a scenario run using the Network Client graph. For more information, see "Infrastructure Resources Monitoring" on page 332.

Chapter 19: Run-Time and Transaction Monitoring

This chapter includes:

Run-Time Graph Overview

The **Run-Time** monitor provides information about the status of the Vusers participating in the performance test, as well as the number and types of errors that the Vusers generate. In addition, the Run-Time monitor provides the User-Defined Data Points graph, which displays the real time values for user-defined points in a Vuser script.

The Run-Time monitor is enabled by default—it automatically begins monitoring Vusers at the start of a performance test.

You can view the following Run-Time monitor graphs during a test run:

Running Vusers Graph

The monitor's **Running Vusers** graph provides information about the status of the Vusers running in the current performance test on all load generator machines. The graph shows the number of running Vusers, while the information in the legend indicates the number of Vusers in each state.

The Name field of each Vuser displays the current status of the Vuser. The following table describes each Vuser status:

Status	Description
Running	The total number of Vusers currently running on all load generators.
Ready	The number of Vusers that completed the initialization section of the script and are ready to run.
Finished	The number of Vusers that have finished running. This includes both Vusers that passed and failed.
Error	The number of Vusers whose execution generated an error.

User-Defined Data Points Graph

The **User-Defined Data Points** graph displays the real-time values of user-defined data points. You define a data point in your Vuser script by inserting an **lr_user_data_point** function at the appropriate place (**user_data_point** for GUI Vusers and **lr.user_data_point** for Java Vusers).

```
Action1()
{
    lr_think_time(1);
    lr_user_data_point ("data_point_1",1);
    lr_user_data_point ("data_point_2",2);
    return 0;
}
```

For Vuser protocols that support the graphical script representations such as Web and Oracle NCA, you insert a data point as a user-defined step. Data point information is gathered each time the script executes the function or step.

By default, ALM Performance Center displays all of the data points in a single graph. The legend provides information about each data point. If desired, you can hide specific data points using the legend below the graphs.

You can also view data points offline, after the completion of the performance test. For more information, see the *HP LoadRunner Analysis User Guide.*

Error Statistics Graph

The monitor's **Error Statistics** graph provides details about the number of errors that accrue during each second of the test run. The errors are grouped by error source—for example, the location in the script or the load generator name.

Operations Graph

The Operations graph shows virtual service operations performance counters on all the SV servers that are used in the scenario. It only shows services that are used in the scenario.

Example
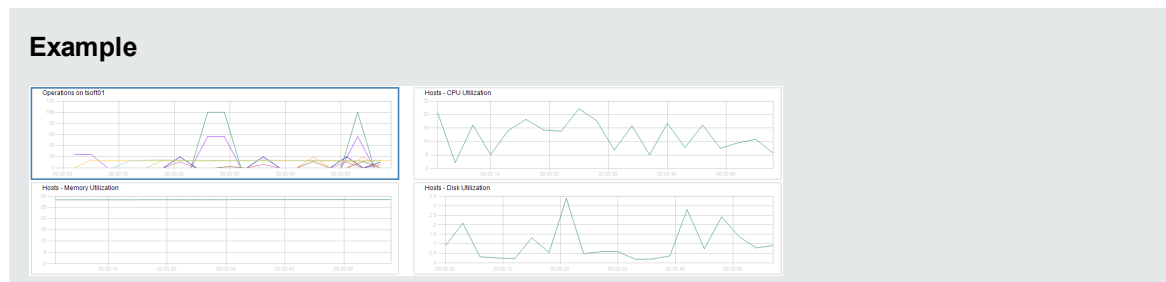
The **Operations on <server>** graph shows the measurement (y-axis) as a function of the elapsed time in the performance test (x-axis).

Measurement	Description
Average Response Time	Average response time of virtual service in milliseconds.
Hit Rate	The number of requests per second of the virtual service operation.
Throughput	Data sent and received by virtual service operation measured in megabytes.

Services Graph

The Services monitor displays information about the virtual services used during a test run.

The **Services on <server>** graph shows the measurement (y-axis) as a function of the elapsed time in the performance test (x-axis).

Example

Measurement	Description
Average Response Time	Average Response Time on virtual service in milliseconds.
Data Simulation Accuracy	Accuracy of Data Model emulation on virtual service displayed as a percentage. Accuracy is compared to the recorded behavior on the corresponding actual service, if available.
Hit Rate	The number of requests per second of the virtual service.
Performance Simulation Accuracy	Accuracy of performance model emulation on virtual service displayed as a percentage. Accuracy is compared to the recorded behavior on the corresponding actual service, if available.
Throughput	Data sent and received on virtual service measured in megabytes per second.

Vusers with Errors Graph

The **Vusers with Errors** graph provides details about the number of Vusers that generate errors during test execution. The errors are grouped by error source.

Transaction Monitor Graphs Overview

The Transaction monitor displays the transaction rate and response time during a test run. The Transaction monitor is enabled by default—it automatically begins monitoring Vuser transactions at the start of a test run. To conserve resources, you can disable the Transaction monitor from the Controller.

You can view the following Transaction monitor graphs during a test run:

- The **Transaction Response Time** graph shows the average response time of transactions in seconds (y-axis) as a function of the elapsed time in the performance test (x-axis).

- The **Transactions per Second (Passed)** graph shows the number of successful transactions performed per second (y-axis) as a function of the elapsed time in the performance test (x-axis).

- The **Transactions per Second (Failed, Stopped)** graph shows the number of failed and stopped transactions per second (y-axis) as a function of the elapsed time in the performance test (x-axis).

- The **Total Transactions per Second (Passed)** graph shows the total number of completed, successful transactions per second (y-axis) as a function of the elapsed time in the performance test (x-axis).

> **Note:**
>
> - If there are no transactions defined in your Vuser script or if no transactions are being executed, no data will be displayed in the online monitor graphs.
>
> - To generate Web Page diagnostics for each transaction, configure the Diagnostics options from the Controller.

Chapter 20: Web Resource Monitors

This chapter includes:

Web Resource Monitoring Overview

The Web Resource monitor enables you to analyze the following resources on the Web server during a performance test run: throughput, HTTP requests, downloaded pages, server retries, TCP/IP connections, and SSL connections.

You can view the following resource monitor graphs during a test run:

Hits per Second Graph

The **Hits Per Second** graph shows the number of hits (HTTP requests) to the Web server (y-axis) as a function of the elapsed time in the performance test (x-axis). This graph can display the whole step, or the last 60, 180, 600, or 3600 seconds. You can compare this graph to the Transaction Response Time graph to see how the number of hits affects transaction performance.

Throughput Graph

The **Throughput** graph shows the amount of throughput (y-axis) on the Web server during each second of the test run (x-axis). Throughput is measured in bytes and represents the amount of data that the Vusers received from the server at any given second. You can compare this graph to the Transaction Response Time graph to see how the throughput affects transaction performance.

In the following example, the Transaction Response time graph is compared with the Throughput graph. It is apparent from the graph that as the throughput decreases, the transaction response time also decreases. The peak throughput occurred at approximately 1 minute into the step. The highest response time also occurred at this time.

Example
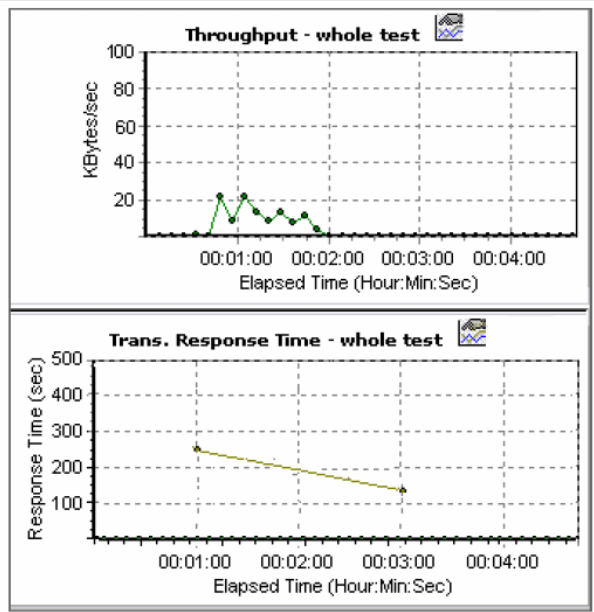
HTTP Responses per Second Graph

The **HTTP Responses per Second** graph shows the number of HTTP status codes (y-axis)—which indicate the status of HTTP requests, for example, "the request was successful" or "the page was not found"—returned from the Web server during each second of the performance test run (x-axis).

The HTTP responses are grouped by status code. You can also group the results shown in this graph by script (using the "Group By" function) to locate scripts which generated error codes.

For a list of status codes and their explanations, see "HTTP Status Codes" on page 277.

Pages Downloaded per Second Graph

The **Pages Downloaded per Second** graph shows the number of Web pages (y-axis) downloaded from the server during each second of the test run (x-axis). This graph helps you evaluate the amount of load Vusers generate, in terms of the number of pages downloaded.

Note: To view the Pages Downloaded per Second graph, you must select **Pages per second (HTML Mode only)** from the script's Run-time settings Preferences tab before running your performance test.

Like throughput, downloaded pages per second is a representation of the amount of data that the Vusers received from the server at any given second.

- The Throughput graph takes into account each resource and its size (for example, the size of each **.gif** file, the size of each Web page).

- The Pages Downloaded per Second graph takes into account simply the number of pages.

In the following example, the Throughput graph is compared with the Pages Downloaded per Second graph. It is apparent from the graph that throughput is not proportional to the number of pages downloaded per second. For example, between 15 and 16 seconds into the performance test, the throughput decreased while the number of pages downloaded per second increased.

Example
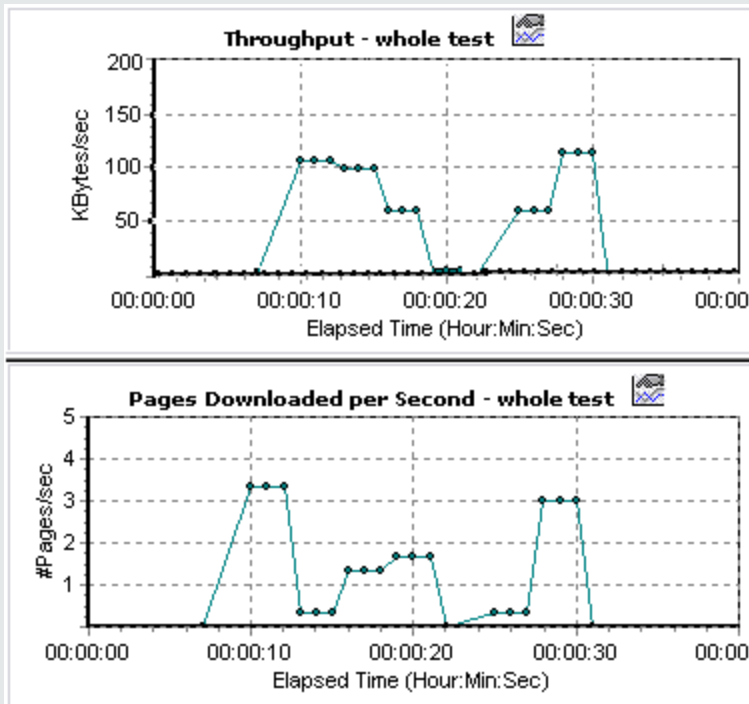
Retries per Second Graph

The **Retries Per Second** graph shows the number of attempted Web server connections (y-axis) as a function of the elapsed time in the performance test (x-axis).

A server connection is retried when:

- The initial connection was unauthorized

- Proxy authentication is required

- The initial connection was closed by the server

- The initial connection to the server could not be made

- The server was initially unable to resolve the load generator's IP address

Connections Graph

The **Connections** graph shows the number of open TCP/IP connections (y-axis) at each point in time of the performance test (x-axis). One HTML page may cause the browser to open several connections, when links on the page go to different Web addresses. Two connections are opened for each Web server.

This graph is useful in indicating when additional connections are needed. For example, if the number of connections reaches a plateau, and the transaction response time increases sharply, adding connections would probably cause a dramatic improvement in performance (reduction in the transaction response time).

Connections per Second Graph

The **Connections Per Second** graph shows the number of new TCP/IP connections (y-axis) opened and the number of connections that are shut down each second of the performance test (x-axis).

This number should be a small fraction of the number of hits per second, because new TCP/IP connections are very expensive in terms of server, router and network resource consumption. Ideally, many HTTP requests should use the same connection, instead of opening a new connection for each request.

SSLs per Second Graph

The SSLs per Second graph shows the number of new and reused SSL connections (y-axis) opened in each second of the performance test (x-axis). An SSL connection is opened by the browser after a TCP/IP connection has been opened to a secure server.

Because creating a new SSL connection entails heavy resource consumption, you should try to open as few new SSL connections as possible; once you have established an SSL connection, you should reuse it. There should be no more than one new SSL connection per Vuser.

If you set your run-time settings to simulate a new Vuser at each iteration (using the run-time settings **Browser Emulation** node), you should have no more than one new SSL connection per Vuser per iteration. Ideally, you should have very few new TCP/IP and SSL connections each second.

WebSocket Statistics Monitor

This **Web Resource** graph shows WebSocket statistics during the run.

Purpose	Provides you with statistics for WebSocket connections, byte rate, and failed connections.
X-axis	Elapsed time since the start of the run.
Y-axis	WebSocket per second throughout the whole scenario.
Note	You cannot change the granularity of the x-axis to a value that is less than the Web granularity you defined in the General tab of the Options dialog box.

HTTP Status Codes

The following table displays a list of HTTP status codes. These codes appear in the "Web Resource Monitoring Overview" on page 273

Code	Description	Code	Description
200	OK	405	Method Not Allowed
201	Created	406	Not Acceptable
202	Accepted	407	Proxy Authentication Required
203	Non-Authoritative Information	408	Request Timeout
204	No content	409	Conflict
205	Reset content	410	Gone
206	Partial content	411	Length Required
300	Multiple Choices	412	Precondition Failed
301	Moved Permanently	413	Request Entity Too Large
302	Found	414	Request - URI Too Large
303	See Other	415	Unsupported Media Type
304	Not Modified	416	Requested range not satisfiable
305	Use Proxy	417	Expectation Failed
307	Temporary Redirect	500	Internal Server Error
400	Bad Request	501	Not Implemented
401	Unauthorized	502	Bad Gateway
402	Payment Required	503	Service Unavailable
403	Forbidden	504	Gateway Timeout
404	Not Found	505	HTTP Version not supported

For more information on the above status codes and their descriptions, see
http://www.w3.org/Protocols/rfc2616/rfc2616-sec10.html#sec10.

Chapter 21: System Resource Monitoring

This chapter includes:

System Resource Monitors Overview

You use ALM Performance Center's System Resource monitors to monitor a machine's system resource usage during a performance test run and isolate 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, UNIX, SiteScope, and SNMP server on a machine during a test run, and determine why a bottleneck occurred on a particular machine.

The resource monitors are automatically enabled when you execute a test run. However, you must specify the machine you want to monitor and which resources to monitor for each machine. You can also add or remove machines and resources during the test run.

Windows Resource Monitoring

The Windows Resources monitor shows the Windows resources measured during the test run. Windows measurements correspond to the built-in counters available from the Windows Performance Monitor.

If you want to monitor a remote Windows server that does not use Windows domain security, you must authenticate the Controller on the remote Windows server. To authenticate the Controller, create an account, or change the password of the account used to log on to the Controller so that it matches the password and user name used to log on to the remote monitored Windows machine. When the remote Windows machine requests another machine's resources, it sends the logged-in user name and password of the machine requesting the resources.

UNIX Resource Monitoring

The UNIX Resources monitor shows the UNIX resources measured during the test run. This graph helps you determine the impact of Vuser load on the various system resources.

The UNIX kernel statistics measurements include those available by the **rstatd** daemon. For a description of the measurements, see "UNIX Resources Performance Counters" on page 281.

> **Note:** You must configure an **rstatd** daemon on all UNIX machines being monitored. For information see "How to Set up the UNIX Monitoring Environment" on the next page.

SNMP Resource Monitoring

The SNMP Resource monitor shows statistics for a Windows or UNIX machine using the Simple Network Management Protocol (SNMP). The SNMP Resources monitor is available for monitoring any machine that runs an SNMP agent, using the Simple Network Management Protocol (SNMP).

How to Set up the UNIX Monitoring Environment

This task describes how to configure the UNIX environment before setting up the UNIX monitor.

This task includes the following steps:

1. Verify whether the rstatd daemon is already configured

   The rstatd daemon might already be configured, because when a machine receives an rstatd request, the inetd on that machine automatically activates the rstatd.

   - The **rup** command reports various machine statistics, including rstatd configuration. Run the following command on the UNIX machine to view the machine statistics:

     ```
     >rup host
     ```

   - You can also use **lr_host_monitor** and see if it returns any relevant statistics.

     If the command returns meaningful statistics, the rstatd daemon is already configured and activated. If not, or if you receive an error message, the rstatd daemon is not configured.

2. Configure the rstatd daemon

   If the rstatd daemon is not yet configured, follow these steps to configure it:

   a. On the UNIX machine, run the command: **su root**

   b. Go to **/etc/inetd.conf** and look for the rstatd row (it begins with the word rstatd). If it is commented out (with a #), remove the comment directive, and save the file.

   c. From the command line, run:

      ```
      kill -1 inet_pid
      ```

      where `inet_pid` is the pid of the inetd process. This instructs the inetd to rescan the **/etc/inetd.conf** file and register all daemons which are uncommented, including the rstatd daemon.

   d. Run **rup** again.

If the command still does not indicate that the rstatd daemon is configured, contact your system administrator.

3. Configure the monitor for a UNIX machine over a firewall (optional)

To monitor a UNIX machine over a firewall, you must run a UNIX utility called rpcinfo and identify the rstatd's port number.

Run **rpcinfo -p <hostname>**. You will receive a list of all RPC servers registered in the host's portmapper, along with the port number. This list will not change until rstatd is stopped and rerun.

Some firewalls allow you to open an RPC program number instead of a port. In such cases, open program 100001. If are prompted to include a version number, specify versions 3 and 4.

4. Configure the monitor measurements on the Controller

For task details, see "How to Create and Configure Monitor Profiles" on page 49.

For a description of the available UNIX monitor measurements, see "UNIX Resources Performance Counters" below.

UNIX Resources Performance Counters

The following default measurements are available for the UNIX machine:

Measurement	Description
Average load	Average number of processes simultaneously in Ready state during the last minute.
Collision rate	Collisions per second detected on the Ethernet.
Context switches rate	Number of switches between processes or threads, per second.
CPU utilization	Percent of time that the CPU is utilized.
Disk rate	Rate of disk transfers.
Incoming packets error rate	Errors per second while receiving Ethernet packets.
Incoming packets rate	Incoming Ethernet packets per second.
Interrupt rate	Number of device interrupts per second.
Outgoing packets errors rate	Errors per second while sending Ethernet packets.
Outgoing packets rate	Outgoing Ethernet packets per second.

Measurement	Description
Page-in rate	Number of pages read to physical memory, per second.
Page-out rate	Number of pages written to pagefile(s) and removed from physical memory, per second.
Paging rate	Number of pages read to physical memory or written to pagefile(s), per second.
Swap-in rate	Number of processes being swapped in.
Swap-out rate	Number of processes being swapped out.
System mode CPU utilization	Percent of time that the CPU is utilized in system mode.
User mode CPU utilization	Percent of time CPU is utilized in user mode.

Chapter 22: Network Delay Monitoring

This chapter includes:

Network Monitoring Overview

Network configuration is a primary factor in the performance of applications. A poorly designed network can slow client activity to unacceptable levels.

You use Network monitoring to determine whether your network is causing a delay in the performance test. You can also determine the problematic network segment.

In a true Web or client/server system, there are many network segments. A single network segment with poor performance can affect the entire system.

The following diagram shows a typical network. To go from the server machine to the Vuser machine, data must travel over several segments.
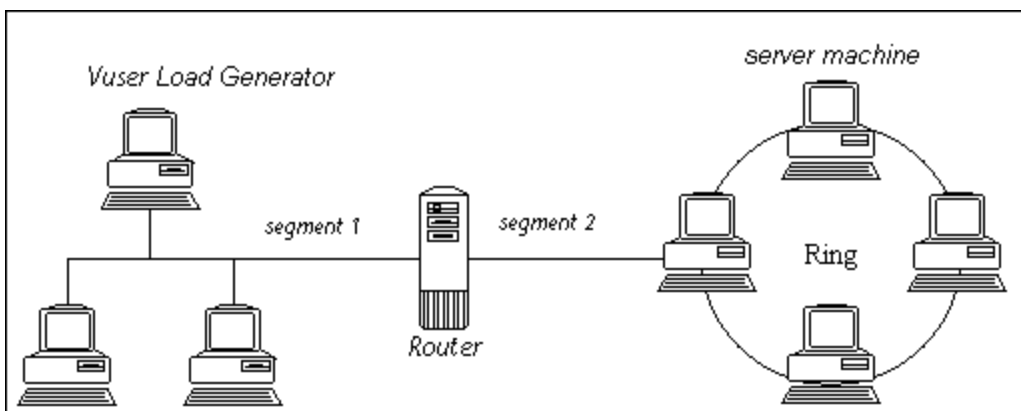
The Network Delay Time monitor shows the delays for the complete path between the source and destination machines (for example the database server and Vuser host). The graph maps the delay as a function of the elapsed performance test time. Each defined path is represented by a separate line with a different color in the graph.

To measure network performance, the Network monitor sends packets of data across the network. When a packet returns, the monitor calculates the time it takes for the packet to go to the requested node and return. This time is the delay which appears in the Network Delay Time graph.

> **Note:** The delays from the source machine to each of the nodes are measured concurrently, yet independently. It is therefore possible that the delay from the source machine to one of the nodes could be greater than the delay for the complete path between the source and destination machines.

- For information about how to set up the network monitoring environment, see "How to Set Up the Network Monitoring Environment" on the next page.

- For information about how to configure the Linux source machine for network monitoring, see "How to Configure the Linux Source Machine for Network Monitoring" on page 287.

How to Set Up the Network Monitoring Environment

This task describes how to prepare your environment for network monitoring.

To lean more about network monitoring, see "Network Monitoring Overview" on the previous page.

This task includes the following steps:

- "Prerequisites" below

- "Configure the Linux source machine - optional" below

- "Configure the firewall between the source and destination machines - Optional " below

- "Configure the Network monitor on the Controller" on the next page

1. Prerequisites

   To enable network monitoring, you must install the Performance Center agent on the source machine. You do not have to install the Performance Center agent on the destination machine.

   To run the Network monitor, you must have administrator privileges on the Windows source machine (unless you are using the ICMP protocol).

2. Configure the Linux source machine - optional

   You can run the Network monitor on Linux source machines, using UDP or ICMP. Before running the Network monitor from a Linux source machine, configure the source machine. For task details, see "How to Configure the Linux Source Machine for Network Monitoring" on the next page.

3. Configure the firewall between the source and destination machines - Optional

   If you are monitoring a network in which there are firewalls between the source and the destination machines, you must configure the firewalls to allow the network data packets to reach their destinations.

   - If you are using the TCP protocol, the firewall that protects the destination machine should not block outgoing ICMP_TIMEEXCEEDED packets (packets that are sent outside the firewall from the machine). In addition, the firewall protecting the source machine should allow ICMP_TIMEEXCEEDED packets to enter, as well as TCP packets to exit.

   - If you are using the ICMP protocol, the destination machine's firewall should not block incoming ICMP_ECHO_REQUEST packets, or outgoing ICMP_ECHO_REPLY and ICMP_ECHO_TIMEEXCEEDED packets. In addition, the firewall protecting the source machine should allow ICMP_ECHO_REPLY and ICMP_ECHO_TIMEEXCEEDED packets to enter, and ICMP_ECHO_REQUEST packets to exit.

   - If you are using the UDP protocol, ensure that the UDP protocol can access the destination

machine from the source machine. The destination machine's firewall should not block outgoing ICMP_DEST_UNREACHABLE and ICMP_ECHO_TIMEEXCEEDED packets. In addition, the firewall protecting the source machine should allow ICMP_DEST_ UNREACHABLE and ICMP_ECHO_TIMEEXCEEDED packets to enter.

> **Note:** To run the Network Delay monitor when there are firewalls between the Controller and the source machine, you must configure the Performance Center agent, MI Listener, and Network Delay monitor for monitoring over a firewall.

4. Configure the Network monitor on the Controller

   For task details, see "How to Create and Configure Monitor Profiles" on page 49.

How to Configure the Linux Source Machine for Network Monitoring

This task describes how to configure a UNIX source machine before running the network monitor.

To lean more about network monitoring, see "Network Monitoring Overview" on page 285.

This task includes the following steps:

- "Assign permissions where Performance Center is installed locally" below

- "Assign permissions where Performance Center is installed on the network" below

- "Connect to the Linux Source Machine Through RSH " on the next page

- "Connect to the Linux Source Machine Through the Agent" on page 289

1. Assign permissions where Performance Center is installed locally

   Follow these steps to assign root permissions to the **merc_webtrace** process:

   a. Log in to the source machine as root.

   b. Type: **cd <performance center_installation>/bin** to change to the **bin** directory.

   c. Type: **chown root merc_webtrace** to make the root user the owner of the **merc_webtrace** file.

   d. Type: **chmod +s merc_webtrace** to add the s-bit to the file permissions.

   e. To verify, type **ls -l merc_webtrace**. The permissions should look like this: **-rwsrwsr-x**.

2. Assign permissions where Performance Center is installed on the network

In a Performance Center network installation, the **merc_webtrace** process is on the network, not on the source machine disk. The following procedure copies the **merc_webtrace** file to the local disk, configures **mdrv.dat** to recognize the process, and assigns root permissions to **merc_ webtrace**:

a. Copy **merc_webtrace** from **<performance center_installation>/bin** to anywhere on the local disk of the source machine. For example, to copy the file to the **/local/<performance center>** directory, type: `cp /net/tools/performance center_installation/bin/merc_ webtrace /local/<performance center>`

> **Note:** All of the source machines that use the same network installation must copy **merc_webtrace** to the identical directory path on their local disk (for example, `/local/<performance center>`), since all of them use the same **mdrv.dat**.

b. Add the following line to the **<performance center_installation>/dat/mdrv.dat** file, in the `[monitors_server]` section:

`ExtCmdLine=-merc_webtrace_path /local/xxx`

c. Log in to the source machine as root.

d. Type: `cd performance center_installation/bin` to change to the **bin** directory.

e. Type: `chown root merc_webtrace` to make the root user the owner of the **merc_webtrace** file.

f. Type: `chmod +s merc_webtrace` to add the s-bit to the file permissions.

g. To verify, type `ls -l merc_webtrace`. The permissions should look like:
`-rwsrwsr-x`.

3. Connect to the Linux Source Machine Through RSH

Follow these instructions if the Controller is connected to the source machine through RSH (default connection mode). In this case you do not need to activate the agent daemon.

Before running the Network monitor the first time, you enter an encrypted user name and password in the Network monitor configuration file.

a. On the Performance Center host machine, type cd <Performance Center installation>/bin to change the bin directory.

b. Run **CryptonApp.exe**.

c. In the **Password** box, type your RSH user name and password, separated by a vertical bar symbol. For example, `myname|mypw`.

d. Click **Generate**. An encoded string is displayed in the Encoded string field.

e. Click **Copy** to copy the encoded string to the clipboard.

f. Add the following line to the **<performance center_installation>/dat/monitors/ndm.cfg** file, in the [hosts] section:

   `Host = <encrypted string copied from clipboard>`

g. Close and open the current performance test. ALM Performance Center will read the updated configuration file and recognize the source machine for monitoring.

4. **Connect to the Linux Source Machine Through the Agent**

   Follow these instructions for activating agent daemon on the source machine if the Controller is not connected to the source machine through RSH.

   a. Type `m_daemon_setup -install` from the **<performance center_installation>/bin** directory.

   b. Make sure that the agent daemon is running whenever you activate the Network monitor.

   c. To stop the Network Delay Monitor agent daemon, type `m_daemon_setup -remove`.

Network Delay Monitoring User Interface

This section includes:

-

Network Delay Time Graph

The Network Delay Time graph shows the delay for the complete path between the source and destination machines (y-axis) as a function of the elapsed performance test time (x-axis).

Each path defined in the Add Destination Machines for Network Delay Monitoring dialog box is represented by a separate line with a different color in the graph.
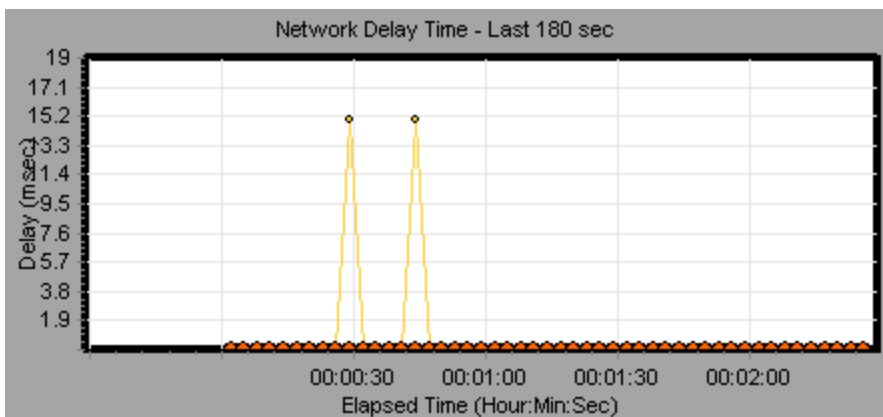
Troubleshooting and Limitations

This section describes troubleshooting for the Network Delay monitor.

If monitoring is unsuccessful and ALM Performance Center cannot locate the source or destination machines, make sure that the specified machines are available to your machine. Perform a "ping" operation. At the command line prompt, type `Ping server_name.`

To check the entire network path, use the trace route utility to verify that the path is valid.

For Windows, type `tracert <server_name>`.

For UNIX, type `traceroute <server_name>`.

If the monitoring problem persists once you verify that the machines are accessible and that the network path is valid, perform the following procedures:

1. If you are using the TCP protocol, run **<performance center root folder>\bin\webtrace.exe** from the source machine to determine whether the problem is related to the Controller, or the WebTrace technology on which the Network Delay monitor is based. If you are using the UDP or ICMP protocols, the problem must be related to the Controller and not WebTrace, since these protocols are not WebTrace technology-based.

2. If you receive results by running **webtrace.exe**, the problem is related to the Controller. Verify that the source machine is not a UNIX machine, and contact the Customer Support Web site with the following information:

   - the Controller log file, **drv_log.txt**, located in the **temp** directory of the Controller machine.

   - the **traceroute_server** log file, located on the source machine.

   - the debug information located in the **TRS_debug.txt** and **WT_debug.txt** files in the path directory. These files are generated by adding the following line to the [monitors_server] section of the **<performance center root folder>\dat\mdrv.dat** file, and rerunning the Network monitor:

     ExtCmdLine=-traceroute_debug path

3. If you do not receive results by running **webtrace.exe**, the problem is related to the WebTrace technology, on which the Network Delay monitor is based. Perform the following procedures on the source machine:

   - Verify that the **packet.sys** file (the Webtrace driver) exists in the **WINNT\system32\drivers** directory.

   - Check whether a driver (such as "Cloud" or "Sniffer") is installed on top of the network card driver. If so, remove it and run WebTrace again.

   - Verify that there are administrator permissions on the machine.

- Using `ipconfig /all`, check that only one IP address is assigned to the network card. WebTrace does not know how to handle multiple IP addresses assigned to the same card (IP spoofing).

- Check the number of network cards installed. Run `webtrace -devlist` to receive a list of the available network cards.

- If there is more than one card on the list, run `webtrace -dev <dev_name> <destination>`, where `<dev_name>` is one of the network card names shown in the list. If you discover that WebTrace is binding to the wrong card, you can use `webtrace set_device <dev_name>` to set a registry key that instructs WebTrace to use a specified card instead of the default one.

- Verify that the network card is of the Ethernet type.

- Contact the Customer Support Web site with the output of `webtrace.exe -debug` (for example, `webtrace.exe -debug www.merc-int.com`) and `ipconfig /all` on the machine.

Chapter 23: Web Server Resource Monitoring

This chapter includes:

Web Server Resource Monitoring Overview

Web Server Resource monitors provide you with information about the resource usage of the Microsoft IIS and Apache Web servers during performance test execution. To obtain this data, you need to activate the online monitor for the server and specify which resources you want to measure before executing the test.

For information about how to configure the monitors on the Controller, see "How to Set Up the Monitoring Environment – Workflow" on page 261.

How to Change the Apache Default Server Properties

This task describes how to modify the Apache default server properties that are defined in the monitor configuration file.

1. Open the **apache.cfg** file in the **<performance center server root folder>\dat\monitors** directory.

2. Edit the following parameters after the **Delimiter=:** statement:

   InfoURL. Server statistics information URL

   ServerPort. Server port number

   SamplingRate. Rate (milliseconds) at which the monitor will poll the server for the statistics information. If this value is greater than 1000, ALM Performance Center will use it as its sampling rate. Otherwise, it will use the sampling rate defined in the Monitors tab of the Options dialog box.

3. Save and close the file.

Apache Performance Counters

The following table describes the measurements and server properties that can be monitored on the Apache Web server during the test run:

Measurement	Description
# Busy Servers	The number of servers in the Busy state.
# Idle Servers	The number of servers in the Idle state.
Apache CPU Usage	The percentage of time the CPU is utilized by the Apache server.
Hits/sec	The HTTP request rate.
KBytes Sent/sec	The rate at which data bytes are sent from the Web server.

Microsoft IIS Performance Counters

The following table describes the measurements and server properties that can be monitored on the Microsoft IIS Web server during the test run:

Object	Measurement	Description
Web Service	**Bytes Sent/sec**	The rate at which the data bytes are sent by the Web service.
Web Service	**Bytes Received/sec**	The rate at which the data bytes are received by the Web service.
Web Service	**Get Requests/sec**	The rate at which HTTP requests using the GET method are made. Get requests are generally used for basic file retrievals or image maps, though they can be used with forms.
Web Service	**Post Requests/sec**	The rate at which HTTP requests using the POST method are made. Post requests are generally used for forms or gateway requests.
Web Service	**Maximum Connections**	The maximum number of simultaneous connections established with the Web service.
Web Service	**Current Connections**	The current number of connections established with the Web service.
Web Service	**Current NonAnonymous Users**	The number of users that currently have a non-anonymous connection using the Web service.
Web Service	**Not Found Errors/sec**	The rate of errors due to requests that could not be satisfied by the server because the requested document could not be found. These are generally reported to the client as an HTTP 404 error code.
Process	**Private Bytes**	The current number of bytes that the process has allocated that cannot be shared with other processes.

Chapter 24: Web Application Server Resource Monitoring

This chapter includes:

Web Application Server Resource Monitoring Overview

You use ALM Performance Center's Web Application Server Resource monitors to monitor Microsoft Active Server Pages servers during a test run and isolate application server performance bottlenecks.

The Microsoft Active Server Pages (ASP) monitor displays statistics about the resource usage on the ASP server during the test run.

MS Active Server Pages Performance Counters

The following table describes the default counters that can be monitored:

Measurement	Description
Errors per Second	The number of errors per second.
Requests Wait Time	The number of milliseconds the most recent request was waiting in the queue.
Requests Executing	The number of requests currently executing.
Requests Queued	The number of requests waiting in the queue for service.
Requests Rejected	The total number of requests not executed because there were insufficient resources to process them.
Requests Not Found	The number of requests for files that were not found.
Requests/sec	The number of requests executed per second.
Memory Allocated	The total amount of memory, in bytes, currently allocated by Active Server Pages.
Errors During Script Run-Time	The number of failed requests due to run-time errors.
Sessions Current	The current number of sessions being serviced.
Transactions/sec	The number of transactions started per second.

Chapter 25: Database Resource Monitoring

This chapter includes:

Database Resource Monitoring Overview

ALM Performance Center's Database Server Resource monitors measure database resource usage statistics for Oracle, or SQL Servers during a performance test run. You use these monitors to isolate database server performance bottlenecks.

The Oracle monitor displays information from Oracle V$ tables: Session statistics, V$SESSTAT, system statistics, V$SYSSTAT, and other table counters defined by the user in the custom query.

