HP Service Test

for the Windows operating system

Software Version: 11.20

User Guide

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Software Release Date: August 2011

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Welcome to This Guide

Welcome to HP Service Test, HP's tool for creating tests, with a focus on testing SOA and headless technologies.

This chapter includes:

- How This Guide Is Organized on page 13
- Who Should Read This Guide on page 15
- Service Test Updates on page 15
- Service Test Documentation on page 15
- Service Test Feature Movies on page 16

How This Guide Is Organized

This guide contains the following chapters:

Chapter 1 Working with Service Test

This chapter describes the Service Test interface, its layouts, and dockable window panes.

Chapter 2 Creating and Saving Tests

This chapter describes how to create a new solution and project.

Chapter 3 Service Test Activities

This chapter describes the standard built-in activities provided with Service Test and their properties.

Chapter 4 Local Activities

This chapter describes the activities that you create by importing a service contract or assembly into Service Test. This includes Web services, REST services, and .NET assemblies.

Chapter 5 Updating Services and Assemblies

This chapter describes how to update Web services, REST services, and .NET Assemblies.

Chapter 6 Web Service Security

This chapter describes how to set security for Web services on both port and test step levels.

Chapter 7 Asynchronous Service Calls

This chapter describes how to create tests for asynchronous patterns.

Chapter 8 Data Handling

This chapter describes how to add data to your test and how to assign it to your test's parameters.

Chapter 9 Running Tests

This chapter describes how to run tests from the user interface or command line.

Chapter 10 Run Results Viewer

This chapter describes how to view the results in the Run Results Viewer and filter or export the information according to your needs.

Chapter 11 ALM/QC Integration

This chapter describes how to integrate with HP ALM/QC (Application Lifecycle Management/Quality Center) to manage your tests and implement version control.

Who Should Read This Guide

This guide is for the following users of Service Test:

- Application developers or configurators
- System or instance administrators
- Functional and load testers

Readers of this guide should be moderately knowledgeable about SOA systems and Web services.

Service Test Updates

You can check online for updates to all HP products installed on your computer at any time by choosing **Start** > **Programs** > **HP Service Test 11.20** > **HP Update**. You can then select which updates to download and (optionally) install.

Service Test Documentation

Service Test includes the following online documentation:

Readme. Choose **HP Service Test 11.20** > **Readme** from the Start menu.

HP Service Test Online Help. Available from the Service Test user interface by clicking in the window and pressing F1 or clicking the **Help** button.

User Friendly Documentation. Online books can be viewed and printed using Adobe Reader, which can be downloaded from the Adobe Web site (www.adobe.com).

- **HP Service Test User Guide.** Choose **HP Service Test 11.20** > **Documentation** > **User Guide** from the Start menu.
- **HP Service Test Installation Guide.** Choose **HP Service Test 11.20** > **Documentation** > **Installation Guide** from the Start menu.
- **HP Service Test Tutorial.** Choose **HP Service Test 11.20** > **Documentation** >**Service Test Tutorial** from the Start menu.

Service Test Feature Movies

Service Test includes a movie which introduces the application and illustrates some of its main features.

To access the movie, select **Help** > **Product Feature Movies** > **Introduction to HP Service Test**.

1

Working with Service Test

This chapter includes:

Concepts

Tasks

References

Concepts

Service Test Overview

Welcome to HP Service Test, HP's tool for the construction and execution of functional tests for headless systems.

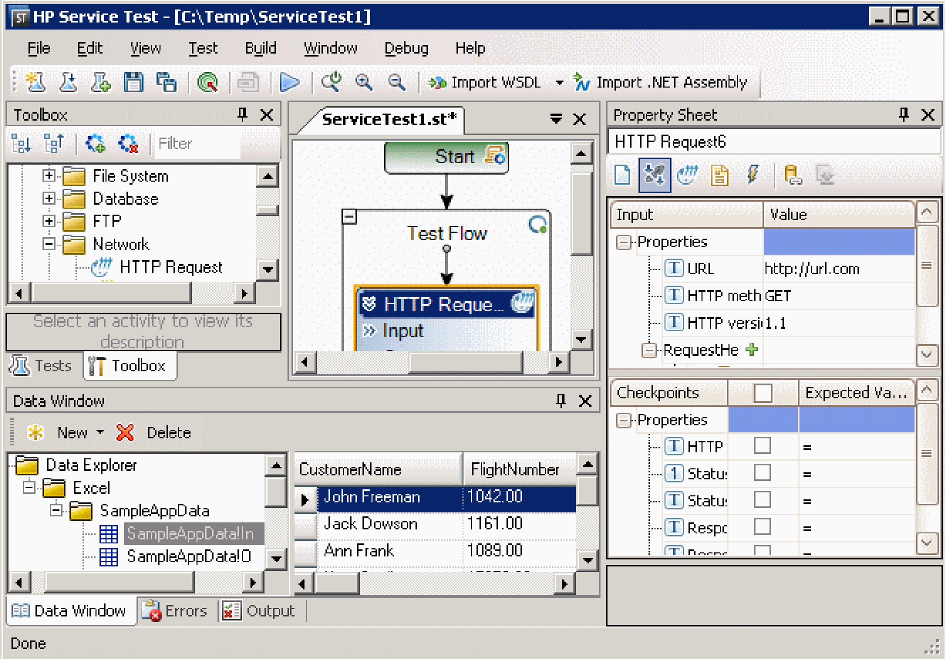
You create a test by dragging and dropping activities from the Service Test toolbox into a canvas. The toolbox provides a collection of activities for functional testing in areas such as REST, Web Services, JMS, and HTTP. You can add more activities to the toolbox by importing WSDLs or providing other contract definitions.

This section includes:

- "Introducing Service Test" on page 19
- "Performing Integrated Testing" on page 19
- "The Canvas" on page 20
- "The Toolbox" on page 25
- "Data Sources" on page 26
- "Using Service Test for Testing Web Services" on page 27
- "Using Service Test for Testing REST Services" on page 27
- "Java Testing" on page 28
- "The Property Sheet" on page 29

Introducing Service Test

Service Test uses a visual designer as a canvas for creating steps in a test. You create tests by dragging activities from the Toolbox onto the canvas and defining their parameters.



Input	Value
Properties	
URL	http://url.com
HTTP meth	GET
HTTP versi	1.1
RequestHe	

Checkpoints	□	Expected Va...
Properties		
HTTP	□	=
Statu:	□	=
Statu:	□	=
Respc	□	=

CustomerName	FlightNumber
John Freeman	1042.00
Jack Dowson	1161.00
Ann Frank	1089.00

Performing Integrated Testing

In testing your systems, you perform known activities and observe the response. By checking the response, you determine whether your system is performing as expected.

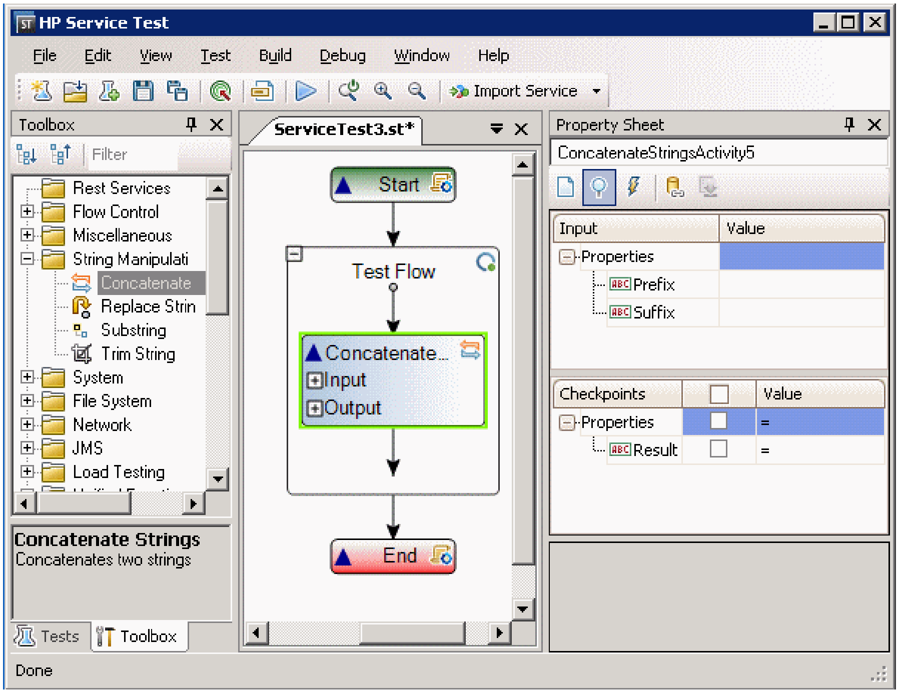
For example, in a **Database** > **Open Connection** activity, you drag the activity into the canvas and provide a Database connection string. You then can drag a **Select Data** activity into the canvas. After running these actions, you can check the response with an expected value to confirm that your service is functioning properly.

The steps to create a basic test are:

- Drag an activity into the canvas
- Assign input data
- Set checkpoints to verify the response

The Canvas

The canvas in Service Test provides a visual representation of the test flow. You populate the canvas by dragging in activities from the Toolbox palette.



You can drag Web Services, REST services, or any Toolbox activity, into the canvas. For a service to appear in the Toolbox, you must first import it (Web services) or define it (REST services) in your project. For details, see "How to Import a WSDL-Based Web Service" on page 206.

Tab Title

The canvas tab title is <**Test name>.st**. An asterisk denotes changes that were not yet saved.

Manipulating Steps

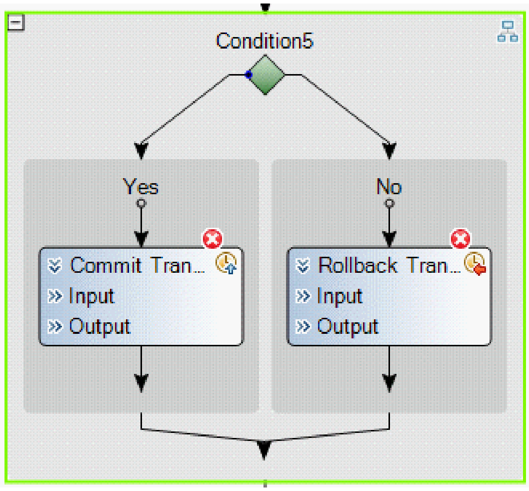
The canvas enables you to manipulate the steps in the following ways:

- **Reorder**. Drag a step from one location to another.
- **Copy and Paste**. Select a step and press **Ctrl+C** to copy it to the clipboard. Press **Ctrl+V** to paste it into another location within the Test Flow or to another loop.
- **Delete**. Select a step and press the keyboard's **Delete** button.

Flow Control

The canvas enables you to control the flow of the steps in the following ways:

- **Loop**. The main **Test Flow** area provides a default loop for test steps. You can add steps to the Test Flow or add additional loops. Using the Properties Sheet, you can specify the type of loop, number of iterations, and conditions for the Test Flow or loop. For details, see "Input/ Checkpoints View" on page 70.
- **Conditional steps**. Adds a two-branched conditional node to the test.

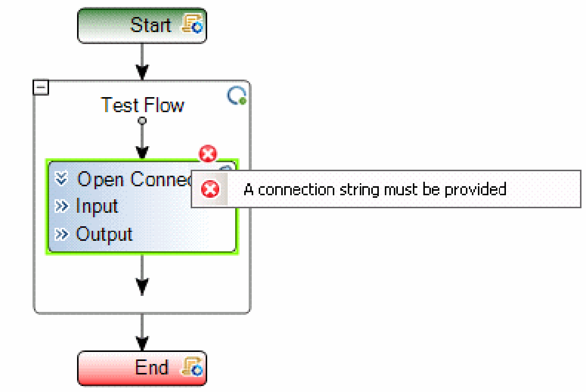


For conditional steps, you drag the **Condition** activity from the Toolbox into the canvas, and then drag an activity into each of the conditional branches.

- **Break.** Moves control to the step after the loop.
- **Continue.** Moves control back to the first step in the **Test Flow** or **Loop** and increments it to the next iteration.

Alerts

Steps that require intervention in order to run, such as **HTTP**, **Custom Code**, and **SOAP Request**, post an alert in their top right corner. Clicking an alert button displays the action that you are required to do.

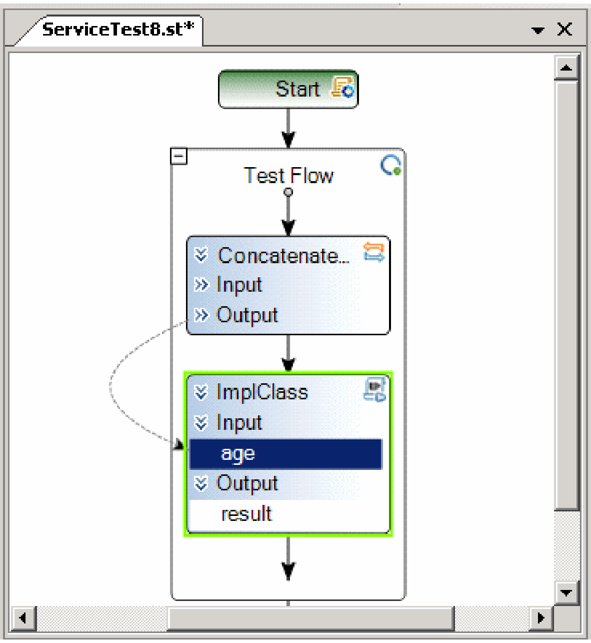


A connection string must be provided

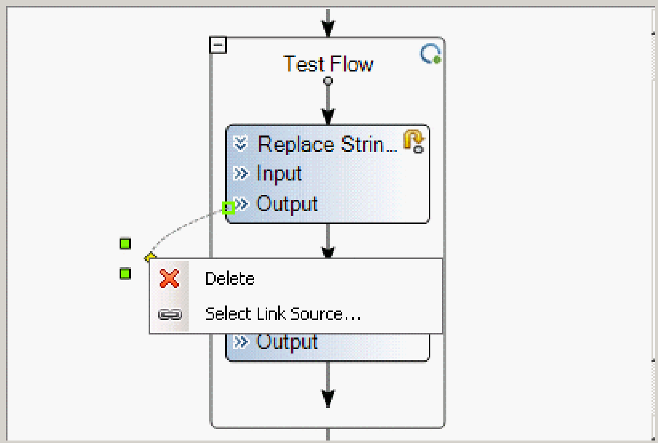
You can also view this information in the Errors tab by selecting **View** > **Errors**.