Before defining the monitoring measurements for the Oracle monitors in the Controller, you must set up the monitoring environment on the database server.

For details about the Oracle monitor configuration, see "How to Set Up the Oracle Monitoring Environment" below.

How to Set Up the Oracle Monitoring Environment

This task describes how to set up the monitor environment before monitoring an Oracle database server.

> **Note:** If a problem occurs in setting up the Oracle environment, check the Oracle server to view the error messages.

This task includes the following steps:

- "Prerequisites" below

- "Configure the Oracle client/server connection" on the next page

- "Connect to the monitored server machine and verify the connection" on the next page

- "Modify the monitoring sample rate (optional)" on page 301

- "Configure the Oracle monitor on the Controller" on page 301

1. Prerequisites
   - Ensure that the Oracle client libraries are installed on the Controller machine.

   - Verify that **%OracleHome%\bin** is included in the path environment variable. If it is not, add it.

   - Ensure that the registries are updated for the version of Oracle that you are using and that they have the following key: **HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE**

   - Ensure that the Performance Center Server is installed in a directory whose path does not include any of the following characters: **( ) : ; * \ / " ~ & ? { } $ % | < > + = ^ [ ].**

■ Verify that the Oracle server you want to monitor is up and running. Note that it is possible to monitor several Oracle database servers concurrently.

> **Note:** Only the 32-bit Oracle client should be installed on the Controller machine running the Oracle monitor. If you have a 16-bit and a 32-bit Oracle client installation on the Controller machine, the 16-bit installation should be uninstalled.

2. **Configure the Oracle client/server connection**

   Set the connection parameters so the Oracle client (Controller machine) can communicate with the Oracle server(s) you plan to monitor.
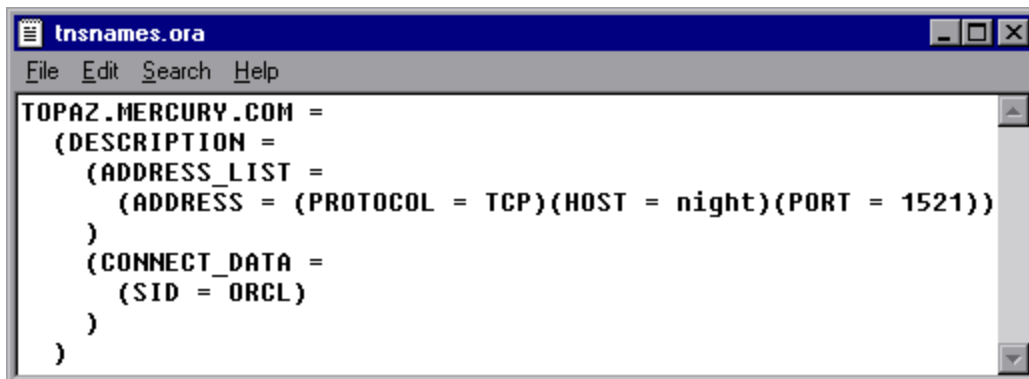
   On the Controller machine, set the following configuration parameters either by editing the **tnsnames.ora** file in a text editor, or using the Oracle service configuration tool.

   > **Example:**
   >
   > **Start > Programs > Oracle for Windows NT > Oracle Net8 Easy Config**

   ■ A new service name (TNS name) for the Oracle instance

   ■ TCP protocol

   ■ The host name (name of monitored server machine)

   ■ The port number (usually 1521)

   ■ The database SID (the default SID is ORCL)

   Example:

3. **Connect to the monitored server machine and verify the connection**

   a. Obtain a username and password for the service from your database administrator, and

ensure that the Controller has database administrator privileges for the Oracle **V$** tables (**V$SESSTAT**, **V$SYSSTAT**, **V$STATNAME**, **V$INSTANCE**, **V$SESSION**).

b. Verify connection with the Oracle server by performing **tns ping** from the Controller machine.

> **Note:** There may be a problem connecting if the Oracle server is behind a DMZ/firewall that limits its communication to application servers accessing it.

c. Run SQL*Plus from the Controller and attempt to log in to the Oracle server(s) with the desired username/password/server combination.

d. Type **SELECT * FROM V$SYSSTAT** to verify that you can view the V$SYSSTAT table on the Oracle server. Use similar queries to verify that you can view the V$SESSTAT, V$SESSION, V$INSTANCE, V$STATNAME, and V$PROCESS tables on the server.

4. Modify the monitoring sample rate (optional)

To change the length of each monitoring sample (in seconds), edit the **dat\monitors\vmon.cfg** file in the Performance Center root folder. The default rate is 10 seconds.

The minimum sampling rate for the Oracle Monitor is 10 seconds. If you set the sampling rate at less than 10 seconds, the Oracle Monitor will continue to monitor at 10 second intervals.

5. Configure the Oracle monitor on the Controller

For task details, see .

Oracle Performance Counters

The following measurements are most commonly used when monitoring the Oracle server (from the V$SYSSTAT table):

Measurement	Description
CPU used by this session	The amount of CPU time (in 10s of milliseconds) used by a session between the time a user call started and ended. Some user calls can be completed within 10 milliseconds and, as a result, the start and end-user call time can be the same. In this case, 0 milliseconds are added to the statistic. A similar problem can exist in the operating system reporting, especially on systems that suffer from many context switches.
Bytes received via SQL*Net from client	The total number of bytes received from the client over Net8.

Measurement	Description
Logons current	The total number of current logons.
Opens of replaced files	The total number of files that needed to be reopened because they were no longer in the process file cache.
User calls	Oracle allocates resources (Call State Objects) to keep track of relevant user call data structures every time you log in, parse, or execute. When determining activity, the ratio of user calls to RPI calls gives you an indication of how much internal work is generated as a result of the type of requests the user is sending to Oracle.
SQL*Net roundtrips to/from client	The total number of Net8 messages sent to, and received from, the client.
Bytes sent via SQL*Net to client	The total number of bytes sent to the client from the foreground processes.
Opened cursors current	The total number of current open cursors.
DB block changes	Closely related to consistent changes, this statistic counts the total number of changes that were made to all blocks in the SGA that were part of an update or delete operation. These are changes that generate redo log entries and hence will cause permanent changes to the database if the transaction is committed. This statistic is a rough indication of total database work and indicates (possibly on a per-transaction level) the rate at which buffers are being dirtied.
Total file opens	The total number of file opens being performed by the instance. Each process needs a number of files (control file, log file, database file) to work against the database.

SQL Server Performance Counters

The following table describes the default counters that can be monitored on version 6.5 of the SQL Server:

Measurement	Description
% Total Processor Time	The average percentage of time that all the processors on the system are busy executing non-idle threads. On a multi-processor system, if all processors are always busy, this is 100%, if all processors are 50% busy this is 50% and if 1/4 of the processors are 100% busy this is 25%. It can be viewed as the fraction of the time spent doing useful work. Each processor is assigned an Idle thread in the Idle process which consumes those unproductive processor cycles not used by any other threads.
% Processor Time	The percentage of time that the processor is executing a non-idle thread. This counter was designed as a primary indicator of processor activity. It is calculated by measuring the time that the processor spends executing the thread of the idle process in each sample interval, and subtracting that value from 100%. (Each processor has an idle thread which consumes cycles when no other threads are ready to run). It can be viewed as the percentage of the sample interval spent doing useful work. This counter displays the average percentage of busy time observed during the sample interval. It is calculated by monitoring the time the service was inactive, and then subtracting that value from 100%.
Cache Hit Ratio	The percentage of time that a requested data page was found in the data cache (instead of being read from disk).
I/O - Batch Writes/sec	The number of 2K pages written to disk per second, using Batch I/O. The checkpoint thread is the primary user of Batch I/O.
I/O - Lazy Writes/sec	The number of 2K pages flushed to disk per second by the Lazy Writer.
I/O - Outstanding Reads	The number of physical reads pending.
I/O - Outstanding Writes	The number of physical writes pending.
I/O - Page Reads/sec	The number of physical page reads per second.
I/O - Transactions/sec	The number of Transact-SQL command batches executed per second.

Measurement	Description
User Connections	The number of open user connections.

Chapter 26: Flex Monitoring

This chapter includes:

Flex RTMP Connections Graph

This graph shows the number of open RTMP connections at any time during the load test scenario run. The throughput represents the amount of data that the Vusers received from the server or sent to the server at any given second.

Purpose	This graph is useful in indicating when additional connections are needed. For example, if the number of connections reaches a plateau, and the transaction response time increases sharply, adding connections would probably cause a dramatic improvement in performance (reduction in the transaction response time).
X-axis	Elapsed time since the start of the scenario run.
Y-axis	Number of connections.

Flex RTMP Throughput Graph

This graph shows the amount of throughput (in bytes) on the RTMP/T server during each second of the load test scenario run. The throughput represents the amount of data that the Vusers received from the server or sent to the server at any given second.

Purpose	Helps you evaluate the amount of load that Vusers generate, in terms of server throughput.
X-axis	Elapsed time since the start of the scenario run.
Y-axis	Throughput of the server in bytes
Note	You cannot change the granularity of the x-axis to a value that is less than the Web granularity you defined in the General tab of the Options dialog box.

Flex RTMP Other Statistics Graph

This graph shows various statistics about Flex RTMP Vusers.

Purpose	The graph shows the duration taken to perform various RTMP tasks.
X-axis	Elapsed time since the start of the scenario run.
Y-axis	Task duration (in milliseconds).

Flex Streaming Delivery Graph

This graph displays the total number of streams that were successfully delivered by the server. A successful delivery is indicated when the server initiates a "NetStream.Stop" message at the end of the requested stream.

Purpose	Helps you evaluate the amount of load that Vusers generate, in terms of server throughput.
X-axis	Elapsed time since the start of the scenario run.
Y-axis	Number of streams delivered

Flex Average Buffering Time Graph

This graph displays the average buffering time for RTMP streams.

Purpose	Helps you evaluate the amount of load that Vusers generate, in terms of time spent for streams in the buffer.
X-axis	Elapsed time since the start of the scenario run.
Y-axis	Buffering time in milliseconds

Chapter 27: Streaming Media Monitoring

This chapter includes:

Streaming Media Monitoring Overview

To isolate server and client performance bottlenecks during a scenario run, you monitor the Windows Media Server and RealPlayer audio/video servers, as well as the RealPlayer and Media Player clients.

> **Note:** For instructions on recording a script containing streaming media functions, see the HP Virtual User Generator.

The streaming media monitors provide you with performance information for the Windows Media Server and RealPlayer audio/video servers, as well as the RealPlayer and Media Player clients. To obtain data for the Windows Media Server and RealPlayer Server, you need to activate the streaming media monitor before executing the scenario, and indicate which statistics and measurements you want to monitor. The RealPlayer Client and Media Player Client do not require pre-session or scenario activation or configuration.

- The Real Client monitor graph shows statistics on the RealPlayer client machine as a function of the elapsed scenario time. The x-axis represents the time that has elapsed since the start of the scenario run. The y-axis represents the resource usage.

- The Media Player Client monitor graph shows statistics on the Windows Media Player client machine as a function of the elapsed scenario time. The x-axis represents the time that has elapsed since the start of the scenario run. The y-axis represents the resource usage.

RealPlayer Client Performance Counters

The following table describes the RealPlayer Client measurements that are monitored:

Measurement	Description
Current Bandwidth (Kbits/sec)	The number of kilobytes in the last second
Buffering Event Time (sec)	The average time spent on buffering
Network Performance	The ratio (percentage) between the current bandwidth and the actual bandwidth of the clip
Percentage of Recovered Packets	The percentage of error packets that were recovered
Percentage of Lost Packets	The percentage of packets that were lost
Percentage of Late Packets	The percentage of late packets
Time to First Frame Appearance (sec)	The time for first frame appearance (measured from the start of the replay)

Number of Buffering Events	The average number of all buffering events
Number of Buffering Seek Events	The average number of buffering events resulting from a seek operation
Buffering Seek Time	The average time spent on buffering events resulting from a seek operation
Number of Buffering Congestion Events	The average number of buffering events resulting from network congestion
Buffering Congestion Time	The average time spent on buffering events resulting from network congestion
Number of Buffering Live Pause Events	The average number of buffering events resulting from live pause
Buffering Live Pause Time	The average time spent on buffering events resulting from live pause

Media Player Client Performance Counters

The following table describes the Media Player Client measurements that are monitored:

Measurement	Description
Average Buffering Events	The number of times Media Player Client had to buffer incoming media data due to insufficient media content.
Average Buffering Time (sec)	The time spent by Media Player Client waiting for sufficient amount of media data in order to continue playing media clip.
Current bandwidth (Kbits/sec)	The number of kbits per second received.
Number of Packets	The number of packets sent by server for a particular media clip.
Stream Interruptions	The number of interruptions encountered by media player client while playing a media clip. This measurement includes the number of times Media Player Client had to buffer incoming media data, and any errors that occurred during playback.
Stream Quality (Packet-level)	The percentage ratio of packets received to total packets.

Stream Quality (Sampling-level)	The percentage of stream samples received on time (no delays in reception).
Total number of recovered packets	The number of lost packets that were recovered. This value is only relevant during network playback.
Total number of lost packets	The number of lost packets that were not recovered. This value is only relevant during network playback.

Chapter 28: ERP/CRM Server Resource Monitoring

This chapter includes:

ERP/CRM Server Resource Monitoring Overview

You use ALM Performance Center's ERP/CRM server resource monitors to monitor ERP/CRM servers during a performance test run and isolate server performance bottlenecks.

The Siebel Server Manager monitor displays statistics about the resource usage of a Siebel Server Manager during the scenario run.

Siebel Server Manager Performance Counters

The following table shows the default counters that can be measured:

Measurement	Description
Average Connect Time	The average connection time.
Average Reply Size	The average size of a user reply.
Average Request Size	The average size of a user request.
Average Requests Per Session	The average number of user requests per session.
Average Response Time	The average amount of time that it takes the server to respond to a request.
Average Think Time	The average amount of think time taken to respond to a request.
Avg SQL Execute Time	The average SQL execute time.
Avg SQL Fetch Time	The average SQL fetch time.
Avg SQL Parse Time	The average SQL parse time.
CPU Time	The CPU time used in the work process.
Elapsed Time	The total amount of elapsed time.
Num of DBConn Retries	The number of database connection retries.
Num of DLRbk Retries	The number of DLRbk retries.
Num of Exhausted Retries	The total number of retries that expired.
Number of SQL Executes	The total number of SQL executes.
Number of SQL Fetches	The total number of SQL fetches.
Number of SQL Parses	The total number of SQL parses.

Number of Sleeps	The number of sleeps.
Object Manager Errors	The total number of object manager errors.
Reply Messages	The total number of reply messages.
Request Messages	The total number of request messages.
SQL Execute Time	The total SQL execute time.
SQL Fetch Time	The total SQL fetch time.
SQL Parse Time	The total SQL parse time.
Sleep Time	The total sleep time.
Tests Attempted	The number of tests attempted.
Tests Failed	The number of tests that failed.
Tests Successful	The number of tests that were successful.
Total Reply Size	The total reply size, measured in bytes.
Total Request Size	The total request size, measured in bytes.
Total Response Time	The total response time.
Total Tasks	The total number of tasks.
Total Think Time	The total think time.

Siebel Server Manager Monitor - Troubleshooting and Limitations

This section describes troubleshooting for the Siebel Server Manager Monitor

The Siebel Server Manager monitor uses a Siebel command line utility (srvrmgr) to gather it's statistics. If you are having trouble getting the Siebel Server Manager monitor to work, run this command from the Siebel Server Manager client:

```
srvrmgr /s <server> /g <gateway> /e <enterprise> /u <user> /p <pw>
```

If this command works from the command line, but SiteScope has trouble executing the command, open **/sitescope/templates.applications/commandline.siebel,** and verify that you can run the following command from the command line:

```
CONNECT_COMMAND:$PATH$/srvrmgr /g $GATEWAY$ /e $ENTERPRISE$ /s $SERVERS$ /u
$USERNAME$ /p $PASSWORD$
```

Note: On a Windows 2000 Advanced Server platform this command must be changed to:

```
CONNECT_COMMAND:$PATH$\srvrmgr.exe /g $GATEWAY$ /e $ENTERPRISE$ /s $SERVERS$ /u
$USERNAME$ /p $PASSWORD$
```

Chapter 29: Application Deployment Solution Monitoring

This chapter includes:

Application Deployment Solution Monitoring Overview

Using ALM Performance Center's Application Deployment Solution monitor, you can isolate server performance bottlenecks by monitoring the Citrix server during a performance test run.

ALM Performance Center's Citrix monitor provides you with information about the application deployment usage of the Citrix server during performance test execution. The Citrix monitor allows you to monitor the server performance statistics from Citrix servers. You can monitor multiple parameters (counters) with a single monitor instance. This allows you to watch server loading for performance, availability, and capacity planning.

To obtain performance data, you need to activate the online monitor for the server and specify which resources you want to measure before executing the performance test.

For information about how to set up the Citrix monitoring environment, see "How to Set up the Citrix Monitoring Environment" below.

How to Set up the Citrix Monitoring Environment

This task describes the working order for setting up the monitoring environment.

To learn more about application deployment solution monitoring, see "Application Deployment Solution Monitoring Overview" above.

1. Prerequisites

   - Make sure that Citrix Server has been installed and is running.

   - If Citrix Server machine is running Windows 2000, make sure that the server machine is also running the Remote Registry service.

   - Measurements that monitor instances are valid for the currently running Citrix session only. If you run this test again, you will need to reconfigure the measurements that are instance-oriented.

   To monitor the different instances, ensure that the server login and logout procedures are recorded in the **Vuser_init** and **Vuser_end** sections respectively, and not in the Action section of the script. For more information, see the *HP Virtual User Generator User Guide*.

2. Map the Network Drive

   From the Controller machine, map a network drive to the Citrix server machine. This ensures that the required authentication is provided to the Controller to access the resource counters.

3. Launch PerfMon

   Launch PerfMon from the Controller machine to enable the counters on the Citrix server. This allows you to monitor the same counters for the ICA Session object on the Citrix monitor.

4. Open the Connection with the Citrix Server

   You can configure the Citrix monitor to view ICA Session object counters only if at least one session is being run on the Citrix server. If no "real" user has opened a connection with the Citrix server, you need to first initialize or run a Citrix Vuser against the server, and only then configure the Citrix Monitor and add the ICA Session counters. If you configure the Citrix monitor without first initializing or running a Citrix Vuser (or connecting to the Citrix server as a "real" user), you will not be able to view the ICA Session object.

5. Configure the Citrix Monitor on the Controller

   For task details, see "How to Create and Configure Monitor Profiles" on page 49.

Citrix MetaFrame Performance Counters

The following sections describe some of the counters that can be measured.

- "Non-Virtual Counters" below

- "Virtual Channel Counters" on page 322

Non-Virtual Counters

The following table describes non-virtual counters:

Measurement	Description
% Disk Time	The percentage of elapsed time that the selected disk drive services read or write requests.
% Processor Time	The percentage of time that the processor executes a non-Idle thread. This counter is a primary indicator of processor activity. It is calculated by measuring the time that the processor spends executing the thread of the Idle process in each sample interval, and subtracting that value from 100%. (Each processor has an Idle thread which consumes cycles when no other threads are ready to run.) It can be viewed as the percentage of the sample interval spent doing useful work. This counter displays the average percentage of busy time observed during the sample interval. It is calculated by monitoring the time the service was inactive, and then subtracting that value from 100%.

Measurement	Description
File data Operations/sec	The rate that the computer issues Read and Write operations to file system devices. This does not include File Control Operations.
Interrupts/sec	The average number of hardware interrupts the processor receives and services per second. It does not include DPCs, which are counted separately. This value is an indirect indicator of the activity of devices that generate interrupts, such as the system clock, the mouse, disk drivers, data communication lines, network interface cards and other peripheral devices. These devices normally interrupt the processor when they have completed a task or require attention. Normal thread execution is suspended during interrupts. Most system clocks interrupt the processor every 10 milliseconds, creating a background of interrupt activity. This counter displays the difference between the values observed in the last two samples, divided by the duration of the sample interval.
Output Session Line Speed	This value represents the line speed from server to client for a session in bps.
Input Session Line Speed	This value represents the line speed from client to server for a session in bps.
Page Faults/sec	A count of the Page Faults in the processor. A page fault occurs when a process refers to a virtual memory page that is not in its Working Set in main memory. A Page Fault will not cause the page to be fetched from disk if that page is on the standby list, and hence already in main memory, or if it is in use by another process with whom the page is shared.
Pages/sec	The number of pages read from the disk or written to the disk to resolve memory references to pages that were not in memory at the time of the reference. This is the sum of Pages Input/sec and Pages Output/sec. This counter includes paging traffic on behalf of the system Cache to access file data for applications. This value also includes the pages to/from non-cached mapped memory files. This is the primary counter to observe if you are concerned about excessive memory pressure (that is, thrashing), and the excessive paging that may result.
Pool Nonpaged Bytes	The number of bytes in the Nonpaged Pool, a system memory area where space is acquired by operating system components as they accomplish their appointed tasks. Nonpaged Pool pages cannot be paged out to the paging file, but instead remain in main memory as long as they are allocated.
Private Bytes	The current number of bytes this process has allocated that cannot be shared with other processes.

Measurement	Description
Processor Queue Length	The instantaneous length of the processor queue in units of threads. This counter is always 0 unless you are also monitoring a thread counter. All processors use a single queue in which threads wait for processor cycles. This length does not include the threads that are currently executing. A sustained processor queue length greater than two generally indicates processor congestion. This is an instantaneous count, not an average over the time interval.
Threads	The number of threads in the computer at the time of data collection. Notice that this is an instantaneous count, not an average over the time interval. A thread is the basic executable entity that can execute instructions in a processor.
Latency – Session Average	This value represents the average client latency over the life of a session.
Latency – Last Recorded	This value represents the last recorded latency measurement for this session.
Latency – Session Deviation	This value represents the difference between the minimum and maximum measured values for a session.
Input Session Bandwidth	This value represents the bandwidth from client to server traffic for a session in bps.
Input Session Compression	This value represents the compression ratio for client to server traffic for a session.
Output Session Bandwidth	This value represents the bandwidth from server to client traffic for a session in bps.
Output Session Compression	This value represents the compression ratio for server to client traffic for a session.
Output Session Linespeed	This value represents the line speed from server to client for a session in bps.

Virtual Channel Counters

The following table describes virtual channel counters:

Measurement	Description
Input Audio Bandwidth	This value represents the bandwidth from client to server traffic on the audio mapping channel. This is measured in bps.
Input Clipboard Bandwidth	This value represents the bandwidth from client to server traffic on the clipboard mapping channel. This is measured in bps.
Input COM1 Bandwidth	This value represents the bandwidth from client to server traffic on the COM1 channel. This is measured in bps.
Input COM2 Bandwidth	This value represents the bandwidth from client to server traffic on the COM2 channel. This is measured in bps.
Input COM Bandwidth	This value represents the bandwidth from client to server traffic on the COM channel. This is measured in bps.
Input Control Channel Bandwidth	This value represents the bandwidth from client to server traffic on the ICA control channel. This is measured in bps.
Input Drive Bandwidth	This value represents the bandwidth from client to server traffic on the client drive mapping channel. This is measured in bps.
Input Font Data Bandwidth	This value represents the bandwidth from client to server traffic on the local text echo font and keyboard layout channel. This is measured in bps.
Input Licensing Bandwidth	This value represents the bandwidth from server to client traffic on the licensing channel. This is measured in bps.
Input LPT1 Bandwidth	This value represents the bandwidth from client to server traffic on the LPT1 channel. This is measured in bps.
Input LPT2 Bandwidth	This value represents the bandwidth from client to server traffic on the LPT2 channel. This is measured in bps.
Input Management Bandwidth	This value represents the bandwidth from client to server traffic on the client management channel. This is measured in bps.
Input PN Bandwidth	This value represents the bandwidth from client to server traffic on the Program Neighborhood channel. This is measured in bps.
Input Printer Bandwidth	This value represents the bandwidth from client to server traffic on the printer spooler channel. This is measured in bps.
Input Seamless Bandwidth	This value represents the bandwidth from client to server traffic on the Seamless channel. This is measured in bps.
Input Text Echo Bandwidth	This value represents the bandwidth from client to server traffic on the local text echo data channel. This is measured in bps.

Measurement	Description
Input Thinwire Bandwidth	This value represents the bandwidth from client to server traffic on the Thinwire (graphics) channel. This is measured in bps.
Input VideoFrame Bandwidth	This value represents the bandwidth from client to server traffic on the VideoFrame channel. This is measured in bps.
Output Audio Bandwidth	This value represents the bandwidth from server to client traffic on the audio mapping channel. This is measured in bps.
Output Clipboard Bandwidth	This value represents the bandwidth from server to client traffic on the clipboard mapping channel. This is measured in bps.
Output COM1 Bandwidth	This value represents the bandwidth from server to client traffic on the COM1 channel. This is measured in bps.
Output COM2 Bandwidth	This value represents the bandwidth from server to client traffic on the COM2 channel. This is measured in bps.
Output COM Bandwidth	This value represents the bandwidth from server to client traffic on the COM channel. This is measured in bps.
Output Control Channel Bandwidth	This value represents the bandwidth from server to client traffic on the ICA control channel. This is measured in bps.
Output Drive Bandwidth	This value represents the bandwidth from server to client traffic on the client drive channel. This is measured in bps.
Output Font Data Bandwidth	This value represents the bandwidth from server to client traffic on the local text echo font and keyboard layout channel. This is measured in bps.
Output Licensing Bandwidth	This value represents the bandwidth from server to client traffic on the licensing channel. This is measured in bps.
Output LPT1 Bandwidth	This value represents the bandwidth from server to client traffic on the LPT1 channel. This is measured in bps.
Output LPT2 Bandwidth	This value represents the bandwidth from server to client traffic on the LPT2 channel. This is measured in bps.
Output Management Bandwidth	This value represents the bandwidth from server to client traffic on the client management channel. This is measured in bps.
Output PN Bandwidth	This value represents the bandwidth from server to client traffic on the Program Neighborhood channel. This is measured in bps.
Output Printer Bandwidth	This value represents the bandwidth from server to client traffic on the printer spooler channel. This is measured in bps.

Measurement	Description
Output Seamless Bandwidth	This value represents the bandwidth from server to client traffic on the Seamless channel. This is measured in bps.
Output Text Echo Bandwidth	This value represents the bandwidth from server to client traffic on the local text echo data channel. This is measured in bps.
Output Thinwire Bandwidth	This value represents the bandwidth from server to client traffic on the Thinwire (graphics) channel. This is measured in bps.
Output VideoFrame Bandwidth	This value represents the bandwidth from server to client traffic on the VideoFrame channel. This is measured in bps.

Chapter 30: Middleware Performance Monitoring

This chapter includes:

Middleware Performance Monitoring Overview

A primary factor in a transaction's response time is the Middleware performance usage. ALM Performance Center's Middleware Performance monitors provide you with information about the Middleware performance usage of the IBM WebSphere MQ server during performance test execution. To obtain performance data, you need to activate the online monitor for the server and specify which resources you want to measure before executing the the performance test.

The IBM WebSphere MQ monitor is used to monitor channel and queue performance counters on an IBM WebSphere MQ (version 5.x) Server.

How to Set Up the IBM WebSphere MQ Monitor

This task describes how to configure the Controller and IBM WebSphere MQ machines:

1. Prerequisites

   Ensure that an IBM WebSphere MQ Client Connection (version 5.21 only) is installed on the Controller machine.

2. Configure the server environment to monitor events

   The LoadRunner MQ Monitor retrieves event messages from two standard MQSeries queues only:

   - SYSTEM.ADMIN.PERFM.EVENT – performance events, such as "queue depth high"

   - SYSTEM.ADMIN.CHANNEL.EVENT – channel events, such as "channel stopped"

   Events must be enabled for the queue manager (and in many cases, on the applicable object, as well). Performance events are enabled by setting attributes for the queue on the MQ Server. Channel events are enabled by default, and cannot be disabled.

   > **Note:** The IBM WebSphere MQ monitor does not retrieve data from a queue manager after the queue manager has been restarted.

   a. Run the following MQSC command:
      ```
      ALTER QMGR PERFMEV(ENABLED).
      ```

   b. Set the queue attributes. For a list of queue attributes, "IBM WebSphere MQ Queue Attributes" on page 330.

3. Add the monitored server to the Controller

a. In the Controller Run view, click the IBM WebSphere MQ graph in the graph tree, and drag it into the right pane.

b. Right-click the graph and select **Add Measurements**, or click anywhere on the graph and select **Monitors > Add Measurements**. The IBM WebSphere MQ dialog box opens.

In the **Monitored Server Machines** section, click **Add.** The Add Machine dialog box opens.

c. The first time that you add measurements, enter the server name or IP address of the machine you want to monitor. The format of the server name is `<machine name>:<port number>`. Select the platform on which the machine runs, and click **OK**.

d. In the **Resource Measurements** section of the IBM WebSphere MQ dialog box, click **Add**.

4. Configure the IBM WebSphere MQ monitor

The IBM WebSphere MQ monitor connects to the IBM WebSphere MQ server (via the MQ Client Connection installed on the Controller machine). In MQ Client environments, the client machine connects to an MQ Server instance, and uses the Server's resources as if they were local to the client machine.

- Specify the connection information and measurements in the MQ Monitor Add Measurements dialog.

IBM WebSphere MQ Performance Counters

The following tables list the available IBM WebSphere MQ monitor measurements:

Queue Performance Counters

The following table describes the Queue Performance counters:

Measurement	Description
Event - Queue Depth High (events per second)	An event triggered when the queue depth reaches the configured maximum depth.
Event - Queue Depth Low (events per second)	An event triggered when the queue depth reaches the configured minimum depth.
Event - Queue Full (events per second)	An event triggered when an attempt is made to put a message on a queue that is full.
Event - Queue Service Interval High (events per second)	An event triggered when no messages are put to or retrieved from a queue within the timeout threshold.

Event - Queue Service Interval OK (events per second)	An event triggered when a message has been put to or retrieved from a queue within the timeout threshold.
Status - Current Depth	Current count of messages on a local queue. This measurement applies only to local queues of the monitored queue manager.
Status - Open Input Count	Current count of open input handles. Input handles are opened so that an application may "put" messages to a queue.
Status - Open Output Count	Current count of open output handles. Output handles are opened so that an application may "get" messages from a queue.

Channel Performance Counters

The following table describes the Channel Performance counters:

Measurement	Description
Event - Channel Activated (events per second)	Event generated when a channel, waiting to become active but inhibited from doing so due to a shortage of queue manager channel slots, becomes active due to the sudden availability of a channel slot.
Event - Channel Not Activated (events per second)	Event generated when a channel, attempts to become active but inhibited from doing so due to a shortage of queue manager channel slots.
Event - Channel Started (events per second)	Event generated when a channel is started.
Event - Channel Stopped (events per second)	Event generated when a channel is stopped, regardless of source of stoppage.
Event - Channel Stopped by User (events per second)	Event generated when a channel is stopped by a user.
Status - Channel State	The current state of a channel. Channels pass through several states from stopped (inactive state) to running (fully active state). Channel states range from 0 (stopped) to 6 (running).

Status - Messages Transferred	The count of messages that have been sent over the channel. If no traffic is occurring over the channel, this measurement will be zero. If the channel has not been started since the queue manager was started, no measurement will be available.
Status - Buffer Received	The count of buffers that have been received over the channel. If no traffic is occurring over the channel, this measurement will be zero. If the channel has not been started since the queue manager was started, no measurement will be available.
Status - Buffer Sent	The count of buffers that have been sent over the channel. If no traffic is occurring over the channel, this measurement will be zero. If the channel has not been started since the queue manager was started, no measurement will be available.
Status - Bytes Received	The count of bytes that have been received over the channel. If no traffic is occurring over the channel, this measurement will appear as zero. If the channel has not been started since the queue manager was started, no measurement will be available.
Status - Bytes Sent	The count of bytes that have been sent over the channel. If no traffic is occurring over the channel, this measurement will appear as zero. If the channel has not been started since the queue manager was started, no measurement will be available.

IBM WebSphere MQ Queue Attributes

You set the following queue attributes using the MQSC command `ALTER QMGR PERFMEV(ENABLED)`:

Measurement	Set Event Attributes
Event - Queue Depth High	• **QDEPTHHI(integer)** - where integer is a value expressed as a percentage of maximum messages allowed, and is in the range of 0 to 100 inclusive. • **QDPHIEV(action) -** where action is the word "ENABLED" or "DISABLED", enabling or disabling the generation of the event, respectively.
Event - Queue Depth Low	To enable the event for a queue, the following attributes of the queue must be set: • **QDEPTHLO(integer) -** where integer is a value expressed as a percentage of maximum messages allowed, and is in the range of 0 to 100 inclusive. • **QDPLOEV(action) -** where action is the word "ENABLED" or "DISABLED", enabling or disabling the generation of the event, respectively.

Event - Queue Full	• **QDEPTHHI(integer)** – where integer is a value expressed as a percentage of maximum messages allowed, and is in the range of 0 to 100 inclusive.
	• **QDPMAXEV(action)** – where action is the word "ENABLED" or "DISABLED", enabling or disabling the generation of the event, respectively.
Event - Queue Service Interval High	• **QSVCINT(integer)** – where integer is a value expressed as milliseconds, in the range of 0 and 999,,999, inclusive. Note: this value is shared with Queue Service Interval OK.
	• **QSVCIEV(type)** – where type is the word "HIGH", "OK", or "NONE", enabling service interval high events, enabling service interval ok events, or disabling the generation of the event, respectively.
Event - Queue Service Interval OK	• **QSVCINT(integer)** – where integer is a value expressed as milliseconds, in the range of 0 and 999,999,999, inclusive. Note: this value is shared with Queue Service Interval High.
	• **QSVCIEV(type)** – where type is the word "HIGH", "OK", or "NONE", enabling service interval high events, enabling service interval ok events, or disabling the generation of the event, respectively.

Chapter 31: Infrastructure Resources Monitoring

This chapter includes:

Infrastructure Resources Monitoring Overview

You can monitor network client resources for FTP, POP3, SMTP, IMAP, and DNS Vusers during a performance test run and isolate client performance bottlenecks.

Activating the Network Client Monitor

The Network Client online monitor graph is only available during performance tests that run relevant scripts, such as FTP, POP3, and so forth.

You can view this graph by dragging it from the Infrastructure Resources Graph section in the graph tree into the right pane of the Run view. The graph appears in the graph view area.

Network Client Performance Counters

The following table describes the Network Client measurements that are monitored:

Measurement	Description
Pings per sec	Number of pings per second
Data transfer bytes per sec	Number of data bytes transferred per second
Data receive bytes per sec	Number of data bytes received per second
Connections per sec	Number of connections per second
Accept connections per sec	Number of connections accepted per seconds
SSL Connections per sec	Number of SSL connections per second
SSL Data transfer bytes per sec	Number of SSL data bytes transferred per second
SSL Data receive bytes per sec	Number of SSL data bytes received per second
SSL Accept connections per sec	Number of SSL connections accepted per seconds

Part 6: Runtime Settings Configuration

Chapter 32: Script Runtime Settings

This chapter includes:

Script Runtime Settings Overview

Before you run a performance test, you can configure the behavior of the Vuser scripts in the test using runtime settings. You can configure general settings and protocol-specific settings.

This section also includes:

- "General Runtime Settings Overview " below

- "Protocol-Specific Runtime Settings Overview " below

General Runtime Settings Overview

After you record a Vuser script, you can configure its runtime settings. The runtime settings define the way the script runs, such as delay between actions, the number of times to repeat an action, and the level of logging.

Configuring runtime settings allows you to emulate different kinds of user activity. For example, you can emulate a user who responds immediately to the server, or a user who stops and thinks before each response. You can also configure the runtime settings to specify how many times the Vuser should repeat a set of actions. The General runtime settings described in this chapter apply to all types of Vuser scripts.

For task details, see "How to Configure Runtime Settings" below.

Protocol-Specific Runtime Settings Overview

Before replaying a Vuser script, you can configure its runtime settings. The runtime settings define the way the script runs, using settings that are specific for your particular environment.

Since runtime settings are protocol-specific, you will notice that not all runtime settings are available.

For task details, see "How to Configure Runtime Settings" below.

How to Configure Runtime Settings

This task describes how to open and configure runtime settings to define the way a script runs.