Connecting Data

The canvas displays the relationship between output and input properties. An arrow indicates the direction of the relationship.



You can edit the link between steps by selecting the linking arrow and choosing **Select Link Source** from the shortcut menu.



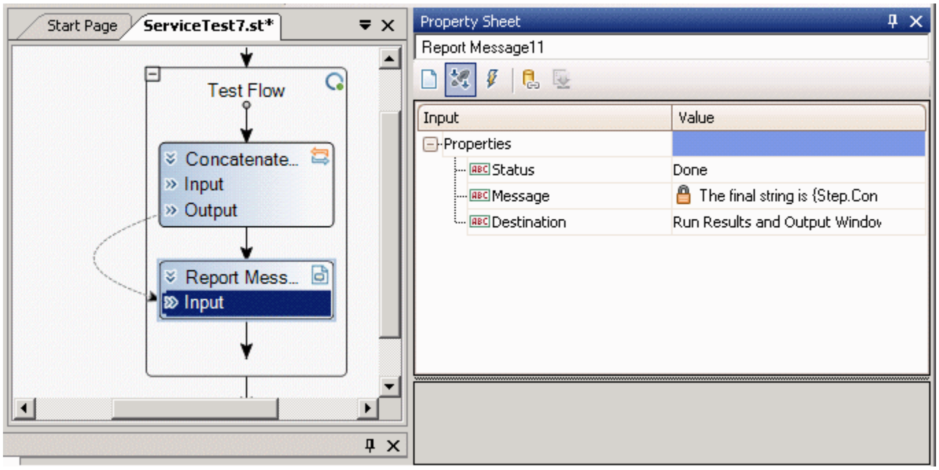
For more information, see the "Select Link Source Dialog Box" on page 395.

For details about linking multiple steps to a single result, see "Outgoing Links" on page 348.

Sending Messages to the Output and Results Viewer

The **Report Message** activity lets you send custom messages to the Output log and/or the Results viewer. You drag the activity to the canvas and set its properties in the Property sheet.

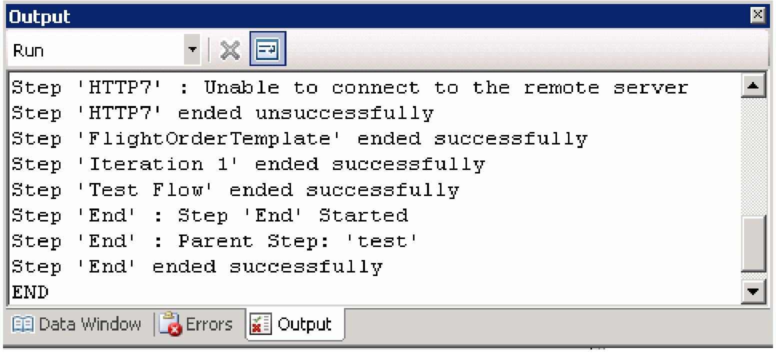
As with any step, you can link its input to the output of a prior step and show the results in the Output window.



Report Message11

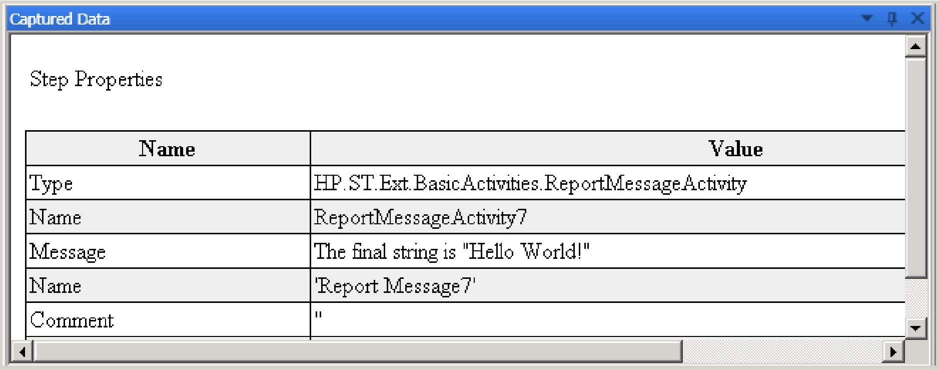
Input	Value
Properties	
Status	Done
Message	The final string is {Step.Con
Destination	Run Results and Output Window

In the following example, the Output window shows the message string.



```
Step 'HTTP7' : Unable to connect to the remote server
Step 'HTTP7' ended unsuccessfully
Step 'FlightOrderTemplate' ended successfully
Step 'Iteration 1' ended successfully
Step 'Test Flow' ended successfully
Step 'End' : Step 'End' Started
Step 'End' : Parent Step: 'test'
Step 'End' ended successfully
END
```

When you use this activity, Service Test adds a **Message** row to the Results report, with the contents of the message.



Step Properties

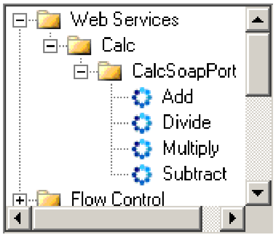
Name	Value
Type	HP.ST.Ext.BasicActivities.ReportMessageActivity
Name	ReportMessageActivity7
Message	The final string is "Hello World!"
Name	'Report Message7'
Comment	''

For more information, see the "Run Results Viewer" on page 439.

The Toolbox

The Toolbox palette contains all of the activities and flow control objects that you need in order to create a test.

After you import a Web service, it appears in the Toolbox, under the **Web Services** node. When you expand the Web Services node, the Toolbox displays the service’s name, port, and operations.



For additional details about each of the nodes, see the "Toolbox Palette" on page 45.

Extensibility

For greater control over test steps, you can define custom code activities that seamlessly integrate with Service Test. You can also customize the behavior of existing activities using event handlers. For more information, see "Coding Service Test Events" on page 507.

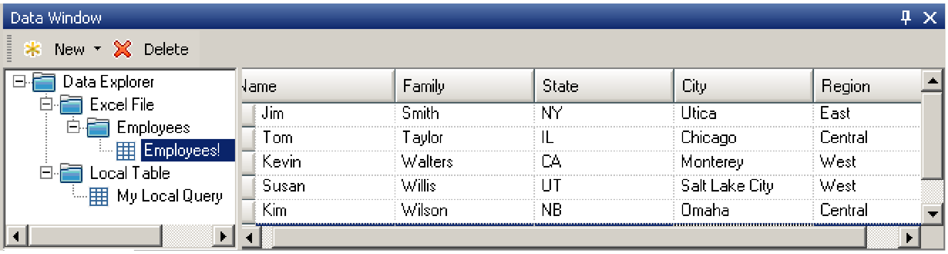
For information about adding new activities, speak with your HP representative.

Data Sources

Using the Data window, you can define data for your test's properties. You can link to a variety of data sources, such as Microsoft Excel or XML files. You can also define data locally for the test steps.

When you load data from Excel, you can indicate whether to make a local copy of the data, or a referenced data source which refers to the data at its original source.

A data grid displays the Excel and locally defined data. If you created a referenced data source, you will be unable to edit the values in the data grid.



Name	Family	State	City	Region
Jim	Smith	NY	Utica	East
Tom	Taylor	IL	Chicago	Central
Kevin	Walters	CA	Monterey	West
Susan	Willis	UT	Salt Lake City	West
Kim	Wilson	NB	Omaha	Central

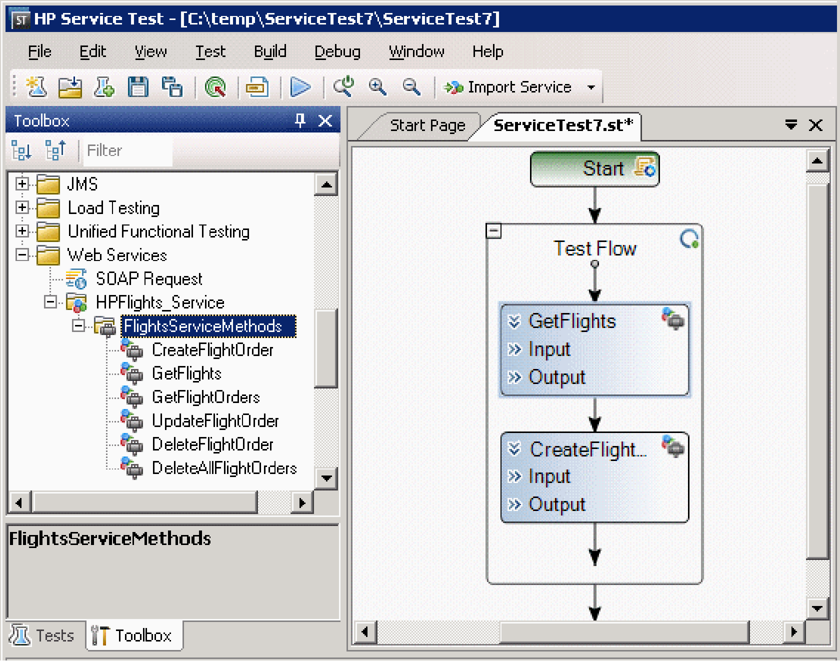
After you load data, you can assign it to properties in your test.

For information on using data in your test, see "How to Assign Data to Test Steps" on page 365.

Using Service Test for Testing Web Services

You can use Service Test to test standard Web Services. For Web services, you import the service's WSDL file.

After importing the WSDL file, the Toolbox window lists the operations in the Toolbox. You then drag the operations directly into canvas and provide input values.



For task details, see "How to Import a WSDL-Based Web Service" on page 206.

Using Service Test for Testing REST Services

You can use Service Test to test non-SOAP Web Services, such as REST.

For REST services, you manually define the metadata and model your activities based on the design of your service's requests.

After setting the REST resource definitions, you can create REST method calls based on the metadata. To validate the results, you set checkpoints for the REST method's response.

Service Test enables you to create templates for individual REST methods. The templates include all of the request and header information, as well as custom parameters. Using this template, you can drag the method into the canvas without having to configure its details repeatedly.

For task details, see "How to Create a Prototype REST Method" on page 214.

Java Testing

Service Test enables you to call Java classes with its **Call Java Class** activity.

In order to use this step, you must implement the Service Test Java interface. The aim of this interface is to define a contract or bridge between the Java artifacts owner and Service Test. The interface contains three methods:

- **getInputProperties.** Returns a mapping of the input property names and their Java class.
- **getOutputProperties.** Returns a mapping of the output property names and their Java class.
- **Execute.** A method that receives the mapping of the input property names and their actual values i.e. their object instance. In this method, you process input properties and delegate them to your own Java artifacts. Afterwards you process the output properties and send their mappings and their actual values as the method's output.

The following table lists the relevant paths:

File	Path
Interface code	➤ **Path**: %ST_DIR%\addins\ServiceTest\JavaCall\Java Interface\src\hp\st\ext\java\ServiceTestCall.java ➤ **Default installation**: C:\Program Files\HP\HP Service Test\addins\ServiceTest\JavaCall\Java Interface\src\hp\st\ext\java\ServiceTestCall.java
Sample code	➤ **Path**: %ST_DIR%\addins\ServiceTest\JavaCall\Java Interface\src\hp\st\ext\java\sample ➤ **Default installation**: C:\Program Files\HP\HP Service Test\addins\ServiceTest\JavaCall\Java Interface\src\hp\st\ext\java\sample

To configure a Java step, you select a root path, a jar file containing the class, and the actual Java class. You can provide additional classpaths and jar files for the Java call. For details about selecting the Java class and packaging, see the "Call Java Class Settings Dialog Box" on page 196.

Service Test supports the following Java classes: **Byte**, **Short**, **Int**, **Long**, **Float**, **Double**, **Boolean**, **Date**, and **String**. The **Char** class is not supported.

For task details, see "How to Create a Call to a Java Class" on page 116.

The Property Sheet

The Property Sheet provides several views that allow you to set and create step properties and define handler events.

The Property Sheet’s toolbar also provides action buttons that allow you to data drive properties and load files.

For details, see the "Property Sheet" on page 51.

UFT (Unified Functional Testing)

UFT (Unified Functional Testing) activities allow you to create tests with steps from Service Test, QuickTest Professional, or LoadRunner's Virtual User Generator. QuickTest Professional is HP's tool for functional testing of client and Web applications. HP LoadRunner enables you to perform Load Testing on your applications and environment.

You create the tests or scripts in the original application and call them within the Service Test flow. You can also call another Service Test test from within the Test Flow.

For user interface details, see the "Toolbox Palette" on page 45.

For task details, see "How to Implement UFT Testing" on page 131.

JMS Transport Overview

The JMS transport method is a J2EE standard for sending messages—either text or Java objects—between Java clients. Service Test supports the sending of text messages between Java clients. There are two scenarios for communication:

- **Peer-to-Peer.** Also known as **Point-to-Point**. JMS implements point-to-point messaging by defining a message queue as the target for a message. Multiple senders send messages to a message queue, and the receiver gets the message from the queue.
- **Publish-Subscribe.** Each message is sent from one publisher to many subscribers through a designated topic. The subscribers only receive messages sent after they have subscribed.

To interpret Topic and Queue names, Service Test calls a lookup method on a JNDI context, defined in the Property Sheet's Test Settings. For details, see the "Test Settings View" on page 77.

For a list of the activities and their properties, see "JMS Activities" on page 162.

For task details, see "Set up a JMS message - optional" on page 34.

Tasks

How to Populate a Test

This task describes how to set up the workflow and add steps to your tests. For details on creating the test and defining user or test variables, see "Creating and Saving Tests" on page 85.

This task includes the following steps:

- "Prepare the service references - optional" on page 31
- "Create the test flow" on page 32
- "Add activities to the test" on page 32
- "Define data for the test" on page 32
- "Create a Custom Code activity - optional" on page 32
- "Add attachments to the test - optional" on page 33
- "Validate an output attachment- optional" on page 33
- "Set up a JMS message - optional" on page 34
- "Configure SOAP Fault information - optional" on page 34
- "Specify an event handler - optional" on page 35

1 Prepare the service references - optional

For Web Service based tests, import your WSDL at this point. For details, see "How to Import a WSDL-Based Web Service" on page 206.

For REST services, build the metadata for the service. For details, see "How to Create a Prototype REST Method" on page 214.

Skip this step when using the built-in activities, such as string manipulation.

2 Create the test flow

Expand the Toolbox nodes and drag **Flow Control** activities onto the canvas:

- **Loop.** Enables you to add a loop other than the standard **Test Flow**. Specify a loop condition in the input properties.
- **Condition**. Enables you to specify conditional branches.
- **Sleep.** Indicates a time delay in milliseconds.

3 Add activities to the test

Expand the nodes of the Toolbox palette and drag activities into the Text Flow box within the canvas. If you added a **Condition** step, drag activities into the condition branches. For a list of the activities, see the "Standard Activities" on page 139.

4 Define data for the test

For details, see "How to Assign Data to Test Steps" on page 365 or "How to Data Drive a Test Step" on page 375.

5 Create a Custom Code activity - optional

Select the **Custom Code** activity from the **Miscellaneous** category and drag it into a loop.

a Open the **Input/Checkpoints** view in the Property Sheet.

b Add new input and output properties based on your needs.

c Open the **Events** view in the Property Sheet.

d Double-click the **Handler** column of the **ExecuteEvent** row. Service Test opens a new tab **TestUserCode.cs**.

e Locate the **Todo** section and enter your custom code. Follow the sample code in the comments and use autocompletion to write your code.

f Click **File** > **Save All** to save all buffers of the test.

For details and examples, see Appendix A, "Coding Service Test Events."

6 Add attachments to the test - optional

For Web Service activities that support input attachments, add an input attachment:

a Select the Web Service in the canvas and open the **Attachments** view in the Property Sheet.

b In the upper pane, select an attachment **Type**: **DIME** or **MIME**.

c Click in the **Attachments** row and click the **Add** button to add an array element.

d Select an **Origin** for the attachment using the **Browse** button.

e Select an **Origin Type**, **Content Type**. Specify a **Content ID** or keep the default value, **Auto**.

7 Validate an output attachment- optional

To validate an output attachment:

a Select the Web Service in the canvas and open the **Attachments** view in the Property Sheet.

b Click in the **Attachments** row in the Checkpoints pane, and click **Add** to add an array element (it may be necessary to expand the column).

c Select the check box adjacent to each item that you want to validate. Specify values for the elements being validated: **Content Type** and/or **Content ID**.

d To validate content, click the **Calculate the file checksum** button icon in the **Content** row. Service Test calculates the file's checksum using the MD5 Hash function.

For user interface details, see "Attachments View" on page 56. You can also check for received attachments in the test's folder, stored as files with a **.bin** extension.

8 Set up a JMS message - optional

For JMS messages, you set up the environment before adding a test step.

a Click in the canvas and open the **Test Settings** view in the Property Sheet. Set the Java test settings for the VM and JMS. For details, see the "Test Settings View" on page 77.

b Expand the **JMS** node in the toolbox and drag a JMS activity into the canvas.

c Set the step's properties. Click on the step in the canvas, and open the **Input/Checkpoints view** in the Property Sheet. Enter a Queue, Subscription, Topic name, and any other relevant property values.

d For Send activities, specify a message.

e For Receive activities, select the output properties you want to validate in the **Checkpoints** pane and specify their values.

For more details, see "JMS Transport Overview" on page 30.

9 Configure SOAP Fault information - optional

To apply negative testing to a Web service:

a Open the **SOAP Fault** view.

b Select **Fault is expected**.

c Provide SOAP Fault checkpoint values for the negative testing:

- ➤ To work In the **XML** layout: Expand the SOAP nodes and define **Any** elements for the SOAP Header and Body. If relevant, provide values for **faultcode**, **faultstring**, or **faultactor**.
- ➤ To work with **XPath** expressions: Click the **XPath** tab and use the Add button to add new XPath entries. Copy the XPATH entry into the cell.

For details, see the "SOAP Fault View" on page 76.

10 Specify an event handler - optional

For non-custom code activities, you can define default event handlers for checkpoints, before step executions, and after step executions.

The checkpoint event handlers help you verify the output values in your test. You can use a Report, Assert, or Log function to gather information about your service.

To add a checkpoint event handler for an activity:

a Select an activity title in the canvas and open the Events view in the Property Sheet.

b In the **CodeCheckPoint** row, select **Create a default handler**.

c Edit the code in the **TestUserCode.cs** tab. Locate the **Todo** section and add your custom code. Follow the sample code in the comments and use auto-complete to create an expression.

d To access the properties of an activity, cast it beforehand. For example:

```
ConcatenateStringsActivity cat = args.Activity as ConcatenateStringsActivity;
args.Checkpoint.Assert.Equals(cat.Prefix+cat.Suffix, cat.Result);
```

e Click **File** > **Save All** to save all buffers of the test.

For details and examples, see Appendix A, "Coding Service Test Events."

Tip: To instruct Service Test to ignore all event handlers, select a handler and press DELETE to clear the field in the grid. To remove the handler, you must delete the code manually in the **TestUserCode.cs** tab.

References

Service Test User Interface

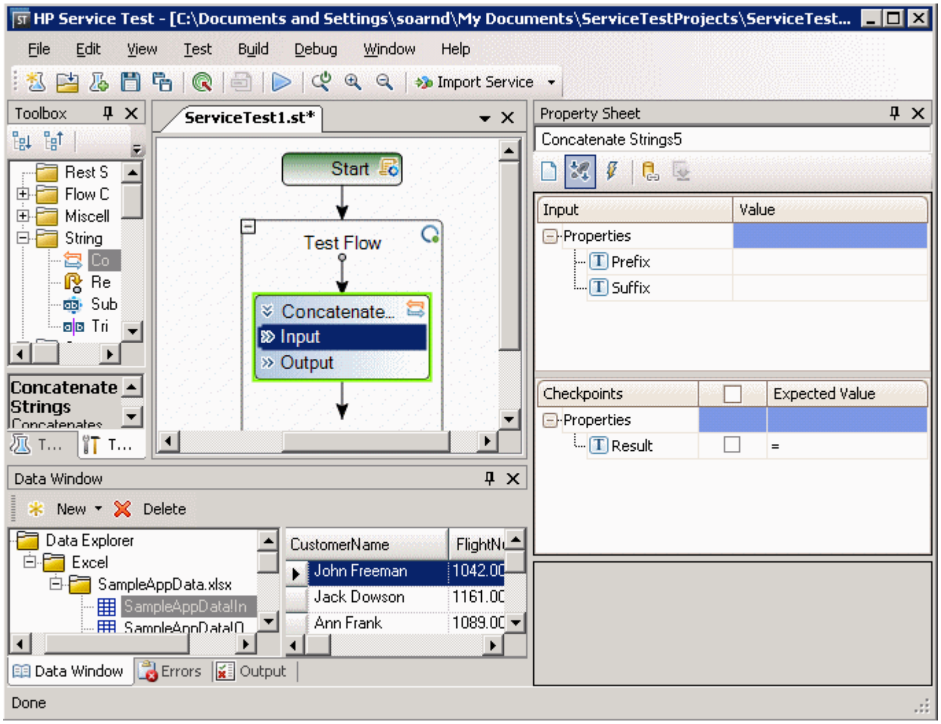
The Service Test interface lets you design a test by dragging activities into a canvas.

This section includes:

- Service Test Main Window on page 37
- Tests Pane on page 42
- Toolbox Palette on page 45
- Output Tab on page 48
- Errors Tab on page 49

Service Test Main Window

This screen is Service Test's main window for creating and populating tests.



CustomerName	FlightN
John Freeman	1042.00
Jack Dowson	1161.00
Ann Frank	1089.00

To access	Select **Start** > **HP Service Test 11.20** > **HP Service Test 11.20.**
Relevant tasks	"How to Populate a Test" on page 31

User interface elements are described below (unlabeled elements are indicated by angle brackets):

UI Elements (A-Z)	Description
	Create New Test. Opens the Create New Test dialog box.
	Open Test. Prompts you to open an existing test.
	Add New Test. Opens the Add New Test dialog box.
💾	**Save.** Saves the file in the active tab. **Tip:** Select **File** > **Save Test As** to save the test to a new location.
	Save All. Saves all open files.
	ALM/QC Connection. Opens the HP ALM/QC Connection dialog box for defining server information and logging into an ALM/QC project.
	Enable Load Testing. Enables the test for Load Testing. **Note**: ➤ This button adds a menu to the **Run** button, to run the test in Load Testing mode. ➤ The button is disabled if you created the test with the Load Test template.
▷ ▷ ▾	➤ **Run Project.** Saves, compiles and runs the current project. ➤ **Run Test (Load Test).** Saves, compiles and runs the current test in Load Test mode with the **mdrv** driver. **Note:** The **Run Test** option is only available for Load Test type tests (created with the Load Test template or converted from the standard template to a load test).
⏸ ⏯	➤ **Break Test.** Pauses the test run. ➤ **Continue Test.** Resumes the test run from the point of the Break.

UI Elements (A-Z)	Description
■	**Stop.** Stops the current test run.
🔍 🔍 🔍	Zoom Controls: ➤ **Default Zoom.** Restores the default enlargement of the objects in the canvas. ➤ **Zoom in.** Enlarges the objects in the test canvas. ➤ **Zoom Out.** Reduces the objects in the test canvas.
☰ ☰ ☰	The following step commands are only active when the test is in **Break** mode. ➤ **Step Over.** Executes the current statement. If the statement calls another procedure, Service Test will not step into that procedure. It will run the procedure, and advance to the next statement in the current procedure. ➤ **Step Into.** Executes the current statement. If the statement calls another procedure, Service Test steps into that procedure. ➤ **Step Out.** If you used **Step Into** and the control moved to a called procedure, **Step Out** runs the current procedure, and returns to the procedure from which it was called.
Import WSDL ▾	Opens one of the Import dialog boxes: ➤ **Import Service from URL or UDDI.** Opens the Import Service from URL or UDDI dialog box. For user interface details, see "Import WSDL from URL or UDDI Dialog Box" on page 230. ➤ **Import Service from FIle or ALM/QC Application Component.** Opens the Select Service dialog box for importing a WSDL from the file system or HP ALM/ QC with HP Service Test Management. For user interface details, see the "Select Service from UDDI Dialog Box" on page 232.

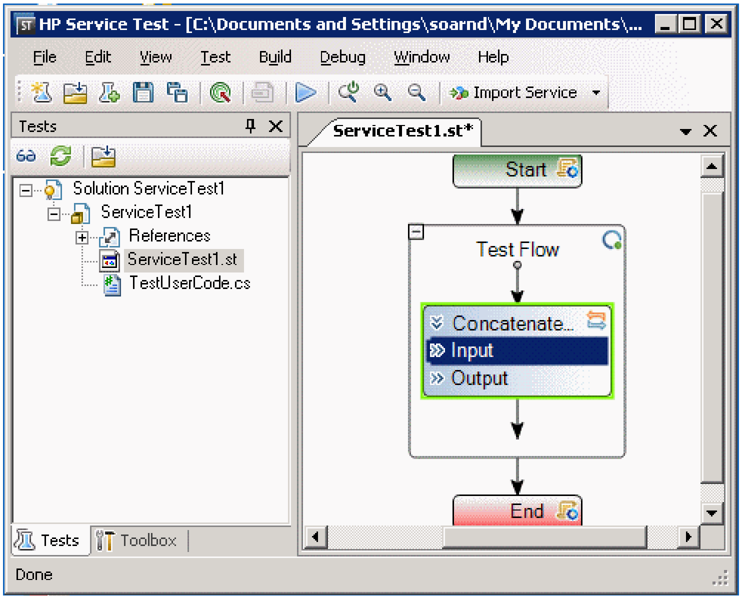
UI Elements (A-Z)	Description
<Editor / Designer pane>	A series of tabs, to view and edit the file selected in the left pane: For example: ➤ Visual display of the test (default) ➤ C Sharp files (**.cs**) ➤ XSD files (**.xsd**) ➤ Solution file (**.sln**)
Data Window tab	Displays the data from an Excel or XML file, a database, or local tables. You can use this data in your tests. ➤ **Data Explorer**. An expandable/collapsible tree hierarchy of the table data. ➤ **New.** Creates a new data node in the Data Explorer through: ➤ **Excel File.** Opens the **Add New Excel File Data Source** dialog box for creating a new set of data. For details, see the "Add New Excel File Data Source Dialog Box" on page 388. ➤ **Local Table**. Opens the **Add New Local Table Data Source** wizard. For details, see the "Add New Local Table Data Source Wizard" on page 390. ➤ **XML**. Opens the **Add New XML Data Source** dialog box. For details, see the "Add New XML Data Source Dialog Box" on page 392. ➤ **Database**. Opens the **Add New Database Data Source** wizard. For details, see the "Add New Database Data Source Wizard" on page 403. ➤ **Delete.** Removes the selected data source. For details, see "Data Window Tab" on page 382.
Errors tab	Displays errors, warning, and messages about the test run. The default location is the bottom pane.
Output tab	Displays the Output log for the compilation and test run. For details, see "Output Tab" on page 48. The default location is the bottom pane.