To learn more about runtime settings, see " Script Runtime Settings Overview" above

To configure the runtime settings in a Vuser script:

1. Use one of the following:

   - **From ALM:** On the ALM sidebar, under **Testing**, select **Test Plan**.Right-click a performance test in the test plan tree and select **Edit Test**.

   - **From Performance Center:** Select **Perspective> Test Plan**. Select a performance test in the test plan tree and click **Edit Test**.

2. In the Workload tab, select a Vuser group and click **Edit Runtime Settings** . The Edit Runtime Settings dialog box opens.

3. Select the runtime settings type to edit and define the required information. For user interface details, see "Edit Runtime Settings Dialog Box" on page 340.

   For a list of runtime settings types that relate to specific protocols, see "Protocol Specific Runtime Settings Types" below.

4. Click **OK** to save the settings and close the dialog box.

Protocol Specific Runtime Settings Types

The following list shows the protocol-specific runtime settings.

Protocol(s)/Category	Runtime Setting
Web Services / JMS	Advanced
Internet Protocols / Browser	Browser Emulation
Java / Java Environment Settings	Classpath Options
Oracle NCA / Oracle NCA	Client Emulation
Citrix ICA / Citrix	Configuration
Internet Protocols / Internet Protocol	Download Filter
WAP, MMS / WAP	Gateway
Java / Java Environment Settings	Java VM
Microsoft .NET / .NET	.NET Environment
Internet Protocols / Internet Protocol	Preferences
Internet Protocols / Internet Protocol	Proxy
WAP, MMS / WAP	Radius
Terminal Emulation / RTE	RTE

Protocol(s)/Category	Runtime Setting
MMS (Multimedia Messaging Service)	Server and Protocol
Internet Protocols, NCA / Network	Speed Simulation
Citrix ICA / Citrix	Timing

Runtime Settings User Interface

This section includes:

Edit Runtime Settings Dialog Box

This dialog box enables you to modify the runtime settings of the test scripts.
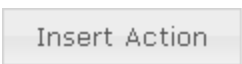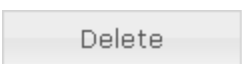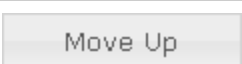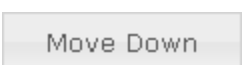
To access	1. Use one of the following: ■ **From ALM:** On the ALM sidebar, under **Testing**, select **Test Plan**.Right-click a performance test in the test plan tree and select **Edit Test**. ■ **From Performance Center:** Select **Perspective> Test Plan**. Select a performance test in the test plan tree and click **Edit Test**. 2. In the Workload tab, select a Vuser group and click **Edit Runtime Settings**. The Edit Runtime Settings dialog box opens.
Important information	If you do not edit the runtime settings, the script runs using the default runtime settings, or the last saved runtime settings if the script was recorded in VuGen.
Relevant tasks	"How to Configure Runtime Settings" on page 337
See also	● " Script Runtime Settings Overview" on page 337 ● *HP Virtual User Generator User Guide*

Run Logic Settings

The Run Logic settings enable you to organize the Vuser script actions and their sequence.

User interface elements are described below:

UI Elements	Description
Run Logic	Displays the Vuser scipt. Every Vuser script contains three sections: **Init, Run,** and **End**. You can instruct a Vuser to repeat the **Run** section a specific number of times when you run the script. Each repetition is known as an **iteration**.

The **Init** and **End** sections of a Vuser script are not repeated when you run multiple iterations.

Within the **Run** section, you can organize your steps into separate actions. You do this when creating the script.

You can organize the actions and their sequence. You can also organize blocks that perform one or more actions. |
Insert Action	Inserts an action to a selected section.
Insert Block	Inserts a block to a selected section.
Delete	Deletes a selected action or block.
Move Up	Moves up a selected action or block.
Move Down	Moves down a selected action or block.
Properties...	Defines the run logic and the iteration for a selected section or block.

Pacing Settings

The Pacing runtime settings let you control the number of iterations and the time between them.

User interface elements are described below:

UI Elements	Description
Iteration Count - Number of Iterations	Specifies the number of times to repeat the script's **Run** section.

UI Elements	Description
Start new Iteration - As soon as the previous iteration ends	The new iteration begins as soon as possible after the previous iteration ends.
Start new Iteration - After the previous iteration ends with a fixed delay of	Starts each new iteration at a fixed delay after the end of the previous iteration.
Start new Iteration - After the previous iteration ends with a random delay of	Starts each new iteration at a random delay from the end of the previous iteration. You specify a range for the delay. When you run the script, the Execution Log shows the actual time the Vuser waited between the end of one iteration and the start of the next one.
Start new Iteration - At fixed or random intervals, every ... [to ...] seconds	You specify the time between iterations—either a fixed number of seconds or a range of seconds from the beginning of the previous iteration. For example, you can specify to begin a new iteration every 30 seconds, or at a random rate ranging from 30 to 45 seconds from the beginning of the previous iteration. Each scheduled iterations begins only when the previous iteration is complete. When you run the script, the Execution Log shows the time the Vuser waited between the end of one iteration and the start of the next one. The Execution Log also indicates if the delay could not be achieved, for example where it took the iteration eight seconds and the delay was seven seconds.

Log Settings

During execution, Vusers log information about themselves and their communication with the server. The log information is useful for debugging purposes.

The Log runtime settings let you disable logging or determine how much information is logged to the output—a **Standard** or **Extended** log.

User interface elements are described below:

UI Elements	Description
Disable logging	Disabling the log is useful when working with many Vusers. If you have tens or hundreds of Vusers logging their runtime information to disk, the system may work slower than normal. During development, enable logging so that you will have information about the replay. You should only disable logging after verifying that the script is functional.
	If you disable logging, it only affects automatic logging. Messages sent manually using message functions such as **lr_output_message**, are still issued.
Standard log	Creates a standard log of functions and messages sent during script execution to use for debugging. Disable this option for large performance testing scenarios or profiles.
	If the logging level is set to **Standard**, the logging mode is automatically set to **JIT logging** when adding it to the Controller host. If, however, the logging mode was disabled or set to **Extended**, then running it from a Controller host will not affect its logging settings.
Extended log	Creates an extended log, including warnings and other messages. Disable this option for large performance tests.
	You can specify which additional information to add to the extended log using the Extended log options:
	• **Parameter substitution.** Logs all parameters assigned to the script with their values.
	• **Data returned by server.** Logs all data returned by the server.
	• **Advanced trace.** Logs all of the functions and messages sent by the Vuser during the session. This option is useful when you debug a Vuser script.

UI Elements	Description
Log Options	The Log runtime settings let you indicate when to send log messages to the log: **Send messages only when an error occurs** or **Always send messages**. During development, you can always send messages. Once you verify that your script is functional, you can enable logging for errors only. If you choose to send messages only when errors occur, also known as JIT, (Just in Time) messaging, you can set an advanced option, indicating the size of the log cache. The **Advanced** options for the Log runtime settings let you indicate the size of the log cache. The log cache stores raw data about the test execution, to make it available should an error occur. When the contents of the cache exceed the specified size, it deletes the oldest items. The default size is 1KB. When an error occurs (either an internal error or a programmed error using **lr_error_ message**), VuGen places the contents of the cache into the log file and Execution Log tab. This allows you to see the events that led up to the error. The actual file size will be greater than the cache size. For example, if your cache size is 1KB, the log file size may be 50 KB. This is normal and only reflects the overhead required for formatting the raw data into readable text.

Think Time Settings

Vuser **think time** emulates the time that a real user waits between actions. For example, when a user receives data from a server, they may wait several seconds to review the data before responding. Vuser scripts use **lr_think_time** functions to emulate the think time delays.

> **Example**
>
> The following recorded function indicates that the user waited eight seconds before performing the next action:
>
> ```
> lr_think_time(8);
> ```

By default, when you run a Vuser script, the Vuser uses the think time values that were recorded into the script during the recording session. VuGen allows you to use the recorded think time, ignore it, limit it, or use a value related to the recorded time.

User interface elements are described below:

UI Elements	Description
Think Time options - Ignore think time	Replays the script ignoring all **lr_think_time** functions.

UI Elements	Description
Think Time options - Replay the think time as recorded	Uses the value recorded. This is the argument that appears in the **lr_think_time** function. For example, `lr_think_time(10)` waits 10 seconds.
Think Time options - Modify replay think time - Multiply recorded value by	Uses a multiple of the recorded think time. This can increase or decrease the think time applied during playback. For example, if a think time of four seconds was recorded, you can instruct your Vuser to multiply that value by two, for a total of eight seconds. To reduce the think time to two seconds, multiply the recorded time by 0.5.
Think Time options - Use random percentage of the recorded think time	Uses a random percentage of the recorded think time. You set a range for the think time value by specifying a range for the think time. For example, if the think time argument is 4, and you specify a minimum of 50% and a maximum of 150%, the lowest think time can be two (50%) and the highest value six (150%)
Think Time options - Limit think time to	Limits the think time's maximum value. You can use this option in conjunction with the other options.

Miscellaneous Settings

User interface elements are described below:

UI Elements	Description
Error Handling	Contains the following options: ● **Continue on Error.** Instructs Vusers to continue script execution when an error occurs. This option is turned off by default, indicating that the Vuser will exit if an error occurs. ● **Fail open transactions on lr_error_message.** Marks all transactions in which an **lr_error_message** function was issued, as **Failed**. The **lr_error_message** function is issued through a programmed **If** statement, when a certain condition is met. ● **Generate Snapshot on Error.** Generates a snapshot when an error occurs. You can see the snapshot by viewing the Vuser Log and double-clicking the line at which the error occurred. **Note:** It is not recommended to enable both the **Continue on Error** and **Generate Snapshot on Error** options in a performance test environment. This configuration may adversely affect the Vusers' performance.

UI Elements	Description
Multithreading	Vusers support multithread environments. The primary advantage of a multithread environment is the ability to run more Vusers per load generator. Only threadsafe protocols should be run as threads. The following multithreading options are available: • **Run Vuser as a process**. Disables multithreading and runs each Vuser as a separate process. > **Note:** The Controller host uses a driver program (such as **mdrv.exe** or **r3vuser.exe**) to run your Vusers. If you run each Vuser as a process, then the same driver program is launched (and loaded) into the memory again and again for every instance of the Vuser. Loading the same driver program into memory uses up large amounts of RAM (random access memory) and other system resources. This limits the numbers of Vusers that can be run on any load generator. • **Run Vuser as a thread**. Enables multithreading. > **Note:** The following protocols are not threadsafe: Sybase-Ctlib, Sybase-Dblib, and Informix.
Automatic Transactions	Instructs the Controller host to handle every step or action in a Vuser script as a transaction. The Controller assigns the step or action name as the name of the transaction. The following options are available: • **Define each action as a transaction.** Disables automatic transactions per action. • **Define each step as a transaction.** Enables automatic transactions per step. > **Note:** If you disable automatic transactions, you can still insert transactions manually during and after recording.

Additional Attributes

You can use the additional attributes node to provide additional arguments to a Vuser script. The Additional Attributes settings apply to all types of Vuser scripts.

You specify command line arguments that you can retrieve at a later point during the test run using the **lr_get_attrib_string**. Using this node you can pass external parameters to prepared scripts.

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
+ Add	**Add new attribute.** Adds a new attribute.
Edit	**Edit attribute.** Modifies the selected attribute.
Delete	**Delete attribute.** Deletes the selected attribute.
<Additional Attributes grid>	A list of the additional attributes and their values.
Description	A description of the selected additional attribute.

Advanced Settings

To use JMS as a transport for Web Service calls, there are several resources that need to be allocated and configured. Those resources include the JVM, JNDI initialization parameters, JMS resources, and timeout values.

ALM Performance Center lets you configure some of those resources through the runtime settings. You can set options in the area of VM (Virtual Machine), the JMS connections, and message timeouts.

User interface elements are described below:

UI Elements	Description
Use external VM	Enables you to select a VM (Virtual Machine) other than the standard one. If you disable this option, Vusers use the JVM provided with Performance Center.
JVM Home	The location of the external JVM. This should point to the JDK home directory, defined by JDK_HOME. Performance Center supports JDK 1.4 and above.
Classpath	The vendor implementation of JMS classes together with any other required supporting classes, as determined by the JMS implementation vendor.
Additional VM Parameters	Extra parameters to send to the JVM such as Xbootclasspath,and any parameters specified by the JVM documentation.
JNDI initial context factory	The fully qualified class name of the factory class that will create an initial context. Select a context factory from the list or provide your own.

UI Elements	Description
JNDI provider	The URL string of the service provider. **Examples:** **Weblogic** - `t3://myserver:myport` **Websphere** - `iiop://myserver:myport`
JMS connection factory	The JNDI name of the JMS connection factory. You can only specify one connection factory per script.
JMS security principal	Identity of the principal (for example the user) for the authentication scheme.
JMS security credentials	The principal's credentials for the authentication scheme.
Number of JMS connections per process	The number of JMS connections per **mdrv** process or Vuser. All Vusers sharing a connection receive the same messages. **Default:** 1 **Maximum:** 50 Vusers. **Note:** The less connections per process, the better the performance.
Receive message timeout options	The timeout for received messages. The following options are available: • **Indefinite wait.** Wait as long as required for the message before continuing. • **No wait.** Do not wait for the Receive message, and return control to the script immediately. If there was no message in the queue, the operation fails. • **Specify the timeout in seconds.** Manually specify a timeout value for the message. If the timeout expired and no message arrived, the operation fails. • **User defined timeout.** Specify the amount of seconds to wait for the message before timing out. The default is five seconds. **Default:** No Wait
Automatically generate selector	Generates a selector for the response message with the correlation ID of the request (**No** by default). Each JMS message sent to the server has a specific ID. Enable this option if you want Performance Center to automatically create a selector that includes the message ID.

Preferences Settings

You use the **Internet Protocol Preferences** runtime settings to control the Vusers in the following areas:

- Image and Text Checks

- Generating Web Performance Graphs

- Advanced Web Runtime Options

- Additional Options for Internet Preferences

User interface elements are described below:

UI Elements	Description
Checks	The **Enable image and text checks** option allows the Vuser to perform verification checks during replay by executing the verification functions: **web_find** or **web_image_check**. This option only applies to test steps that were recorded in HTML-based mode. Vusers running with verification checks enabled, require additional memory.
Generate Web performance graphs	Collects data to create several Web Performance graphs: **Hits per Second and HTTP codes**, **Pages per Second,** and **Response Bytes per Second**. You view the graphs during test execution using the online monitors and after test execution using HP Analysis. You view the Component Breakdown graph after test execution using the Analysis. Select the types of graph data for the Vuser to collect. **Note:** If you do not use the Web Performance graphs, disable all graphs to conserve memory.

UI Elements	Description
Advanced	• **WinInet replay instead of Sockets (Windows only).** Instructs Vusers to use the WinInet replay engine instead of the standard Sockets replay. There are two HTTP replay engines: Sockets-based (default) or WinInet based. The WinInet is the engine used by Internet Explorer and it supports all of the features incorporated into the IE browser. The limitations of the WinInet replay engine are that it is not scalable, nor does it support UNIX. In addition, when working with threads, the WinInet engine does not accurately emulate the modem speed and number of connections. The proprietary sockets-based replay is a lighter engine that is scalable for performance testing. It is also accurate when working with threads. The limitation of the sockets-based engine is that it does not support SOCKS proxy. If you are recording in that type of environment, use the WinInet replay engine. • **File and line in automatic transaction names.** Creates unique transaction names for automatic transactions by adding file name and line number to the transaction name (enabled by default). **Note:** This option places additional information in the log file, and therefore requires more memory. • **Non-critical resource errors as warnings.** This option returns a warning status for a function which failed on an item that is not critical for performance testing, such as an image or Java applet that failed to download. This option is enabled by default. If you want a certain warning to be considered an error and fail your test, you can disable this option. You can set a content-type to be critical by adding it to the list of Non-Resources. For more information, see the HP Virtual User Generator User Guide. • **Save snapshot resources locally.** Saves the snapshot resources to files on the local machine. This feature lets the runtime viewer create snapshots more accurately and display them quicker.
Set Advanced Options	Enables you to set advanced options in the following areas: DNS caching, HTTP version, Keep-Alive HTTP connections, Accept server-side compression, Accept-Language headers, HTTP-request connect timeout, HTTP-request receive timeout, Network buffer size, and Step download timeout. For more information, see the relevant "Advanced Options for Internet Preferences - HTTP" below.

Advanced Options for Internet Preferences - HTTP

User interface elements are described below:

UI Elements	Description
HTTP version	Specifies which version HTTP to use: version 1.0 or 1.1. This information is included in the HTTP request header whenever a Vuser sends a request to a Web server.
Keep-Alive HTTP connections	Keep-alive is a term used for an HTTP extension that allows persistent or continuous connections. These long-lived HTTP sessions allow multiple requests to be sent over the same TCP connection. This improves the performance of the Web server and clients. The keep-alive option works only with Web servers that support keep-alive connections. This setting specifies that all Vusers that run the Vuser script have keep-alive HTTP connections enabled. **Default:** Enabled
Accept-Language request header	Provides a comma-separated list of accepted languages. For example, **en-us**, **fr**, and so on.

HTTP errors as warnings	Issues a warning instead of an error upon failing to download resources due to an HTTP error.
	
	● **HTTP-request connect timeout (seconds).** The time, in seconds, that a Vuser will wait for the connection of a specific HTTP request within a step before aborting. Timeouts provide an opportunity for the server to stabilize and respond to the user.
	
	   Note: This timeout also applies to the time the Vuser will wait for a WAP connection, initiated by the **wap_connect** function.
	
	● **HTTP-request receive timeout (seconds).**The time, in seconds, that a Vuser will wait to receive the response of a specific HTTP request within a step before aborting. Timeouts provide an opportunity for the server to stabilize and respond to the user.
	
	   Default: 120 seconds
	
	● **HTTP Keep-Alive timeout.** Enter the number of seconds to keep idle connections open.

UI Elements	Description
Request Zlib Headers	Sends request data to the server with the **zlib** compression library headers. By default, requests sent to the server include the **zlib** headers. This option lets you emulate non-browser applications that do not include **zlib** headers in their requests. To exclude these headers, set this option to **No**. **Default:** Yes
Accept Server-Side Compression	Indicate to the server that the replay can accept compressed data. The available options are: **None** (no compression), **gzip** (accept gzip compression), **gzip, deflate** (accept gzip or deflate compression), and **deflate** (accept deflate compression). **Note:** By accepting compressed data, you may significantly increase the CPU consumption. The default is to accept **gzip, deflate** compression.

Advanced Options for Internet Preferences - General

User interface elements are described below:

UI Elements	Description
DNS caching	Instructs the Vuser to save a host's IP address to a cache after resolving its value from the Domain Name Server. This saves time in subsequent calls to the same server. In situations where the IP address changes, as with certain load balancing techniques, be sure to disable this option to prevent Vusers from using the value in the cache (enabled by default).
Convert from/to UTF-8	Converts received HTML pages and submitted data from and to UTF-8. You enable UTF-8 support in the recording options. For more information, see the *HP Virtual User Generator User Guide*. **Default:** No
Step timeout caused by resources is a warning	Issues a warning instead of an error when a timeout occurs due to a resource that did not load within the timeout interval. For non-resources, Performance Center issues an error. **Default:** Disabled

UI Elements	Description
Parse HTML content-Type	When expecting HTML, parse the response only when it is the specified content-type: **HTML**, **text\html**, **TEXT** any text, or **ANY**, any content-type. **Note:** text/xml is not parsed as HTML. The default is **TEXT**. The timeout settings are primarily for advanced users who have determined that acceptable timeout values should be different for their environment. The default settings should be sufficient in most cases. If the server does not respond in a reasonable amount of time, check for other connection-related issues, rather than setting a very long timeout which could cause the scripts to wait unnecessarily.
Step download timeout (sec)	The time that the Vuser will wait before aborting a step in the script. This option can be used to emulate a user behavior of not waiting for more than x seconds for a page.
Network buffer size	Sets the maximum size of the buffer used to receive the HTTP response. If the size of the data is larger than the specified size, the server will send the data in chunks, increasing the overhead of the system. When running multiple Vusers from the Controller, every Vuser uses its own network buffer. This setting is primarily for advanced users who have determined that the network buffer size may affect their script's performance. **Default:** 12kB **Maximum size:** 0x7FFF FFFF
Print NTLM information	Prints information about the NTLM handshake to the standard log.
Print SSL information	Prints information about the SSL handshake to the standard log.
Max number of error matches issued as ERRORS	Limits the number of error matches issued as ERRORS for content checks using a LB or RB (left boundary or right boundary). This applies to matches where a failure occurs when the string is found (Fail=Found). All subsequent matches are listed as informational messages. **Default:** 10 matches.
Maximum number of META Refresh to the same page	The maximum number of times that a META refresh can be performed per page. **Default:** 2

UI Elements	Description
content Check values in UTF-8	Store the values in the contentCheck XML file in UTF-8.
Tree-View request body limit	Limits the number of request body bytes displayed in Tree-View, 0 for no limit.
IP Version	Specifies the IP version.
web_sync retry interval (millisec)	Specifies the number of milliseconds to wait between testing the condition that yields false and the next retry.
web_sync retry timeout (millisec)	Specifies the maximum number of milliseconds during which retries are allowed. If the computed timeout exceeds the step timeout (as determined by the 'Step download timeout' run-time setting, the latter is used.

Advanced Options for Internet Preferences - Authentication

User interface elements are described below:

UI Elements	Description
Fixed think time upon authentication retry (msec)	Automatically adds a think time to the Vuser script for emulating a user entering authentication information (username and password). This think time will be included in the transaction time. **Default:** 0
Disable NTLM2 session security	Uses full NTLM 2 handshake security instead of the more basic NTLM 2 session security response. **Default:** 0
Use Windows native NTLM implementation	Use the Microsoft Security API for NTLM authentication instead of the indigenous one.
Override credentials in Windows native NTLM implementation	Overrides the credentials in the Windows native NTLM implementation.

UI Elements	Description
Enable integrated Authentication	Enable Kerberos-based authentication. When the server proposes authentication schemes, use **Negotiate** in preference to other schemes. **Default:** 0
Induce heavy KDC load	Do not reuse credentials obtained in previous iterations. Enabling this setting will increase the load on the KDC (Key Distribution Center). To lower the load on the server, set this option to **Yes** in order to reuse the credentials obtained in previous iterations. This option is only relevant when Kerberos authentication is used. **Default:** No

Advanced Options for Internet Preferences - Log

User interface elements are described below:

UI Elements	Description
Print buffer line length	Line length for printing request/response header/body and/or JavaScript source, disabling wrapping.
Print buffer escape only binary zeros	• **Yes.** Escape only binary zeros when printing request/response headers/body and/or JavaScript source. • **No**. Escape any unprintable/control characters.

Advanced Options for Internet Preferences - Web (Click and Script) Specific

User interface elements are described below:

UI Elements	Description
Home Page URL	The URL of the home page that opens with your browser. **Default:** about:blank
DOM-based snapshots	Generates snapshots from the DOM instead of from the server responses. **Default:** Yes
Charset conversions by HTTP	Perform charset conversions by the `content-Type:....; charset=...' HTTP response header. Overrides `Convert from /to UTF-8.'
Reparse when META changes charset	Reparse HTML when a META tag changes the charset. Effective only when **Charset conversions by HTTP** is enabled. **Auto** means reparsing is enabled only if it used in the first iteration.

UI Elements	Description
Fail on JavaScript error	Fails the Vuser when a JavaScript evaluation error occurs. ALM issues a warning message only after a JavaScript error, but continues to run the script. **Default:No**.
Initialize standard classes for each new window project	When enabled, the script—the src compiled script, will not be cached.
Ignore acted on element being disabled	Ignore the element acted on by a Vuser script function being disabled.
Optimize timers at end of step	When possible, executes a setTimeout/setInterval/<META refresh> that expires at the end of the step before the expiration time. **Default:** Yes
Single setTimeout/setInterval threshold (seconds)	Specifies an upper timeout for the window.setTimeout and window.setInterval methods. If the delay exceeds this timeout, these methods will not invoke the functions that are passed to them. This emulates a user waiting a specified time before clicking on the next element. **Default:** 5 seconds
Accumulative setTimeout/setInterval threshold (seconds)	Specifies a timeout for the window.setTimeout and window.setInterval methods. If the delay exceeds this timeout, additional calls to window.setTimeout and window.setInterval will be ignored. The timeout is accumulative per step. **Default:** 30 seconds
Reestablish setInterval at end of step	**0** = No; **1** = Once; **2** = Yes.
Limit no-network timers at end of step	Limits the number of setTimeout/setInterval-specified script evaluations at the end of a step when no network requests are issued (zero for no limit). Applicable only when 'Optimize timers at end of step' is enabled.

UI Elements	Description
History support	Enables support for the window.history object for the test run. The options are **Enabled**, **Disabled**, and **Auto**. The Auto option instructs Vusers to support the window.history object only if it was used in the first iteration. **Default:** Auto **Note:** By disabling this option, you improve performance.
Maximum history size	The maximum number of steps to keep in the history list. **Default:** 100 steps
navigator.browserLanguage	The browser language set in the navigator DOM object's **browserLanguage** property. **Default:** The recorded value. **Note:** Scripts created with older recording engines, use **en-us** by default.
navigator.systemLanguage	The system language set in the navigator DOM object's **systemLanguage** property. **Default:** The recorded value. **Note:** Scripts created with older recording engines, use **en-us** by default.
navigator.userLanguage	The user language set in the navigator DOM object's **userLanguage** property. **Default:** The recorded value. **Note:** Scripts created with older recording engines, use **en-us** by default.
screen.width	Sets the width property of the screen DOM object in pixels. **Default:** 1024
screen.height	Sets the height property of the screen DOM object in pixels. **Default:** 768

UI Elements	Description
screen.availWidth	Sets the availWidth property of the screen DOM object in pixels. **Default:** 1024
screen.availHeight	Sets the availHeight property of the screen DOM object in pixels. **Default:** 768
Default block size for DOM memory allocations	Sets the default block size for DOM memory allocations. If the value is too small, it may result in extra calls to malloc, slowing the execution times. Too large a block size may result in an unnecessarily big footprint. **Default:** 16384 bytes
Memory Manager for dynamically-created DOM objects	• **Yes.** Use the Memory Manager for dynamically-created DOM objects. • **No.** Does not use the Memory Manager, for example when multiple DOM objects are dynamically created in the same document as under SAP. • **Auto**—Use the protocol recommended. **Default:** Yes for all protocols except for SAP
JavaScript Runtime memory size (KB)	Specifies the size of the JavaScript runtime memory in kilobytes. **Default:** 256 KB
JavaScript Stack memory size (KB)	Specifies the size of the JavaScript stack memory in kilobytes (default is 32 KB). **Default:** 32 KB

Advanced Options for Internet Preferences -Web JavaScript

User interface elements are described below:

UI Elements	Description
Enable running JavaScript code	Enables JavaScript code to run.
JavaScript Engine runtime size (KB)	Specifies the memory size to allocate for the JavaScript Engine runtime in Kilobytes. One runtime will be created for all Vuser in the process.
JavaScript Engine stack size per-thread	Specifies the memory size to allocate for each Vuser thread in the JavaScript Engine, in Kilobytes.

Proxy Settings

You use the **Proxy** runtime Settings to set the proxy-related settings. The following proxy options are available in the runtime settings.

User interface elements are described below:

UI Elements	Description
No proxy (direct connection to the Internet)	All Vusers should use direct connections to the Internet. This means that the connection is made without using a proxy server.
Obtain the proxy settings from the default browser	All Vusers use the proxy settings of the default browser from the machine upon which they are running.
Use custom proxy	● **Use automatic configuration script.** Enables you to specify a JavaScript file (usually with a .**pac** extension) containing proxy assignment information. This script tells the browser when to access a proxy server and when to connect directly to the site, depending on the URL. In addition, it can instruct the browser to use a specific proxy server for certain addresses and another server for other addresses. Specify either a web location beginning with **http://**. For example, **http://hostname/proxy.pac**. ● **Use proxy server.** Select to supply actual proxy server details. ■ **HTTP (Address of proxy to use).** The HTTP proxy server's IP address or name. ■ **HTTP Port.** The HTTP port. ■ **HTTPS (Address of proxy to use).** The HTTPS proxy server's IP address or name. ■ **HTTPS Port.** The HTTPS port. ■ **Use same server for all protocols.** Select to use same proxy server for all Internet protocols (HTTP, HTTPS) rather than specifying a specific server for secure sites. **Note:** You can specify one proxy server for all HTTP sites, and another proxy server for all HTTPS (secure) sites.

UI Elements	Description
Exceptions	When specifying proxy server information, you can specify that all Vusers use a specified proxy server. In such a case, if there are any URLs that you want Vusers to access directly, that is, without using the proxy server, type the list of these URLs in the Exceptions box. • **Do not use proxy server for addresses beginning with.** Type the addresses you want to exclude from the proxy server. Use semicolons to separate entries. • **Do not use proxy server for local (intranet) addresses.** Select this check box to exclude local addresses, such as those from an Intranet, from the proxy server.
Authentication	When specifying proxy server information, if the proxy server requires authentication for each Vuser, use this dialog box to type the relevant password and user name. • **User Name.** The user name for Vusers to access the proxy server. • **Password.** The password required by Vusers to access the proxy server.

Download Filter Settings

The Download Filters runtime setting lets you specify the Web sites from which Vusers should download resources during replay. You can indicate either the sites to exclude or the sites to include. You control the allowed or disallowed sources, by specifying a URL, host name, or host suffix name.

User interface elements are described below:

UI Elements	Description
Include only addresses in list	Includes the addresses in the address list. The Vuser filters out resources from all Web sites except for those in the Include list.
Exclude addresses in list	Excludes the addresses in the address list. The Vuser downloads resources from all Web sites except for those specified in the list
+ Add	**Add Address.** Enables you to add an address to the address list.
Edit	**Edit Address.** Enables you to modify an address from the address list.

UI Elements	Description
🗑 Delete	**Delete Address.** Enables you to delete an address from the address list.
Type	The address type: **URL**, **Host**, or **Host Suffix**
Data	The address data. Note: Depending on the address type, be sure to enter the data as follows: • **URL**. Enter a complete URL beginning with **http://** or **https://**. • **Host.** Enter the name of the host machine with its domain, such as www.hp.com. • **Host Suffix.** The common suffix for several host names, such as hp.com. This is useful when you have several Web sites on a common domain.

Browser Emulation Settings

You use the **Browser Emulation** settings to set the browser properties of your testing environment.

Browser Setting	Runtime Setting
Every visit to the page	Select **Simulate Browser Cache** and enable **Check for newer versions of stored pages every visit to the page**.
Every time you start Internet Explorer	Select **Simulate Browser Cache** only.
Automatically	Select **Simulate Browser Cache** only.
Never	Select **Simulate Browser Cache** and enable **Check for newer versions of stored pages every visit to the page**.

User interface elements are described below:

UI Elements	Description
User-Agent Selection **(browser to be emulated - customize your browser)**	By default, the user-agent emulates the Microsoft Internet Explorer 6.0 browser agent. You can, however, instruct the script to emulate a different browser, that is compatible with Internet Explorer 6.0. This setting creates a **User-Agent** header that identifies the type and version of the browser.

UI Elements	Description
Simulate browser cache	Instructs the Vuser to simulate a browser with a cache. By default, cache simulation is enabled. When the cache is disabled, Vusers will ignore all caching functionality and download all of the resources for every request. Even if you disable the cache simulation, each resource is only downloaded once for each page, even if it appears multiple times. A resource can be an image, frame, or another type of script file. When running multiple Vusers, every Vuser uses its own cache and retrieves images from the cache. If you disable this option, all Vusers emulate a browser with no cache. You can also set the following browser cache options: • **Cache URLs requiring content (HTML).** Cache only the URLs that require the HTML content. The content may be necessary for parsing, verification, or correlation. When you select this option, HTML content is automatically cached. This option is enabled by default. **Tip:** To decrease the memory footprint of the Vusers, disable this option, unless it is an explicit requirement for your test. • **Specify URLs requiring content in addition to HTML pages.** This setting lets you specify the URL content types other than HTML pages, that you want to store in the cache for verification purposes. For example, text/xml or image/gif. Separate multiple content types with a semicolon. • **Check for newer versions of stored pages every visit to the page.** This setting instructs the browser to check for later versions of the specified URL, than those stored in the cache. When you enable this option, the "If-modified-since" attribute is added to the HTTP header. This option brings up the most recent version of the page, but also generates more traffic during the scenario or session execution. By default, browsers do not check for newer resources, and therefore this option is disabled.
Download non HTML resources	Loads graphic images when accessing a Web page during replay. This includes both graphic images that were recorded with the page, and those which were not explicitly recorded along with the page. When real users access a Web page, they wait for the images to load. Therefore, enable this option if you are trying to test the entire system, including end-user time. To increase performance and not emulate real users, disable this option. **Tip:** Disable this option if you experience discrepancies in image checks, since some images vary each time you access a Web page (for example, advertiser banners).

UI Elements	Description
Simulate a new user on each iteration	Resets all HTTP contexts between iterations to their states at the end of the **init** section. This setting allows the Vuser to more accurately emulate a new user beginning a browsing session. It deletes all cookies, closes all TCP connections (including keep-alive), clears the emulated browser's cache, resets the HTML frame hierarchy (frame numbering will begin from 1) and clears the user-names and passwords. This option is disabled by default. • **Clear cache on each iteration.** Clears the browser cache for each iteration in order to simulate a user visiting a Web page for the first time. Disable this option if you want Vusers to use the browser's cache, simulating a user who recently visited the page.

Speed Simulation Settings

The Speed Simulation settings let you emulate your network connection.

Using these settings, you select a bandwidth that best emulates the environment under test.

User interface elements are described below:

UI Elements	Description
Use maximum bandwidth	By default, bandwidth emulation is disabled and the Vusers run at the maximum bandwidth that is available over the network.
Use bandwidth	Indicate a specific bandwidth level for your Vuser to emulate. You can select a speed ranging from 14.4 to 512 Kbps, emulating analog modems, ISDN, or DSL.
Use custom bandwidth	Indicate a bandwidth limit for your Vuser to emulate. Specify the bandwidth in bits, where 1 Kilobit=1024 bits.

Data Format Extension Configurations Settings

The configurations settings let you convert specified data to more readable formats.

User interface elements are described below:

UI Elements	Description
Enable Data Format Extension	Enables Data Format Extensions during replay.

Classpath Settings

The Classpath settings let you specify the location of additional classes that were not included in the system's CLASSPATH environment variable. You may need these classes to run Java applications and insure proper replay.

User interface elements are described below:

UI Elements	Description
Classpath Entries	Enter the path of additional classes that were not included in the system's CLASSPATH environment variable. Separate multiple entries with a semicolon.

Client Emulation Settings

The Oracle NCA Client Emulation runtime settings let you specify the communication parameters for your NCA client. You should configure the settings to accurately emulate your Oracle NCA environment.

User interface elements are described below:

UI Elements	Description
Socket mode	The communication to and from the client is performed on a socket level—not on the higher HTTP level. • **Timeout (seconds):** The time that an Oracle NCA Vuser waits for a response from the server. The default value of -1 disables the timeout and the client waits indefinitely.
Pragma mode	In Pragma mode, communication is carried out in the Oracle-defined Pragma mode. This communication level, above the HTTP and Servlet levels, is characterized by the periodic sending of messages. In this mode, the client recognizes that the server cannot respond with data immediately. The server sends messages at given intervals until it is able to send the requested data. • **Max Retries**. Indicates the maximum number of **IfError** messages the client will accept from the server before issuing an error. **IfError** messages are the periodic messages the server sends to the client, indicating that it will respond with the data as soon as it is able. • **Retry Interval.** Defines the interval between retries in the case of **IfError** messages. • **Include retry intervals in transaction.** Includes the interval between retry time, as part of the transaction duration time.

UI Elements	Description
Enable Heartbeat	You can enable or disable the heartbeat sent to the Oracle server. The heartbeat verifies that there is proper communication with the server. If you are experiencing a heavy load on the Oracle NCA server, disable the heartbeat. If you enable the heartbeat, you can set the frequency of how often heartbeat messages are sent to the server. In the Frequency box, you can define the frequency of the heartbeat signal. The default is 120 seconds. **Default:** Enabled
Forms Version	You can specify the version of the Oracle Forms server detected during recording. **Note:** Modify this setting only if the server was upgraded since the recording.
Diagnostic	This section lets you provide information about diagnostic modules for the database layer of Oracle Applications. • **Application version.** The version of Oracle Application. This option is relevant when using Oracle Application—not a custom Oracle NCA application. It is only required when using Oracle database breakdown.

Citrix Configuration Settings

The Citrix Configuration settings relate to the screen latency, data compression, disk cache, and queuing of mouse movements. These settings, which will influence the load on the server, should correspond to the properties of your Citrix client. To view the client properties, select the icon representing the ICA connection in the Citrix Program Neighborhood, and select **Properties** from the right-click menu. Select the **Default Options** tab.

User interface elements are described below:

UI Elements	Description
SpeedScreen Latency Reduction	The mechanism used to enhance user interaction when the network speed is slow. You can turn this mechanism **on** or **off**, depending on the network speed. The **auto** option turns it on or off based on the current network speed. If you do not know the network speed, set this option to **Use Server Default** to use the machine's default.
Use data compression	Instructs Vusers to compress the transferred data. To enable this option, select the check box to the left of the option; to disable it, clear the check box. You should enable data compression if you have a limited bandwidth (enabled by default).

UI Elements	Description
Use disk cache for bitmaps	Instructs Vusers to use a local cache to store bitmaps and commonly-used graphical objects. To enable this option, select the check box to the left of the option; to disable it, clear the check box. You should enable this option if you have a limited bandwidth (disabled by default).
Queue mouse movements and keystrokes	Instructs Vusers to create a queue of mouse movements and keystrokes, and send them as packets to the server less frequently. This setting reduces network traffic with slow connections. Enabling this option makes the session less responsive to keyboard and mouse movements. To enable this option, select the check box to the left of the option; to disable it, clear the check box (disabled by default).
Sound quality	Specifies the quality of the sound: **Use server default**, **Sound off**, **High sound quality**, **Medium sound quality**, or **Low sound quality**. If the client machine does not have a 16-bit Sound Blaster-compatible sound card, select **Sound Off**. With sound support enabled, you will be able to play sound files from published applications on your client machine.

Gateway Settings

You use the **Gateway** link to set the WAP Gateway settings.

User interface elements are described below:

UI Elements	Description
Connection Options	The connection options specify the method that the Vuser uses to connect to the WAP gateway. • **WAP Gateway.** Runs the Vusers accessing a Web server via a WAP Gateway. • **HTTP Direct.** Runs the Vusers in HTTP mode, accessing a Web server directly. If you select the HTTP Direct connection mode, the remaining WAP Gateway options are not applicable.

UI Elements	Description
Gateway Settings	If the Vusers connect through a gateway, the IP, Port, and WAP Versions options specify the Gateway connection. • **IP.** The IP address of the gateway. • **Port.** The port of the gateway. When running your Vusers through a WAP gateway, the Vusers automatically use default port numbers, depending on the selected mode. However, you can customize the settings and specify a custom IP address and port for the gateway. • **WAP version.** The WAP version, **1.x (WSP)** or **2.0 (HTTP proxy)**. If you recorded in WAP 1.x (WSP), you can run the Vusers in either 1.x (WSP), or 2.0 (HTTP proxy) mode. If you recorded in WAP 2.0 (HTTP proxy), then you can only run the Vusers in the same mode. If you are running the script in WAP 1.x (WSP), you can specify several connection and advanced options.
Gateway Connection Mode	The connection mode settings apply to WAP version 1.x (WSP) connections. • **Connection-oriented Mode.** Sets the connection mode for the WSP session to Connection-Oriented. • **Connectionless Mode.** Sets the connection mode for the WSP session to Connectionless. • **Enable security.** Enables a secure connection to the WAP gateway.
Advanced Gateway Options	Open the **Advanced** option in the Gateway runtime settings to configure the WAP Capabilities and other advanced Gateway options. For details see "Advanced Gateway Options" below.

Advanced Gateway Options

User interface elements are described below:

UI Elements	Description
Confirm Push support	In CO mode, if a push message is received, this option instructs the Vuser to confirm the receipt of the message (disabled by default). For more information, see the HP Virtual User Generator User Guide.
Push support	Enables push type messages across the gateway (disabled by default).
CAPSessionResume	Enables requests for session suspend or resume.

UI Elements	Description
Acknowledge headers	Returns standard headers that provide information to the gateway. • **Server SDU buffer size.** The largest transaction service data unit that may be sent to the server during the session. **Default:** 4000 • **Client SDU buffer size.** The largest transaction service data unit that may be sent to the client during the session. **Default:** 400 • **MethodMOR.** The number of outstanding methods that can occur simultaneously. • **PushMOR.** The number of outstanding push transactions that can occur simultaneously. • **BearerType.** The type of bearer used as the underlying transport. • **Retrieve messages.** When a push messages is received, this option instructs the Vuser to retrieve the message data from the URL indicated in the push message. **Default:** Disabled
Support Cookies	Provides support for saving and retrieving cookies. **Default:** Disabled
WTP Segmentation and Reassembly	Enables segmentation and reassembly (SAR) in WTP, Wireless Transport Protocol. **Default:** True • **WTP Retransmission Time.** The time in seconds that the WTP layer waits before resending the PDU if it did not receive a response. **Default:** 5000
WTLS Abbreviated Handshake	Use an abbreviated handshake instead of a full one, when receiving a redirect message. **Default:** False

UI Elements	Description
WTLS Deffie Hellman	Use the Deffie Hellman encryption scheme for WTLS (Wireless Transport Layer Security) instead of the default scheme, RSA. **Default:** False • **WTLS Deffie Hellman identifier.** An identifier for the Deffie Hellman encryption scheme. This identifier is required for the abbreviated handshake with the Operwave gateway that uses the Deffie Hellman encryption scheme. • **Network MTU Size.** The maximum size in bytes, of the network packet. **Default:** 4096

SAPGUI Settings

The SAPGUI runtime settings let you set the general settings for a SAPGUI Vuser script. Performance Center uses these settings when running the script.

User interface elements are described below:

UI Elements	Description
Send status bar text	Send the text from the status bar to the log file.
Send active window title	Send the active window title text to the log file. The Performance runtime settings allow you to indicate whether or not to display the SAP client during replay.
Show SAP Client during replay	Shows an animation of the actions in the SAP client during replay. The benefit of displaying the user interface (UI) is that you can see how the forms are filled out and closely follow the actions of the Vuser. This option, however, requires additional resources and may affect the performance of your performance test.
Take ActiveScreen snapshots during replay	Captures replay snapshots with the Control ID information for all active objects. ActiveScreen snapshots differ from regular ones, in that they allow you to see which objects were recognized by VuGen in the SAPGUI client. As you move your mouse across the snapshot, VuGen highlights the detected objects. You can then add new steps to the script directly from within the snapshot. It also allows you to add steps interactively from within the snapshot for a specific object. For more information, see the *HP Virtual User Generator User Guide*.

UI Elements	Description
Advanced	Advanced options let you set a timeout for the **SAPfewgsvr.exe** process, save a snapshot on error, and configure Performance Center to use SAPlogon during replay.
	Each Vuser invokes a separate **SAPfewgsvr.exe** process during test execution. In some instances, the process stays active even after the replay session has ended. You can check the Windows Task Manager to see if the process is still active.
	The Advanced SAPGUI settings let you set a timeout for this application. When the timeout is reached, Performance Center closes any **SAPfewgsvr** processes not previously terminated.
	• **Replay using running SAPlogon application**. Instructs the Vusers to use the SAPlogon application that is currently running for replay.
	• **Set SAPfewgsvr application timeout**. Allows you to modify the **SAPfewgsvr.exe** process timeout.
	• **Timeout to SAPfewgsvr.** The **SAPfewgsvr.exe** process timeout in seconds.
	Default: 300 seconds

Java Environment Settings

For Java scripts, you provide information about the Java virtual machine settings in the Java VM section.

User interface elements are described below:

UI Elements	Description
Use internal logic to locate JDK	Search the PATH, registry, and Windows folder for the JDK to use during replay.
Use specified JDK	Use the specified JDK during replay.
Using Xbootclasspath parameters	Replays the script with the Xbootclasspath /p option.
Load each Vuser using dedicated class loader	Load each Vuser using a dedicated class loader. This will allow you to use a unique namespace for each Vuser and manage their resources separately.

.NET Environment Settings

The .NET environment runtime settings let you specify information about the application, such as its base path and the location of its configuration file.

User interface elements are described below:

UI Elements	Description
AUT Application Base Path	The AUT (Application Under Test) base directory from which DLLs are loaded during replay. By default, during recording, all of the necessary DLLs are stored in the script's directory. Use this option to specify the location of any missing DLL files for the AUT. This is usually the installation path of the recorded application. **Note:** The AUT must be installed on the machine running the script. If you leave this box empty, the Vusers use the local script\bin directory as the application base directory during replay.
AUT Configuration File	The file name of the recorded application's configuration file. Performance Center copies the AUT configuration file to the script\bin directory and loads the locally saved file. To specify a different location, use a full path. If you only specify a file name, and the file is not in the script\bin folder, the Vusers load it from the App base directory.
AppDomain Per Vuser.	Enables execution of each Vuser in a separate app domain (true by default). Running Vusers in separate app domains enables each Vuser to execute separately without sharing static variables and prevents locking between them. ADO.NET providers deploy a feature called **connection pooling** which can significantly influence performance test accuracy. Whenever only one app domain is used for all Vusers, connection pooling is turned on—.NET Framework keeps the database connections open and tries to reuse them when a new connection is requested. Since many Vusers are executed in the context of a single application domain, they may interfere with one another. Their behavior will not be linear and that may decrease their accuracy. The default setting, **true**, allocates a separate connection pool for each Vuser. This means that there is connection pooling in the scope of each Vuser, but the Vusers will not interfere with one another. This setting provides more accuracy, but lower scalability. If you disable this option, you need to manually disable connection pooling for the database. For more information, see the *HP Virtual User Generator User Guide*.
Support for previous .NET versions	Supports previous .NET versions.

Shared DLLs Settings

The Shared DLLs settings let you manage the shared DLLs.

User interface elements are described below:

UI Elements	Description
+ Add	**Add new entry.** Adds a new DLL entry.
✏ Edit	**Edit entry.** Modifies the selected DLL entry.
🗑 Delete	**Delete entry.** Deletes the selected DLL entry.

Radius Settings

RADIUS (Remote Authentication Dial-In User Service) is a client/server protocol and software that enables remote access servers to communicate with a central server to authenticate dial-in users. It also authorizes their access to the requested system or service.

RADIUS allows a company to maintain user profiles in a central database that all remote servers can share. It provides better security, allowing a company to set up a policy that can be applied at a single administered network point. Using a central service enables you to track usage for billing and store network statistics.

RADIUS has two sub-protocols:

- **Authentication.** Authorizes and controls user access.

- **Accounting.** Tracks usage for billing and for keeping network statistics.

For Vusers, the RADIUS protocol is supported for WSP replay for both of the Radius sub-protocols—authentication and accounting. You supply the dial-in information in the Radius runtime settings:

User interface elements are described below:

UI Elements	Description
Network Type	The accounting network type: GPRS (General Packet Radio Service) or CSD (Circuit-Switched Data).
IP Address	The IP address of the Radius server.
Authentication port number	The authentication port of the Radius server.
Accounting port number	The accounting port of the Radius server.
Secret Key	The secret key of the Radius server.

UI Elements	Description
Connection Timeout (sec)	The time in seconds to wait for the Radius server to respond. **Default:** 120 seconds.
Retransmission retries	The number of times to retry after a failed transmission. **Default:** 0
Store attributes returned by the server to parameters	Allow Vusers to save attributes returned by the server as parameters, which can be used at a later time. **Default:** False
Radius client IP	Radius packets source IP, usually used to differentiate between packets transmitted on different NIC cards on a single load generator machine.

RTE Settings

Terminal Emulator runtime settings allow you to configure your TE Vusers so that they accurately emulate real users performing remote terminal emulation. You can configure settings for the number of connection attempts, device names, typing delay, and X-System synchronization.

User interface elements are described below:

UI Elements	Description
Maximum number of connection attempts	The **TE_connect** function is generated when you record a connection to a host. When you replay an RTE script, the **TE_connect** function connects the terminal emulator to the specified host. If the first attempt to connect is not successful, the Vuser retries a number of times to connect successfully. Details of each connection are recorded in the report file **output.txt**. Enter the maximum number of times that a Vuser will try to connect. **Default:** Vusers try to connect 5 times
Use original device name	In certain environments, each session (Vuser) requires a unique device name. The **TE_connect** function generates a unique 8-character device name for each Vuser, and connects using this name. Select this option to connect using the device name that is contained within the com_string parameter of the **TE_connect function**. The original device name setting only applies to IBM block-mode terminals. **Default:** Selected

UI Elements	Description
Delay before typing	The delay setting determines how Vusers execute **TE_type** functions. • **First key (milliseconds).** Specifies the amount of time that a Vuser waits before entering the first character in a string. • **Subsequent key (milliseconds).** Specifies the amount of time that a Vuser waits between submitting successive characters. **Note:** If you type zero for both the first key and the subsequent key delays, the Vuser will send characters as a single string, with no delay between characters. You can use the **TE_typing_style** function to override the Delay settings for a portion of a Vuser script.
X-System synchronization	RTE Vuser scripts use the **TE_wait_sync** function for synchronization. You can set a timeout value and a stable-time value that applies to all **TE_wait_sync** functions. • **Timeout (seconds).** When you replay a **TE_wait_sync** function, if the system does not stabilize before the synchronization timeout expires, the **TE_wait_sync** function returns an error code. To set the synchronization timeout, type a value (in seconds). **Default:** 60 seconds • **Stable time (milliseconds).** After a Vuser executes a **TE_wait_sync** function, the Vuser waits until the terminal is no longer in the **X-SYSTEM mode**. After the terminal returns from the X-SYSTEM mode, the Vuser still monitors the system for a short time. This makes sure that the terminal has become stable, that is, that the system has not returned to the X-SYSTEM mode. Only then does the **TE_wait_sync** function terminate. To set the time that a Vuser continues to monitor the system after the system has returned from the X-SYSTEM mode, type a value (in milliseconds). **Default:** 1000 milliseconds.

Server and Protocol Settings

The following section describes the runtime settings specific to MMS (Multimedia Messaging Service) Vusers. These runtime setting allow you to configure the Server and Protocol settings.

User interface elements are described below:

UI Elements	Description
MMSC URL	The URL of the MMSC (Multimedia Messaging Center) server.
MMS Version	The version of the MMS protocol used by the script.
Timeout (seconds)	The time that the server waits for incoming messages. **Default:** 60 seconds.
SMSC IP	The IP address of the SMSC server used for sending MMS notifications over SMPP.
SMSC Port	The IP port of the SMSC server used for sending MMS notifications over SMPP.
Automatic WAP Connections	Defines when to connect and disconnect from a WAP gateway. This setting is only relevant when a WAP gateway is used. The possible values are: ● **Per Iteration.** Connect at the beginning of each iteration and disconnect at the end of each iteration. ● **Per Send or Receive.** Connect and disconnect at the beginning and end of each message. ● **None.** Do not use automatic WAP connections. **Default:** Per Iteration
Default Sender address	The default address sent in the Sender header. **Default:** +999999

Timing Settings

The Citrix Timing runtime settings relate to the connect and waiting timeouts. These settings apply to the entire script. To set the waiting time for a specific section of the script, use the **Set Waiting Time** step in the Vuser script. The new waiting time applies from the point of insertion until the end of the script or the next **Set Waiting Time** step.

User interface elements are described below:

UI Elements	Description
Connect time	The time in seconds to wait idly at an established connection before exiting. **Default:** 180 seconds
Waiting time	The time in seconds to wait idly at a synchronization point before exiting. **Default:** 60 seconds.

UI Elements	Description
Typing rate	The delay in milliseconds between keystrokes.

Part 7: My Performance Center

Chapter 33: Personalizing Performance Center

This chapter includes:

My Performance Center Overview

My Performance Center provides an interface specifically designed for facilitating execution of day-to-day performance testing activities. It allows you to create a personalized view of performance testing features. Using My Performance Center, you can create and edit tests, manage test assets, as well as run and track test runs.

My Performance Center User Interface

This section includes:

My Performance Center Window

This section describes the My Performance Center window.

To access	Use one of the following:
	• In your web browser, enter the Performance Center Server URL (`http://<PCS server name>/loadtest`). Log in to your domain and project with your ALM credentials.
	• In your web browser, enter the ALM URL (`http://<ALM Platform server name>[<:port number>]/qcbin`). In the HP Application Lifecycle Management Options window, click **My Performance Center**.
	Note: If you are an external authentication user, you are not required to provide name and password in the login window. For more details on external authentication, see the *HP ALM External Authentication Configuration Guide*.
Important information	• If more than one Performance Center Server is installed in your system together with a load balancer, you should access My Performance Center by entering the load balancer's URL. Alternatively, you can also enter the server's defined internal URL.
	• You can control user access to Performance Center projects by defining user groups that can enter them, and by determining the types of tasks each user group performs according to permission levels. For more information, see the *HP Application Lifecycle Management Administrator Guide*.

User interface elements are described below:

UI Elements	Description
Views	Contains a list of the available views. For information about the available views, see "My Performance Center Views" on page 386.
My Notifications/ Notification Panel	Enables you to receive and send notifications to other users. For information about the available views, see "My Notifications" on page 389.

UI Elements	Description
Perspectives - System Perspectives	Enables you to select a predefined groups of views. The group of views are: ● **Project Activity.** Displays views related to project activity. ● **Test Plan.** Displays the Test Plan tree . Enables you to create and manage tests. For user interface details, see "Test Plan Page" on page 390. ● **Test Lab.** Enables you to ran and manage test sets. For user interface details, see "Test Lab Page" on page 391. ● **Test Runs.** Enables you to view and manage test runs. For user interface details, see "Test Runs Page" on page 399. ● **Topologies.** Displays details about topologies defined in the system. For user interface details, see "Topologies Page" on page 402. ● **Test Resources.** Displays views related to view VuGen scripts and manage monitor profiles. For user interface details, see "Test Resources Page" on page 403. ● **Trending.** Enables you to view performance trending information. For user interface details, see "Performance Trending Page" on page 422. ● **PAL.** Enables you to view performance application lifecycle information. For user interface details, see "PAL Flow Pane" on page 452. ● **Timeslots.** Enables you to view and manage timeslots. For user interface details, see "Timeslots Page" on page 406. ● **Testing Hosts.** Enables you to view and manage hosts. For user interface details, see "Testing Hosts Page" on page 407. ● **Usage Reports.** Provides you with an overall analysis of Performance Center. The analysis includes site users, resource usage, concurrent resource usage vs. license limitations, timeslot usage, and resource usage by duration and runs. For more details on usage reports, see the *HP ALM Lab Management Guide*. ● **Community.** Provides views that enable easy access to Performance Center RSS feeds, links to relevant groups and forums, and the product's Web site.
Perspectives - Personal Perspectives	Enables you create a personalized group of views to suit your specific testing needs.
Test Set	Enables you to filter the Test Lab page by a test set. **Available in:** Test Lab page

UI Elements	Description
Test	Enables you to display a test from the selected test set. **Available in:** Test Lab page
Manage PAL Applications	Enables you to associate PAL entities, such as data sets with a specific AUT. **Available in:** PAL page
Edit Layout	**Edit Layout.** Enables you to edit views.
(refresh icon)	**Refresh.** Refreshes the current display.
(download icon)	**Download Applications**. Opens the Download Applications window, enabling you to download standalone applications needed for working with ALM Performance Center.
(favorite icon)	**Add a Favorite.** Opens the Add Favorite dialog box, enabling you to add a favorite view.
(gear icon)	**Open Menu.** Opens a menu that contains the following options for managing the view: • **Select Columns.** Enables you to select which columns to display in the view. • **Refresh this View.** Refreshes the information displayed in the view. • **Remove this View.** Removes the view.
(maximize icons)	**Show in Maximized/Exit Maximized view.** Maximizes or returns to the normal view.
(– +)	**Minimizes/Maximizes data.** Minimizes or maximizes the displayed data.

My Performance Center Views

This section describes the views that are available in My Performance Center.

To access	In My Performance Center, select **Views.**
Important information	When a **System Perspective** is selected, the Views list is set to Read Only, and a check mark in the relevant check box identifies which views are included in the currently selected perspective. When creating a User Perspective, you use the check boxes to select which views to include in your perspective.

User interface elements are described below:

UI Elements	Description
Performance Test Set	Enables you to view and edit selected test instances within test sets. You can create, edit, rename, and remove test instances. You can also run tests directly from this view. For more details about working with test sets, see *HP Application Lifecycle Management User Guide*. For more details on this view, see "Performance Test Set Pane" on page 397 **Available in:** System Perspective > Test Lab
VuGen Scripts	Enables you to view and upload VuGen scripts to ALM. For more information on managing scripts, see "VuGen Script Management" on page 24. **Available in:** System Perspective > Test Resources
Topologies	Displays details about topologies defined in the system. For more information on topologies, see "Topologies" on page 30. **Available in:** System Perspective > Topologies
Topology Preview	Displays a preview of the topology defined in a performance test selected in the Performance Test Sets view. For more information on topologies, see "Topologies" on page 30. **Available in:** System Perspective > Topologies
Monitor Profiles	Enables you to create and manage existing monitor profiles. For more information about monitor profiles, see "Monitor Profiles" on page 48. **Available in:** System Perspective > Test Resources
Test Runs	Enables you to view and manage results for individual test runs. For more details, see "Test Runs Page" on page 399. ● For more information on viewing test runs and test run results, see *HP Application Lifecycle Management User Guide*. ● For information on managing test run results, see "Results/Last Run Results Tab" on page 207. **Available in:** System Perspective > Test Plan/ Test Lab/ Test Runs
Test Run Results	Displays result information for a test run selected in the Test Runs view. ● For information on viewing test runs and test run results, see *HP Application Lifecycle Management User Guide*. ● For information on managing test run results, see "Results/Last Run Results Tab" on page 207. **Available in:** System Perspective > Test Runs

UI Elements	Description
Performance Trending	Enables you to create trend reports in order to identify performance improvements and regressions. For more information about trending, see "Trending" on page 414. **Available in:** System Perspective > Trending
Manage Production Data Sets	Enables you to import and monitor PAL data sets from the production system. For more information about PAL data sets, see "Manage Production Data Sets Pane" on page 453. **Available in:** System Perspective > PAL
PAL Reports	Enables you to manage PAL reports. It displays a list of available reports, and enables you to create new reports, and to delete or duplicate existing reports. For more information about PAL reports, see "PAL Reports Pane" on page 456. **Available in:** System Perspective > PAL
Timeslots	Enables you to view reserved timeslots for the project. For more information on timeslots, refer to the *HP Application Lifecycle Management User Guide*. **Available in:** System Perspective > Timeslots
Performance Center Hosts	Enables you to view and manage Performance Center hosts. For more information about hosts, see the *HP ALM Lab Management Guide*. **Available in:** System Perspectives > Testing Hosts
AUT Hosts	Enables you to view and manage AUT hosts. For more information about AUT Hosts, refer to the *HP ALM Lab Management Guide*. **Available in:** System Perspective > Topologies
Currently Running Tests	Enables you to keep track of currently running tests in the system. **Available in:** System Perspective > Project Activity
Currently Running Tasks	Enables you to keep track of currently running tasks in the system. **Available in:** System Perspective > Project Activity
Event Log	Displays a list of events generated for a specific test run selected in the Test Runs view. For more information about the Event Log, see "Initializing Run Page" on page 209. **Available in:** System Perspective > Test Runs
Last Modified Entities	Enables you to keep track of changes to performance testing entities. **Available in:** System Perspective > Project Activity

UI Elements	Description
Web Page	Enables easy access to the product's Web site. **Available in:** System Perspective > Community
Performance Center RSS	Enables easy access to Performance Center RSS feeds. **Available in:** System Perspective > Community
Reports	Enables you to generate various usage reports. You can export generate reports to a .pdf or an Excel file. **Available in:** System Perspective > Usage Reports
Groups and Forums	Enables easy access to relevant groups and forums. **Available in:** System Perspective > Community
Test Sets Tree	Enables you to manage your test sets tree.
Test Plan Tree	Enables you to manage your test plan tree. For more details, see "Test Plan Page" on the next page **Available in:** System Perspective > Test Plan

My Notifications

This pane enables you to communicate with other My Performance Center users.

To access	In My Performance Center, select **My Notifications.**

User interface elements are described below:

UI Elements	Description
My Last Notifications	Enables you to view and send notifications.
Notifications Management	Contains a list of the available notifications.
	Displays the notification panel. Enables you to send notifications. Located at the bottom of the My Performance window. Click **Hide** to hide panel.

Test Plan Page

This page enables you to create and manage Performance Center tests in the test plan tree.

To access	In My Performance Center, select **Perspective > Test Plan.**
Relevant tasks	"How to Design a Performance Test" on page 63
See also	"Performance Test Design Overview" on page 63

User interface elements are described below:

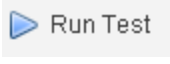| UI Elements	Description
<My Performance Center common UI elements>	For My PC menus and buttons, see "My Performance Center Window" on page 384.
	New Folder. Opens the Create New Test Folder dialog box, enabling you to add a test subject under a selected folder. **Syntax exceptions:** A folder name cannot include the following characters: \ ^ *
	New Test. Opens the Create New Performance Test dialog box, enabling you to add a test under a selected folder.
	Upload Script. Opens the Upload VuGen Scripts dialog box, enabling you to upload VuGen scripts to Performance Center. For more details, see "Upload VuGen Scripts Dialog Box" on page 28.
	Delete. Deletes the selected test or folder in the test plan tree. When deleting a folder, the selected folder is deleted and all related tests are moved to the Unattached folder. You cannot delete the root **Subject** folder. When deleting a test, the selected test is deleted permanently. In addition, all test runs associated with the deleted test are deleted from the project and removed from any associated test sets. **Note:** Deleting a performance test that is linked to a timeslot will affect the timeslot.
	Refresh. Refreshes the test plan tree so that it displays the most upto- date information.

Preview Tab

This tab displays test details and enables you to edit and run your test. For more details, see "Test Design / Summary / Preview Tab" on page 68.

Test Instances Tab

This tab displays details about the test instances of a selected test.

User interface elements are described below:

UI Elements	Description
+ Assign Test Set	Opens the Assign Test Set dialog box, enabling you to assign a selected test to an existing or a newly created test set.
▷ Run Test	Opens the Run dialog box, enabling you to execute the selected test instance. For more details, see "Run Test Dialog Box" on page 220.
Test Instance ID	A unique numeric ID for the test instance, assigned automatically by ALM. This is a read-only field.
Test Set	The name of the test set associated with the selected test.
Test Instance Path	The path of the test instance.
Responsible	Responsible tester for the test instance.
Delete Test Instance	Deletes a selected test instance and its test instance runs.

Test Runs Tab

This tab enables you to manage results and related actions for test runs. For more details, see "Test Runs Page" on page 399.

Test Lab Page

This page enables you to create and manage Performance Center tests in the test plan tree.

To access	In My Performance Center, select **Perspective > Test Lab.**
Relevant tasks	"How to Design a Performance Test" on page 63
See also	"My Performance Center Window" on page 384
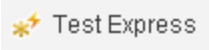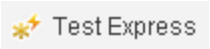
User interface elements are described below:

UI Elements	Description
<My Performance Center common UI elements>	For My PC menus and buttons, see "My Performance Center Window" on page 384.
Performance Test Set Pane	Enables you to design tests, assign tests to test sets, and run tests. For more details, see "Performance Test Set Pane" on page 397.
Test Runs Pane	Enables you to manage results and related actions for test runs. For more details, see "Test Runs Page" on page 399.

Test Express Designer

This window simplifies the process of creating, designing, and running performance tests. It guides you through each step, including selecting scripts for a test, scheduling how many Vusers to run in each script and for how long to run them, and selecting a post-run action. During test run, you can view the performance test initialization steps performed by Performance Center and the status for each step. If each step is completed successfully, the performance test continues running and the Performance Test Run page opens.

To access	**Test Lab Page:**
	1. In My Performance Center, select **Perspective > Test Lab.**
	2. Click ![Test Express].
	PAL:
	1. In My Performance Center, select **Perspective** > **PAL**.
	2. In the PAL Flow pane, click **Design and run load test** or **Tune load test**.
	3. Click ![Test Express].
Important Information	You can refine and adjust your performance test using the Performance Test Designer window. For more details, see "Performance Test Designer Window" on page 72.
Relevant tasks	"How to Design a Performance Test" on page 63

See also	• "Performance Test Design - Introduction" on page 62
	• "Performance Test Execution Introduction" on page 198
	• "Performance Test Run Page" on page 211

Step 1 Scripts Pane

This pane enables you to select VuGen scripts to run in the performance test.

User interface elements are described below:

UI Elements	Description
▷	Adds the selected VuGen script to the Step 2 - Design pane.
	Tip: You can also add a script by dragging it from the tree to the Groups table in the Design pane.
↻	Refreshes the resources tree.
<resources tree>	Displays the available VuGen scripts.

Step 2 - Design

This pane enables you to define a performance test. Defining a performance test includes setting a test run duration, and selecting load generators on which to run the Vuser groups.

 User interface elements are described below:

UI Elements	Description
Test Name	The name of the test.
Test Folder	The test plan folder name.

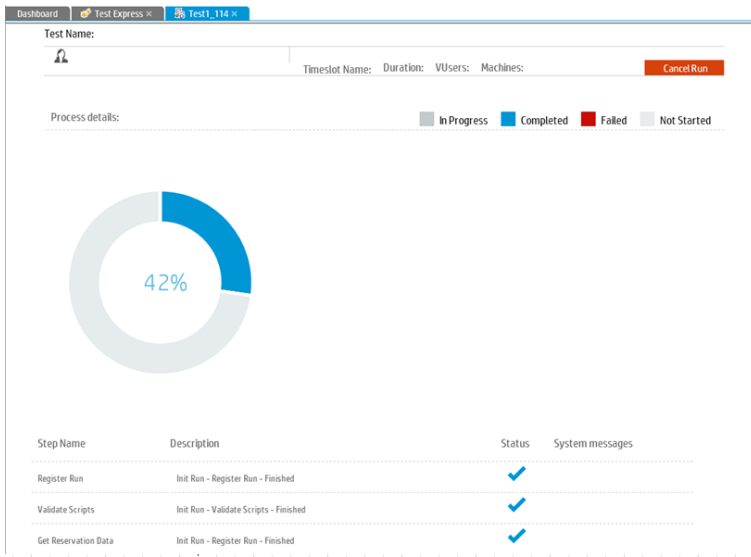| UI Elements	Description
Groups	**Name.** The name of the Vuser group. **Script.** The name of the Vuser script. **Vusers.** The number of Vusers assigned to the group. **Load Generators.** The load generator on which the group is running. Click the down arrow to select a load generator. **Command Line.** Opens the Script Command Line dialog box, enabling you to type the name and value of the parameter you want to send using the format, `<Parameter_ Name> <value>`. For information about the command line parsing functions, or for details about including arguments on a command line, see the *HP LoadRunner Online Function Reference*, provided with HP Virtual User Generator.
Start/End Vusers	You can start all Vusers simultaneously or start a specific number of Vusers gradually. • **To start all Vusers simultaneously:** Move the slider all the way to right. • **To start a specific number of Vusers gradually:** Move the slider to the appropriate predefined settings. The Scheduler will run X Vusers and then wait the predefined time before running another X Vusers.
Duration	The duration of the test run in hours and minutes. **Note:** This indicates the test run duration once the gradual initialization and stopping of all Vusers is done.
Scheduler Preview	Displays a preview graph by Vuser groups. For more details, click the Scheduler Preview tooltip icon ⓘ.

Step 3 - Run

This pane enables you to run the performance test and determine the action to be taken when the test run is complete.

User interface elements are described below:

UI Elements	Description
Post-Run Actions	Indicates the action to be taken when the test run is complete. • **Do not collate results.** Frees the machines immediately after the performance test ends. When the run has finished, the run results are left on the load generators. You can analyze the results at a later stage from the Results. • **Collate results.** When the run has finished, the run results are collected from all the load generators. This is recommended because collation of results takes only a few minutes, and can prevent loss of or inaccessibility to results in case any of your load generators becomes unavailable. • **Collate and analyze results.** When the run has finished, the run results are collected and analyzed. Data analysis requires some time, depending on the size of the results file. If there is no timeslot available to include the data analysis, select the Collate option instead, and run late Analysis when a data processor becomes available. You run late Analysis from the Results tab. For user interface details, see "Results/Last Run Results Tab" on page 207.
Test Validation	Displays the validation results of your performance test • **Level.** The type of message: **Error** or **Warning**. • **Details.** Describes the error or warning.
Save and Run	Saves and runs the performance test. The Process Details page opens, displaying the performance test initialization steps performed by Performance Center and the status for each step. For user interface details, see "Process Details Page" below. If each step is completed successfully, the performance test starts running and the Performance Test Run page opens. For user interface details, see "Performance Test Run Page" on page 211.
Save	Saves the performance test.

Process Details Page

This page displays the performance test initialization steps performed by Performance Center and the status for each step.

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
\<progress chart\>	Displays test initialization steps progress in percentage.
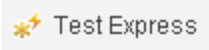
UI Elements	Description
Step Name	Displays the following steps: • **RegisterRun.** Performance Center initializes the run process. • **ValidateScripts.** Performance Center checks that the selected scripts' Run Logic runtime settings are in sync with the scripts' state. • **GetReservationData.** Performance Center checks the required resource information from the selected timeslot. • **CheckDiskSpace**. Performance Center checks that there is enough disk space on the Controller. • **LaunchController.** Performance Center initializes the Controller so that other testing entities, such as load generators and scripts can connect to it. If there is a problem launching the Controller, Performance Center automatically attempts to find an alternative Controller. This attempt appears as an additional initialization step. If no alternative Controller is available, the step fails. • **ConnectToLGs.** Performance Center checks that the required load generators are valid and connects them to the Controller. If this step fails, Performance Center attempts to find alternative load generators automatically. If this step still fails, check the test definitions and select different load generators for the test. • **DownloadScripts.** Performance Center downloads the required Vuser scripts. • **StartControllerServices.** Performance Center initializes the Controller's configuration settings in preparation to run the performance test. • **MapVirtualHosts.** Performance Center maps virtual hosts to actual hosts. • **LoadLTOMToController.** Performance Center creates the performance test and adds the Vuser scripts to the Controller. • **StartRun.** Performance Center starts the performance test run.
Description	A detailed description of the current status of the step.
Status	Displays whether the step passed or failed.
System Messages	Displays error messages generated when a step fails. These error messages can also be viewed from the Event Log. For details about the event log, refer to the *HP ALM Lab Management Guide*.

Performance Test Set Pane

This pane enables you to design tests, assign tests to test sets, and run tests.

To access	**Test Lab Page:**
	In My Performance Center, select **Perspective > Test Lab.**
	PAL:
	1. In My Performance Center, select **Perspective** > **PAL**.
	2. In the PAL Flow pane, click **Design and run load test** or **Tune load test**.
Relevant tasks	• "How to Design a Performance Test" on page 63
	• "How to Work with PAL" on page 447
See also	• "My Performance Center Views" on page 386
	• "PAL Overview" on page 445

User interface elements are described below (unlabeled elements are shown in angle brackets):

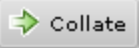| UI Elements	Description
\<My Performance Center common UI elements\>	For My PC menus and buttons, see "My Performance Center Window" on page 384.
Test Express	Opens the Test Express view, which enables you to design and run the performance test. For more details, see "Test Express Designer" on page 392.
Run Test	Opens the Run dialog box, which enables you to run the performance test. For more details, see "Run Test Dialog Box" on page 220.
Create New Test	Opens the Create New Performance Test dialog box, enabling you to define a performance test. For more details, see "Create New Performance Test Dialog Box" on page 459.
Edit Test	Opens the Performance Center Test Designer window, enabling you to define a performance test. Defining a performance test includes selecting scripts for the test, scheduling how many Vusers to run in each script and for how long, choosing topologies and monitor profiles for the test, and enabling collection of diagnostics data for the test run. For more details, see "Performance Test Designer Window" on page 72.
Assign Test	Opens the Assign Test to Test Set dialog box, enabling you to add a test instance of a selected test to a specified test set.
Rename	Enables you to rename the test.