UI Elements (A-Z)	Description
Tests pane	Displays the test components in a tree hierarchy. For details, see the "Tests Pane" on page 42. The default location is the left pane.
Property sheet	A series of screens showing the general properties, schemas, snapshots, and event information for the activity selected in the canvas. For details, see "Property Sheet" on page 51. **Note:** Only active when viewing the canvas.
Toolbox palette	A tree view of all of the available activities. This includes built-in activities and operations of imported services. For details, see the "Toolbox Palette" on page 45. The default location is the left pane.

Tests Pane

The **Tests** pane enables you to view all the test components in a tree hierarchy.

This screen is Service Test's main window for creating and populating tests.



To access	Select **View** > **Tests** (CTRL+ALT+L).
Relevant tasks	"How to Create a New Test" on page 89
See also	"Test User Interface" on page 99

The following elements are included (unlabeled UI elements are shown in angle brackets):

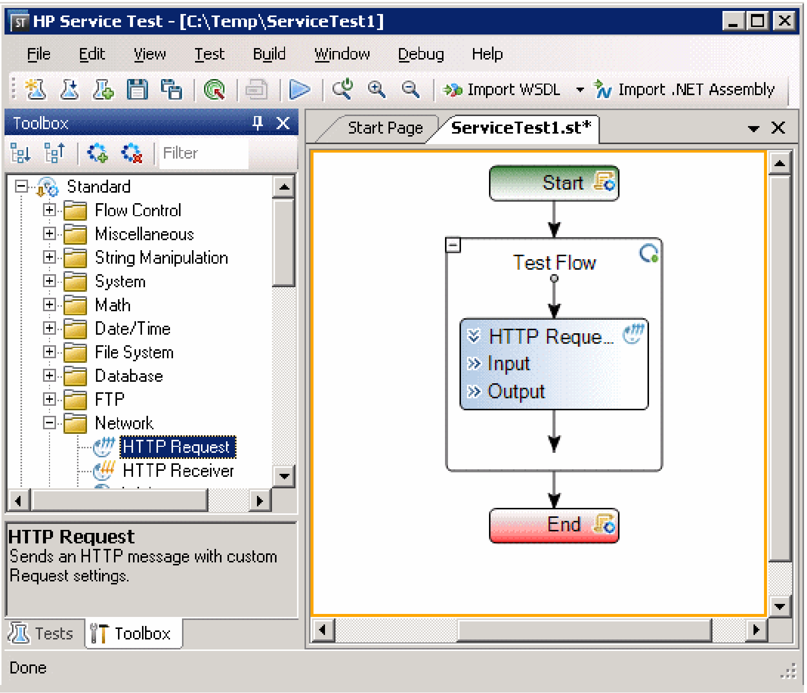
UI Elements (A-Z)	Description
👓	**Show All.** Shows/hides all files associated with current test.
🔄	**Refresh.** Refreshes the **Tests** tree.
📂	**Open.** Opens a tab with the contents of the selected file. **Note:** Only available for the st, canvas file.
<Test> Tree	Tree hierarchy of the test components. Expanding the parent node displays all the references and dependent files. **Tip.** To view all files, click the **Show All** button.
<Test> Tree - File context menu	➤ **Refresh**. Reloads the entire tree. ➤ **Remove.** Deletes the selected node.
<Test> Tree - Project context menu	➤ Build commands: **Build**, **Rebuild**, **Clean** ➤ References: **Add Reference** ➤ Open/Run: **Open With**, **Run Project** ➤ Edit: **Cut**, **Paste**, **Remove**, **Rename**
<Test> Tree - References context menu	➤ **Add Reference.** Opens the Add Reference dialog box.

UI Elements (A-Z)	Description
<Test> **Tree - Test file (*.st) context menu**	➤ Open commands: **Open**, **Open With**, **Open Containing Folder in Explorer** ➤ Add commands: **New Item**, **Existing Item**, **New Folder**, **Existing Folder**, **New Dependent Item**, **Existing Dependent item** ➤ Edit commands: **Cut**, **Copy**, **Paste**, **Delete**, **Rename**
<Test> **Tree** **- Solution context menu**	➤ **Build Solution**. Begins a new build (F8). ➤ **Rebuild Solution**. Rebuilds the current solution (ALT+F8). ➤ **Clean Solution.** Performs a clean build. ➤ **Add.** Enables you to add a New Test, Existing Test, New Solution Folder, or another Item to the solution tree. ➤ **Paste.** Pastes a solution from the clipboard. ➤ **Rename.** Renames the current solution node.

Toolbox Palette

The Toolbox palette enables you to view all of the available activities. This includes imported services and built-in activities such as that you can use in your visual design, such as **Replace String** or **File Exists**.

This screen is Service Test's main window for creating and populating tests.



HTTP Request
Sends an HTTP message with custom Request settings.

To access	Use one of the following: ➤ Click the **Toolbox** tab in the left pane (Default layout). ➤ Select **View** > **Toolbox.**
Important information	➤ You drag activities from this tab into the canvas. ➤ The activity becomes a step in the test. ➤ Only available when viewing the **Toolbox** tab.
Relevant tasks	"Create the test flow" on page 32

Toolbar Controls

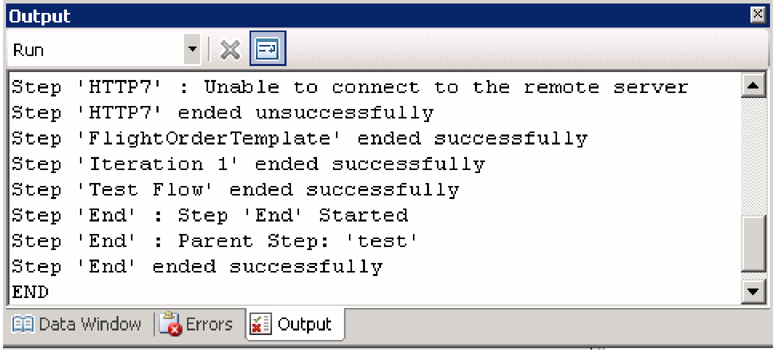
The following toolbar controls elements are included in the Toolbox Palette:

Tree Elements (A-Z)	Description
	Expand All. Expands all nodes in the Activity list.
	Collapse All. Collapses all node in the Activity list.
🔒	**Security Settings.** Opens the Security Settings for Port <Port_Name> dialog box. These settings apply to all operations in the port. For details, see the "Security Settings for Port <Port_Name> Dialog Box" on page 305. **Note:** Only available when selecting the Port node of a Web service.
	Add Activity. Opens the Add Testing Activities dialog box, displaying all of the activities in the Global and ALM/QC repositories.
	Remove Activity. Opens the Remove Activities from Toolbox dialog box for selecting the activities to remove from the Toolbox. **Note:** ➤ Removing an activity only removes it from the Toolbox. It remains, however, in the repository, for future use. ➤ This command does not apply to Standard activities.
➕	**Add Resource.** Adds a resource under the selected node. **Note:** Located adjacent to the **Filter** box, for the REST Services node only.
	Add Method. Adds a method under the selected node. **Note:** Located adjacent to the **Filter** box, for the REST Services node only.

Tree Elements (A-Z)	Description
🔄	**Refresh.** Refreshes the activities in their stored location. This is useful when the WSDL is stored on a shared location and may have been modified by another user. You can refresh the activities instead of reimporting the service.
🔄	**Update WSDL.** Reimports the WSDL from its original source. If the service's operations changed, this will be reflected in its node in the Toolbox.
✖	**Delete.** Delete a service, resource, or method. **Note:** Located adjacent to the **Filter** box, for the REST Services node only.
✎	**Rename.** Rename a service, resource, or method. **Note:** Located adjacent to the **Filter** box, for the REST Services node only.
<activity list>	A tree hierarchy of built-in and custom activities. You drag activities into the canvas to create test steps. For details, see Chapter 3, "Service Test Activities."
Filter box	Filters the toolbox display by the entered text.

Output Tab

Enables you to view the output messages that were generated while compiling and running the test.



```
Step 'HTTP7' : Unable to connect to the remote server
Step 'HTTP7' ended unsuccessfully
Step 'FlightOrderTemplate' ended successfully
Step 'Iteration 1' ended successfully
Step 'Test Flow' ended successfully
Step 'End' : Step 'End' Started
Step 'End' : Parent Step: 'test'
Step 'End' ended successfully
END
```

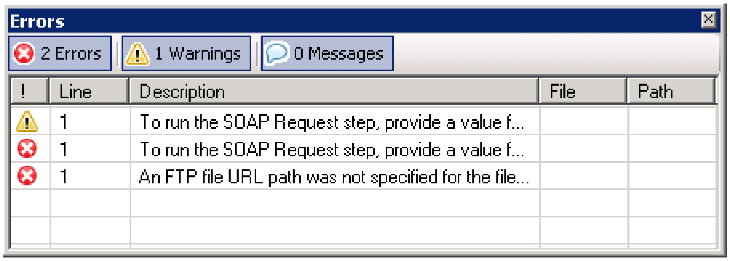
To access	Select **View** > **Output** (CTRL+ALT+O).
Important information	Click on a row to navigate to the code that generated the output message.
Relevant tasks	"How to Run a Test" on page 417

The following elements are included (unlabeled UI elements are shown in angle brackets):

UI Elements (A-Z)	Description
✖	**Clear All.** Clears all the information in the message window.
↵	**Toggle Word Wrap.** Wraps the text of each message onto the next line.
<message window>	Displays all build and debug information issued to the log during the test run.
<Show Output from>	A drop-down list for selecting the output to display: **Build**, **Design**, **Debug**, or **Run.** **Default:** Run

Errors Tab

Enables you to view a list of the errors generated during the test run, and their level of severity: Message, Warning, or Error.



Errors

⊗ 2 Errors | ⚠ 1 Warnings | 0 Messages

!	Line	Description	File	Path
⚠	1	To run the SOAP Request step, provide a value f...		
⊗	1	To run the SOAP Request step, provide a value f...		
⊗	1	An FTP file URL path was not specified for the file...		

To access	Click **Errors** tab in bottom pane or select **View** > **Errors** or CTRL+ALT+K.
Important information	➤ Click on a row to jump to the line in the code that generated the error. ➤ Click any column header, for example **Line** or **File**, to sort by that criteria.
Relevant tasks	"How to Run a Test" on page 417
See also	"Alerts" on page 22

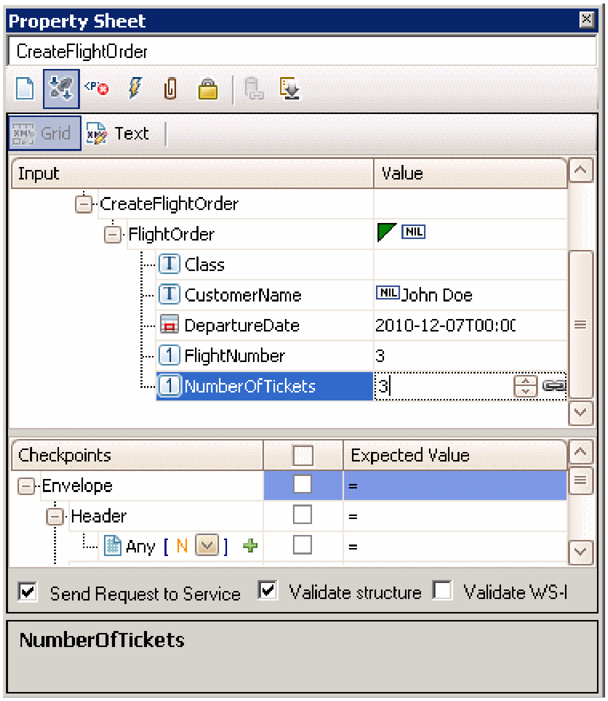
The following elements are included:

UI Elements	Description
⊗ 2 Errors	Shows or hides the errors detected during the test run.
⚠ 1 Warnings	Shows or hides the warnings detected during the test run.
0 Messages	Shows or hides the informational messages detected during the test run.

UI Elements	Description
! (Exclamation Point)	Message Type: ➤ ❌ Error ➤ ⚠ Warning ➤ ℹ Informative message
Description	Description of the error, warning or message and advice on how to fix the problem.
File	The file that generated the error, warning, or message.
Line	The line number in which the error was detected.
Path	The complete path of the file that generated the error.

Property Sheet

The Property Sheet displays a series of tabs showing the properties, schemas, and events for the step selected in the canvas.



CreateFlightOrder

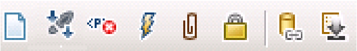
Input	Value
CreateFlightOrder	
FlightOrder	NIL
Class	
CustomerName	NIL John Doe
DepartureDate	2010-12-07T00:0(
FlightNumber	3
NumberOfTickets	3

Checkpoints	□	Expected Value
Envelope	□	=
Header	□	=
Any [N]	□	=

☑ Send Request to Service ☑ Validate structure □ Validate WS-I

NumberOfTickets

To access	Select **View** > **Property Sheet.**

Important information	➤ Only active when the canvas is visible. ➤ The toolbar displays different buttons based on the type of activity or view.  ➤ The buttons to the left of the horizontal divider, are **View** buttons, such as **General** or **Events** views. ➤ The buttons to the right of the horizontal divider, are **Action** buttons, such as **Data-Drive** and **Load XML**. These differ based on the active step and view.
Relevant tasks	➤ "How to Populate a Test" on page 31 ➤ "How to Set Security for a Web Service on the Port Level" on page 284

This section includes:

- "Value Column Icons" on page 52
- "Array Control Buttons" on page 54
- "Property Sheet Views" on page 54
- "Action Buttons" on page 81

Value Column Icons

The following buttons represent information, drop-down lists, or actions within the Property Sheet's **Value** column:

UI Elements (A-Z)	Description
◤	**Include argument in the request.** Toggle to clear the triangle and exclude the argument.
[●]	**Include an array element.** Toggle to clear the box and exclude the array element.
NIL	**Set to NIL.** Toggle to clear the icon and remove the NIL value assignment.