UI Elements	Description
✖ Remove	Enables you to remove the test.
🗾 Select Test Set	Opens the Select Test Set dialog box, enabling you to select a test set. **Available in:** PAL
ID	The ID number of the test.
VS	The version status of the test.
Test Name	The name of the test.
Status	The run status of the test.
Responsible	The user responsible for the test.
Last Modified	The date on which the test was last modified.
Version	The version number of the test.
Checkout By	The user responsible for checking out the test.
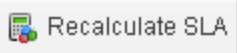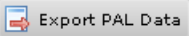
Test Runs Page

This page enables you to manage results and related actions for test runs.

To access	**From Perspective:** • In My Performance Center, select **Perspective** > **Test Plan**. Click a performance test in the test plan tree. Click the **Test Run** tab. • In My Performance Center, select **Perspective** > **Test Lab** or select **Perspective** > **Test Runs**. **From PAL:** 1. In My Performance Center, select **Perspective** > **PAL**. 2. In the PAL Flow pane, click **Export Data to Production**.
Relevant tasks	"How to Work with PAL" on page 447
See also	• "PAL Overview" on page 445 • "Test Plan Page" on page 390

User interface elements are described below:

UI Elements	Description
Collate	**Collate Runs.** Collates results of test runs that have not yet been collated. **Note:** • If a test is running on the Controller that will perform the collating, ALM Performance Center issues an alert. Click **OK** to proceed with collating the results, or **Cancel** to defer the action until later. • Should the Collate Results process encounter an error, the Collate Errors dialog box appears, displaying details of the error. To analyze the partially collated results, select **Analyze partially collated results**. Note that analyzing partially collated results is an irreversible operation.
Analyze	**Analyze Run.** Analyzes results for the selected test run. ALM Performance Center generates analysis data and deletes the temporary results from the load generators and the Controller. **Note:** Only enabled when the test run state is **Before Creating Analysis Data**.
Recover Results	**Recover Results.** Enables you to recover and collate the results of a failed test run. **Note:** • Only enabled when the test run is in the failed state. • Enables you to collate results only up to the point where the test failed.
HTML Report	**Show HTML Report.** Opens an HTML version of the Analysis Summary report, which analyzes the data collected during the performance test run. The report provides general information about the performance test, lists statistics about the test run, and provides links to graphs containing test run data. For more details regarding the summary report, see the *HP LoadRunner Analysis User Guide.*

UI Elements	Description
SLA Report	**SLA Report.** Opens the SLA Report for the selected test run. For details, see "SLA Report" on page 238. **Note:** This feature is available only if SLAs were defined during the performance test design phase. Fore more information about SLAs, see "Service Level Agreements" on page 144.
Recalculate SLA	**Recalculate SLA.** Opens the Calculate SLA dialog box. For details, see "Calculate Service Level Agreement Dialog Box" on page 239. **Note:** This feature is available only if SLAs were defined during the performance test design phase. For more information about SLAs, see "Service Level Agreements" on page 144.
Delete	**Delete.** Deletes selected test run.
View Hosts	**View Hosts.** Opens the Timeslot Hosts box, which displays the requested and actual hosts.
Export PAL Data	**Export PAL Data.** Opens the Export PAL Data dialog box.
Add Filter	Enables you to filter the information being displayed in the Test Runs grid. Click the drop-down arrow to apply a filter.
Last Modified	Enables you to filter the information being displayed in the Test Runs grid by the last modified date. Click the drop-down arrow to apply a filter.
Run ID	The test run ID.
Run Name	The name of test run.
Test	The name of the test.
State	Displays the current state of the selected test runs.
SLA Status	⊗ . Indicates a failed SLA status. ⊘ . Indicates a passed SLA status. ⊘ . Indicates that there is no data about the SLA status.
Exec Date	The date and time of the test run.
Duration	The time, in minutes, that the test took to run.
Tester	The name of the user running the test.

UI Elements	Description
Timeslot	The ID of the test run timeslot.
Results tab	Displays result information for the selected test run.
Event Log tab	Displays a list of events generated for the selected test run.

Topologies Page

This page enables you to view details about topologies defined in the system, and create and manage AUT Hosts.

To access	In My Performance Center, select **Perspective > Topologies.**
Relevant tasks	"How to Design Topologies" on page 31
See also	"My Performance Center Window" on page 384 "Topologies" on page 30
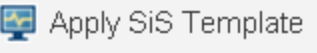
User interface elements are described below:

UI Elements	Description
<My Performance Center common UI elements>	For My PC menus and buttons, see "My Performance Center Window" on page 384.

Topologies Pane

This pane displays details about the about topologies defined in the system.

User interface elements are described below:
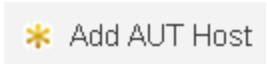
UI Elements	Description
View Topology	Displays a preview page of the select topology.
Apply SiS Template	Enables you to apply a SiteScope template to the selected topology.
Add Filter	Enables you to filter the information being displayed in the Test Runs grid. Click the drop-down arrow to apply a filter.
ID	A unique numeric ID for the topology, assigned automatically by ALM. This is a read-only field.
Name	The name for the topology.

UI Elements	Description
Description	A description of the topology.
Last Modified	The date the topology was last modified.

AUT Hosts Pane

This pane enables you to view your inventory of AUT host defined in the system.

User interface elements are described below:

UI Elements	Description
✳ Add AUT Host	Opens the Add AUT Host dialog box, enabling you to define a new AUT host. For user interface details, see the *HP ALM Lab Management Guide*.
ID	A unique numeric ID for the AUT host, assigned automatically by ALM. This is a read-only field.
Logical Name	The logical name given to the AUT host.
Machine	The name or IP address of the AUT host machine.
Platform	Platform The base operating system of the AUT host machine: Window or UNIX.
OS	The operating system of the AUT host machine.
Protocol	The network protocol used for communication with the AUT host (for monitoring purposes). **Default value:** NetBIOS, WMI,SSH.

Test Resources Page

This page enables you to view VuGen scripts, create new analysis templates, and create and manage monitor profiles.

To access	In My Performance Center, select **Perspective > Test Resources.**
Relevant tasks	• "How to Design a Performance Test" on page 63 • "How to Upload VuGen Scripts" on page 25 • "How to Customize Analysis Templates" on page 189 • "How to Create and Configure Monitor Profiles" on page 49

See also	• "Performance Test Design Overview" on page 63
	• "Vuser Scripts" on page 25
	• "Analysis Templates Overview"
	• "Monitor Profiles Overview" on page 49
	• "My Performance Center Window" on page 384

User interface elements are described below:

UI Elements	Description
<My Performance Center common UI elements>	For My PC menus and buttons, see "My Performance Center Window" on page 384.

VuGen Scripts Pane

This pane enables you to view and upload VuGen scripts.

User interface elements are described below:

UI Elements	Description
⬆	**Upload Script.** Opens the Upload VuGen Scripts dialog box, enabling you to upload VuGen scripts to Performance Center. For more details, see "Upload VuGen Scripts Dialog Box" on page 28.
Add Filter	Enables you to filter the information being displayed in the VuGen Scripts grid. Click the drop-down arrow to apply a filter.
ID	A unique numeric ID for the VuGen scripts, assigned automatically by ALM. This is a read-only field.
Script Name	The name for the script.
Responsible	Responsible tester for the script.
Last Modified	The date the script was last modified.
Protocol	The Vuser script's protocol.
Mode	The method to use for uploading the script: • **All.** Uploads all the files contained in the .zip file. With this option the upload takes a long time. • **Runtime.** Only the runtime files—that is the scripts, runtime settings, parameters, and so on—are uploaded.

Analysis Templates Pane

This pane enables you to create, view, upload and download analysis templates.

User interface elements are described below:

UI Elements	Description
✱ Create New Analysis Template	Opens the Create New Analysis Template dialog box, enabling you to create a new analysis template in Performance Center. For more details, see
⬆	**Upload New Analysis Template File.** Opens the Upload Analysis Template dialog box, enabling you to upload analysis templates to Performance Center. For more details, see
⬇	**Download Analysis Template File.** Downloads the selected analysis template zip file to your machine.
✖ Delete	**Delete Analysis Template.** Deletes the selected analysis template from the Analysis Templates grid.
Add Filter	Enables you to filter the information being displayed in the Analysis Templates grid. Click the drop-down arrow to apply a filter.
ID	A unique numeric ID for the analysis templates, assigned automatically by ALM. This is a read-only field.
Name	The name for the analysis template.
Template File	The name of the analysis template zip file.
Uploaded By	The user who uploaded the analysis template zip file.
Uploaded Date	The date the analysis template zip file was uploaded .

Monitor Profiles Pane

This pane enables you to view and manage monitor profiles.

User interface elements are described below:

UI Elements	Description
✱ Create New Monitor Profile	Opens the Create New Monitor Profile dialog box, enabling you add a new monitor profile.
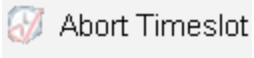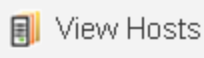
UI Elements	Description
✳ Create New Monitor Over Firewall	Opens the Create New Monitor Over Firewall dialog box, enabling you create a monitor-over-firewall agent.
🖫 Update Monitor Profile Name	Opens the Update Monitor Profile Name dialog box, enabling you to rename the selected monitor profile.
✏ Edit	Opens the Monitor Profile page, enabling you to add and manage a monitor type for the selected monitor profile. For more details, see "Edit Monitors Dialog Box" on page 53.
✖ Delete	**Delete Monitor Profile.** Deletes the selected monitor profile from the Monitor Profiles grid.
Add Filter	Enables you to filter the information being displayed in the VuGen Scripts grid. Click the drop-down arrow to apply a filter.
ID	A unique numeric ID for the monitor, assigned automatically by ALM. This is a read-only field.
Name	The name of the monitor.
Description	A description of the monitor.
Last Modified	The date the monitor was last modified.

Timeslots Page

This page enables you to view VuGen scripts and create and manage monitor profiles.

To access	In My Performance Center, select **Perspective > Timeslots.**
Relevant tasks	• *HP Application Lifecycle Management User Guide.* • *HP ALM Lab Management Guide*
See also	• *HP Application Lifecycle Management User Guide.* • *HP ALM Lab Management Guide* • "My Performance Center Window" on page 384

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
<My Performance Center common UI elements>	For My PC menus and buttons, see "My Performance Center Window" on page 384.
✗ Delete Timeslot	Deletes the selected timeslot.
🖊 Abort Timeslot	Aborts the selected timeslot.
🗐 View Hosts	Opens the Timeslot Hosts dialog box, displaying the requested and actual hosts.
Add Filter	Enables you to filter the information being displayed in the timeslots grid. Click the drop-down arrow to apply a filter.
ID	A unique numeric ID for the timeslot, assigned automatically by ALM. This is a read-only field.
Valid	indicates whether the timeslot is valid .
Created By	The user who reserved the timeslot.
Start Time	The date and time that the timeslot is due to start or started.
Duration	The duration of the timeslot.
Hosts	The number of hosts (including Controller) requested for the timeslot.
Vusers	The number of Vusers reserved for the timeslot.
Test	The name of the test.
Run	A unique numeric ID for the run, assigned automatically by ALM. This is a read-only field.
End Time	The date and time that the timeslot ends.

Testing Hosts Page
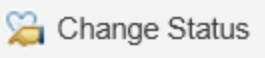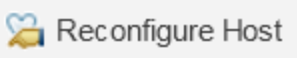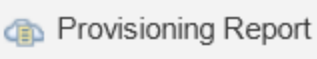
This page enables you to view and manage hosts used for test execution.

To access	In My Performance Center, select **Perspective > Testing Hosts.**
Important information	You can provision hosts from the cloud for use in performance testing. For more information, see the *HP ALM Lab Management Guide*

Relevant tasks	• "How to Design a Performance Test" on page 63 • *HP ALM Lab Management Guide*
See also	• "My Performance Center Window" on page 384 • *HP ALM Lab Management Guide*

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
<My Performance Center common UI elements>	For My PC menus and buttons, see "My Performance Center Window" on page 384.
✳ Add Host	Opens the Add Host Dialog box, enabling you to create a testing host. For more information, see *HP ALM Lab Management Guide*.
☁ Provision Hosts	Opens the Provision Cloud Hosts dialog box, enabling you to provision hosts. You can choose how many hosts to provision and where the hosts are provisioned, and you can select all necessary host configurations. For more information, see *HP ALM Lab Management Guide*.
✖ Delete Host	Deletes the selected host.
♡ Check Host	Open the Check Host dialog box, enabling you to check connectivity between the selected host and other machines in the system.
◌ Reboot Host	Enables you to remotely reboot host machines. **Note:** • You cannot reboot Controller and Load generator hosts while they are in the **Running** state. You can only reboot these hosts when they are idle. • You cannot reboot a UNIX load generator host. • Available only for hosts with Performance purposes.
🕒 Data Processor Queue	Opens the Data Processor Queue window, enabling you to view the pending data processing requests.

UI Elements	Description
Change Status	Opens the Change Host Status dialog box, enabling you to change the status of a selected host. The possible statuses are: • **Operational.** The host is working. • **Non-operational.** The host is not working. • **Unavailable.** The host is not available.
Reconfigure Host	Resets the following on the selected host machine: • Host license • System user (IUSR_METRO) • Communication Security passphrase **Note:** You can reconfigure only one host at a time.
Provisioning Report	Opens the provisioning report for the selected cloud host. For more information, see *HP ALM Lab Management Guide*. This option is disabled if the selected host is not a cloud host.
<Cloud Hosts Summary Panel>	Displays a summary of cloud hosts by status/host state. Click on the number next to a status/host state to filter the Hosts grid by that status/host state.
<Quick Views> All Performance Testing Host ⌄	Lists predefined filters for the testing hosts grid. The following quick views are available: • **All Performance Testing Hosts.** • **Cloud Load Generators.** • **Local Performance Testing Hosts.** • **Custom.**
Add Filter	Enables you to filter the information being displayed in the testing hosts grid. Click the drop-down arrow to apply a filter.

UI Elements	Description
Source	The testing host's source: • **Local.** The host exists in your testing lab. • **Cloud.** The host was provisioned from a cloud provider.
Name/IP	The name or IP address of the host.
Label	The logical name of the cloud host as specified during provisioning. **Available in:** All Performance Testing Hosts and Cloud Load Generators
Purpose	The testing tools available on the host. For example: Controller, Load generator, Data processor. **Note:** • If the host machine is located over a firewall, or is a UNIX machine, it cannot function as a Controller or Data processor. • If you selected **Windows Standalone LG** or **Unix Load Generator** as the installation option, **Load Generator** is automatically selected as the purpose for the host and the other options are disabled.
Status	The status of the host. The possible statuses are: • **Operational.** The host machine is up and running. • **Non-operational.** The host machine is down. • **Unavailable**. There is no information available about the status of the host.

UI Elements	Description
State	The current activity on the host.
	Idle. Indicates that the host is not being used.
	Installing. Indicates that a patch is being installed on the host.
	Rebooting. Indicates that the host is rebooting.
	<Run states>. Indicates the host state during a performance test run.
	<Data processing states>. Indicates the state of the host during a data processing task.
	<Provisioning states>. Indicates the provisioning status of a cloud host. Host State changes to idle once the host is provisioned.
Location	The name of the host location.
Attributes	The system attributes of the host.
	Example: Memory, strength, installed components.
	Tip: You can customize the host attributes in Lab Management. For details, refer to the *HP Application Lifecycle Management Administrator Guide*.
Priority	A rank assigned to the host. The higher the priority you give the host, the more likely the host will be allocated to a test. There are a number of criteria to consider when assigning priority. The main considerations are whether the host is a dedicated machine or a shared resource, and the type of hardware installed on the machine.
	Not Available in: Custom view
Privacy Type	The privacy type of the host. You can modify all hosts in Lab Management, including private hosts. In ALM, you can only create and modify private hosts within the project's pool.
	Not Available in: Custom view
Active Timeslot ID	The ID of the timeslot for which this host is reserved, and which is now open.

UI Elements	Description
Cloud Host Identifier	A unique ID for the host assigned by the cloud provider. **Available in:** Cloud Load Generators
Cloud Request Id	The cloud provider's ID for a single provision request. A provision request includes all requested batches of hosts. Each batch has its own Cloud Request Item ID. **Tip:** You can filter by Cloud Request ID to see all hosts that were provisioned in a single provision request. **Available in:** Cloud Load Generators
Cloud Template	The host template used to provision the host. Changing a host template does not affect existing hosts that were provisioned from the template. **Available in:** Cloud Load Generators
Task	Indicates the host status. **Available in:** Custom view
MI Listener	The IP address or name of the MI Listener that enables data collection. Relevant only for hosts located over a firewall. **Available in:** Custom view
Cloud Account	The name of the cloud account from which the host was provisioned. **Available in:** Custom view
Cloud Image	The machine image applied to the cloud host. **Available in:** Custom view
Cloud Instance Type	The hardware specs of the cloud host. **Available in:** Custom view
Cloud Region	The region from which a cloud host was provisioned. **Available in:** Custom view
Runtime State	Indicates the host state during a performance test run. **Available in:** Custom view

UI Elements	Description
Active Timeslot ID	The ID of the timeslot for which this host is reserved, and which is now open. **Available in:** Custom view
Description tab	Describes the currently selected host.
Installed PC Components tab	Displays a list of the Performance Center components installed on the host machine, including versions and patches.
Installed Programs tab	Displays a list of all of the programs installed on the host machine. Details include the version, the publisher of the software, and the date it was installed in the host machine.
Processes tab	Displays detailed information about the processes and resource usage of the selected host. For more details, see *HP ALM Lab Management Guide*.
Services tab	Displays the services running on the host machine. For more details, see *HP ALM Lab Management Guide*.
Check Host Status tab	Displays the status of each step of the host checks. For more details, see *HP ALM Lab Management Guide*.

Chapter 34: Trending

This chapter includes:

Trend Reports Overview

The ALM Performance Center trend reports allow you to compare performance test run data over time, thereby giving you better visibility and control of your application's performance.

By comparing the same measurement in more than one instance of a test run, you can identify whether its performance trend is improving or regressing.
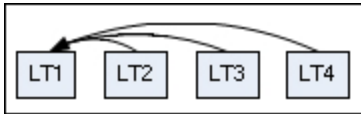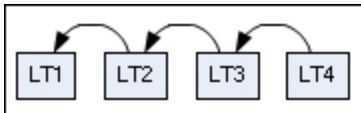
For example, if you were interested in the performance trend of the transaction response time measurement, the trend report clearly displays whether over several instances of a test run, this value has increased or decreased from one run to another - a performance regression or improvement respectively.

This section also includes:

- "Comparison Methods" below

- "Trend Thresholds" on the next page

- "Custom Measurement Mapping" on page 417

Comparison Methods

There are two methods of comparing measurements contained in a performance test run for the purposes of identifying performance trends: Compare to Baseline and Compare to Previous.

Comparison Method	Description
Compare to Baseline	You select one performance test run in the trend report and define it as the baseline. All measurements in the report are then compared to the measurements contained in the baseline.
Compare to Previous	All measurements in a performance test are compared to the measurements in the performance test run that immediately precedes it in the report.

It is important to understand the difference between the two comparison methods. The following example will illustrate how the same data can yield different results depending on the method you select.

As shown in the image below, the average Transaction Response Time measurement is being trended from four performance test runs: **3**, **4**, **5**, and **6**.

Transaction Response Time(Compare to baseline)					
Name	Type	Average			
		6/24/2010 (3[Base])	6/24/2010 (4)	6/24/2010 (5)	6/24/2010 (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%)

Performance test run (PT) **3** has been defined as the baseline (as indicated by the word **Base** in parentheses). The average transaction response times contained in the other performance test runs are compared to PT **3** only.

In PT **3**, the average transaction response time for **TRX_01** was **2.045**. The average transaction response time for the same transaction in PT **5** was **2.035**, which represents a slightly faster response time and therefore a slight improvement in the performance of this measurement. The percentage difference between the two figures is displayed in brackets, in this case **-0.49%**.

However, if the Compare to Previous comparison method was selected, then the average transaction response time in PT **5** would be compared not to PT **3**, but rather to PT **4** (since **4** precedes it in the table). The value for PT **4** is **4.073** while for PT **5** it's **2.035**, a percentage difference of **-50.04%**.

Transaction Response Time (Compare to previous run)					
Name	Type	Average			
		6/24/2010 (3[Base])	6/24/2010 (4)	6/24/2010 (5)	6/24/2010 (6)
All	TRT	4.567	1.22 (-73.29%)	2.32 (+90.16%)	12.455 (+436.85%)
TRX_01	TRT	2.045	4.073 (+99.17%)	2.035 (-50.04%)	1.05 (-48.4%)
TRX_02	TRT	1.045	2.07 (+98.09%)	1.015 (-50.97%)	1.051 (+3.55%)
TRX_03	TRT	3.053	3.067 (+0.46%)	2.009 (-34.5%)	2.654 (+32.11%)
TRX_04	TRT	6.055	6.868 (+13.43%)	5.011 (-27.04%)	7.05 (+40.69%)

Using exactly the same data, the two comparison methods have yielded very different results. Only a slight improvement with the Compare to Baseline method (**-0.49%**), while a more significant improvement with the Compare to Previous method (**-50.04%**).

Trend Thresholds

To identify significant improvements or regressions in performance, you can define unique thresholds to track differentials between measurements being compared. If a differential exceeds a defined threshold, that value appears in a predetermined color, identifying it as an improvement, minor regression, or major regression.

For example, if you define an improvement threshold for comparing transaction response times as 50%, then any transaction response time that is 50% lower than that of the baseline or previous run (depending on the comparison method) will appear in the color you defined for improvements.

In the example below, the following performance thresholds for the transaction response time (TRT) measurement have been defined:

- **Improvement.** At least 90% decrease

- **Major Regression.** At least 50% increase

These threshold definitions mean that any performance improvements or regressions which exceeds these percentages will be displayed in color, making them more identifiable.

In the following table, the Compare to Previous comparison method is used.

Transaction Response Time (Compare to previous run)				
Name	**Type**	**Average**		
		6/24/2010 (3[Base])	6/24/2010 (4)	6/24/2010 (5)
Action_Transaction	TRT	0.002	0.94 (+46900%)	0 (-100%)
All	TRT	0.002	0.311 (+15450%)	0 (-100%)

In the table above, we see that the value of the TRT measurement for the **Action_Transaction** in performance test run **4** is **46900%** higher than in performance test run **3** - a performance regression which far exceeds the defined threshold for major regressions. Therefore, the value appears in red, the default color for major regressions.

The corresponding value for performance test run **5** represents a **100%** improvement on performance test run **4.** Since this percentage exceeds the defined threshold for improvements, the value appears in green, the default color for improvements.

Custom Measurement Mapping

The Custom Measurement Mapping feature allows you to reconcile inconsistent transaction or monitor names between performance test runs, thereby allowing you to properly trend these measurements.

The following are two examples of when you would use the Custom Measurement Mapping feature:

- **Inconsistent transaction name**

  You run a performance test that contains the transaction **BuyBook**. A while later you run the performance test again. However, in the time between the two performance test runs, the transaction name has been changed to **TRX_01_BuyBook**.

  As a result of this inconsistent naming, you cannot obtain any trending information for this measurement, as Performance Center cannot recognize that the two transactions are actually the same, and compare them for trending purposes.

To overcome this problem, you map the two measurements (**BuyBook** and **TRX_01_BuyBook)** to a new third measurement which you create, for example **Buy_Book_mapped.** You add this new user-defined measurement to the trend report. Performance Center can then compare two instances of the **Buy_Book_mapped** transaction and give you meaningful trending information.

You can give the new transaction the same name as one of the current transactions. Additionally, you can configure the mapping so that all future instances of the transaction are automatically mapped to the new transaction name.

- **Inconsistent monitor name**

You want to compare your application's performance when it runs on different operating systems or when it runs on different Web/application servers.

You run the performance test once on a Windows platform, and then again on a Linux platform. You then want to compare the CPU utilization between the two runs. However, each platform provides a different name for this measurement. For example, **% Processor Time (Processor_Total)** in Windows, and **CPU Utilization** in Linux.

Performance Center cannot successfully obtain trending information for this measurement because the measurement names may be different.

To overcome this problem, you map the two measurements (**% Processor Time (Processor_Total)** and **CPU Utilization**) to a third measurement which you create, for example **CPU_mapped.** You then add this new user-defined measurement to the trend report. Performance Center can then compare the two instances of the **CPU_mapped** transaction and give you meaningful trending information.

You can give the new monitor the same name as one of the current monitors. Additionally, you can configure the mapping so that all future instances of the monitor are automatically mapped to the new monitor name.

Trend by Quality Attributes Template - Trended Measurements

The following table shows which measurements are trended, and by which quality attribute the information is displayed when the Trend by Quality Attributes template is selected:

Quality Attribute	Trended Measurement
Performance	Transaction Response Time (compared to baseline). For more information on comparison methods, see "Trend Reports Overview" on page 415.
System Performance	CPU utilization Disk utilization Available memory

Quality Attribute	Trended Measurement
Availability	Transaction Summary (compared to baseline). For more information on comparison methods, see "Trend Reports Overview" on page 415.
Repeatability	Transaction Percentiles (compared to baseline). For more information on comparison methods, see "Trend Reports Overview" on page 415.
Stability	Error Statistics Transaction Failures

Measurement Acronyms

The following table lists all the measurement acronyms that might be used in the trend report:

Data Type	Full Name	Initials
Vusers	Running Vusers	VU
Errors	Errors	ERR
Transactions	Transaction Response Time	TRT
	Transaction Per Second	TPS
	Transaction Summary	TRS
Web Resources	Hits per Second Throughput Connections	WEB
User Defined Data Points	User Defined Data Points	UDP
System Resources	Windows Resources	WIN
	UNIX Resources	UNX
	Server Resources	SRVR
	SNMP	SNMP
	SiteScope	SiS
Web Server Resources	Apache	APA
	MS IIS	IIS
	iPlanet	PLA

Data Type	Full Name	Initials
Web Application Server Resources	Ariba	ARI
	ATG Dynamo	ATG
	BroadVision	BDV
	ColdFusion	CFU
	MS ASP	ASP
	Oracle Application Server	OAS
	SilverStream	SST
	WebLogic	WL
	WebSphere	WS
Database Server Resources	DB2	DB2
	Oracle	ORA
	MS SQL	SQL
	Sybase	SYB
ERP/CRM Server Resources	SAP	SAP
	SAP Portal	SAPP
	SAP CCMS	CCMS
	SAP GUI	SAPU
	Siebel Web Server	SIEB
	Siebel Server Manager	SIEB
J2EE	Server Request	J2EE
.NET	Server Request	NET
Additional Components	COM+	COM
	.NET	NET
Application Deployment Solution	Citrix MetaFrame XP	CTRX
Middleware Performance	IBM WebSphere MQ	MQ
Application Traffic Measurement	F5 BIG-IP	F5

Trend Reports User Interface
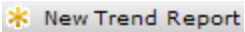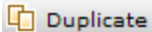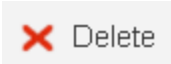
This section includes:

Performance Trending Page

This page enables you to manage trend reports. It displays a list of available reports, and enables you to create new reports, and to delete or duplicate existing reports.

To access	Use one of the following: • On the ALM sidebar, under **Testing**, select **Test Lab**. Select the **Test Runs** tab, and on the toolbar, click the **Performance Trending** button . • On the ALM sidebar, under **Performance Center**, select **Performance Lifecycle**. Click **Open Trending Perspective in MyPC**. • In My Performance Center, select **Perspective** > **Trending**.
Tip	On the ALM sidebar, under **Performance Center**, select **Performance Lifecycle** to view the five most recently created trending reports.
Relevant tasks	"How to Manage a Performance Test Run" on page 200

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
<My Performance Center common UI elements>	For My PC menus and buttons, see "My Performance Center Window" on page 384.
New Trend Report	Opens the Trend Report creation page, which enables you to create trend reports.
Duplicate	Creates a duplicate of the selected report.
Rename	Enables you to edit the report name and description.
Delete	Deleted the selected report.
ID	The trend report ID number.
Report Name	The name of the report.
Description	A description of the report.
Modified by	The user who last modified the report.

, continued

UI Elements	Description
Responsible	The user who created the report.
Last Modified	The date on which the report was last modified.
Runs	The number of trended runs contained in the report.

Create New Trend Report Page

This page enables you to create trend reports.

To access	1. In My Performance Center, select **Perspectives** > **Trending**. 2. On the Performance Trending page, click **New Trend Report**.
Relevant tasks	

General Details Pane

User interface elements are described below:

UI Elements	Description
Name	The name of the report.
Description	A description of the report.

Contents and Layouts Pane

User interface elements are described below:

UI Elements	Description
Description	A description of the selected template.
Transaction Trends template	Provides trend views that display trending information for the following measurements: • Transaction Response Time • Transaction Pass/Fail Summary • Transactions per Second

UI Elements	Description
Transactions and Monitors Trends template	Provides trend views that display trending information for the following measurements: • Transaction Response Time • Transaction Summary • System Resources (specifically: CPU utilization, Disk utilization, and Available memory)
Trend by Quality Attributes template	Provides trend views that display trending information from the point of view of quality attributes. For a table which displays which measurements are trended and by which quality attribute, see "Trend by Quality Attributes Template - Trended Measurements" on page 418.
User Defined template	This template provides only the basic layout for the report with no further predefined tab or trend view configuration.
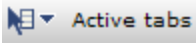
\<Report Name> Trend Report

This page enables you to manage the test runs that are included in the report, as well as to manage the trend views which display the trending information.

To access	1. In My Performance Center, select **Perspectives** > **Trending**. 2. On the Performance Trending page, in the Trend Reports grid, click the name of the report to open. The report opens as an additional tab on the My Performance Center Dashboard.

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
Export to PDF	Opens the Export Trend Report page, which enables you to export the selected report to a .pdf file. For user interface details, see "Export Trend Report Page" on page 433.
Thresholds	Opens the Threshold Settings dialog box, which enables you to define the thresholds to be used for identifying performance improvements and regressions. For user interface details, see "Threshold Settings Dialog Box" on page 438.
Custom Measurement Mapping	Opens the Custom Measurement Mapping dialog box, which enables you to define and customize mapped measurements. For user interface details, see "Custom Measurement Mapping Dialog Box" on page 439.

UI Elements	Description
Edit Layout	Enables you to drag and drop trend views within a trend view tab.
Active tabs	Enables you to view tabs that are not currently displayed. **Note:** A maximum of five tabs can be displayed at one time.
Refresh	Refreshes the information contained in the report.
	Add a New Tab. Adds a new tab to the report.
<Trend Views>	Trend views are display items that present trending information, and are contained within the <trend view tabs>. For more information, see "Trend Views" on page 428.
<Trend View tabs>	The <trend view tabs> contain the trend views and are defined by the template on which the report is based. For more information, see "Trend View Tabs" on page 427.
Trend Overview tab	The Trend Overview tab displays the test runs trended in the report, and provides options for managing the test runs. For more information, see "Trend Overview Tab" below.

Trend Overview Tab

The Trend Overview tab is used for managing the information contained in the trend report.

To access	The Trend Overview tab is displayed by default when you access a <report name> Trend Report.
Important information	The Trend Overview tab is common to all trend reports, irrespective of which template is selected.
See also	"<Report Name> Trend Report " on the previous page

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
+	**Add runs to trend report.** Opens the Select Test Runs to Trend Report dialog box. For user interface details, see "Select Test Runs to Trend Report Dialog Box" on page 436.
✖	**Remove run from trend report.** Remove test runs from the trend report.

UI Elements	Description
	Set run as baseline. Sets the selected test run as the baseline run for comparing test runs. For more information on comparison methods, see "Trend Reports Overview" on page 415. **Note:** The first run which is added to the report is automatically defined as the baseline.
	Move Run Up/Down. Moves the selected test run up or down in the run order. Changing the position of the test run may have an effect on the comparison value when the Compare to previous method is selected. For more information on comparison methods, see "Trend Reports Overview" on page 415.
	Customize Table Columns. Customizes which columns appear in the Trended Runs table. For user interface details, see "Select Columns Dialog Box" on page 434.
<Trended runs table>	Displays information for all trended test runs in the report. It is divided into three sections, **General Details**, **Workload Characteristics**, and **Performance Overview**.
General Details	Columns in this section display general information relating to the test run. For a list of the available fields under this section see **Customize Table Columns** above.
Performance Overview	Columns in this section contain information relating to the overall performance of your application. The purpose of this section is to provide you with basic overview trending information without having to open a trend view. The basic trend information is shown by upward or downward arrows that indicate performance improvements or regressions with regards the baseline only. For more information on comparison methods, see "Trend Reports Overview" on page 415. For a list of the available fields under this section see **Customize Table Columns** above.

UI Elements	Description
Run Information pane	Displays details for the selected test run. The following information is displayed: ● **Performance Test Set.** The test set from which the test was run. ● **Test.** The name of the test. ● **Comments.** Comments about the test run. ● **Run Date.** The date of the test run. ● **State.** The publish state of the run. Either **Trended** or **Not Trended**. If Not Trended, then the reason for this error appears in this field. A link appears to republish the run after you have fixed the error.
Workload Characteristics	Columns in this section are intended to display enough information in order for you to identify whether the test runs are similar enough in terms of workload, and therefore suitable for trending. The values displayed in this section are relevant only for the selected time range. Changing the selected time range will likely lead to different results. For more information on the Define Time Range filter, see "Select Test Runs to Trend Report Dialog Box" on page 436. For a list of the available fields under this section see **Customize Table Columns** above.

Trend View Tabs

A report tab can contain any number of trend views. The tabs are defined by the template on which the report is based, and which sets the name of the tab and automatically includes trend views that are related to its name.

To access	1. In My Performance Center, select **Perspectives** > **Trending**. 2. On the Performance Trending page, in the Trend Reports grid, click the name of the report to open. The report opens as an additional tab on the My Performance Center Dashboard. The trend view tabs are displayed by default.
Important information	The trend view tabs which appear by default depend on which template the report is based on.
See also	"<Report Name> Trend Report " on page 424

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
\<tab management menu>	Select a trend view tab and click the ⌄ down arrow to open the tab management menu, which contains the following options (not available on the Trend Overview tab): • ⊞ **Add View to Tab.** Opens the Add Trend Views to Tab dialog box. For user interface details, see "Add Trend Views to Tab Dialog Box" on page 440. • **Edit Tab Title.** Enables you to change the name of the tab. • ← **Move Tab Left.** Moves the tab left in the tab order. • → **Move Tab Right.** Moves the tab right in the tab order. • ✖ **Delete This Tab.** Deletes the tab and all of the trend views contained in it, from the report.
\<Trend view>	A display item that presents trending information. For more information, see "Trend Views" below.

Trend Views

A trend view is a display item that presents trending information for a particular performance metric, for example, transaction response time.

To access	1. In My Performance Center, select **Perspectives** > **Trending**. 2. On the Performance Trending page, in the Trend Reports grid, click the name of the report to open. The report opens as an additional tab on the My Performance Center Dashboard. The trend view tabs are displayed by default. Trend Views are contained within the trend view tabs. The trend view tabs are displayed by default.
See also	"\<Report Name> Trend Report " on page 424

Edit Trend View Menu

This menu contains options that enable you to edit the trend view's display and comparison settings.

To access	On the trend view, click the **Open edit menu** button ⚙ (Not available in the Trend Overview tab).

User interface elements are described below:

UI Elements	Description
3D Mode (stacked bar chart view only)	Enables you to view the chart in 3D.
Color Trends (table view only)	Activates the trend report's threshold settings. For more information about thresholds, see "Trend Reports Overview" on page 415.
Compare to baseline/previous (table view only)	Enables you to change the comparison method displayed in the trend view. For more information on comparison methods, see "Trend Reports Overview" on page 415.
Delete this Trend View	Deletes the trend view.
Do not show difference (table view only)	Enables you to hide value differentials between test runs. It is recommended to use this setting when exporting the report to a CSV format.
Edit Display Setting	Enables you to change the appearance of the trend view. The available settings are: **Table view.** This view is best suited for displaying comparisons between measurements. You can view threshold settings in this view only. For more information, see "Display Setting: Table" on the next page. **Line graph view.** This view is best suited for displaying trending information graphically over a timeline. For more information, see "Display Setting: Line Graph" on the next page. **Stacked bar chart view.** This view displays trending information graphically over a timeline. It is best suited for trending a small number of multiple measurements. For more information, see "Display Setting: Stacked" on page 432.
Edit Trend View Title	Enables you to edit the trend view title.
Export to CSV (table view only)	Enables you to export the report to a CSV format.
Select Measurements	Opens the Measurements Configuration dialog box, which enables you to add measurements to the trend view. For user interface details, see "Measurements Configuration Dialog Box" on page 441.

UI Elements	Description
Show difference as value/percentage (table view only)	Enables you to define how to display value differentials between test runs in the trend view - as values or as percentages.
Show Values (stacked bar chart view only)	Enables you to view the measurement values on the actual bar columns.

Display Setting: Table

This section explains the Table trend view display setting.

To access	
	1. On the trend view, click the **Open edit menu** button ⚙ (Not available in the Trend Overview tab).
	2. Select **Edit Display Setting**.
	3. In the Edit Display Setting dialog box, select **Table**.
Important information	You can view threshold settings in table view only.

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
<Measurement value name>	The name of the measurement value being trended, for example, minimum, maximum, average, and so on.
<Measurement value>	The actual value of the measurement being trended, and its comparison value, displayed per test run. For more information about comparison methods, see "Trend Reports Overview" on page 415.
Name	The name of the measurement being compared.
Type	The type of measurement being compared.

Display Setting: Line Graph

This section explains the Line Graph trend view display setting.

To access	1. On the trend view, click the **Open edit menu** button ⚙ (Not available in the Trend Overview tab).
	2. Select **Edit Display Setting**.
	3. In the Edit Display Setting dialog box, select **Line**.
Important information	• When you hold the cursor over the line graph, a tooltip appears displaying the exact amount of units for that measurement, correct to the nearest test run on the timeline. In other words, if you hold the cursor near the left point of the line graph, you see the value of the first test run.
	• When you click a section in the line graph/measurement in the legend, it becomes highlighted, as does the corresponding section in the legend/line graph.

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
\<graph slope>	The upward or downward slope of the line represents an upward or downward change in the measurement's unit. For example, a higher transaction response time (which is a performance regression), or a higher transactions per second value (which is a performance improvement).
\<x-axis>	Lists the test runs according to their run date.
\<y-axis>	The relevant unit of measurement. **Example:** For the Transaction Response Time measurement, the y-axis values represent seconds, while for the transactions per second measurement, the values represent the number of transactions.
B	Displays the measurement in bold.
C	Displays the color of the measurement as it appears in the graph. Click the colored square in the column to select a different color for the measurement.
Function	Displays the value of the measurement being trended.
Name	The name of the measurement.
Scale	Indicates the scale of the measurement. When viewing information in the line graph view, you can adjust the scale of any measurement to make comparing measurements more meaningful. To change the scale of a measurement, click the value in the column and select the desired scale from the Set Scale box that opens. You can also apply the selected scale to all the measurements in the graph.

UI Elements	Description
Type	Contains an acronym that identifies the measurement type. For a full list of available acronyms, see "Measurement Acronyms" on page 419.
V	Determines whether the measurement is visible. All measurements are displayed by default. Clear the check box to hide a measurement.

Display Setting: Stacked

This section explains the Stacked Bar Chart trend view display setting.

To access	1. On the trend view, click the **Open edit menu** button ⚙ (Not available in the Trend Overview tab). 2. Select **Edit Display Setting**. 3. In the Edit Display Setting dialog box, select **Stacked**.
Important information	• If different values are selected for the same measurement (for example, **Maximum** and **Average** transaction response times), then the measurements appear as stacked bars. That is, the values appear above each other for the bar that represents the transaction response time measurement for a specific test run. • When you hold the cursor over a bar, a tooltip appears which displays the exact number of units for that measurement, correct for that test run. • When you click a section in the bar chart/measurement in the legend, it becomes highlighted, as does the corresponding section in the legend/bar chart.

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
<bar height>	The height of the bar represents the change in the measurement's unit. For example, a higher transaction response time, which represents a performance regression, or a higher transactions per second value, which represents a performance improvement.
<x-axis>	Lists the test runs according to their run date.
<y-axis>	The relevant unit of measurement. **Example:** For the Transaction Response Time measurement, the y-axis values represent seconds, while for the transactions per second measurement, the values represent the number of transactions.

UI Elements	Description
C	Displays the color of the measurement as it appears in the graph. Click the colored square in the column to select a different color for the measurement.
Function	Displays the value of the measurement being trended.
Name	The name of the measurement.
Scale	Indicates the scale of the measurement. When viewing information in the line graph view, you can adjust the scale of any measurement to make comparing measurements more meaningful. To change the scale of a measurement, click the value in the column and select the desired scale from the Set Scale box that opens. You can also apply the selected scale to all the measurements in the graph.
Type	Contains an acronym that identifies the measurement type. For a full list of available acronyms, see "Measurement Acronyms" on page 419.
V	Determines whether the measurement is visible. All measurements are displayed by default. Clear the check box to hide a measurement.

Export Trend Report Page

This page enables you to export the selected trend report to a .pdf file.

To access	1. In My Performance Center, select **Perspectives** > **Trending**. 2. On the Performance Trending page, in the Trend Reports grid, click the name of the report to open. The report opens as an additional tab on the My Performance Center Dashboard.
See also	"<Report Name> Trend Report " on page 424

User interface elements are described below:

UI Elements	Description
Details area	Enables you to define report details, such as report title, author, and summary.
Logo area	Enables you to set the image that is placed on the cover page of the report and at the top of each page of the report. The HP logo is available by default.
content area	Enables you to specify data to include in your report, such as a title page, table of contents, and trend views.

Select Columns Dialog Box

This dialog box enables you to select columns to be displayed in the <report name> Trend Report's Trend Overview tab.

To access	On the <report name> Trend Report, select the **Trend Overview** tab, and click the **Customize table columns** button ![icon].
Important information	Due to space limitations, the names of the columns in the Trend Overview tab may differ from how they appear in this dialog box. In these cases, column names as they appear in the Trend Overview tab appear in parentheses.
See also	"<Report Name> Trend Report " on page 424

Select Columns for 'General Details' Section

User interface elements are described below:

UI Elements (A-Z)	Description
Project Name (Project)	The name of the project in which the test was run.
Publish State (State)	Indicates whether the test run was successfully added to the report or not, either **trended** or **not trended** respectively. A test run that was not successfully added appears in red and a tooltip displays the reason. **Note:** Displayed by default.
Run By	The name of the user who ran the test. **Note:** Displayed by default.
Run Date (Date)	The date of the load test run. **Note:** Displayed by default.
Run Duration (Duration)	The duration of the test run, in minutes. **Note:** Displayed by default.

UI Elements (A-Z)	Description
Run ID	The run ID. **Note:** Displayed by default.
Test Name (Test)	The name of the test.
Test Version	The version of the test.
Total Vusers in Run (Total Vusers)	The number of Vusers in the test run, within the selected time range.
Trended Time Range (Trended Range)	The time range within the test run that is selected for trending.

Select Columns for 'Workload Characteristics' Section

User interface elements are described below:

UI Elements (A-Z)	Description
Hits per Second (HPS)	The average number of hits per second within the trended time range.
Passed Transactions per Minute (TPM)	The number of transactions that passed per minute of the test run within the selected time range. **Note:** Displayed by default.
Passed Transactions per Second (TPS)	The number of transactions that passed per second of the test run within the selected time range. **Note:** Displayed by default.
Total Hits (Hits)	The total number of hits per second within the trended time range.
Total Number of Transactions (Transactions)	The total number of transactions in the test run that passed, failed or stopped within the selected time range. **Note:** Displayed by default.

UI Elements (A-Z)	Description
Total Throughput (Throughput)	The total throughput within the trended time range.
Total Vusers in Trended Range (Trended Vusers)	The maximum number of running Vusers within the trended time range. **Note:** Displayed by default.
Throughput per Second (Throughput per Sec.)	The amount of throughput per second within the selected time range.

Select Columns for 'Performance Overview' Section
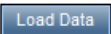
User interface elements are described below:

UI Elements (A-Z)	Description
Average Transaction Response Time (Response Time)	The weighted average transaction response time for all the transactions within the selected time range. **Note:** Displayed by default.
Errors per Second (EPS)	The average amount of errors per second within the selected time range. **Note:** Displayed by default.
Failed Transactions (Failed)	The actual amount of transactions that failed within the selected time range.
Passed Transactions (Passed)	The actual amount of transactions that passed within the selected time range.
Total Errors (Errors)	The total number of errors within the selected time range.
Transaction Success Rate (Success)	The percentage of the total amount of transactions that passed within the selected time range. **Note:** Displayed by default.

Select Test Runs to Trend Report Dialog Box

This dialog box enables you to add performance test runs to the report.

To access	1. In My Performance Center, select **Perspectives** > **Trending**.
	2. On the Performance Trending page, in the Trend Reports grid, click the name of the report to open. The report opens as an additional tab on the My Performance Center Dashboard.
	3. On the <report name> Trend Report, select the **Trend Overview** tab, and click the **Add runs to trend report** button ![plus] .
Important information	• In order to add performance test runs to the trend report, there must be a data processor present in your project pool.
	• 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. It is recommended that you use a machine dedicated for this purpose.
	• ALM Performance Center extracts the performance test data from Analysis using a granularity of 16 seconds. This value might be different from the defined granularity in Analysis, and may lead to slight variations when comparing values between Analysis and ALM Performance Center.

User interface elements are described below:

UI Elements	Description
Project	A list of available projects from which to select test instances to trend.
Test Set	A list of available test sets from which to select test instances to trend.
Test	The tests contained in the selected test set.
![Refresh icon]	**Refresh.** Enables you to refresh the dialog box information
![Load Data button]	Populates the test runs table with all analyzed instances of the selected test.
Run ID	The Run ID.
Run Name	The name of the test run.
Time Range	The duration of the test run that is selected for trending. **Example:** If a test run's overall duration is 30 minutes, and the time range is defined as **0-15min**, then only the first 15 minutes of the test run will be considered for trending. **Default:** The whole test run in selected.
Exec Date	The date and time of the test run.

UI Elements	Description
Duration	The duration (in minutes) of the test run.
Max Vusers	The maximum number of running Vusers during the test run.
Total Transactions Passed	The total number of passed transactions during the test run.
Total Errors	The total number of errors during the test run.
▼	**Time Range filter.** Opens the Define Time Range dialog box, which enables you to change the defined time range within a test run for trending purposes. In the Define Time Range dialog box, select one of the following options: ● **Trend Complete Run.** Makes all data collected from the beginning to the end of the test run available for trending. ● **Trend Part of Run**. Makes only part of the test run available for trending. Select the desired part of the run to trend by entering the start and end times in the **Start Time** and **End Time** boxes.
Add	Adds the selected test runs to the trend report.

Threshold Settings Dialog Box

This dialog box enables you to define which percentage differentials between measurement constitute significant improvements or regressions in performance.

To access	1. In My Performance Center, select **Perspectives** > **Trending**. 2. On the Performance Trending page, in the Trend Reports grid, click the name of the report to open. The report opens as an additional tab on the My Performance Center Dashboard. 3. On the <report name> Trend Report, click the **Set Thresholds** button ⊕ Thresholds .
Important information	The threshold definition and color settings are applied on a global level and hold true across all trend views in the report.

User interface elements are described below:

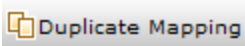| UI Elements (A-Z)	Description
Improvement	Enter the percentage differential between instances of the measurement that will be considered an improvement in performance.

UI Elements (A-Z)	Description
Major Regression	Enter the percentage differential between instances of the measurement that will be considered a major regression in performance.
Measurement Type	The type of measurement.
Minor Regression	Enter the percentage differential between instances of the measurement that will be considered a minor regression in performance.

Custom Measurement Mapping Dialog Box

This dialog box enables you to map measurements with different names to a new single measurement which you create.

To access	1. In My Performance Center, select **Perspectives** > **Trending**. 2. On the Performance Trending page, in the Trend Reports grid, click the name of the report to open. The report opens as an additional tab on the My Performance Center Dashboard. 3. On the <report name> Trend Report, click the **Custom Measurement Mapping** button .

User interface elements are described below:

UI Elements	Description
Create New Mapping	Opens the Add New Mapping dialog box, enabling you to create a new mapped measurement. In the Add New Mapping dialog box, enter the following information: • **Name.** The name of the new mapped measurement. • **Description.** A description of the new mapped measurement. • **Data Type.** Select the measurement type: **Transaction**, **Monitor**, or **Other**.
Duplicate Mapping	Creates a duplicate of the selected mapped measurement.
Refresh	Refreshes the mapped measurements table.
Date Type	The mapped measurement's data type.

UI Elements	Description
Description	A description of the mapped measurement.
Details	A table which lists all the test runs in the trend report. The runs appear in the same order as they appear in the Trend Overview tab.
	Click in the **Type** and **Name** fields to select which measurements to map to the mapped measurement.
	The following fields appear in the table:
	• **Run ID.** The test run ID.
	• **Type.** The measurement type.
	• **Name.** The measurement name.
	Note: When you use the **Default** option, all future instances of the measurement are automatically mapped to the current settings.
ID	The mapped measurement's ID.
Name	The mapped measurement's name.

Add Trend Views to Tab Dialog Box

This dialog box enables you to add trend views to a trend report.

To access	1. In My Performance Center, select **Perspectives** > **Trending**.
	2. On the Performance Trending page, in the Trend Reports grid, click the name of the report to open. The report opens as an additional tab on the My Performance Center Dashboard.
	3. Select the desired trend view tab.
	4. Click the ⬇ down arrow next to the tab name to open the tab management menu and select ⊞ **Add View to Tab**.

User interface elements are described below:

UI Elements	Description
Monitors Trend Views	Trend measurements related to monitors.

UI Elements	Description
Other Trend Views	Trend measurements other than transactions and monitor measurements (Web Resources and Error Statistics). Included in this section are three basic non-configured trend views, each one based on one of the trend view display options. You can select one of these trend views and customize it as desired.
Transactions Trend Views	Trend measurements related to transactions.

Measurements Configuration Dialog Box

Each trend view has a default set of measurements that it trends. This dialog box enables you to add additional measurements.

To access	1. In My Performance Center, select **Perspectives** > **Trending**.
	2. On the Performance Trending page, in the Trend Reports grid, click the name of the report to open. The report opens as an additional tab on the My Performance Center Dashboard. The trend view tabs are displayed by default.
	Trend Views are contained within the trend view tabs.
	3. On a trend view, click the **Open edit menu** button ⚙ (Not available in the Trend Overview tab), then select **Select Measurements**.

Trend Data Types Pane

The Trend Data Types pane contains a list of the measurements that are available for trending. Only measurements that contain data appear.

User interface elements are described below:

UI Elements	Description
Monitors	All monitor related measurements that contain data.
Others	All non-transaction/monitor measurements.
Transactions	All transactions that contain data.
User-Defined	This node appears only if you have mapped any measurements. For more information on mapped measurements, see "Trend Reports Overview" on page 415.

Measurement Selection Pane

User interface elements are described below:

UI Elements (A-Z)	Description
	Rule. This icon indicates that the measurement has already been selected using an automatic selection rule.
Define automatic selection rule	Opens the Automatic Selection Rule dialog box, which enables you use regular expressions to define a rule that automatically selects measurements to be included in the trend view. The automatic selection rule applies to measurements that are currently displayed in the trend report data, as well as any future measurements.
Name	The name of the available measurement.
Select values to trend	Displays the available values of the selected measurement which can be included in the trend view.

Chapter 35: Performance Application Lifecycle (PAL)

This chapter includes:

PAL Overview

Performance Application Lifecycle (PAL) is a process which enables better communication between the development and operation teams around the testing and monitoring of applications.

PAL enables you to use user traffic and system monitoring data in production to design a load test that closely resembles production behavior. You can import production data from HP Business Service Management (BSM), Webtrends Analytics, Microsoft IIS W3C Extended Log Format, and Google Analytics.

Using the production system information, you can generate PAL reports to analyze and compare results between the production data and the load test data. Based on the results of these comparisons, load tests can be tuned to resemble production system activity.

PAL's importance stems from the basic need to correctly plan testing initiatives. Without a clear understanding of what users are doing in production, and how the production system behaves, it is very difficult to:

- focus testing on the most widely used business cases and scenarios

- test the system under appropriate loads

- define testing targets (for example, Service Level Agreements)

This section also includes:

- "PAL Flow" below

- "Comparison Methods" on the next page

- "PAL Thresholds" on page 447

- "Tuning Load Tests" on page 447

PAL Flow

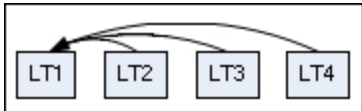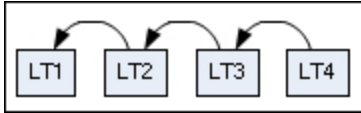The PAL flow includes the following main steps:

Step	Description
Import production data	Import data from the production systems. Performance Center supports data from HP Business Service Management (BSM), Webtrends Analytics, Microsoft IIS W3C Extended Log Format, and Google Analytics. Different production monitoring systems provide different data which may influence which information is available to the user.
Create PAL report using production data	Create a report based on the production data. The report displays information on the different activities that were observed in production. For example, measurements related to transactions, such as hits and response time.
Design and run load test	Use the production report to create a load test. The first load test design will probably exhibit very different behavior from production and is only a starting point for tuning. Execute the load test to gather traffic data and other information.
Add load test data to PAL report	Add load test data to the report and compare it to the production data. This comparison is the basis of the load test tuning process.
Tune load test	Update the load test to try bring the behavior and patterns of usage to resemble production as closely as possible. This is an iterative process in which the load test is updated, executed, and compared until it resembles the load in production.
Export data to production	Export various items that can help speed up the deployment of a new version to production. This information may include the scripts that can be used in Business Service Management (BSM) monitoring and the SiteScope templates that can be re-used in production. The information should be exported once the defined load test has been run on the final version of the application and the application has been certified for release.

Comparison Methods

There are two methods of comparing measurements contained in a performance test run for the purposes of comparing testing environment data with real production environment data.

Comparison Method	Description
Compare to Baseline	You select one performance test run in the PAL report and define it as the baseline. All measurements in the report are then compared to the measurements contained in the baseline.

Comparison Method	Description
Compare to Previous	All measurements in a performance test are compared to the measurements in the performance test run that immediately precedes it in the report. Compare to previous depends on the order of the data sets in the report. LT1 LT2 LT3 LT4

PAL Thresholds

To identify significant differences in performance, you can define unique thresholds to track differentials between measurements being compared. If a differential exceeds a defined threshold, that value appears in a predetermined color, identifying it as a minor difference, or major difference.

Tuning Load Tests

The first time you run your load test it will probably exhibit very different behavior than your production report. Remember that the output generated is only a starting point for tuning. Based on your PAL comparison reports, update the load test, run it again, and compare the updated load test to production. Continue this iterative process until the load test closely resembles production.

You can tune the test during runtime or after the run ends. When tuning during runtime, the framework enables you to continuously adjust the data to view your changes almost immediately.

How to Work with PAL

This task describes how to work with PAL to create a testing environment similar to your real production environment.

This task includes the following steps:

1. Open PAL

   Use one of the following:

   - On the ALM sidebar, under **Performance Center**, select **Performance Lifecycle**. Click **Open PAL Perspective in MyPC**.

   - In My Performance Center, select **Perspective** > **PAL**. For more information, see "Personalizing Performance Center" on page 382.

2. Define a PAL application
   a. Click **Manage PAL Applications**. The Manage PAL Applications Dialog Box opens.

b. Add an application. For user interface details, see "Manage PAL Applications Dialog Box" on page 454.

3. Import production data

a. In the PAL Flow pane, click **Import Production Data**. The PAL Data Sets Pane opens. For user interface details, see "Manage Production Data Sets Pane" on page 453.

b. Select a data set folder and click **Upload**. The Upload Production Data Set Dialog Box opens. For user interface details, see "Upload Production Data Set Dialog Box" on page 455.

c. Upload the data set file. The data file is stored as a .zip file.

For information on how to create data sets using IIS W3C extended log format, Google Analytics, or Webtrends, see "How to Create Data Sets from IIS, Google Analytics, or Webtrends" on the next page.

4. Create production report

a. In the PAL Flow pane, click **Create Production Report**. The PAL Reports Pane opens. For user interface details, see "PAL Reports Pane" on page 456.

b. Select a report folder and click **New PAL Report**. The Create New Performance Application Lifecycle Report Dialog Box opens. For user interface details, see "Create New Performance Application Lifecycle Report Dialog Box" on page 457.

c. In the Create New Performance Application Lifecycle Report Dialog Box, click **Create**. The report opens as an additional tab on the My Performance Center Dashboard. The report contains sub-tabs. The Data Sources sub-tab is displayed by default. For user interface details, see "<Report Name> PAL Report" on page 461.

d. Define data sets and performance metrics to be used for the production report. For example, you can set threshold settings, custom measurement mappings, and scaling factors.

5. Design load test based on production report

a. In the PAL Flow pane, click **Design and Run load test**. The Performance Test Set Pane opens. For user interface details, see "Performance Test Set Pane" on page 397.

b. Click **Create New Test** to create a performance test. The Create New Performance Test dialog box opens. For user interface details, see "Create New Performance Test Dialog Box" on page 459.

6. Run load test

In the Performance Test Set Pane, click **Run Test**. The Run dialog box opens. For user interface details, see "Run Test Dialog Box" on page 220.

7. Add load test data to the report

    a. In the PAL Flow pane, click **Add load test data to report**. The PAL Reports Pane opens. For user interface details, see "PAL Reports Pane" on page 456.

    b. Select a report. In the Data Sources sub-tab, add load test data to the report. For user interface details, see "Data Sources Tab" on page 463.

    c. Click the report sub-tabs to view and compare production and load test behavior. For user interface details, see "PAL Report View Tabs" on page 465.

8. Tune the load test

    a. Based on the comparison report, edit the load test and rerun the test. For user interface details, see "Performance Test Set Pane" on page 397.

    b. View the updated report and compare the load test and production data. For user interface details, see "PAL Report View Tabs" on page 465.

    c. Continue tuning until the load test closely resembles production. You can tune the test during runtime or after the run ends.

9. Export the test run details

    a. In the PAL Flow pane, click **Export data to production**. The Test Run Pane opens. For user interface details, see "Test Runs Page" on page 399.

    b. View the result information for the selected test run.

    c. To export test run data once the load test has run on the final version of the application, click **Export PAL Data**. For user interface details, see "Export PAL Data Dialog Box" on page 460.

How to Create Data Sets from IIS, Google Analytics, or Webtrends

This task describes how to create a data sets from IIS W3C Extended Log File Format, Google Analytics, or Webtrends.

Note: This task is part of a higher-level task. For details, see "How to Work with PAL" on page 447.

Creating Data Sets from IIS W3C Extended Log File Format

This task includes the following steps:

1. Create log files

   a. Open the Internet Information Services (IIS) Manager window.

   b. Under **Connections**, select a Website (not a virtual directory).

   c. In the right pane, select **Logging**.

   d. In the Log File section, under **Format**, verify that **W3C** is selected.

   e. Click the **Select Fields** button and select the following fields: **Date**, **Time**, **Client IP Address**, **Server Name**, **Server Port**, **Method**, **URI Stem, URI Query**, **Protocol Status**, **Time Taken**, **Host**, **User Agent**, **Cookie**, and **Referer**.

   f. Under **Directory**, set the directory location for storing the logs.

2. Create the IIS data set file.

   Open the PAL Data Set Creator wizard to create the IIS data set file. For user interface details, see "PAL Data Set Creator Wizard" on page 482.

Creating Data Sets from Google Analytics

This task includes the following steps:

1. Create a new custom report.

   a. From Google Analytics, click the **Customization** tab.

   b. Click the **New Custom Report** button.

   c. Add a title name.

   d. In the **Type** section, select **Flat Table**.

   e. In the **Metric Groups** section, add **Unique Visitors** and **Pageviews**.

   f. In the **Dimensions** section, add **Page** and Hour of **Day**.

   g. In the **Views** section, select Web sites.

   h. Click **Save**.

2. Export the report.

   Open the report, and select **Export > CSV**.

3. Create the Google Analytics data set file.

Open the PAL Data Set Creator wizard to create the Google Analytics data set file. For user interface details, see "PAL Data Set Creator Wizard" on page 482.

Creating Webtrends Data Sets

Open the PAL Data Set Creator wizard to create the Webtrends data set file. For user interface details, see "PAL Data Set Creator Wizard" on page 482.

PAL User Interface

This section includes:

PAL Flow Pane

The PAL Flow pane enables you to navigate through the PAL phases.

To access	Use one of the following: • On the ALM sidebar, under **Performance Center**, select **Performance Lifecycle**. Click **Open PAL Perspective in MyPC**. • In My Performance Center, select **Perspectives** > **PAL**. The PAL Flow pane is located at the top of the page.
Relevant tasks	"How to Work with PAL" on page 447
See also	"PAL Overview" on page 445

User interface elements are described below:

UI Elements	Description
	Introduction to PAL. Displays the PAL overview pane.
	Import production data. Opens the Manage Production Data Set pane. This pane enables you to import data from the production system. For user interface details, see "Manage Production Data Sets Pane" on the next page.
	Create production report. Opens the PAL Reports pane. This pane enables you to manage PAL reports. It displays a list of available reports and enables you to create new reports. It also enables you to delete or duplicate existing reports. For user interface details, see "PAL Reports Pane" on page 456.
	Design and run load test. Opens the Performance Test Set pane. This pane enables you to design and run load tests based on production reports. For user interface details, see "Performance Test Set Pane" on page 397.

UI Elements	Description
	Add load test data to report. Opens the PAL Reports pane. This pane enables you to manage PAL reports. It displays a list of available reports and enables you to create new reports. It also enables you to delete or duplicate existing reports. For user interface details, see "PAL Reports Pane" on page 456.
	Tune load test. Opens the Performance Test Set pane. This pane enables you to design and run load tests based on production reports. You can tune the test during a test run or at the end of the run. For user interface details, see "Performance Test Set Pane" on page 397.
	Export data to production. Opens the Performance Test Runs pane. This pane enables you to manage results related actions for test runs. For user interface details, see "Test Runs Page" on page 399.
⊟	Minimizes the PAL Flow pane.
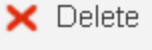
Manage Production Data Sets Pane

This pane enables you to import data from the production system.

To access	1. In My Performance Center, select **Perspective** > **PAL**. 2. In the PAL Flow pane, click **Import Production Data**.
Relevant tasks	"How to Work with PAL" on page 447
See also	"PAL Overview" on page 445

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
<My Performance Center common UI elements>	For My PC menus and buttons, see "My Performance Center Window" on page 384.
	Opens the Upload Production Data Set. For more details, see "Upload Production Data Set Dialog Box" on page 455.
	Enables you to add a data set folder.
	Enables you edit the data set folder details.
	Saves the data set locally in ZIP format.

UI Elements	Description
✖ Delete	Enables you to delete the data set folder.
<PAL Reports table>	Displays a list of all available PAL reports.
Name	The name of the data set.
ID	The ID number of the data set.
Date Uploaded	The date the data set was uploaded.
Description	A description of the data set.
Application	The application name.

Manage PAL Applications Dialog Box

This dialog box enables you to associate PAL entities, such as data sets with a specific AUT.
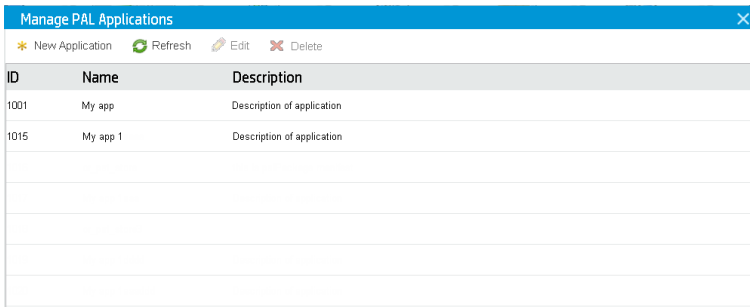
To access	1. In My Performance Center, select **Perspective** > **PAL**. 2. Click **Manage PAL Applications**.
Relevant tasks	"How to Work with PAL" on page 447
See also	"PAL Overview" on page 445

User interface elements are described below:

UI Elements	Description
✱ New Application	Defines a new application.
⟳ Refresh	Refreshes the table.

UI Elements	Description
Edit	Edits a selected application.
Delete	Deletes a selected application.
ID	The ID number of the application.
Name	The name of the application.
Description	A description of the application.

Upload Production Data Set Dialog Box

This dialog box enables you to upload production data set files.

To access	1. In My Performance Center, select **Perspective** > **PAL**. 2. In the PAL Flow pane, click **Import Production Data**. 3. In the PAL Data Sets pane, click **Import**.
Relevant tasks	"How to Work with PAL" on page 447
See also	"PAL Overview" on page 445

User interface elements are described below:
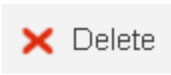
UI Elements	Description
Name	The name of the data set file.
Description	A description of the data set file.
Select production data set file	Click the **Browse** button to select the data set file.
Select Folder	Indicates the folder for storing the data set file.
Take application name from data set	Uses the application defined in the data set file.
Select Application	Indicates the application for use with the data set file.
Messages	Indicates the progress of the uploading process.
Upload	Uploads the data set file to the specified location.

PAL Reports Pane

This pane enables you to manage PAL reports. It displays a list of available reports and enables you to create new reports. It also enables you to delete or duplicate existing reports.

To access	1. In My Performance Center, select **Perspective** > **PAL**. 2. In the PAL Flow pane, click **Create Production Report** or **Add load test data to report**.
Tip	On the ALM sidebar, under **Performance Center**, select **Performance Lifecycle** to view the five most recently created PAL reports.
Relevant tasks	"How to Work with PAL" on page 447
See also	"PAL Overview" on page 445

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
<My Performance Center common UI elements>	For My PC menus and buttons, see "My Performance Center Window" on page 384.
New PAL Report	Opens the Create New Performance Application Lifecycle Report, which enables you to create PAL reports. For more details, see "Create New Performance Application Lifecycle Report Dialog Box" on the next page.
New Folder	Adds a PAL report folder.
Duplicate	Creates a duplicate of the selected report.
Rename	Renames the selected report or folder.
Delete	Deletes the selected report or folder.
<PAL Reports table>	Displays a list of all available reports. Click a report to view data. For more details, see "<Report Name> PAL Report" on page 461.
Name	The name of the report.
ID	The ID number of the report.
Description	A description of the report.

UI Elements	Description
Report Items	The report items in use.
Application	The name of the application in use.
Created By	The user who created the report.

Create New Performance Application Lifecycle Report Dialog Box

This dialog box enables you to create PAL reports.

To access	On the PAL Reports page, click **New PAL Report** ![New PAL Report].
Relevant tasks	"How to Manage a Performance Test Run" on page 200

General Details Area

User interface elements are described below:

UI Elements	Description
Name	The name of the report.
Description	A description of the report.
Location	The location of the report.

Application Area

User interface elements are described below:

UI Elements	Description
Select an application to base the report upon	List the available applications.

Template Area

User interface elements are described below:

UI Elements	Description
Based on HP BSM Production Info	A report based on HP Business Service Management (BSM). This template displays the following preconfigured PAL report views: • Workload Data • Performance Data • Distribution Data • Monitors Data
Based on HP BSM Production Info - Advanced	A report based on HP Business Service Management (BSM). This template displays the following preconfigured PAL report views: • Workload Data • Performance Data • Distribution Data • Monitors Data • Top 10 Hits, Top 10 Users and Workload Data • Top 10 Response Time and Performance Data • Top 10 Hits Percentage and Distribution Data

UI Elements	Description
Based on non-BSM info (e.g., WebTrends)	A report based on on WebTrends and other non-HP data sources. This template displays the following preconfigured PAL report views: • Workload Data • Performance Data • Distribution Data
Empty	Provides only the basic layout for the report without the preconfigured PAL report views.
Description	A description of the selected template.

Create New Performance Test Dialog Box

This dialog box enables you to create a performance test.

To access	Use one of the following options: • In My Performance Center, select **Perspective** > **Test Plan**. In the test tree, click **New Test**. • In My Performance Center, select **Perspective** > **PAL**. In the PAL Flow pane, click **Design and run load test** or **Tune load test**. Click **Create New Test**.
Relevant tasks	"How to Work with PAL" on page 447
See also	"PAL Overview" on page 445

User interface elements are described below:

UI Elements	Description
Test name	The name of the performance test.
Test Plan folder	The folder in the test plan tree in which the test resides. **Available from:** PAL perspective
Assign to Test Set	The test set in which the test resides.

Export PAL Data Dialog Box

This dialog box enables you to export test run data once the load test has run on the final version of the application.

To access	1. In My Performance Center, select **Perspective** > **PAL**. For more information, see "Personalizing Performance Center" on page 382. 2. In the PAL Flow pane, click **Export Data to Production**. 3. Click **Export PAL Data**.
Relevant tasks	"How to Work with PAL" on page 447
See also	"PAL Overview" on page 445

User interface elements are described below:

UI Elements	Description
Description	The description of the exported test run data.
Run Info	The list of exported information.
Application	Indicates the associated application.
Export	Saves the data set locally in ZIP format.

<Report Name> PAL Report
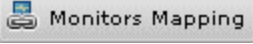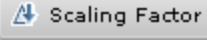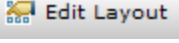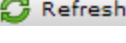
This tab enables you to view and manage the PAL report. The PAL reports includes multiple tabs that allow you manage the data that is included in the report, as well as to manage the views which display the PAL information.

To access	1. In My Performance Center, select **Perspective** > **PAL**. 2. In the PAL Flow pane, click **Create Production Report** or **Add load test data to report**. 3. In the PAL Reports pane, click a report.
Important information	The PAL sub-tabs which appear by default depend on which template the report is based on. The Data Sources tab is common to all PAL reports irrespective of which template is selected.
Relevant tasks	"How to Work with PAL" on page 447
See also	"PAL Overview" on page 445

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
Export to PDF	Opens the Export Report to PDF dialog box, which enables you to export the selected report to a .pdf file. For user interface details, see "Export Report to PDF Dialog Box" on page 463.

UI Elements	Description
Thresholds	Opens the Threshold Settings dialog box, which enables you to define the thresholds to be used for identifying major and minor differences between production and testing data. For user interface details, see "Threshold Settings Dialog Box" on page 474.
Transactions Mapping & Grouping	Opens the Transactions Mapping and Grouping Dialog Box, which enables you to map and group similar transactions in your production data or in your load test results. For user interface details, see "Transactions Mapping and Grouping Dialog Box" on page 477.
Monitors Mapping	Opens the Monitors Mapping dialog box which enables you to map production and testing monitored hosts to monitor measurements, such as CPU, memory, and virtual memory used. For user interface details, see "Monitors Mapping Dialog Box" on page 475.
Scaling Factor	Opens the Set Scaling Factors dialog box, which enables you to define the scaling factor. For user interface details, see "Set Scaling Factors Dialog Box" on page 479.
Global Filter	Opens the Global Filter dialog box, which enables you to filter the transactions displayed in the PAL report views. For user interface details, see "Set Global Transactions Filter Dialog Box" on page 480.
Edit Layout	Enables you to arrange views within a PAL view tab.
Active tabs	Enables you to view tabs that are not currently displayed.
Refresh	Refreshes the information contained in the report.
Data Sources Tab	The Data Sources tab is used for managing the information contained in the PAL report. For more details, see "Data Sources Tab" on the next page.
<PAL report view tabs>	The PAL report view tabs contain the PAL report views and are defined by the template on which the report is based. For more details, see "PAL Report View Tabs" on page 465.
<PAL report views>	PAL report views are display items that present PAL information, and are contained within the PAL report view tabs. For more information, see "PAL Report Views" on page 466.
	Add a New Tab. Adds a new tab to the report.

Export Report to PDF Dialog Box

This page enables you to export the selected PAL report to a .pdf file.