UI Elements (A-Z)	Description
🔒	**Read-only node**. Values that cannot be changed such as properties linked to a data source other than a constant value, or nodes with read-only attribute in the activity signature, first HTTP header, and so forth.
⚠	**Warning**. A warning related to the data source. For example, **The data types of the link source and link destination do not match**.
⌄	➤ For **Input properties**: A drop-down list of possible values. For example, for boolean values it provides a list of values for boolean type data: **true**, **false**, **0**, or **1**. For date types, it opens a calendar. This drop-down arrow is located adjacent to the **Link to a data source** button 🔗. ➤ For **Checkpoints**: A drop-down list of the relevant comparison operators such as: =,!=, >, >=, <, <=, **Starts**, **Ends**, **Contains**, or **Regex**. The greater than operator, >, when used with strings, indicates that it appears later in the alphabet.
⇕	**Scroll**. A scroll control for integer data types.
...	**Browse**. Enables you to locate a file or folder for example, when using a **File System** type step. For an **Open Connection** step, this opens the Connection Builder dialog box. For details, see "Connection Builder Dialog Box" on page 190.
🔗	**Link to a data source**. Opens the Select Link Source Dialog Box allowing you to select values for the property from a data source. For details see "Select Link Source Dialog Box" on page 395.
🔗	**Display list of outgoing links.** Shows a list of all input properties that link to this output property. For details, see "Outgoing Links" on page 348.

Array Control Buttons

The following buttons allow you to handle array type properties. These buttons are adjacent to the property name in the Property Sheet's left pane.

After you add array elements, you can set the number of iterations to use the different array values. For details, see "Flow Control Activities" on page 140.

UI Elements (A-Z)	Description
✚	**Add array element.** Adds one array element to the selected node in the in the **Properties** tree.
✖	**Remove array element.** Removes the selected array element from the **Properties** tree.
⧉	**Duplicate array element.** Adds a copy of the selected array element.

Property Sheet Views

The following section describes each of the Property Sheet views.

- "Asynchronous View" on page 55
- "Attachments View" on page 56
- "Data Source Properties View" on page 58
- "Data Sources View" on page 57
- "Database Data Source Properties View" on page 59
- "Dependencies View" on page 61
- "Events View" on page 61
- "Filter Settings View" on page 63
- "General View" on page 64
- "HTTP View" on page 66
- "HTTP Input/Checkpoints View" on page 68
- "HTTP Receiver View" on page 69

- "Input/Checkpoints View" on page 70
- "Multipart View" on page 75
- "Security Settings View" on page 75
- "SOAP Fault View" on page 76
- "Test Settings View" on page 77
- "Test Variables View" on page 79
- "XML Body View" on page 80

Asynchronous View

For Web Service operation steps, this view enables you to indicate that the step's response is asynchronous.

The **Asynchronous** view's user interface elements are described below.

UI Elements (A-Z)	Description
Listen for response on	The port upon which to listen for a response.
This is an asynchronous call	Indicates that the call is asynchronous and enables you to specify a listener.

For details see Chapter 7, "Asynchronous Service Calls."

Attachments View

The **Attachments** view's user interface elements are described below (unlabeled elements are shown in angle brackets).

UI Elements (A-Z)	**Description**
<Input Attachment>	Input attachments for the current Web Service step: ➤ **Type.** Attachment type: NONE, DIME, or MIME. ➤ **Attachments.** A list of the input attachments and their properties: ➤ **Origin**. The file to send as an attachment. ➤ **Origin Type**. The attachment type. **File** is default. ➤ **Content Type**. The attachment's content type: application/zip, image/gif, image/ief, image/jpeg, image/png, image/tiff, text/plain, text/richtext, text/html, or text/xml. ➤ **Content ID**. A unique ID for the attachment or **Auto** for an ID generated by Service Test. **Note:** To add input attachments, click the **Add** button in the parent node.
<Output Attachment>	The server response saved as an attachment. ➤ **Attachments.** A list of the output attachments and their properties to validate: ➤ **Content**. The file content's checksum value. The checksum is computed by applying the MD5 hash function to the file. ➤ **Content Type**. The attachment's content type. ➤ **Content ID**. The unique ID of the attachment. **Note**: To add output attachments, click the **Attachments** row in the Checkpoints pane, and click **Add** ✚ to add an array element. (You may need to expand the column width to access the button). **Tip:** To validate an output attachment, select the check box adjacent to the elements you want to validate. Received attachments are saved in the test's folder, with **bin** extensions.

For task details, see "Add attachments to the test - optional" on page 33.

Data Sources View

The **Data Sources** view's user interface elements are described below.

UI Elements (A-Z)	Description
Add	Opens the **Attach Data Source to Loop** dialog box for selecting data sources from the **Data Window** tab.
Data Navigation Policies	A list of the data sources sorted by: ➤ **Data Source Name.** The name of the data source as it appears in the Data Window. ➤ **Policy.** A summary of the data navigation policy, for example: **Start at first row, froward one row, wrap around.** ➤ **QueryID.** A unique ID for the entry.
Edit	Opens the **Data Navigation** dialog box for setting the data policy—the way to use the data from the table. For user interface details, see "Data Navigation Dialog Box" on page 399.
Remove	Deletes the selected data source from the list—not from the Data Window.

For details about setting policies, see "How to Set the Navigation Properties" on page 374.

Data Source Properties View

The **Data Source Properties** view's user interface elements are described below.

UI Elements (A-Z)	Description
Add	Opens the **Define New Data Relation** dialog box. For user interface details, see "Define/Edit New Data Relation Dialog Box" on page 402.
Allow data driving from ALM/QC	Enables or disables the use of ALM/QC Test Resources as values for the data table. For details, see "Data Awareness in ALM/QC" on page 489. **Note:** This only applies to Excel data sources. **Important:** For Excel data sources with multiple sheets, you must enable this option for each data sheet.
Child Relations	A list of the data sources sorted by: ➤ **Child Data Source.** The sheet or table to use as a data source. ➤ **Primary Key.** A column in the parent data source to use as a primary key for the child relation. ➤ **Foreign Key.** The column in the child data source to use as a foreign key for the child relation.
Data Files	A list of the data files that were imported for the current data source.
Edit	Opens the **Edit Data Relation** dialog box. For user interface details, see "Define/Edit New Data Relation Dialog Box" on page 402.
Remove	Deletes the selected data relation from the list.

For details about defining data relations, see "Create a new child relation" on page 364.

Database Data Source Properties View

The **Database Data Source Properties** view's user interface elements are described below.

UI Elements (A-Z)	**Description**
Child relations pane	A list of the data sources sorted by: ➤ **Child data source.** The sheet or table to use for the data source. ➤ **Primary key.** A column in the parent data source to use as a primary key for the child relation. ➤ **Foreign key.** The column in the child data source to use as a foreign key for the child relation. For details about modifying or adding a relation, see the "Define/Edit New Data Relation Dialog Box" on page 402.
Connection string pane	The **Connection string** section contains the following elements: ➤ **Connection string.** A drop-down list of connection strings that were defined. ➤ Opens the Connection Builder dialog box. For details, see the "Connection Builder Dialog Box" on page 190. ➤ ✎ Opens a text editor for editing the connection string. ➤ **<Connection string text>.** A read-only window showing the selected connection string. ➤ **<Connection status>.** A string indicating whether or not there is an open connection to the database.

UI Elements (A-Z)	Description
Name	The name of the data source.
SQL statement pane	The **SQL statement** section contains the following elements: ➤ **SQL statement.** A drop-down list of SQL statements strings that were defined in this test. ➤ Opens the **Query Designer**. For details, see the "Query Designer Dialog Box" on page 193. ➤ Opens a text editor for editing the SQL statement. ➤ <**SQL statement text**>. A read-only window showing the selected SQL statement. ➤ <**Query status**>. A string indicating whether or not there query was executed successfully.

For details about creating a database type data source, see "Add a Database data source" on page 361.

Dependencies View

The **Dependencies** view lists the resources that are used by the test. For each resource, a grid provides the resource name, its type, and location. This includes the resources that were imported as .NET assemblies.

Events View

The **Events** view's user interface elements are described below (unlabeled elements are shown in angle brackets).

UI Elements (A-Z)	Description
<**Events list**> - **default**	A list of events for the activity: ➤ **CodeCheckPointEvent.** Triggered when the activity is executed. ➤ **AfterExecuteStepEvent.** Triggered after the activity was executed. ➤ **BeforeExecuteStepEvent.** Triggered before the activity is executed. **Tip:** For details about an event, select it and select **Create a default handler**. Refer to comments in the template.
<**Events list**> - **HTTP Receive**	➤ **OnFilter.** The code to execute when the messages are filtered. ➤ **ReceiveRequest.** The code to execute when a request is received. ➤ **SendResponse.** The code to execute when a response is sent.

UI Elements (A-Z)	Description
<Events list> - IBM Websphere MQ	➤ **BeforeCreateQueueManager.** Code to execute before creating a Queue Manager. ➤ **BeforeMQGet.** Code to execute before getting the messages from the MQ queue through browsing. ➤ **AfterMQGet.** Code to execute after getting the messages from the MQ queue through browsing. ➤ **BeforeMQPutMessage.** Code to execute before putting a message from the MQ queue. ➤ **AfterMQPutMessage.** Code to execute after putting a message from the MQ queue. ➤ **BeforeMQGetMessage.** Code to execute before getting a message from the MQ queue. ➤ **AfterMQGetMessage.** Code to execute after getting a message from the MQ queue. ➤ **BeforeMQPublishMessage.** Code to execute before publishing a message to an MQ topic. ➤ **AfterMQPublishMessage.** Code to execute after publishing a message to an MQ topic. ➤ **BeforeMQReceiveMessage.** Code to execute before receiving a message published on an MQ topic. ➤ **AfterMQReceiveMessage.** Code to execute after receiving a message published on an MQ topic. For task details, see "How to Retrieve Messages from an MQ Queue" on page 125.
<Events list> - Wait	➤ **TimeoutReached.** The code to execute when the timeout (Input properties) is reached.

UI Elements (A-Z)	Description
<Events list> - Web Services	➤ AfterGenerateRequest ➤ AfterProcessRequestSecurity ➤ AfterProcessRequestAttachments ➤ OnFilter ➤ OnSendRequest ➤ OnReceiveResponse ➤ BeforeProcessResponseAttachments ➤ BeforeProcessResponseSecurity ➤ BeforeSaveResponse ➤ BeforeApplyProtocolSettings For details about Web Services, see Chapter 4, "Local Activities."
Handler	The handler to call when the event is detected. Choose **Create a default handler** if no handler is available. This opens the **TestUserCode.cs** tab for editing the handler template.

For details about writing event handlers, see "Specify an event handler - optional" on page 35.

Filter Settings View

The **Filter Settings** view enables you to set a filter for received messages. This view is available for **HTTP Receive** steps and operations from Web Service calls imported as server response steps.

The **Filter Settings** view's user interface elements are described below.

UI Elements (A-Z)	Description
✖	Clears the text in the filter area.
🔗	Opens the Select Link Source dialog box, to allow you to link to existing data.

UI Elements (A-Z)	Description
<filter text>	A text area containing the filtering expression. You can enter free text or a regular expression and use the Select Link Source dialog box to create a data expression. **Note**: When filtering request headers, you can only filter requests that contain both a key and value. Headers that have a key, but no value, cannot be filtered.
Filter Type	The type of filtering: **Exact match**, **Starts with**, **Ends with**, **Contains**, and **Regular expression**. **Note:** If you specify **Exact Match** and you are trying to match a key-value pair, you must specify both the key and value strings.
Receive any message	Enables the client to receive any message.
Receive the first message matching the following filter	Enables the client to receive only the messages that match the filter.

For details see Chapter 7, "Asynchronous Service Calls."

General View

The **General** view's user interface elements are described below. The properties differ based on the activity type.

For more information about activity-specific general properties, see the specify activity in Chapter 3, "Service Test Activities."

UI Elements (A-Z)	Description
Comment	An editable note describing the purpose of the step. Service Test also places the comment in the test report.
Properties - default	➤ **Step ID.** A unique ID for the step. ➤ **Name.** Step name as it should appear in the canvas.

UI Elements (A-Z)	Description
Properties - Service Test test	**Result directory.** The path of the results relative to the solution directory. **Default:** RunStReport
Properties - Service Test test/ QTP test / VuGen script	**Test path.** The path of the Service Test or QuickTest test, or VuGen (LoadRunner's Virtual User Generator) script to run. **Note:** For Service Test, click the **Select ST test** button on the Property Sheet toolbar to select a test.

General Properties - Web Services

To following table lists the General properties that are specific for Web services.

Property (A-Z)	Description
ContentType	The type of content: For example text/xml; charset=utf-8.
Endpoint Address	The endpoint location of the service as derived from the WSDL file.
IsOneWay	Indicates whether the service is a one way service: true or false.
SoapAction	An expression indicating the SOAP action, for example, HP.SOAQ.SampleApp/IHPFlights_Service/ DeleteFlightOrder.
Timeout	The maximum time in milliseconds to wait for the response. Enter -1 to disable the timeout and instruct the client to wait for the response as long as required.

HTTP View

The **HTTP** view's user interface elements, for REST Services and **HTTP Request** activities, are described below (unlabeled elements are shown in angle brackets).