To access	1. In My Performance Center, select **Perspective** > **PAL**.
	2. In the PAL Flow pane, click **Create Production Report** or **Add load test data to report**.
	3. In the PAL Reports pane, click a report.
	4. Click **Export to PDF**.
See also	"<Report Name> PAL Report" on page 461
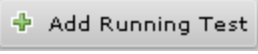
User interface elements are described below:

UI Elements	Description
Details area	Enables you to define report details, such as report title, author, and summary.
Logo area	Enables you to set the image that is placed on the cover page of the report and at the top of each page of the report. The HP logo is available by default.
content area	Enables you to specify data to include in your report, such as a title page, table of contents, and report views.

Data Sources Tab

The Data Sources tab is used for managing the information contained in the PAL report.

To access	1. In the PAL Flow pane, click **Create Production Report** or **Add load test data to report**.
	2. In the PAL Reports pane, click a report. The Data Sources tab is displayed by default.
Important information	The Data Sources tab is common to all PAL reports, irrespective of which template is selected.
See also	"<Report Name> PAL Report" on page 461

User interface elements are described below:

UI Elements	Description
[+ Add Production Data]	Opens the Add Data dialog box and displays the Production tab. Select the production data to be used for comparison. For user interface details, see "Add Data Dialog Box" on page 471.
[+ Add Testing Data]	Opens the Add Data dialog box and displays the Test Run Results tab. Select the testing data to be used for comparison. For user interface details, see "Add Data Dialog Box" on page 471.
[+ Add Running Test]	Opens the Select Run Test dialog box and displays all the tests that are currently running. To tune a test during runtime, select a running test, select the refresh frequency rate from the **Refresh Time Intervals** drop-down list. Click **OK**. The test is added to the Data Sources tab. **Note:** A test added during runtime is displayed in blue in the Data Sources grid. After the test run ends, you can publish it by clicking **Add Testing Data**. The test will now be displayed in black.
[✖]	**Remove item from report.** Removes production data sets or test runs from the PAL report.
[baseline icon]	**Set run as baseline.** Sets the selected item (production data set or test run) as the baseline run for the comparison. **Note:** The first item which is added to the report is automatically defined as the baseline.
[⬆⬇]	**Move Up/Down.** Moves the selected item up or down in the order. Changing the position of the report item may have an effect on the comparison value when the Compare to previous method is selected. For more information on comparison methods, see "PAL Overview" on page 445.
[columns icon]	**Customize Table Columns.** Customizes which columns appear in the PAL Runs table. For user interface details, see "Select Columns Dialog Box" on page 473.
<Data Sources grid>	Displays information for all the items in the report. For a list of the available fields, see **Customize Table Columns** above.
Report Item Information	Includes a description and current state of the selected report item.
PAL Report Completion	Indicates the flow for completing the report.

PAL Report View Tabs

A report tab can contain any number of views. The tabs are defined by the template on which the report is based. The tabs and views can be customized.

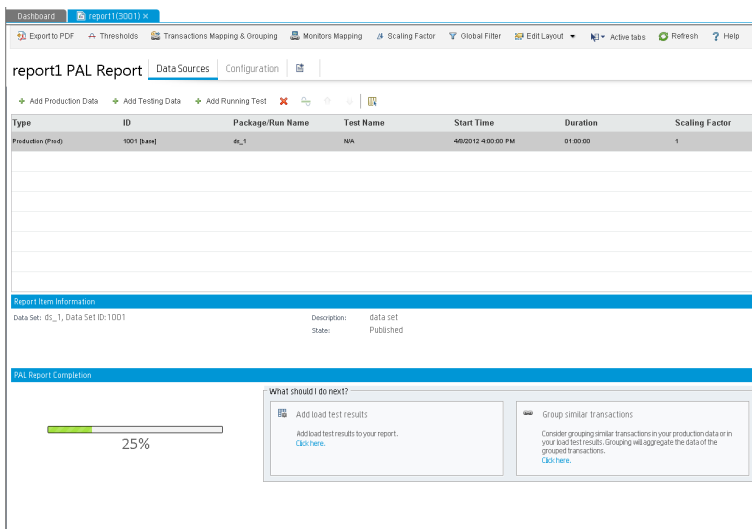| **To access**	1. In My Performance Center, select **Perspectives** > **PAL**.
	2. In the PAL Flow pane, click **Create Production Report** or **Add load test data to report**.
	3. In the PAL Reports pane, click a report. The report opens as an additional tab on the My Performance Center Dashboard. The PAL report view tabs are displayed.
Important information	• The view tabs which appear by default depend on which template the report is based on.
	• For user interface details on the Data Sources tab, see "Data Sources Tab" on page 463.
Relevant tasks	"How to Work with PAL" on page 447
See also	"PAL Overview" on page 445

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
⌄	Click the down arrow next to the tab name to open the tab management menu, which contains the following options: • **Add View to Tab.** Opens the Add Views to Tab dialog box. For user interface details, see "Add Views To Tab Dialog Box" on page 468. • **Edit Tab Title.** Enables you to change the name of the tab. • ⬅ **Move Tab Left.** Moves the tab left in the tab order. • ➡ **Move Tab Right.** Moves the tab right in the tab order. • ✖ **Delete This Tab.** Deletes the tab and all of the trend views contained in it, from the report. **Note:** This option is not available for all views.
\<PAL report view>	A display item that presents PAL information within a PAL report view tab. For more information, see "PAL Report Views" below.

PAL Report Views

A PAL report view is a display item that presents PAL information for a particular performance metric.

To access	1. In My Performance Center, select **Perspectives** > **PAL**. 2. In the PAL Flow pane, click **Create Production Report** or **Add load test data to report**. 3. In the PAL Reports pane, click a report. The report opens as an additional tab on the My Performance Center Dashboard. The PAL report view tabs are displayed. The PAL report views are contained within the tabs.
Relevant tasks	"How to Work with PAL" on page 447
See also	"PAL Report View Tabs" on the previous page

User interface elements are described below:

UI Elements	Description
⚙	**Edit PAL report view.** Contains options that enable you to edit the PAL report view's display and comparison settings.
⌜⌝⌞⌟	**Show in Maximized/Normal view.** Maximizes or returns to the normal PAL report view.
⊟ ⊞	**Minimizes/Maximizes data.** Minimizes or maximizes the displayed data.

PAL Report View Menu

Important	Some options are not available in all views.

User interface elements are described below:

UI Elements	Description
Select Measurements	Opens the Measurements Configuration dialog box, which enables you to add measurements to the view. For user interface details, see "Select Measurements Dialog Box" on page 470.
Edit Display Setting	Enables you to change the appearance of the view. The available settings are table view, line graph view, and stacked bar chart view.
Edit View Title	Enables you to edit the view title.
Compare to baseline/previous	Enables you to change the comparison method displayed in the view. For more information on comparison methods, see "Comparison Methods" on page 446.
Show difference as value/percentage	Enables you to define how to display value differences between items or data sets in the view - as values or as percentages.
Do not show difference	Enables you to hide value differences between items or data sets. It is recommended to use this setting when exporting the view to a CSV format.
Color View	Activates the PAL report's threshold settings.
Export to CSV	Enables you to export the view to a CSV format.
Delete this View	Deletes the view.

Add Views To Tab Dialog Box

This dialog box enables you to add views to a PAL report view tab.

To access	1. In My Performance Center, select **Perspectives** > **PAL**.
	2. In the PAL Flow pane, click **Create Production Report** or **Add load test data to report**.
	3. In the PAL Reports pane, click a report. The report opens as an additional tab on the My Performance Center Dashboard. The PAL report view tabs are displayed.
	4. Click the ⤓ down arrow next to the tab name to open the tab management menu and select ⊞ **Add View to Tab**.
Important Information	Some views are not relevant for all report types.
See also	

User interface elements are described below:

UI Elements	Description
Workload	Displays data that will help you tune the amounts and pacing of the scripts.
Top 10 Hits	Lists the top ten actions with the highest number of hits.

UI Elements	Description
Top 10 Users	Lists the top ten actions with the highest number of users.
Performance Data	Shows the number of hits for each action, as well as response time, and total time in system.
Top 10 Response Time	Lists the top ten actions with the highest total response time in seconds.
Top 10 Time in System	Lists the top ten actions with the highest time in the system in seconds.
Distribution	Displays distributions of different business processes.
Top 10 Hits Percentage	Lists the top ten actions with highest number of hits by percentage.
Top 10 Users Percentage	List the top ten actions with highest number of users by percentage.
Monitoring	Displays monitoring data that helps compare the behavior of the underlying hardware and software in the production and testing systems.
Over Time View	Displays hits over time in the production system.
Locations Throughput	Displays location throughput.
Locations Total Runs	Displays total runs per location.
Add	Adds select views to a PAL report view tab.

Select Measurements Dialog Box

Each PAL view has a default set of measurements that it uses. This dialog box enables you to customize the measurements displayed in a selected report view.

To access	1. In My Performance Center, select **Perspectives** > **PAL**.
	2. In the PAL Flow pane, click **Create Production Report** or **Add load test data to report**.
	3. In the PAL Reports pane, click a report. The report opens as an additional tab on the My Performance Center Dashboard. The PAL report view tabs are displayed. The PAL report views are contained within the tabs.
	4. On a PAL report view, select the menu button , then select **Select Measurements**.
Important Information	The term transaction applies to any activity measured by testing and production systems. This includes VuGen script transactions, HP RUM transactions and actions, and URLs measured by other production systems.

User interface elements are described below:

UI Elements	Description
Data Types pane	Displays transactions with data. The transactions are enabled based on existing data.

UI Elements	Description
Transactions Pane	This pane displays the following: • **<Top check box>.** Selects/clears all transactions in the grid. To select/clear a specific transaction, select/clear the check box to the left of the transaction name. • **Mapping Type.** Indicates the mapping type: **All**, **Mapped**, **Not Mapped**. • **Name.** Enables you to locate a specific transaction. Type the name and press **Enter**. • **Page Size.** Sets the number of transactions displayed per page.
Apply	Applies the changes.
Use Global Filter	Includes the transactions from the Set Global Transactions Filter dialog box. For more details, see "Set Global Transactions Filter Dialog Box" on page 480.

Add Data Dialog Box

This dialog box enables you to add production data sets and performance test runs to the report. The added data is used for comparison and it is the basis for the load test tuning process.

To access	1. In the PAL Flow pane, click **Create Production Report** or **Add load test data to report**. 2. In the PAL Reports pane, click a report. 3. In the Data Sources tab, click **Add Production Data** or **Add Testing Data**.

User interface elements are described below:

UI Elements	Description
Production Tab	Enables you to select a production data set for the PAL report.
Test Run Results Tab	Enables you to select a test run for the PAL report.
Add	Adds the selected production data set and test run results to the PAL report.
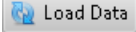
Production Tab

User interface elements are described below:

UI Elements	Description
▼	Enables you to filter the data sets displayed in the production grid. Select one of the following options: • **Only data sets linked to the report application.** Displays data sets associated with PAL application defined in the selected report. • **All**. Displays all data sets regardless of a selected PAL application.
Load Data	Populates the production grid with data sets based on the matched filtering criterion.
Name	The name of the data set.
ID	The data set ID.
Type	The data set type.
Date Uploaded	The date the data set was uploaded.
Description	The description of the data set.
Application	The application associated with the data set.

Test Run Results Tab

User interface elements are described below :

UI Elements	Description
▼	Enables you to filter the results displayed in the run results grid. Includes the following options: **Project**, **Test Set**, and **Test**.
Load Data	Populates the run results grid with results based on the matched filtering criteria.
ID	The Run ID.
Run Name	The name of the test run.

UI Elements	Description
Time Range	The duration of the test run that is selected. **Example:** If a test run's overall duration is 30 minutes, and the time range is defined as **0-15 min**, then only the first 15 minutes of the test run will be considered for trending. **Default:** The whole test run in selected.
▼	**Time Range filter.** Opens the Define Time Range dialog box, which enables you to change the defined time range within a test run for reporting purposes. Select one of the following options: • **Publish Complete Run.** Makes all data collected from the beginning to the end of the test run available for the report. • **Publish Part of Run**. Makes only part of the test run available for the report. Select the desired part of the run by entering the start and end times in the **Start Time** and **End Time** boxes.
Exec Date	The date and time of the test run.
Duration	The duration (in minutes) of the test run.
Max Vusers	The maximum number of running Vusers during the test run.
Total Transactions Passed	The total number of passed transactions during the test run.
Total Errors	The total number of errors during the test run.

Select Columns Dialog Box

This dialog box enables you to select columns to be displayed in the <report name> PAL Report's Data Sources tab.

To access	On the <report name> PAL Report, select the **Data Sources** tab, and click the **Customize table columns** button 🔲 .
See also	"<Report Name> PAL Report" on page 461

User interface elements are described below:

UI Elements	Description
Duration	The duration of the test run, in minutes.
Global Filter	The applied global filter.
ID	The run ID.
Name	The package or run name.
Publish Progress	Indicates whether the report item was successfully added to the report.
Test Name	The test name.
Scaling	Indicated the scaling factor. For more details on setting the scaling factor, see "Set Scaling Factors Dialog Box" on page 479.
Start Time	The date and time of the report item.
Type	Indicates the type of report item.

Threshold Settings Dialog Box

This dialog box enables you to define threshold values for the PAL measurement types.

To access	On the <report name> PAL Report, click the **Thresholds** button ⊕ Thresholds .
Important information	• The term transaction applies to any activity measured by testing and production systems. This includes VuGen script transactions, HP RUM transactions and actions, and URLs measured by other production systems. • The threshold definition and color settings are applied on a global level and hold true across all views in the report.

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
Measurement Type	The type of measurement.
Minor Difference	Enter a threshold value for indicating a minor difference between the production and test data.

UI Elements	Description
Major Difference	Enter a threshold value for indicating a major difference between the production and test data.
<color settings>	Enables you to select in which color the measurement appears in the report. Click the colored square in the column to select a different color for the measurement.
Response Time	Measures the average response time transactions take to complete (in seconds).
Hits	Measures the total number of transaction hits over the entire test run.
Hits Distribution	The percentage of transaction hits occurrence from the total amount of all transaction hits.
Users	Counts the number of users that performed a specific transaction.
Users Distribution	The percentage of transaction users from the total amount of users in all transactions.
Time In System (Hits X Response time)	Total time a specific transaction was running in the system. Calculated by multiplying the average transaction response time by the number of hits.
Transactions per Second (TPS)	The number of times a transaction was executed in a second. Calculated by dividing the number of hits by the duration of the data set.
HP SiteScope Monitors (SiS)	The metrics monitored by HP SiteScope.

Monitors Mapping Dialog Box
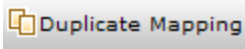
This dialog box enables you to map monitored hosts and monitors.

To access	On the <report name> PAL Report, click the **Monitors Mapping** button Monitors Mapping .
Relevant tasks	"How to Work with PAL" on page 447
See also	"<Report Name> PAL Report" on page 461 "PAL Overview" on page 445

Monitored Hosts Tab

Enables you to create mapping for the monitored hosts.

User interface elements are described below (unlabeled elements are shown in angle brackets):

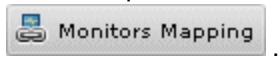| UI Elements	Description
✳ Create New Mapping	Adds a new mapping.
✖ Delete	Deletes a selected mapping.
▢ Duplicate Mapping	Creates a duplicate of the selected mapping.
↻ Refresh	Refreshes the list of mappings.
\<top grid>	Includes the following columns: **ID.** The mapping ID. **Name.** The mapping name. **Description.** A description of the mapping.
Mapping Information: Name	The mapping name.
Mapping Information: Description	A description of the mapping.
Mapping Information: Details	Lists details of a selected measurement. The following fields are displayed in the table: • **Data Set ID.** The data set ID. • **Data Set Type.** The measurement type. • **Name.** The monitored host name.
Messages	Indicates the status of the mapping.

Monitors Tab
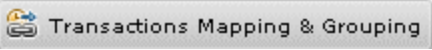
Enables you to create mapping for monitor measurements.

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
✳ Create New Mapping	Adds a new mapping.
✖ Delete	Deletes a selected mapping.
⬜ Duplicate Mapping	Creates a duplicate of the selected mapping.
⟳ Refresh	Refreshes the list of mappings.
\<top grid\>	Includes the following columns: **ID.** The mapping ID. **Name.** The mapping name. **Description.** A description of the mapping.
Mapping Information: Name	The mapping name.
Mapping Information: Description	A description of the mapping.
Mapping Information: Monitored Hosts Mapping	The host whose measurements are being monitored. Click in the field to select which monitored host to map to the mapped measurement.
Mapping Information: Details	Lists details of a selected measurement. The following fields are displayed in the table: • **Data Set ID.** The data set ID. • **Data Set Type.** The measurement type. • **Name.** The monitor measurement name.
Messages	Indicates the status of the mapping.

Transactions Mapping and Grouping Dialog Box

This dialog box enables you to map and group similar transactions in your production data or in your load test results. Grouping and mapping aggregates the data of the grouped transactions.

To access	On the <report name> PAL Report, click the **Transactions Mapping & Grouping** button ⬛ Transactions Mapping & Grouping .
Important Information	The term transaction applies to any activity measured by testing and production systems. This includes VuGen script transactions, HP RUM transactions and actions, and URLs measured by other production systems.
Relevant tasks	"How to Work with PAL" on page 447
See also	"<Report Name> PAL Report" on page 461 "PAL Overview" on page 445

Mapping Production to Testing > Transactions Section

The pane enables you to map between production and load test transactions in order to have comparable data in your report. This is relevant in cases where transactions that measure the same business process have different names.

For example the transaction for measuring the search page is called Search in the VuGen script whereas the production system calls it Find. Mapping between the transactions makes them comparable.

User interface elements are described below:

UI Elements	Description
⬛ Import	Enables you to import mappings from other reports.
✖ Delete	Enables you to delete a selected mapping.
Production	Lists the available production transactions.
Performance Test	Lists the available testing transactions or groups and enables you to map a testing transaction or a group to a production transaction.
Mapping Name	The mapping name of a production transaction. This is the transaction name that will be used in the reports.
Status	Indicates whether the production transaction is mapped or not.
Map	Applies the mapping changes.

Internal Transactions Grouping > Load Test or Production Transactions Section

This pane enables you to group similar transactions in your production data or in your load test results. This is important when similar transactions are given different names. For example the Login transaction has a suffix added to denote the script it's in, so that several Login transactions are
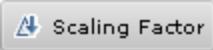
measured (for example. **login_1**, **login_2**, **login_3**, etc.) although they all measure the same business process. Grouping will aggregate the data of the grouped transactions.

User interface elements are described below:

UI Elements	Description
New	Clears details in the Group Details pane.
Delete	Deletes a selected group name from the Grouping Name pane.
Grouping Name	Lists the available groups. This icon indicates that the group is created using regular expressions. The group contains measurements that are currently displayed under **Available Measurements**, as well as any future measurements.
Group's Name & Selected Measurements	Enter a group name. Use the arrows to move measurements between **Selected Measurements** and **Available Measurements**. To save the group, click the **Group** button.
Available Measurements	Lists the available transaction measurements. • Use the arrows to move measurements between **Available Measurements** and **Selected Measurements**. • Filter . Enables you to locate a specific measurement, type the measurement name and click this button. The results are displayed below. • **Create group using this regular expression.** Enables you use regular expressions to define a rule that automatically selects measurements to be included in a group. The automatic selection rule applies to measurements that are currently displayed under **Available Measurements**, as well as any future measurements. To define a rule, type the regular expression and select the **Create group using this regular expression** check box. The applicable measurements are added under **Selected Measurements**.
Group	Enables you to group the selected transaction measurements. The group name is added to the Grouping Name pane.

Set Scaling Factors Dialog Box

This dialog box enables you to readjust data set durations and differences, to enable you to compensate for the dissimilarity between the data sets due to different durations or difference in system configuration (for example, number and power of servers). It also enables you to plan for larger loads.

To access	On the <report name> PAL Report, click the **Scaling Factor** button ![Scaling Factor].

Duration Adjustments Pane

Affects the following measurement types: Hits and Time in System.

User interface elements are described below:

UI Elements	Description
Adjust data set duration	Adjusts duration differences of data sets to match the data set duration used for the baseline.

Scaling Factors Pane

Affects the following measurement types: Hits, Users, Time in System, and transaction per second (TPS).

User interface elements are described below:

UI Elements	Description
Data Set ID	The data set ID.
Data Set Type	The data set type (**Production** or **Testing**).
Data Set Duration	The duration of the data set.
Scaling Factor	Indicates the scale of the measurement. To change the scale of a measurement, click the upward/downward arrow to adjust to the desired scale.

Scaling Factors Preview Pane

The pane previews the scaling factor changes set to the affected measurements. For example, x2 indicates the measurement is being multiplied by 2.

Set Global Transactions Filter Dialog Box

This dialog box enables you to filter transactions from the PAL report views.

To access	On the <report name> PAL Report, click the **Global Filter** button ![Global Filter].

Important Information	This filter does not affect mapped transactions.
Relevant tasks	"How to Work with PAL" on page 447

Percentage Filter Tab

This tab enables you to set the filter percentage.

User interface elements are described below:

UI Elements	Description
Data Set ID	The data set ID.
Data Set Type	The data set type (**Production** or **Testing**).
Global Filter	Indicates the filter percentage. To change the percentage of a filter, click the upward/downward arrow to adjust to the desired value.

Transaction Selection Tab

This tab enables you to select the transactions to be displayed in the report views.

User interface elements are described below:

UI Elements	Description
<Top check box>	Selects/clears all transactions in the grid. To select/clear a specific transaction, select/clear the check box to the left of the transaction name.
Mapping Type	Indicates the mapping type: **All**, **Mapped**, **Not Mapped**.
Name	Enables you to locate a specific transaction. Type the name and press **Enter**.
Page Size	Sets the number of transactions displayed per page.

PAL Data Set Creator Wizard

This wizard enables you to create production data sets using IIS W3C Extended Log File Format, Google Analytics, or Webtrends. After creating the data sets, you can upload them from PAL and use them in your reports.

To access	1. From the **HP ALM Performance Center Additional Components installation disk (DVD 2)**, navigate to **Additional Components > PAL Data Set Creator**. 2. Run **PALDatasetCreator.exe**.
Relevant tasks	• "How to Create Data Sets from IIS, Google Analytics, or Webtrends" on page 449 • "How to Work with PAL" on page 447
Wizard map	This wizard contains: "Select Data Source Page" below > "Select Log to Import Page" on the next page > "Webtrends Credentials Page" on page 484 > "Webtrends Data Extractor Page" on page 485
See also	• "PAL Overview" on page 445 • "Upload Production Data Set Dialog Box" on page 455

Select Data Source Page

This wizard page enables you to select a data source type.

Important information	General information about this wizard is available here: "PAL Data Set Creator Wizard" above.

Wizard map	The "PAL Data Set Creator Wizard" on the previous page contains: **"Select Data Source Page" on the previous page** > "Select Log to Import Page" below > "Webtrends Credentials Page" on the next page > "Webtrends Data Extractor Page" on page 485
See also	• "PAL Overview" on page 445 • "Upload Production Data Set Dialog Box" on page 455

User interface elements are described below:

UI Element	Description
Microsoft IIS W3C Extended Log Format	Creates a production data set file using IIS W3C Extended Log File Format.
Google Analytics	Creates a production data set file using Google Analytics.
Webtrends	Creates a production data set file using Webtrends.

Select Log to Import Page

This wizard page enables you to select Google Analytics and IIS W3c logs.

Important information	• General information about this wizard is available here: "PAL Data Set Creator Wizard" on the previous page. • Available only if you selected **Microsoft IIS W3C Extended Log Format** or **Google Analytics** in the "Select Data Source Page" on the previous page.

Wizard map	The "PAL Data Set Creator Wizard" on page 482 contains: "Select Data Source Page" on page 482 > **"Select Log to Import Page" on the previous page** > "Webtrends Credentials Page" below>"Webtrends Data Extractor Page" on the next page
See also	• "PAL Overview" on page 445 • "Upload Production Data Set Dialog Box" on page 455

User interface elements are described below:

UI Element	Description
Application Name	The PAL application name.
Log Location	Enables you to browse for, and select, a log.
Date	The date of the log file.
Hour	Defines the time range for sampling the log.
Session Name	Defines the session name. **Available for:** IIS W3C Extended Log File Format
Create	Creates the data set file.

Webtrends Credentials Page

This wizard page enables you to connect to a Webtrends host.

Important information	• General information about this wizard is available here: "PAL Data Set Creator Wizard" on page 482. • Available only if you selected **Webtrends** in the "Select Data Source Page" on page 482.
Wizard map	The "PAL Data Set Creator Wizard" on page 482 contains: "Select Data Source Page" on page 482 > "Select Log to Import Page" on page 483 > **"Webtrends Credentials Page" on the previous page**>"Webtrends Data Extractor Page" below
See also	• "PAL Overview" on page 445 • "Upload Production Data Set Dialog Box" on page 455

User interface elements are described below:

UI Element	Description
Webtrends host	Indicates the Webtrends host name.
Username	Indicates the user name. **Note:** You must have permissions to access the Data Extraction API.
Password	Indicates the password.

Webtrends Data Extractor Page

This wizard page enables you to create a Webtrends dataset.

Important information	• General information about this wizard is available here: "PAL Data Set Creator Wizard" on page 482. • Available only if you selected **Webtrends** in the "Select Data Source Page" on page 482.
Wizard map	The "PAL Data Set Creator Wizard" on page 482 contains: "Select Data Source Page" on page 482 > "Select Log to Import Page" on page 483 > "Webtrends Credentials Page" on page 484>**"Webtrends Data Extractor Page" on the previous page**
See also	• "PAL Overview" on page 445 • "Upload Production Data Set Dialog Box" on page 455

User interface elements are described below:

UI Element	Description
Profiles	Indicates the Webtrends profile.
Date	Defines the date for sampling the Webtrends data.
Hour	Defines the time range for sampling the Webtrends data.
Create Dataset	Creates a Webtrends dataset.

Part 8: Performance Center Administration

Chapter 36: Performance Center Administration - Introduction

Performance Center Administration Overview

Performance Center administration is performed in Lab Management. You must be a Lab Management administrator to perform these tasks.

Lab Management administrators are defined in the ALM Site Administration site. For details on how to create a Lab Management administrator user, see the *HP ALM Lab Management Guide*.

Performance Center administration responsibilities include managing lab resources, such as hosts and host pools, creating and maintaining testing assets, and other administration tasks.

For related task details, see "How to Work with Performance Center Administration" below.

How to Work with Performance Center Administration

This section lists the tasks that a Lab Management administrator can perform. Some tasks are available only for projects with Performance Center licenses.

Prerequisites

To perform any of these tasks, you must be a Lab Management administrator. For details on how to create a Lab Management administrator, see the *HP ALM Lab Management Guide*.

Perform initial Performance Center configuration

Immediately after installing the Performance Center components, the relevant component's configuration tool opens, prompting you for initial configuration settings. If this configuration was skipped, you must configure the settings manually before you can start working with Performance Center.

For details, see "How to Initially Configure Performance Center" on page 495.

Create Performance Center projects and define project settings

You create projects in Site Administration, and define the limits and other settings for the project in Lab Management, in the Project Settings module. For details, see the *HP ALM Lab Management Guide*.

Manage and maintain Performance Center lab resources

You manage hosts, host pools, host locations, and relevant MI Listeners from the Lab Resources modules. For details, see the *HP ALM Lab Management Guide*.

When you plan to perform maintenance tasks on the hosts—such as installing patches, rebooting hosts, and so on—it is recommended to reserve these hosts in timeslots. This way, you can be sure that they will be available for maintenance. For details, refer to the *HP ALM Lab Management Guide*.

View and manage performance test runs

The test runs from Performance Center can be viewed and managed in the Test Runs module. For details, see the *HP ALM Lab Management Guide*.

View Performance Center usage reports

Performance Center usage reports provide you with an overall analysis of Performance Center site users, resource usage, concurrent resource usage vs. license limitations, timeslot usage, as well as resource usage by duration and runs. For details, see the *HP ALM Lab Management Guide*.

You can also export these reports to PDF and Excel format. For details, see the *HP ALM Lab Management Guide*.

Upload application patches

Before you can install application patches on Performance Center Servers and hosts, you must upload the patches to the system. For details, see the *HP ALM Lab Management Guide*.

Manage Performance Center Servers

You manage Performance Center Servers in Lab Management from the PC Servers module. For details, see the *HP ALM Lab Management Guide*.

Manage Performance Center and Performance Center host licenses

You manage the Performance Center license and Performance Center host license in Lab Management from the Licenses module. For details, see the *HP ALM Lab Management Guide*.

Manage Diagnostic Servers and Mediators

Integrating diagnostics modules with ALM enables monitoring and analysis of the performance of complex applications under test. For details on setting up the diagnostics modules, see the *HP ALM Lab Management Guide*.

Maintain system health

You track and maintain the health of the system Lab Management from the System Health module. For details, see the *HP ALM Lab Management Guide*.

Change the Performance Center system user

You use the System Identity Utility, installed on the Performance Center Server, to change the Performance Center system user on the Performance Center Server and hosts. For details, see .

Update the Communication Security passphrase

You use the System Identity Utility, installed on the Performance Center Server, to update the

Communication Security passphrase on the Performance Center Server and hosts. For details, see "How to Update the Communication Security Passphrase" on page 500.

Update the secure host communication settings

Initially, you define secure communication settings on each Performance Center host or standalone load generator using the Host Security Setup utility, installed locally on each host or load generator. For details, see "How to Configure Security Settings Locally on Hosts" on page 518.

To update these settings on all the hosts and load generators simultaneously, you can use the Host Security Manager, installed on the Performance Center Server. For details, see "How to Update Host Security Settings Remotely" on page 519.

Configure general Performance Center settings

You manage general Performance Center settings in Lab Management. On the masthead, click and select **Performance Center General Settings**. For user interface details, see the *HP ALM Lab Management Guide*.

Chapter 37: Initial Performance Center Configuration

This chapter includes:

Initial Performance Center Configuration Overview

Immediately after installing the Performance Center Server and hosts, the relevant component's configuration tool opens, prompting you for initial configuration settings. If any parts of the configuration were skipped, you must configure the settings manually before you can start working with Performance Center.

You can perform the configuration by running the configuration tool on the relevant machine, or alternatively by defining the settings manually in Lab Management.

For details on running the relevant configuration tools, see the *HP ALM Performance Center Installation Guide*.

For details on configuring the initial settings in Lab Management, see "How to Initially Configure Performance Center" below.

How to Initially Configure Performance Center

This task describes how to manually perform the initial configuration of the Performance Center Server and hosts in Lab Management.

This task includes the following steps:

- "Prerequisites" below

- "Log into Lab Management" below

- "Add the Performance Center Server(s) to ALM" on the next page

- "Add the Performance Center license and the host license" on the next page

- "Add Performance Center hosts to the system" on the next page

1. Prerequisites

   - The Performance Center Server and Performance Center hosts must be installed according to instructions provided in the *HP ALM Performance Center Installation Guide*.

   - To perform any of these tasks, you must be a Lab Management administrator. For details on how to create a Lab Management administrator, refer to the *HP ALM Lab Management Guide*.

2. Log into Lab Management

   a. Open your Web browser and type the ALM URL in the following format:

   ```
   http://<ALM>[<:port number>]/qcbin
   ```

b. In the HP Application Lifecycle Management window that opens, click **Lab Management**.

c. Enter your Lab Management Administrator user name and password and click **Login**.

3. Add the Performance Center Server(s) to ALM

On the Lab Management sidebar, under **Servers**, select **PC Servers**, and add your Performance Center Server. For details on how to add a Performance Center Server, refer to the *HP ALM Lab Management Guide*.

4. Add the Performance Center license and the host license

On the Lab Management sidebar, under **Performance Center**, select **PC Licenses**.

Add the Performance Center license, and then the host license. For interface details, refer to the *HP ALM Lab Management Guide*.

5. Add Performance Center hosts to the system

On the Lab Management sidebar, under **Lab Resources**, select **Hosts**. For user interface details, refer to the *HP ALM Lab Management Guide*.

Chapter 38: Performance Center System Administration

This chapter includes:

ALM Performance Center Communication Security

During installation of ALM and the Performance Center Server and hosts, a passphrase, known as the **Communication Security passphrase**, is defined. This passphrase enables secure communication between the Performance Center components and ALM. This passphrase must be identical on all of the components of the system.

The Communication Security passphrase can be updated from time to time. For information about updating the Communication Security passphrase, see "How to Update the Communication Security Passphrase" on the next page.

Performance Center System User

During installation of the Performance Center Server and hosts, a default Performance Center system user, **IUSR_METRO** (default password **P3rfoRm@1nce**), is created in the Administrators user group of the server/host machines.

> **Note:** To prevent security breaches, you can replace Performance Center's default system user by creating a different local system user, or by using a domain user.

For stronger security, you can create a non-administrator Performance Center system user in a local group under the Users group. This system user has the permissions granted to any user in the Users group with extended rights to Web services and the HP file system and registry.

With these limited permissions, such a system user cannot perform all administrative system tasks. You need to specify a configuration user (a user with administrative privileges that is defined on the Performance Center Server and hosts) that Performance Center uses when administrative tasks are required on the system. After the tasks are complete, the system user reverts back to itself, with its limited Performance Center user permissions.

> **Note:** The configuration user is saved in the database so that whenever an administrative-level system user is required to perform a task, the system automatically uses the configuration user, without asking for its credentials.

The Performance Center Server is installed with the System Identity Utility that enables you to manage the Performance Center system user on the Performance Center Server and hosts from one centralized location.

Using this utility, you can periodically update the Performance Center system user name and password. For more information, see "How to Change the System User" on page 501.

Remote Performance Center Server and Host Administration

To perform administrative tasks on the Performance Center Server or hosts (such as adding, configuring, or resetting a Performance Center Server/host), Performance Center must use a user with

administrative privileges. This must be the Performance Center system user with administrative privileges or, if the Performance Center system user is non-administrative, a configuration user.

When the Performance Center system user has administrative privileges and is defined on the remote machine, tasks are performed upon request. After validating the Performance Center system user or configuration user, Performance Center can perform required tasks.

How to Update the Communication Security Passphrase

This task describes how to update the Communication Security passphrase on the ALM-Performance Center system components.

To learn more about ALM-Performance Center communication security, see "ALM Performance Center Communication Security" on the previous page.

This task includes the following steps:

- "Update the Communication Security passphrase on ALM" below

- "Update the Communication Security passphrase on the Performance Center components" below

1. Update the Communication Security passphrase on ALM

    a. In Site Administration, update the **COMMUNICATION_SECURITY_PASSPHRASE** default parameter. For details, see the *HP Application Lifecycle Management Administrator Guide*.

    b. Restart the HP Application Lifecycle Management service on the ALM server.

2. Update the Communication Security passphrase on the Performance Center components

    The System Identity Utility is installed on the Performance Center Server. You use this utility to update the Communication Security passphrase on the Performance Center Server and hosts from one centralized location.

    a. From the Performance Center Server installation's bin directory, open the System Identity Utility (**<Performance Center Server Installation directory>/bin/IdentityChangerUtil.exe**).

    > **Note:** You can run this utility from any one of the Performance Center Servers in the system.

    b. Enter the ALM details to connect to ALM.

    c. The System Identity Utility opens. For user interface details, see "System Identity Utility Window" on page 508.

In the **Communication Security Passphrase** section, select **Change**, and enter the new Communication Security passphrase.

d. Click **Apply**.

How to Change the System User

You use the System Identity Utility, installed on the Performance Center Server, to change the system user on the Performance Center Server and hosts.

When you change the system user, or a user's password, the System Identity Utility updates the Performance Center Server and hosts.

To learn more about the Performance Center system user, see "Performance Center System User" on page 499.

This task includes the following steps:

- "Prerequisites" below

- "Launch the System Identity Utility on the Performance Center Server" below

- "Change the details of the Performance Center user" on the next page

- "Verify that the system user was changed on the Performance Center Server" on the next page

1. Prerequisites
    - When changing the system user, Performance Center must be down. That is, all users must be logged off the system and no tests may be running.

    - When changing the user password:

        ○ Ensure that each host is listed in the Machines table under **one alias only**.

        ○ In the case of a domain user, when the domain IT team notifies you that the password is to be changed, you need to temporarily change the Performance Center system user on the Performance Center Server and hosts to a different user. After the domain IT team has changed the password of the domain user and has notified you of this change, you need to change the Performance Center system user back to the domain user on the Performance Center Server and hosts.

2. Launch the System Identity Utility on the Performance Center Server
    a. In the Performance Center Server installation's **bin** directory, open the System Identity Utility (**<Performance Center Server Installation directory>/bin/IdentityChangerUtil.exe**).

    b. Enter the ALM details to connect to ALM.

The System Identity Utility opens. For user interface details, see "System Identity Utility Window" on page 508.

3. Change the details of the Performance Center user

Enter the relevant details to update and click **Apply**. The utility updates the Performance Center Server and hosts, starting with the Performance Center Server.

In the lower part of the utility window, the **Machines** table displays the status of each machine during the configuration process.

If the utility is unable to change the user on the Performance Center Server, it stops the configuration, rolls back the change, and issues a message explaining why the change cannot be made. Correct the error and click **Apply** again.

When configuration completes successfully on the Performance Center Server, the utility proceeds with the configuration of the hosts. The utility attempts to configure all the hosts, even if the configuration on one or more hosts is unsuccessful. In this case, after the utility has attempted to configure all the hosts, correct the errors on the failed hosts, and click **Reconfigure**. The utility runs again on the whole system.

> **Note:** If the configuration continues to fail, you can configure the Performance Center Server and hosts manually. However, all attempts should be made to correct errors that cause the configuration to fail. **Manual configuration should be left as a last resort.** For details on configuring the Performance Center Server and hosts manually, see "How to Configure the System User Manually" on the next page.

4. Verify that the system user was changed on the Performance Center Server

   a. Open IIS Manager. Under **Sites > Default Web Site**, choose a virtual directory.

   b. Under **Authentication** select **Anonymous Authentication**. Verify that the anonymous user defined was changed for the following virtual directories: **PCS**, **LoadTest** and **Files** (a virtual directory in LoadTest).

   c. Check in the **PCQCWSAppPool** and **LoadTestAppPool** application pools that the identity is the Performance Center user.

How to Configure the System User Manually

This task describes how to manually configure the Performance Center system user on the Performance Center Server and hosts.

> **Note:**
>
> - First try to configure the Performance Center user using the System Identity Utility (see "How to Change the System User" on page 501). **Use these manual instructions as a last resort only.**
>
> - This section applies to an administrative or non-administrative Performance Center user on the Performance Center Server and hosts.
>
> - Manual configuration of the Performance Center user on the Performance Center Server and hosts involves granting the required Performance Center policies, updating the Performance Center user, and, for a non-administrative Performance Center user, granting the required Performance Center permissions.
>   Follow all the procedures carefully, noting which procedures are relevant for the Performance Center Server and which for the hosts.

This task includes the following steps:

- "Define the Performance Center user as an Admin or Non-Admin user" below

- "Configure IIS settings (Performance Center Server only)" on the next page

- "Configure the COM object identity" on the next page

- "Reset services" on the next page

- "Admin user only: Verify Performance Center user policies" on page 505

- "Non-Admin user only: Configure Performance Center user policies and permissions" on page 505

1. Define the Performance Center user as an Admin or Non-Admin user

   The Performance Center system user can have administrative or non-administrative permissions. You define what type of user it is by adding it to the relevant local user group on the Performance Center Server or host.

   a. Open the Computer Management (**Control Panel > Administrative Tools > Computer Management**).

   b. Add the user to the appropriate user group. In **System Tools > Local Users and Groups > Users**.

- **For administrative system users:** Double-click the Performance Center user, and click the **Member of** tab. If **Administrators** is not listed, click **Add**, select **Administrators**, and click **OK**.

- **For non-administrative system users:** Double-click the Performance Center user, and click the **Member of** tab. Change the Performance Center user to belong to the following groups:

    - **Users**

    - **Distributed Com Users**

    - **Performance Log Users**

2. Configure IIS settings (Performance Center Server only)

    a. Open the IIS Manager on the Performance Center Server machine:

        - **Windows 2003:** Change the system user in the **LoadTest** and **PCS** virtual directories.

        - **Windows 2008:** For each of the **LoadTest** and **PCS** virtual directories, add the Performance Center system user and grant the user full control on the virtual directory.

    b. Change the **PCQCWSAppPool** and **LoadTestAppPool** application pool identity to the Performance Center system user.

3. Configure the COM object identity

    For the Performance Center Server and hosts, change the identity of the COM objects to the Performance Center user.

    For all the COM objects listed in the **<Performance Center component installation>\bin\MiDCOM.ini** file, configure the identity to be the Performance Center user as follows:

    a. Run **dcomcnfg**.

    b. For each COM object, under **Properties > Identity**, select **This user** and enter the Performance Center user details.

4. Reset services

    For the Performance Center Server and hosts, reset the services as follows:

    - **Performance Center Servers and hosts:** Reset the **RemoteManagement Agent service** using the following commands:

    ```
    %installation folder%\al_agent\bin\alagentservice.exe -remove
    %installation folder%\al_agent\bin\alagentservice.exe -install <username>
    <password>
    ```

where `username` and `password` are those of the Performance Center user.

- **Performance Center hosts only:**

  ○ Reset the **Performance Center Agent service** using the following commands:

  ```
  %installation folder%\launch_service\bin\magentservice.exe -remove
  %installation folder%\launch_service\bin\magentservice.exe -install
  <username> <password>
  ```

  where `username` and `password` are those of the Performance Center user.

  ○ Open the Services console, and restart the **Performance Center Load Testing Service**.

5. Admin user only: Verify Performance Center user policies

   > **Note:** This section is relevant when configuring an administrative Performance Center user only.

   On the Performance Center Server and hosts, verify that the Performance Center user has the necessary policies. For details, see "Required Policies for the Performance Center System User" on page 507.

   If any of these policies is missing, grant the Performance Center user the missing policies.

6. Non-Admin user only: Configure Performance Center user policies and permissions

   > **Note:** This section is relevant when configuring a non-administrative Performance Center user only.

   On the Performance Center Server and hosts:

   a. Grant the Performance Center user the required policies. For details, see "Required Policies for the Performance Center System User" on page 507.

   b. Change registry permissions: Open the Registry Editor (**regedt32**) and give the Performance Center user full access to:

   ```
   - HKEY_LOCAL_MACHINE\Software\Mercury Interactive- HKEY_CLASSES_
   ROOT\interface-
   HKLM\SYSTEM\CurrentControlSet\Control\SecurePipeServers\winreg -
   HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Perflib -
   HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Winlogon
   ```

   In addition, on hosts only:

   ```
   - HKLM\SOFTWARE\Microsoft\Jet\4.0\Engines\Text (used by Analysis)
   ```

```
- HKEY_CLASSES_ROOT\CLSID\{67489277-9AB8-4AF6-91B4-94ED62303BE5}
```

For 32-bit:

```
- HKEY_LOCAL_MACHINE\SOFTWARE\Hewlett-Packard\HPOvLIC
```

 For 64-bit:

```
- HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Hewlett-Packard\HPOvLIC
```

c. Add full control permissions to directories and files:

○ In the File System folder grant the **Performance Center user** full control of:

```
- The Performance Center directory
(C:\Program Files\HP\Performance Center) and all sub-directories-
%CommonProgramFiles%- %windir%\TEMP- If the systemroot is on an NTFS
partition, grant at least Read access to   -
%SystemRoot%\System32\Perfc009.dat   - %SystemRoot%\System32\Perfh009.dat
```

In addition, on hosts only:

```
- C:\Documents and Settings\Default User\Local Settings\Temp-
%windir%\wlrun7.ini- %windir%\wlrun5.ini- %windir%\mercury.ini-
%windir%\collate.txt- %windir%\OnlineSet.ini
```

```
- C:\\ProgramData\com.hp.autopass (%ProgramData%\com.hp.autopass)
```

```
- C:\\\ProgramData\HP\LoadRunner\data (%ProgramData%\HP\LoadRunner\data)
```

If a file does not exist, create it and give the user full access.

○ In the File System folder, after installing Web services, grant the **IWAM_Machine user**
Read permissions in the following directory:

```
windir%\TEMP
```

d. Add permissions to run .NET applications:

Add full control permissions for the Performance Center user to all folders needed to run **.NET**
applications (Web services, and so on).

In a command line, go to
%windir%\Microsoft.NET\Framework\v2.0.50727

and run

```
aspnet_regiis.exe -ga <MachineName>\IUSR_METRO
```

e. Change permissions of the Crypto key:

Open **C:\Documents and Settings\All Users\Application
Data\Microsoft\Crypto\RSA\MachineKeys**.

Right-click the **f9416f003254e6f10da1f9bad8e4c383** file and select **Properties**.

In the **Security** tab, add the **Users Group** and grant it full control.

Required Policies for the Performance Center System User

This section describes the policies required for the Performance Center system user.

> **Note:** This section applies to:
>
> - An administrative or non-administrative Performance Center user
>
> - All Performance Center servers and hosts

The Performance Center user must be granted all of the following policies:

Policy	Reason
Create global object	For Autolab running Vusers on the Controller.
Batch logon rights	The minimum policies required to run Web applications.
Service logon rights	The minimum policies required to run Web applications.
Access this computer from the network	The minimum policies required to run Web applications.
Log on locally	Required by infra services. For example, after reboot, the system logs in with the Performance Center system user.

System Identity Utility Window

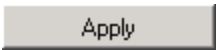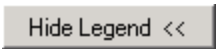This utility enables you update the ALM-Performance Center Communication Security passphrase, as well as the Performance Center system user (by default, **IUSR_METRO**) and/or password on the Performance Center Server and hosts from one centralized location.

To access	From the Performance Center Server installation's bin directory, open the System Identity Utility (**<Performance Center Server Installation directory>/bin/IdentityChangerUtil.exe**).
Important information	• This utility does not apply changes to UNIX machines, Standalone Load Generators, or machines that are located over the firewall. • When updating the Communication Security passphrase, it is essential that it is updated in ALM as well. • This utility applies changes to the Performance Center servers and hosts listed in the Machines grid. • When changing the system user, Performance Center must be down. That is, all users must be logged off the system and no tests may be running.

Relevant tasks	• "How to Change the System User" on page 501
	• "How to Update the Communication Security Passphrase" on page 500
See also	• "Performance Center System User" on page 499
	• "ALM Performance Center Communication Security" on page 499

User interface elements are described below:

UI Elements	Description
Apply	Applies the selected changes on the Performance Center Server and hosts, starting with the Performance Center Server.
Hide Legend << Show Legend >>	Hides/shows the legend.
Reconfigure	If, when applying a change, there are errors on any of the Performance Center hosts, troubleshoot the problematic host machines, then click **Reconfigure**. The utility runs again on the Performance Center Server and hosts.

UI Elements	Description

Performance Center User	The Performance Center system user details.
	
	• **Change.** Enables you to select which detail to change.
	
	  ■ **None.** Do not change the user's name or password.
	
	  ■ **Password Only.** Enables you to change only the Performance Center system user's password.
	  Note: When changing the password:
	  - Ensure that each host is listed in the **Machines** table under one alias only.
	  - In the case of a domain user, when the domain IT team notifies you that the password is to be changed, you need to temporarily change the Performance Center system user on the Performance Center Server and hosts to a different user. After the domain IT team has changed the password of the domain user and has notified you of this change, you need to change the Performance Center system user back to the domain user on the Performance Center Server and hosts.
	
	  ■ **User.** Enables you to change the Performance Center system user name and password.
	
	• **Domain\Username.** The domain and user name of the Performance Center system user.
	
	• **Password/Confirm Password.** The password of the Performance Center system user.
	
	• **Delete Old User.** If you are changing the user, this option enables you to delete the previous user from the machine.
	
	  Note: You cannot delete a domain user.

User Group	The details of the user group to which the Performance Center system user belongs.
	
	• **Group type.** The type of user group.
	
	  ■ **Administrator Group.** Creates a user in the Administrators group with full administrator policies and permissions.
	
	  ■ **Other.** Creates a local group under the Users group, granting policies and permissions as well as other Performance Center permissions.

UI Elements	Description
Configuration User	If you are creating a non-administrative Performance Center system user, that is, if you selected **Other** under **User Group**, you need to configure a configuration user (a system user with administrative privileges) that the non-administrative Performance Center system user can impersonate when it needs to perform administrative tasks. For more details, refer to "Performance Center System User" on page 499. If you selected **Delete Old User** in the **Performance Center User** area, ensure that the configuration user you are configuring is not the same as the system user you are deleting. Alternatively, do not delete the old user. ● **Domain\Username.** The domain and user name of a system user that has administrator privileges on the Performance Center Server and hosts. ● **Password/Confirm Password.** The password of a system user that has administrator privileges on the Performance Center Server and hosts.
Communication Security Passphrase	The Communication Security passphrase that enables the Performance Center Server and hosts to communicate securely with ALM. ● **Change.** Enables you to change the passphrase. ● **New passphrase.** The new Communication Security passphrase. **Note:** This passphrase must be identical to the Communication Security passphrase defined in ALM. For details, refer to the "How to Update the Communication Security Passphrase" on page 500.

UI Elements	Description

Machines grid	• **Type.** Indicates whether the machine type is a Performance Center server or a host.
	
	• **Name.** The machine name.
	
	• **Configuration Status.** Displays the configuration status on each of the Performance Center components.
	
	   ■ **Configuration complete.** The system user configuration was completed.
	
	   ■ **Needs to be configured.** The Performance Center server/host is pending configuration. Displayed only after the Performance Center Server configuration is complete.
	
	   ■ **Configuring.....** The Performance Center Server/host in being configured.
	
	   ■ **Configuration failed.** The Performance Center Server/host configuration failed. The utility displays the reason for failure together with this status.
	
	Note:
	
	   ■ If the utility is unable to apply the change on the Performance Center Server, the utility stops the configuration, rolls back the change, and issues a message explaining why the change cannot be applied. Correct the error and click **Apply** again.
	
	   ■ When configuration completes successfully on the Performance Center Server, the utility proceeds with the configuration of the hosts. The utility attempts to configure all the hosts, even if the configuration on one or more hosts is unsuccessful. In this case, after the utility has attempted to configure all the hosts, correct the errors on the failed hosts, and click **Reconfigure**. The utility runs again on the whole system.
	
	   ■ When changing system user details, if the configuration continues to fail, you can perform the change on the Performance Center Server and hosts manually. However, this is not recommended—all attempts should be made to correct errors that cause the configuration to fail. Changing the system user manually should be left as a last resort. For details on changing the system user manually, see "How to Configure the System User Manually" on page 503.

Chapter 39: Secure Host Communication

This chapter includes:

Secure Host Communication Overview

The need to secure communication channels from hackers attacking the corporate networks is critical. Securing communication channels ensures confidentiality, integrity, and the user's authenticity within the scope of the load testing application.

Because load generators and Controllers serve so many projects, it is essential that the channels between Controllers and load generators remain opaque to all machines except for the Controllers and load generators participating in running performance tests or collating test data after a run.

Secure communication is established between the Controller and load generator hosts using a **security key**. Each host in the system must be set up with the identical security key. If security keys on the hosts do not match, secure communication cannot be established.
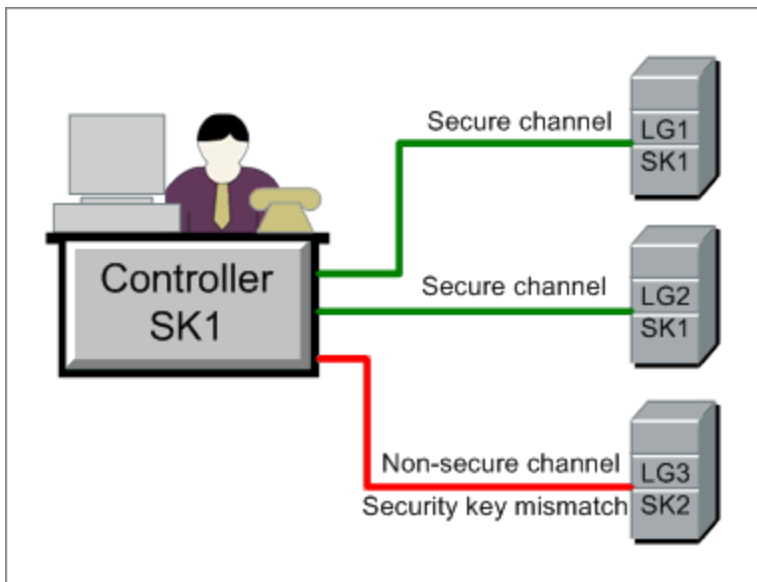
A host is in **secure mode** when it has a security key and security is enforced.

A host is in **non-secure mode**:

- if it has no security key

- if it has a security key but security is **not** enforced

When a host in secure mode tries to communicate with a host in non-secure mode, security is automatically enforced on the non-secure host—assuming their security keys match—allowing secure communication to be established.

> **Note:**
>
> - When you run a performance test, if secure communication cannot be established between a secure host (Controller or load generator) and another host participating in the test, the test cannot run.
>
> - By definition, non-secure hosts can communicate with each other and participate in test runs over non-secure channels.

This can be summarized in the following table:

	Both Hosts in Secure Mode	**Security Mode on Hosts Differ**	**Both Hosts in Non-Secure Mode**
Security keys match	Test runs over secure channel	Test runs over secure channel	Test runs over non-secure channel
Security keys do not match	Test does not run	Test does not run	Test runs over non-secure channel

Host Security Configuration

When you install the hosts (Controllers and load generators), by default no security settings are defined on them, and communication channels between the hosts are not secure. To enforce secure communication between the hosts, you must configure security settings on each host machine immediately after installing the hosts.

When configuring these settings **for the first time**, to avoid configuration over non-secure channels, you must set the security on each host locally using the **Host Security Setup utility**. For details, see "How to Configure Security Settings Locally on Hosts" on page 518.

After initial security configuration, you can update security settings locally or simultaneously across all the Performance Center hosts from a remote location using the **HP Host Security Manager** utility. This utility is installed on the same Performance Center Server. For details, see "How to Update Host Security Settings Remotely" on page 519.

Remote Security Configuration

You can align security settings across all the Performance Center hosts simultaneously from a remote location using the **HP Host Security Manager** utility.

The utility lists all the Performance Center hosts, as well as the MI Listeners required to connect to the hosts that are over a firewall, where applicable.
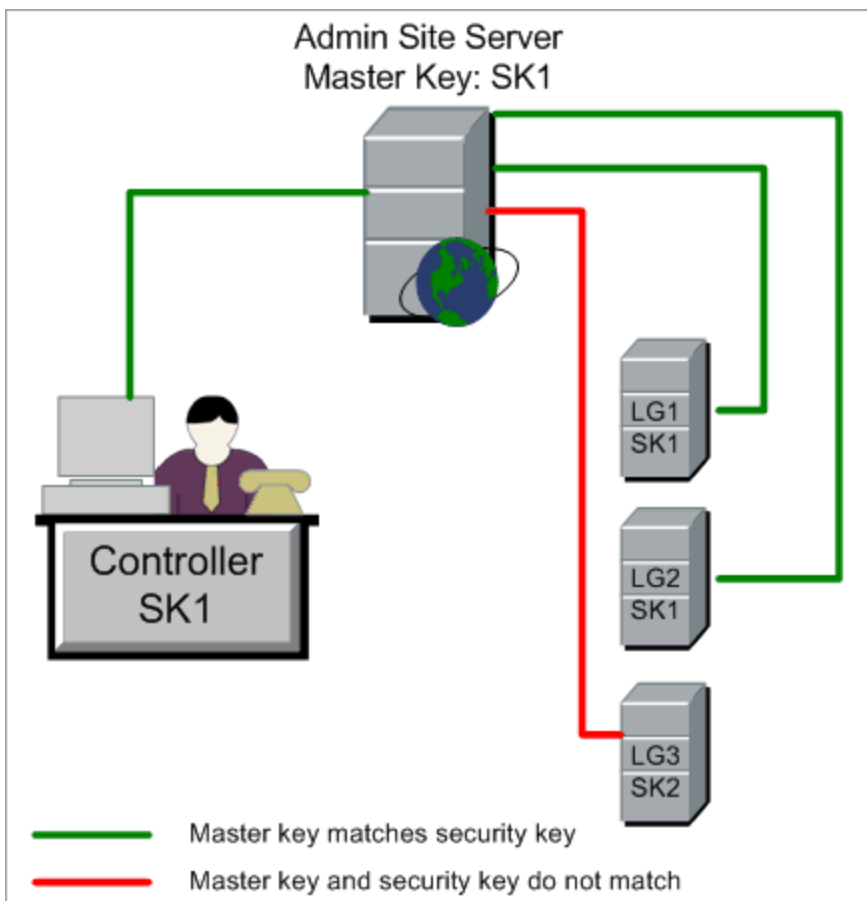
Using Host Security Manager, you can update the security key on all the hosts, or update the security mode on selected hosts. For details, see "How to Update Host Security Settings Remotely" on page 519.

Master Security Key

To update security settings on the hosts, Host Security Manager uses a master key that matches the security keys on all the hosts. This enables secure communication between Host Security Manager and the hosts for the purpose of remotely updating the security settings.

If the master key and security key on a particular host do not match, Host Security Manager cannot update security settings on that host.

When you open Host Security Manager for the first time, you are prompted for a key.
Host Security Manager stores this key as a master key for secure communication with the hosts. If you do not enter the key at this point, you are prompted for it again when you try to update the security settings.

Considerations for Updating Linux Load Generators

- Linux load generators that use rsh (remote shell) to connect to the Controller host cannot be updated using Host Security Manager. To update security settings on such load generators, use the local Host Security Setup utility. See "How to Configure Security Settings Locally on Hosts" on the next

page.

- To update security settings on a Linux load generator using Host Security Manager, you must launch the load generator daemon for a user and manually grant write permissions to the user on **<installation folder>/config**.

Host Security Best Practices

- To avoid sending security settings over a non-secure channel, perform **initial configuration** of the security settings on each host locally (see "How to Configure Security Settings Locally on Hosts" below).

- Security settings should be changed once a month.

- Security settings can be updated:

  - manually on each host

  - remotely on all hosts simultaneously using the Host Security Manager utility

  If the host's settings fail when using the Host Security Manager utility, you must update the settings manually.

How to Configure Security Settings Locally on Hosts

This task describes how to configure security settings locally on Controllers and load generators.

> **Note:** This task is part of a higher-level task. For details, see "How to Work with Performance Center Administration" on page 491.

Windows Hosts

1. On each host, launch the Host Security Setup utility (**Start > All Programs > HP Performance Center Host > Tools > Host Security Setup**).

   For user interface details, see "Host Security Setup Dialog Box" on page 524.

2. Select a security mode for the host.

3. If you selected to enforce secure communication, enter a security key (6 - 16 characters). Enter the key a second time for confirmation.

Linux Hosts

1. Log in as root user and change to tcsh.

2. Go to the **/opt/HP/HP_LoadGenerator** directory and type:

   >source ./env.csh

3. Run **SecurityKeyConsole.exe**, located in the **<Installation_folder>/bin/** directory.

4. In the Console window, enter an option as follows:

   ▪ To change the security mode, enter 1.

   ▪ To change the security key, enter 2.

5. If you are changing the security mode:

   ▪ To turn the security on, enter 1.

   ▪ To turn the security off, enter 0.

6. If you are changing the security key, enter the new key. A valid key is 6 - 16 characters long.

How to Update Host Security Settings Remotely

This task describes how to use Host Security Manager to update security settings on the Performance Center hosts remotely, from the Performance Center Server.

> **Note:** This task is part of a higher-level task. For details, see "How to Work with Performance Center Administration" on page 491.

This task includes the following steps:

- "Prerequisites" below

- "Register Performance Center hosts in Host Security Manager" below

- "Update the security settings" below

- "Results" on the next page

1. Prerequisites

   ■ Each host must have a security key defined on it, and all of the hosts' security keys must be identical.

   ■ Host Security Manager must have a master security key that is identical to the security key on all of the hosts. For details, see "Remote Security Configuration" on page 516.

2. Register Performance Center hosts in Host Security Manager

   For Host Security Manager to communicate with the Performance Center hosts, you must first register the hosts in Host Security Manager.

   > **Note:** Every time you use Host Security Manager to update security settings, make sure that the list of hosts in Host Security Manager is updated.

   a. Open Host Security Manager: On the Performance Center Server, select **Start > All Programs > HP Performance Center Server > Tools > Host Security Manager**. For user interface details, see" Host Security Manager Window" on page 522.

   b. Before opening, the tool prompts you for the ALM login credentials. Enter the credentials.

   c. In the Host Security Manager, click **Get Performance Center Hosts**. The list of hosts is updated as follows:

      ○ The hosts—and, where relevant, their associated MI Listeners—are imported from ALM into the utility.

      ○ If you are updating the list, hosts that are no longer in ALM are removed from the list.

3. Update the security settings

   a. Update the desired security setting:

      ○ **Security key.** Click **Update Security Key**, enter the new key, and enter it again for confirmation.

      ○ **Security Mode.** Select the hosts in the list that you want to update. To select multiple hosts, hold down the CTRL key on your keyboard while selecting the relevant hosts. Click **Update Security Mode**, and select a security mode.

b. Click **Update**.

Host Security Manager attempts to update the security setting on the hosts listed under **Update progress**. As it attempts to update each host, it displays the update status, **Updated** or **Failed**, before attempting to update the next host.

If a host is not updated successfully, check for possible reasons. You can stop the update process by clicking **Stop**.

If there is a mismatch between Host Security Manager's master security key and the host's security key, the Update Error dialog box opens, prompting you for an appropriate action:

○ **Skip host.** Skip updating this host.

○ **Establish a secure channel using this key.** Use a different security key to communicate securely with the host.

○ **Communicate over non-secure channel.** Update the security setting over a non-secure channel. **This action is not recommended**, especially when updating the host security to secure mode. You should rather update the security setting locally on the host (see "How to Configure Security Settings Locally on Hosts" on page 518).

To apply the selected error-handling action to all similar mismatches, select **Use this solution with all similar mismatches**.

> **Note:** The security key update also updates Host Security Manager's master security key. If the update fails on all of the hosts, Host Security Manager's master key is not updated.

4. Results

If the update was successful, Host Security Manager displays the time and status of the security key/mode update for each host.
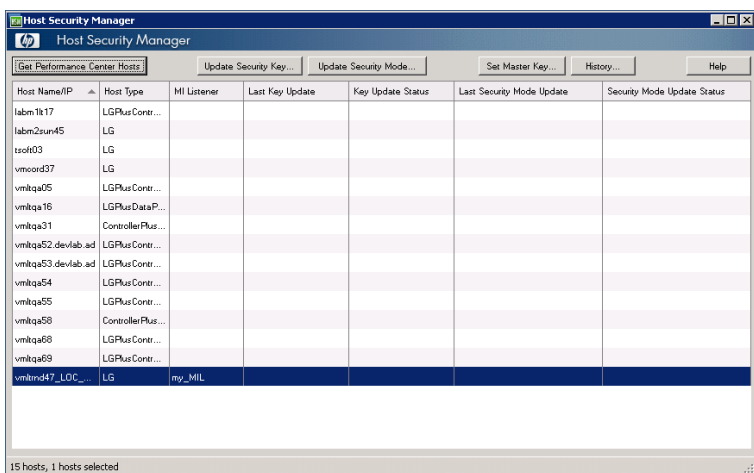
Secure Host Communication User Interface
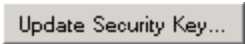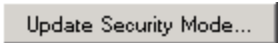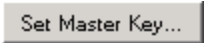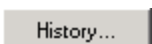
This section includes:

Host Security Manager Window

This window enables you to update security settings remotely on all of the hosts in the performance testing system.

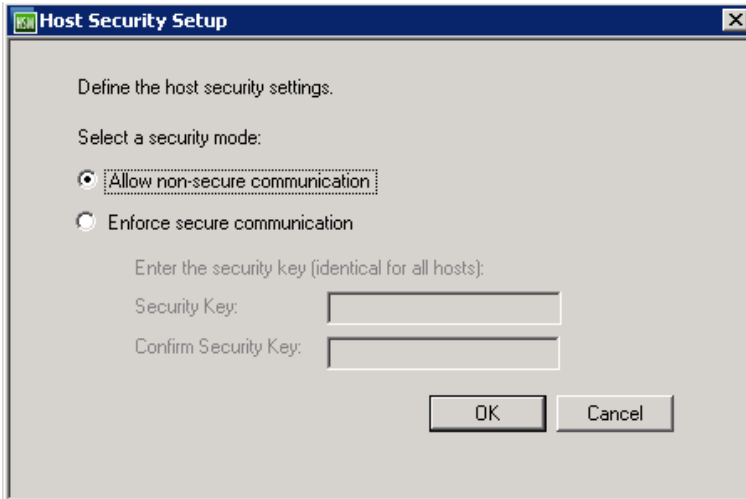|	
To access	On the Performance Center server select **Start > All Programs > HP Performance Center Server > Tools > Host Security Manager**.
Important information	• You must provide Host Security Manager with a master security key before you can update the security settings. • Every time you use Host Security Manager to update security settings, click **Get** Performance Center **Hosts** to make sure that the list of hosts is up to date.
Relevant tasks	"How to Update Host Security Settings Remotely" on page 519
See also	" Secure Host Communication Overview " on page 515

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
Get Performance Center Hosts	Imports all the hosts defined in ALM into Host Security Manager.
Update Security Key...	Opens the Update Security Key dialog box, enabling you to update the security key on all the hosts. For details, see " Update Security Key Dialog Box" on page 525.

UI Elements	Description
Update Security Mode...	Opens the Update Security Mode dialog box, enabling you to update the security mode on selected hosts. For details, see " Update Security Mode Dialog Box" on page 526.
Set Master Key...	Opens the Set Master Key dialog box where you update Host Security Manager's master security key.
History...	Opens the History dialog box, enabling you to view the history of updates made to the hosts. The information displayed includes the date of the update, the operation (key/mode update), and the update status (Passed/Failed).
<Hosts table>	Displays the following information: **Host Name/IP.** The name or IP address of the host. **Host Type.** The type of host: Controller/Load Generator. **MI Listener.** When the host is over a firewall, the name of the MI Listener through which the host communicates with the other hosts. **Last Key Update.** The last time the security key was updated. **Key Update Status.** The status of the last security key update. **Last Security Mode Update.** The last time the security mode was updated. **Security Mode Update Status.** The status of the last security mode update. **Tip:** You can sort the details on this page in ascending or descending order by clicking the heading of the column by which you want to sort. Click the column heading again to reverse the sort order.

Host Security Setup Dialog Box

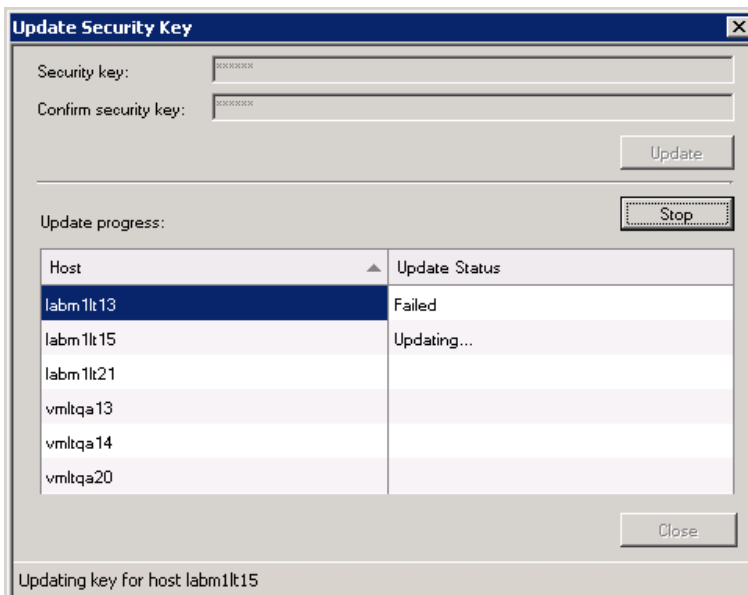This dialog box enables you to update a host's security settings manually.

To access	On the host machine, select **Start > All Programs > Performance Center Host > Tools > Host Security Setup**
Important information	When configuring security settings on hosts for the first time, to avoid configuration over non-secure channels, it is recommended to configure security settings on each host locally using the Host Security Setup utility. After initial security configuration, you can update security settings locally, or simultaneously across all the hosts in the system using the HP Host Security Manager utility installed on the Performance Center Server. For details, see "Remote Security Configuration" on page 516.
Relevant tasks	"How to Configure Security Settings Locally on Hosts" on page 518
See also	"Host Security Configuration " on page 516

User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements	Description
Select a security mode	Select one of the following security modes: ● **Allow non-secure communication.** Allows the host to communicate with other machines over a non-secure channel. (Default) ● **Enforce secure communication.** Enforces the host to communicate with other machines over a secure channel. If you select this option, you must provide the key (6 - 16 characters long) matching the security key on the other hosts with which it needs to communicate.

Update Security Key Dialog Box

This dialog box enables you to update the security key simultaneously on all the hosts.

To access	In Host Security Manager, click **Update Security Key**.
Important information	When you update the security key, the Host Security Manager's master security key is also updated. If the update fails on all the hosts, the Host Security Manager's master key is not updated.
Relevant tasks	"How to Update Host Security Settings Remotely" on page 519

User interface elements are described below:

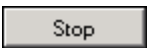| UI Elements	Description
Update	Updates the security key on all of the hosts.
Stop	Stops updating the hosts.
Security Key/Confirm Security Key	Enter the new security key to be updated on all the hosts, and a second time for confirmation. **Note:** The key must be 6 - 16 characters long.
Update progress	Displays the hosts and their status during and after the update.

Update Security Mode Dialog Box

This dialog box enables you to update the security mode simultaneously on selected hosts.
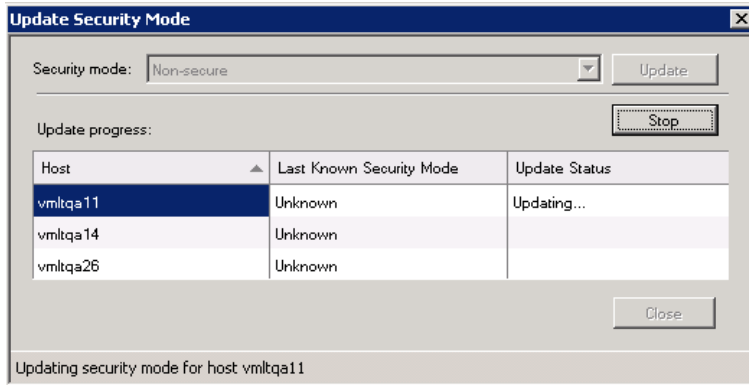
To access	In Host Security Manager, click **Update Security Mode**.
Relevant tasks	"How to Update Host Security Settings Remotely" on page 519

User interface elements are described below:

UI Elements	Description
Update	Updates the security mode on the selected hosts.
Stop	Stops updating the hosts.

UI Elements	Description
Security mode	Select a security mode: • **Non-secure**. Allows non-secure communication. • **Secure**. Enforces secure communication.
Update progress	Displays the hosts, their previous status (if known), and their status during and after the update.

Troubleshooting and Limitations

This section describes troubleshooting and limitations for secure host communication.

Cannot Run Test Over Secure Channels

Problem description: When you try to run a test over secure channels, the test cannot initialize because it cannot connect to a Controller or load generator.

Troubleshooting:

Verify that the reason the test cannot run is because of a security key mismatch: try to run the same test with the same hosts from a local Controller.

If a Security Key Mismatch error is displayed in the error log, the keys do not match. Align the security keys on all the host machines.

Test Run Fails. Load Generator Status is Changed to Resource Failure

Problem description: When trying to run a test over secure channels, the test fails to run and the load generator status changes to **Resource Failure**.

Troubleshooting: To re-enable the load generators, manually reset the status on each affected load generator to **Operational**.

When Opening Host Security Manager Get Unhandled Exception

Problem description: When you open Host Security Manager for the first time, a message displays the following exception: **Unhandled exception has occurred....**

Troubleshooting: Click **Continue** to close the message window.

Send Documentation Feedback

If you have comments about this document, you can contact the documentation team by email. If an email client is configured on this system, click the link above and an email window opens with the following information in the subject line:

Feedback on User and Administrator Guide (ALM Performance Center 12.01)

Just add your feedback to the email and click send.

If no email client is available, copy the information above to a new message in a web mail client, and send your feedback to SW-Doc@hp.com.

We appreciate your feedback!