UI Elements (A-Z)	**Pane** **Body type**	**Description**
Import Schema	Request/Response: ➤ XML	Imports an **.xsd** file containing the schema of the request or response.
Load XML	Request/Response: ➤ XML	Loads an XML file with the request or response body.
Load File	Request: ➤ Text	Loads a non-XML file containing the request.
✕ Clear	Request/Response: ➤ XML	Clears the contents of the **Request/ Response Body** areas.
✕	Request/Response: ➤ Text ➤ File Request: ➤ Post Form	**Remove.** Deletes the contents of the: ➤ Body text ➤ Entered path ➤ Selected value in grid
...	Request/Response: ➤ File	**Browse.** Enables you to load a non-XML file containing the request/ response body.
🔗	Request/Response: ➤ XML ➤ Text (Request only) ➤ File	**Link Body.** Opens the Select Link Source dialog box for selecting a data source. For details, see "Select Link Source Dialog Box" on page 395.

UI Elements (A-Z)	**Pane Body type**	**Description**
<**checkpoint list**>	Response pane	A list of the checkpoints with the following information: ➤ **Name.** The name of the checkpoint as it will appear in the results. ➤ **Regular Expression.** A regular expression representing the expected value. ➤ **Validate.** Compares the actual value with the expected value.
<**message body**>	Request/Response panes	The body of the request or response loaded through a file, pasted from a clipboard (**Edit** > **Paste**), or manually entered (POST form)
<**post form list**>	Request: ➤ Post Form	A list of the post form elements: ➤ **Name.** The name of the element. ➤ **Value.** The element's value.
Request Body	Request pane	The format of the request body: **XML, Text**, **File**, or **Post Form.**
Response Body	Response pane	The format of the response body: **XML, Text**, or **File.**

HTTP Input/Checkpoints View

For REST Services, you can set the method's HTTP settings and use them as a template for that method. The **HTTP Input/Checkpoints** view's user interface elements are described below.

UI Elements(A-Z)	Description
Checkpoints	The REST output properties for validation: ➤ **HTTP Version.** 1.0 or 1.1. ➤ **Status Code**. An integer indicating the status code. ➤ **Status Description**. A textual description of the status. ➤ **Response Body**. The body returned by the server. **Tip**: To validate a property, make sure to select its check box.
Input	The REST Input properties: ➤ **Endpoint Address**. The endpoint URL for the REST service. ➤ **HTTP Method.** GET, POST, PUT, DELETE, TRACE, OPTIONS, HEAD, and CONNECT. ➤ **HTTP Version.** 1.0 or 1.1 ➤ **Request Headers.** An array of key names and their values, for example, Content-Type in the **Name** row and text/xml the **Value** row. **Tip:** To add more Name/Value pairs, click the green plus sign in the parent node.

HTTP Receiver View

The **HTTP Receiver** view's user interface elements, for REST Services and **HTTP Receiver** activities, are described below (unlabeled elements are shown in angle brackets).

UI Elements (A-Z)	Response Body type	Description
Import Schema	**XML**	Imports an **.xsd** file containing the schema of the response.
Load XML	**XML**	Loads an XML file with the response values.
Clear	**Applies to type:** ➤ XML ➤ Text ➤ File	**Clear.** Clears the contents of the: ➤ Body text (XML type) ➤ Selected value in grid (Text type) ➤ Entered path (File type)
...	**File**	**Browse.** Enables you to load a non-XML file containing the response body.
<body of received message>	**XML**	The body of the response loaded through a file, pasted from a clipboard (**Edit** > **Paste**), or manually entered.
Received Message Body		The way in which to represent the response: **XML, Text**, or **File.**

Input/Checkpoints View

The **Input/Checkpoints** view's user interface elements are described below (unlabeled elements are shown in angle brackets).

For more information about activity-specific properties, see Chapter 3, "Service Test Activities."

UI Elements (A-Z)	Description
<checkpoint list>	A list of the step's output parameters, displaying the following columns: ➤ **Checkpoints.** A list of the output parameters. ➤ **Validate**. When checked, validates the current output parameters when running the step. When unchecked, ignores the parameters. ➤ **Value**. The expected value for the output parameter. Provides a drop-down list for comparison operators, number scrolling, and boolean values. You can manually enter the expected value into the cell.

UI Elements (A-Z)	Description
<**context menu**>	Provides shortcuts for including properties and setting their values. ➤ **Collapse/Expand All**. Controls the display of array elements. ➤ **Set Auto-value**. Inserts a sample value for the argument, based on its data type. ➤ **Include/Include All.** Includes the current or all Choice input properties in the test run. ➤ **Exclude/Exclude All.** Excludes the current or all Choice input properties from the test run. ➤ **Copy XPath**. Copies a simplified XPath expression to the clipboard. For details, see "XPath Checkpoints" on page 412. ➤ **Copy Fully Qualified XPath**. Copies the complete XPath expression of the value to the clipboard. ➤ **Link to Data Source.** Opens the Select Link Source dialog box. ➤ **Clear Cell Contents.** Clears the contents of the cell. ➤ **Display Outgoing Links.** Lists the property's outgoing links. For details, see "Outgoing Links" on page 348. **Tip:** Right-click in **Values** column to see the menu. **Note:** Some options are only available for specific property types.
<**properties list**>	A list of all the properties. The fields differ per step type: ➤ For the Start step: **Test Input Parameter** ➤ For the End step: **Test Output Parameter** ➤ For most activities: **Input** properties ➤ For SOAP Requests (under Web Services category), tools to work with a schema file. ➤ For loops, the loop type and properties. See "Loop - Input Properties" on page 141.

UI Elements (A-Z)	Description
Checkpoint properties	Additional checkpoint properties: ➤ **Trim whitespace (from start and end of string).** Removes whitespace before and after the text. ➤ **Ignore case.** When looking for a match, ignores the case. ➤ **Stop test if checkpoint fails.** Exits the test run if the checkpoint fails. You set this individually for each checkpoint. **Note:** You must click on a row in the Checkpoint section to see these properties. The first two properties are only available for string data types.
Value column	The property value as a constant value or a link to a data source. An icon adjacent to the value provides information about the property, such as read-only, data type, optional, and enables you to select values when appropriate. For a list of the most common icons, see the "Array Control Buttons" on page 54. **Tip:** Click inside a row to display the relevant icons. **Note:** To view the buttons and icons, click within a row of the **Value** column.

Web Service and SOAP Request Checkpoint Options

The following options only apply to **Web Service** and **SOAP Request** steps.

UI Elements	Description
Send request to service	Sends the step's request to the service when running the test. This is the normal behavior for Web Services and most types of actions. It is enabled by default. To send messages using JMS transport, clear this check box. Link a subsequent JMS step to the output of this step. For Web services, you can set the security settings and include attachments, and send this over JMS.
Validate Structure	Adds a checkpoint that verifies that the service is in conformance with the schema defined for the SOAP XML response—either for the response defined in the operation or a SOAP Fault response. The Run Results Viewer indicates whether or not the validation succeeded. This option is available only when the **Send request to server** option is enabled. It is enabled by default. **Tip**: If you modify the elements in the response, this will not affect the response schema. For example, adding array elements, selecting specific Choice elements, changing the derived type, and so forth, only affect the response—not the schema. To validate the element values, specify expected values in the **Value** column or use an XPath expression.
Validate WS-I	Adds a checkpoint to verify that the SOAP response in compliance with WS-I standards. The Run Results Viewer indicates whether the response was in compliance. It also provides a **View Report** link that opens the WS-I Validation report in a separate window.

XPath Checkpoint Options

The following options are only relevant for steps with XML output properties, such as **String to XML**.

UI Elements (A-Z)	Description
XML tab	A grid representation of the response's schema. In this section you can enter the expected response values. ➤ **Import Schema.** Imports a schema for the XML response. ➤ **Load XML.** Loads an XML file as a basis for the schema of the response. ➤ **Clear.** Removes the displayed schema.
XPath tab	A list of XPath expressions used to evaluate the XML response. ➤ ➕ Adds a line for a new XPath expression. ➤ ❌ Removes the selected XPath expression. ➤ **Ignore namespaces:** Ignores namespaces in the XPath validation, allowing you to use simple XPath expressions. For details, see "How to Set XPath Checkpoints" on page 421.

Database Property Options

The following options are only relevant for properties of the **Database** > **Select Data** step.

UI Elements (A-Z)	Description
Generate Output	Retrieves table data from the database and constructs an array with the current table structure. If you enabled **Generate output** in the Query Builder, you do not need to generate the output again. For details, see "Query Builder Dialog Box" on page 191.
Manage Columns	If the table structure changed since you generated the output, the Manage Columns dialog box lets you manage the columns. This is common when columns names were a parameter, or if a column was deleted from the table.

Multipart View

For HTTP steps, this view enables you to configure multipart requests. Multipart messages are sent with the HTTP request and consist of two or more header/body sets.

The **Mulitpart** view's user interface elements are described below.

UI Elements (A-Z)	Description
Enable Multipart	Enables the **Input**/**Checkpoints** view for multipart HTTP requests.

For details about the input and output properties, see "Network Activities" on page 154.

Security Settings View

Using the Property Sheet's Security Settings view, you can configure security settings for a specific step. To configure security for an entire port, see the "Security Settings for Port <Port_Name> Dialog Box" on page 305.

For information about choosing a scenario, see "Setting Security Overview" on page 274.

For task details, see "How to Set Security for a Web Service on the Port Level" on page 284.

The **Security Settings** view's user interface elements are described below.

UI Elements (A-Z)	Description
Save	Saves the security scenario settings to an **.stss** (Service Test Security Scenario) file, for use by other tests.
Import	Loads security settings from a previously saved stss file.
Edit port's settings	Opens the Security Settings dialog box for configuring the port security. For details, see the "Security Settings for Port <Port_Name> Dialog Box" on page 305.

UI Elements (A-Z)	Description
Service Details	The type of Web service. After selecting a type, Service Test provides an interface for modifying the relevant security settings. The service types are: ➤ "Web Service Scenario" on page 307 ➤ "WCF Service (Custom Binding) Scenario" on page 313 ➤ "WCF Service (Federation) Scenario" on page 315 ➤ "WCF Service (WSHttpBinding) Scenario" on page 317 **Note:** Visible only when clearing the **Use the port's security settings** option.
Use the port's security setting	Uses the port's security settings for the current step.

SOAP Fault View

The **SOAP Fault** view's user interface elements are described below. This view is only available for Web Service or SOAP activities.

UI Elements (A-Z)	Description
Fault is expected	Indicates that a SOAP fault is expected during the test run. This setting confirms that the application did not perform a task that it was not designed to perform.

UI Elements (A-Z)	Description
XML tab	The SOAP envelope, containing the Header and Body of the SOAP message. In this section you enter the expected response. You can define **Any** type elements or values for the following properties: ➤ **faultcode.** A status code indicating that the SOAP request was invalid. ➤ **faultstring.** A response string indicating that the SOAP request was invalid. ➤ **faultactor.** An indication of the source of the fault.
XPath tab	A list of XPATH expressions used to evaluate the SOAP response. ➤ ➕ Adds a line for an XPATH expression. ➤ ❌ Removes the selected entry.

For more information about SOAP faults and how they can be used for Negative testing, see "Negative Testing" on page 413.

For task details, see "Configure SOAP Fault information - optional" on page 34.

Test Settings View

Test settings apply to all the activities in the test. The **Test Settings** view's user interface elements are described below.

Load Settings

UI Elements (A-Z)	Description
Load enabled (read-only)	Indicates whether the test is enabled for load testing. To enable load testing, select **Test** > **Enable Test for Load**. **Note:** Once a test is enabled for load testing, you cannot disable it.

JVM (Java Virtual Machine) Settings

UI Elements (A-Z)	Description
Additional VM Parameters	Extra parameters to send to the JVM such as Xbootclasspath, and any parameters specified by the JVM documentation.
Classpath	The vendor implementation of JMS classes together with any other required supporting classes, as determined by the JMS implementation vendor.

JMS Settings

UI Elements (A-Z)	Description
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 Service Test to automatically create a selector that includes the message ID. **Note**: This option only affects the **Send and Receive Message from Queue** activity.
JMS connection factory	The JNDI name of the JMS connection factory. This setting is unique per test.
JMS security credentials	The principal's credentials for the authentication scheme.
JMS security principal	Identity of the principal (for example the user) for the authentication scheme.
JNDI initial context factory	The fully qualified class name of the factory class that will create an initial context. Provides a list of context factories and enables manual entries.
JNDI provider URL	The URL of the service provider. For example: Websphere - iiop://myserver:myport
Number of JMS connections per process	The number of JMS connections each execution process creates. The default is 1, and the maximum is 50. The fewer connections you have, the better your performance.

UI Elements (A-Z)	Description
Received message timeout options	The timeout for received messages. The default is **No wait**. ➤ **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. ➤ **User defined timeout.** Wait a specified number of seconds for the message. If it does not arrive, the operation fails. (default)
User defined timeout	The amount of seconds to wait for the message before timing out. The default is 20 seconds.

.NET Settings

UI Elements (A-Z)	Description
Assembly Paths	The .NET assembly paths for the test. This entry should include all relevant folder paths and environment variables. Separate multiple values with semicolons.

Test Variables View

The **Test Variables** view's user interface elements are described below. This view is available only when selecting the canvas, **Start** step, or **End** step.

UI Elements (A-Z)	Description
System variables	A read-only list of common system variables and their values: ScenarioID, SystemTempDir, GroupName, TestDir, TestName, LocalHostName, OS, OSVersion, ProductDir, ProductName, ProductVer, and UserName.
User variables	A list of the user variables for all profiles. When enabling the **Compare Profiles** option, the grid displays the variable values for each profile in separate columns.

Test Variables View - Action Buttons

UI Elements (A-Z)	Description
✚	**Add New User Variable.** Adds a new user variable to the all profiles.
✖	**Remove User Variable.** Deletes the selected user variable from all profiles.
	Add New Profile. Adds a new User Variable profile to the list.
	Edit Active Profile. Opens the Manage Profiles dialog box that lets you to remove or rename profiles.
⚖	**Compare Profiles.** Displays the profiles side-by-side for comparison.
<Profile list>	A list showing the existing User Variable profiles.

XML Body View

The **XML Body** view's user interface elements, for SOAP Request steps, are described below (unlabeled elements are shown in angle brackets).

UI Elements (A-Z)	Description
✖	**Clear.** Clears the contents of the: ➤ Request Body (upper pane) ➤ Checkpoint keys (lower pane)
Import File	For **Text** body types, imports a file containing the body of the request. For **XML** body types, imports a schema file.
Load XML	Loads an XML file with Body request values, that correspond to the loaded schema. (**Body: XML** only)
...	**Browse.** Enables you to load a non-XML file containing the request body (**Body: File** only)
<checkpoint list>	A list of the checkpoints keys and their values in the bottom pane.

UI Elements (A-Z)	Description
<request body>	The body of the request loaded through a file, pasted from a clipboard (**Edit** > **Paste**), or manually entered (POST form)
Body (bottom)	The data type of the response body. **Text** or **XML.** **Default:** Text
Body (top)	The data type of the request body. **Text**, **XML**, **File**, or **Post Form.** **Default:** Text

Action Buttons

The following buttons represent actions, primarily performed on step properties. The availability of the buttons depends on the step type.

UI Elements (A-Z)	Description
	Data Drive Entire Step. Data-drives all values for the step. It adds data expressions to the **Value** columns of all input properties. For details, see "How to Data Drive a Test Step" on page 375.
	Load from Replay. Loads XML data in order to populate a service's schema with values (for Web Services only). For details, see "How to Run a Test" on page 417.
Select Java File...	**Select Java File.** Opens the Call Java Class Settings Dialog Box for setting additional classpaths for the call (for Call Java Class steps only). For details, see the "Call Java Class Settings Dialog Box" on page 196.

UI Elements (A-Z)	Description
+ ▾	**Add Input/Output Property.** Opens the Add Input/Output Property dialog box, allowing you to define a new property and its data type. **Note:** Only available for Custom Code, REST method, and Start/End steps, or when selecting the entire canvas. For details, see "Coding Service Test Events" on page 507.
✎	**Edit Property.** Opens the Edit Property dialog box for changing the name, type, or description of a property. **Note:** Only available for Custom Code, REST method, and Start/End steps, or when selecting the entire canvas, provided that at least one property was added.
✗	**Remove Property.** Deletes the selected property from the list. **Note:** Only available for Custom Code, REST method, and Start/End steps, or when selecting the entire canvas, provided that at least one property was added.
Select QTP/ST Test	For **Call QTP Test** and **Call Service Test** steps: Invokes the Open Test dialog box for selecting the test to call from this step.
Update QTP/ST Test	For **Call QTP Test** and **Call Service Test** steps: Updates the QTP or Service Test test from its original location.

Troubleshooting and Limitations - General

- It is not recommended to open two instances of Service Test on the same machine.
- On some operating systems or after installing certain Windows service packs or updates, you may be unable to view the content of the Help files. **Workaround**: Select the CHM file in the product's help folder, and click **Properties** from the shortcut menu. Select **Unblock**. For details, see http://support.microsoft.com/kb/902225.
- XPATH aggregate functions are not supported.

- The Run Results dashboard does not show iteration statistics.
- The **Test Variables** view shows empty values for the **TestDir**,**TestName**, and **SystemTempDir** system variables. You can access the **TestDir** and **TestName** variables from the Select Link Source dialog box or through event handler code.

2

Creating and Saving Tests

This chapter includes:

Concepts

Tasks

Reference

Concepts

Test Overview

To test your applications, you use Service Test to create tests or business components.

You can base new tests on the standard Service Test template, or, if you have LoadRunner installed, on a Load Testing template.

You can create tests on either the file system, or within HP ALM/QC (Application Lifecycle Management/Quality Center). You create business components in the ALM/QC repository.

Business Process Testing

Business Process Testing is a methodology in which several test components are combined to create a complete business process. The BPT user composes a business process by combining a series of test components with data flow between them.

Test components are usually comprised of several steps or service operations. For example, a component's first step may be to read the contents of a file. Its second step could be searching for a string and replacing it. Its third step could be reporting the output to a report.

You can create business process test components from within HP ALM/QC or through Service Test.

In HP ALM/QC, using the BPT model, non-technical SMEs (Subject Matter Experts) can define design steps that are required for the component, using simple textual descriptions of the step's function.

After these are defined, the technical engineer creates a component through a testing application such as Service Test, that performs the desired actions. For further information about creating Business Components from within HP ALM/QC, see the *HP Business Process Testing User Guide*.

A Subject Matter Expert using Business Process Testing in HP ALM/QC combines your saved business components into one or more business process tests. These tests are used to check that the application behaves as expected.

This section also includes:

- "Benefits of Business Process Testing" on page 87
- "Business Process Testing in Service Test" on page 88

Benefits of Business Process Testing

Some of the advantages of working with a BPT module over individual tests are:

- Enables less-technical subject matter experts to create tests
- Enables structured automated testing
- Reduces the duplication of effort when combining manual tests with automatic tests
- Enables component reusability to speed-up the automation process
- Provides the ability to pass parameters from one step to another within your business process. You can save the output of a step to a parameter and use it as an input value for subsequent steps
- Simplifies on-going test maintenance
- Minimizes time-to-test

For more information about creating a BPT components in HP ALM/QC, see the *HP Business Process Testing User Guide*.

Business Process Testing in Service Test

You can create a business component within Service Test or from within ALM/QC. You can also save an existing test as a business component using the **File** menu's **Save as Business Component** option.

When you create a business component within Service Test, the following limitations apply:

- Load Test activities are not supported.
- UFT (Unified Functional Testing) activities are not supported.
- Business components cannot be saved on the file system—only on ALM/QC.
- You cannot save a load-enabled test as a business component.Create a new business component from the **File** menu, or save a non-load-enabled test as a business component.
- Encoded password type properties are not supported. If the component has a property of type password (or encrypted in ALM 11.00 and later), the value will be treated as an ordinary string, without encoding or decoding.
- If you save a Load-Test enabled test as a business component, it will no longer be Load-Test enabled.
- Multiple User Variable profiles are not supported. Remove all but one of the profiles. For details, see "Test Variables View - Action Buttons" on page 80.
- The business component's name must not contain one of the following characters: \, /, :, ", ?', <, >,|*, %, !, {, or }.

You cannot save an existing test containing these activities as a business component. You must first remove these test steps before saving the test as a business component.

For details about creating a business component in Service Test, see "How to Create a New Business Component" on page 92.

Tasks

How to Create a New Test

The following steps describe how to create a new test.

- "Set the path type - optional" on page 89
- "Connect to ALM/QC- optional" on page 89
- "Open the Create a New Test dialog box" on page 89
- "Select a template" on page 90
- "Specify a name" on page 90
- "Select a location" on page 90
- "Generate the test" on page 90
- "Add steps to the test" on page 90

1 Set the path type - optional

By default, the path used for the test is relative. If you plan to transfer the test to other machines, you can use an absolute path. This setting is only relevant for UFT (Unified Functional Testing) steps, such as to a **Call to QuickTest Test** step. Select **Edit** > **Settings** and clear the **Use a Relative Path for UFT Steps** option.

2 Connect to ALM/QC- optional

To create tests in an ALM/QC repository, first connect to the ALM/QC server. For details, see "How to Connect to ALM/QC" on page 495.

3 Open the Create a New Test dialog box

Select **File** > **New** > **Test**. For user interface details, see the "Create New Test Dialog Box" on page 100.

4 Select a template

In the Create a New Test dialog box, select the **Service Test** template. For load testing, select the **Service Test Enabled for Load Testing** template. The latter template is available only when LoadRunner is installed on the machine.

5 Specify a name

Accept the default name or specify your own string in the **Name** box. The test name should not exceed 80 characters.

6 Select a location

Accept the default location, or click the **Browse** button adjacent to the **Location** box to open the Open Folder dialog box.

For a location on the file system, browse to the folder and click **Open**.

For ALM/QC tests, click the **ALM/QC Test Plan** button in the left pane, and navigate to the folder. Use the New Folder button to create a new branch. Click **Open**.

7 Generate the test

In the Create a New Test dialog box, click **Create**.

8 Add steps to the test

Drag activities from the Toolbox into the canvas. For details, see Chapter 3, "Service Test Activities."

9 Set the custom properties

Define or set custom properties for the step when applicable. Click in the Property Sheet and open the **General** tab, **Input/ Properties** tab, and so forth.

The available properties depend on the activity type. For example, for Web services, you can set a timeout for the response. For Java Call steps, you can set the machine's Java configuration.

For details, see the "Property Sheet" on page 51.

How to Add a Test to a Solution

The following steps describe how to add a new test or an existing one to your solution. Each test has its own canvas upon which you can add a different set of activities.

- "Add a new test to the current solution" on page 91
- "Add an existing test to the current solution" on page 91

Add a new test to the current solution

1. Select **File** > **Add** > **New Test**. For user interface details, see the "Add New Test Dialog Box" on page 102.
2. In the Add New Test dialog box, select the **Service Test** template. For load testing, select the **Service Test Enabled for Load Testing** template. The latter template is only available when LoadRunner is installed on the machine.
3. Specify a name. Accept the default name or specify your own string in the **Name** box.
4. Select a location. Accept the default location, or click the **Browse** button adjacent to the **Location** box to open the Open Folder dialog box.
    - For a location on the file system, browse to the folder and click **Open**.
    - For HP ALM/QC tests, click the **ALM/QC Test Plan** button in the left pane, and navigate to the folder. Use the New Folder button to create a new branch. Click **Open**.
5. Click **Create** to generate the test.

Add an existing test to the current solution

1. Select **File** > **Add** > **Existing Test**.
2. In the **Open** dialog box, browse to a **Service Test** test on the file system or in ALM/QC.
3. Click **Open** to add the existing test.

Note: The ability to add multiple tests is limited to solutions stored on the file system—not those stored on QC/ALM.

How to Create a New Business Component

The following steps describe how to create a new business component from within Service Test. Each template provides an empty canvas to which you can add activities to create the business component. For more information, see "Business Process Testing" on page 86.

If you have Service Test installed on your ALM/QC machine, you can launch Service Test directly from the **Test Plan** or **Business Component** module **Automation** tab. For details, see the *HP ALM/QQC User Guide*.

- "Prerequisite - Connect to ALM/QC" on page 92
- "Open the Create a New Test dialog box" on page 93
- "Select a template" on page 93
- "Specify a name" on page 93
- "Select a location" on page 93
- "Generate the business component" on page 93
- "Add component steps" on page 93

1 Prerequisite - Connect to ALM/QC

To create a business component, you must first connect to a project in an ALM/QC with a valid Business Process Testing license. Select **File** > **ALM/QC Connection**. For details, see "How to Connect to ALM/QC" on page 495.

2 Open the Create a New Test dialog box

Select **File** > **New** > **Business Component**. For user interface details, see the "Create New Test Dialog Box" on page 100.

3 Select a template

In the Create New Test dialog box, select the **Components** node in the **Categories** pane. In the **Templates** pane, select the **Business Component** template.

4 Specify a name

Accept the default name or specify your own string in the **Name** box.

5 Select a location

Click the **Browse** button adjacent to the **Location** box and locate a folder for the component in ALM/QC.

6 Generate the business component

In the Create New Test dialog box, click **Create**.

7 Add component steps

Drag the activities into the canvas to create steps in the business component.

Tip: To convert an existing test to a business component, select **File** > **Save as Business Component** and save the script to the desired location in ALM/QC. If your test contains UFT or Load Testing steps, you cannot convert it until you remove these steps.

How to Define Test Properties or User/System Variables

The following steps describe how to define test properties, user variables, and operating system variables. These settings are optional.

- "Define test properties" on page 94
- "Define user variables" on page 94
- "Define user variable profiles" on page 95
- "Set user variable values" on page 95
- "Set OS variable values for the test - optional" on page 96

Define test properties

This step applies if you want to define custom properties that can be used by all steps in the test, with the ability to assign data from a data source.

1. Click in a blank area of the canvas. In the Property Sheet, open the **Test Input Parameters** view.
2. Click the **Add Property** button to define a new input or output property.
3. In the **Add Input/Output Property** dialog box, specify a property name and data type. All types that were defined in any reference file, are available.
4. Click in the **Default Value** column. Specify a value or click the **Link to Source** button to specify a data source. For details, see "Select Link Source Dialog Box" on page 395.

Define user variables

Service Test lets you create user variables and set their values. You can define multiple profiles for the variable values. You select a profile to be active before the test run. For details, see "Define user variable profiles" on page 95.

1. Click in a blank area of the canvas. In the Property Sheet, open the **Test Variables** view.
2. Click the **Add User Variable** button to define a new user variable.

Set user variable values

You can set values for variables in one of the following ways:

- In the Property Sheet's **Test Variables** view, click in the **Profile** column and manually enter values.
- Open the Toolbox (left pane) and drag the **Set Test Variable** activity from the **Miscellaneous** category into the **Test Flow** (or loop). In the **Property Sheet**, define the variable key and value. To obtain values, click the Link to a Data Source button in the row. In the Select Link Source dialog box, select the **Test Variables** option. Select a name and value for the **Variable key** and **Variable value**.
- Open the Property Sheet's **Events** view for the step or define a Custom Code activity. Edit the event handler code and assign a value using the **TestProfile** object. The following example sets the value of the Region user variable to NE.

  ```
  activity.Context.TestProfile.SetVariableValue("Region", "NE");
  ```

  For details, see Appendix A, "Coding Service Test Events."

Repeat this step for each variable for which you want to set values.

Define user variable profiles

This step applies only if you created user variables as described in the above steps.

1. Define one or more user variables as described above.
2. Click the **Add New Profile** button.
3. In the New Test Profile dialog box, specify a name and indicate the profile (if any) from which to copy the properties. If you do not copy from an existing profile, Service Test copies the user variables from the active profile without its values.
4. To rename or delete a profile, click the **Manage Profiles** button. Click **Remove** or **Rename**.
5. Click the **Compare** button to display the profiles side-by-side.

6. Only the active profile is accessed during the test run. To make a profile active, select it from the **Active Profile** list.

   For user interface details, see the "Test Variables View" on page 79.

Set OS variable values for the test - optional

This step lets you set global operating system variables that will apply to all steps in the current test run.

1. Open the Toolbox and drag the **Set OS Environment Variable** activity from the **System** category into the **Test Flow** or another custom loop.
2. In the Property Sheet's **Input/Checkpoints** view, define the variable key and value or click the **Link to Source** button to specify a data source.

Tip: To view a list of the test variables, click in a blank area of the canvas. In the Property Sheet, open the **Test Variables** view. The System variables are listed in the lower pane.

How to Upgrade Tests Using the Batch Upgrader

Service Test 11.20 provides an upgrade tool, **STBatchUpgrader.exe**, located in the product's **bin** folder. This tool lets you run a batch file to upgrade tests created in version 11.10, making them compatible for version 11.20.

If you do not upgrade your tests with the batch upgrade tool, when you open a test created in version 11.10, it prompts you to upgrade the test.

Tests created in Service Test version 11.00, must first be opened and saved in Service Test 11.10, before you can upgrade them to version 11.20.

For the tool's options, see "Batch Upgrader Command Line Options" on page 104, The following steps describe how to use the **STBatchUpgrader** tool.

- ➤ "Prerequisite" on page 97
- ➤ "Open a Run or Command Line box" on page 98
- ➤ "Locate the Batch Upgrader tool" on page 98
- ➤ "Add command line options" on page 98
- ➤ "Run the command" on page 98

1 Prerequisite

Make sure that Service Test is not running.

If you ran the upgrader tool once while Service Test was running, the logs may become corrupted. Backup and delete all of the existing logs in the <**Service test installation**>**bin****logs** folder before proceeding.

If desired, create a backup copy of the older tests.

2 Open a Run or Command Line box

Select **Start** > **Run** to open the Run dialog box. Alternatively, type cmd to open a command line window.

3 Locate the Batch Upgrader tool

Locate the **STBatchUpgrader.exe** file in the Service Test's **bin** subfolder. Enter it into the Run box or drag it to the command line prompt.

4 Add command line options

Add the relevant options as described in "Batch Upgrader Command Line Options" on page 104, using the following syntax:

```
STBatchUpgrader.exe source [destination] [/ALM url domain project] [/
login username password] [/log logfile] [/report reportfile]
```

For example, the following string runs the upgrade on all tests in the ST_11_1 folder on the ALM server, pumpkin, for the TEST1 project in the AUTOMATION domain. It places the report in c:\logs\MyLogfile.log.

```
STBatchUpgrader.exe Subject\ST11_1 /ALM http://pumpkin:8080/qcbin
AUTOMATION TEST1 /login user password  /log c:\logs\MyLogfile.log.
```

5 Run the command

Run the command. Verify the validity of the tests in the destination folder.

Reference

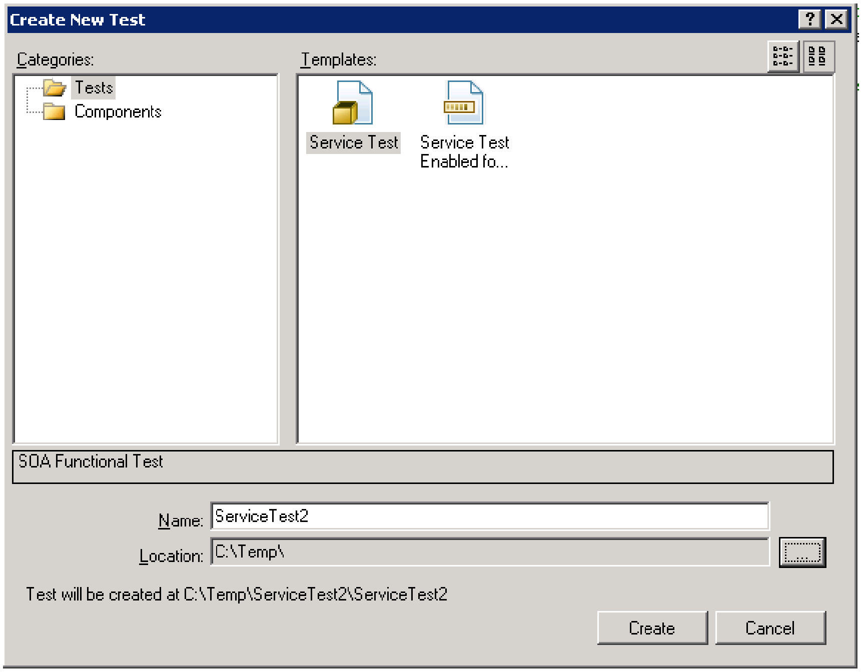
Test User Interface

This section includes:

- Create New Test Dialog Box on page 100
- Add New Test Dialog Box on page 102
- Batch Upgrader Command Line Options on page 104

Create New Test Dialog Box

This dialog box enables you to specify the location and name of the new test.



SOA Functional Test

Name: ServiceTest2

Location: C:\Temp\

Test will be created at C:\Temp\ServiceTest2\ServiceTest2

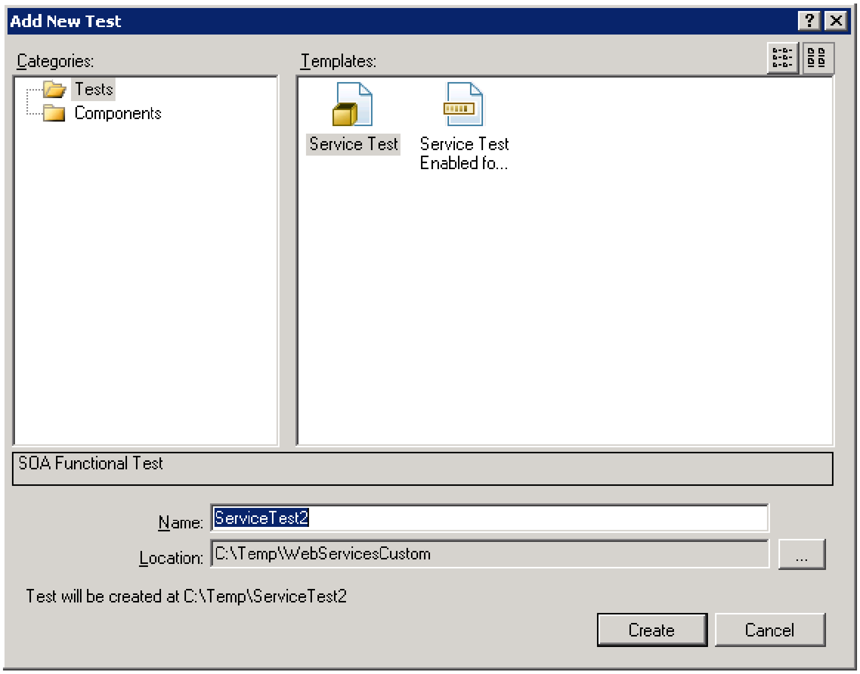
To access	Select **File** > **New** > **Test** (CTRL + SHIFT +N).
Relevant tasks	"How to Create a New Test" on page 89 "How to Create a New Business Component" on page 92

User interface elements are described below:

UI Elements (A-Z)	Description
...	**Browse.** Enables you to select a location for the new test. To select a location on an ALM/QC server, first connect to the server. For details, see "How to Connect to ALM/QC" on page 495.
Categories pane	A list of the test categories: ➤ **Tests**: For regular and Load Testing type tests. ➤ **Components**: For Business Process Testing.
Create	Creates a new test or business component in the selected location.
Location	The complete path of the test. Use the **Browse** button to select a location. For business components, connect to an ALM/QC project.
Name	The name of the test or business component. It can contain only letters, numbers, underscores, spaces, and dots (".").
Templates pane	A collection of templates: ➤ Tests: **Service Test** and **Service Test Enabled for Load Testing**. ➤ Components: **Business Component** **Note:** The **Service Test Enabled for Load Testing** template is visible only when HP LoadRunner is installed.

Add New Test Dialog Box

This dialog box enables you to specify the location and name of the new test.



SOA Functional Test

Name: ServiceTest2

Location: C:\Temp\WebServicesCustom

Test will be created at C:\Temp\ServiceTest2

To access	Select **File** > **Add** > **New Test.**
Relevant tasks	"How to Add a Test to a Solution" on page 91

User interface elements are described below:

UI Elements (A-Z)	Description
...	**Browse.** Selects a location for the new test. To select a location on an ALM/QC server, first connect to the server. For details, see "How to Connect to ALM/QC" on page 495.
Categories pane	A list of the test categories: ➤ **Tests**: For regular and Load Testing type tests. ➤ **Components**: For business process components.
Create	Adds a new test or business component to the current solution.
Location	The complete path of the test or the location if connected to ALM/QC. Use the **Browse** button to select a location. For business components, connect to an ALM/QC project.
Name	A name for the test or business component. May contain only letters, numbers, underscores, spaces, and dots (".").
Templates pane	A collection of templates: ➤ **Tests**: Service Test and Service Test Enabled for Load Testing. ➤ **Components**: Business Component **Note:** The Service Test Enabled for Load Testing template is only visible when HP LoadRunner is installed.

Batch Upgrader Command Line Options

You operate the batch upgrade tool from the command line. For task details, see "How to Upgrade Tests Using the Batch Upgrader" on page 96. The following table describes the command line options:

UI Elements (A-Z)	Description
/ALM	Indicates that ALM/QC connection information will follow.
/log	Indicates that the log will be written to an alternate file. By default, log files are store in the <**Service test installation**>\bin\logs folder.
/login	Indicates that login information will follow.
/report	Instructs the upgrader tool to generate a summary report.
destination	➤ For tests on the File system: The full UNC path of the directory in which to store the tests after the upgrade. ➤ For tests in ALM/QC: a target folder path under the Test Plan module, in which to store the upgraded tests. **Note**: ➤ The **destination** value must be a local or remote folder with the same write access permissions as the **source** path. ➤ The destination folder should be an empty folder that does not include any tests. ➤ If you do not specify a destination folder, the tests will be upgraded in the source folder, overwriting the originals.
domain	The name of an ALM/QC domain in which the source tests are stored.
logfile	The full path of the file to which the log will be written.
project	The name of an ALM/QC project in which the source tests are stored.

UI Elements (A-Z)	Description
reportfile	The full path of an existing folder, with the file name including an extension, to where the summary report should be written. For example, c:\logs\MySUmmary.txt.
source	➤ For tests on the File system: The full UNC path of the directory containing the tests to be upgraded. ➤ For tests in ALM/QC: a source folder path under the Test Plan module).
url	The URL of an ALM/QC instance to which to connect in the following form: http://{instance_domain}:8080/qcbin
username, password	For ALM mode, the username and password with which to log in to the ALM project.

Troubleshooting and Limitations - Upgrading Tests

This section describes limitations for opening tests created with earlier versions of Service Test.

- When upgrading a test from version 11.00 (via 11.10), Service Test does not retain the Security settings.
  Workaround: In Service Test 11.00, save the Security Scenario to an **.stss** file. Import this file for your service when you upgrade it to version 11.10. For details, see "Setting Security Overview" on page 274.
- In certain instances, if Service Test was unable to upgrade the test, you may need to modify the code to make it compatible with version 11.20:
  - The user code file is now titled TestUserCode.cs.
  - The namespace at the beginning of the test is Script.

- The class definition is public class TestUserCode : TestEntities.

```
namespace Script
{
        using System;
        using System.Xml;
        using System.Xml.Schema;
        using HP.ST.Ext.BasicActivities;
        using HP.ST.Fwk.RunTimeFWK;
        using HP.ST.Fwk.RunTimeFWK.ActivityFWK;
        using HP.ST.Fwk.RunTimeFWK.Utilities;
                                using HP.ST.Fwk.RunTimeFWK.CompositeActivities;
        using System.Windows.Forms;
        using HP.ST.Ext.FTPActivities;


        [Serializable()]
        public class TestUserCode : TestEntities
        …
```

- The **args** variable is not supported in version 11.20.
  Workaround: Change the **args** variable name to the concrete Activity name as it appears at the top of the Property Sheet. For example, change **args**.Output.outStr = **args**.Input.inStr; to **CodeActivity8**.Output.outStr=**CodeActivity8**.Input.inStr;.

3

Service Test Activities

This chapter includes:

Concepts

Tasks

References

Concepts

Activity Overview

You create a test by dragging and dropping **activities** from the Service Test Toolbox into a canvas. The toolbox provides a collection of built-in standard activities for functional testing in areas such as file and string manipulation, and messaging through HTTP, FTP, and JMS.

The activities are divided into several categories:

- **Standard Activities.** This category includes the built-in activities, such as **String Manipulation**, **Database**, **Network**, **File System**. For a complete list of the standard activities, see "Standard Activities" on page 139.
- **Local Activities.** This category includes the activities that are stored as part of the test or business component. These can be imported services such as Web or REST service operations, and .NET assemblies. For details, see Chapter 4, "Local Activities."
- **File System Activities.** This category includes activities that reside in the file system on either local or network drives. These are Local activities that you moved into the file system repository that can be shared between tests.
- **ALM/QC Activities.** This category includes the activities that reside in the ALM/QC repository. These are Local activities that you moved into the ALM/QC repository that can be shared between tests. This category only appears when a connection to an ALM/QC server is open.

You can also create new custom activities, using the extensibility API provided with Service Test. These will be stored under the Standard Activities. For details, see "Extensibility in Service Test" on page 533.

For general information about the Service Test interface and creating tests, see Chapter 1, "Working with Service Test."

Tasks

How to Use Date and Time Activities

The following describes various tasks that you can perform with the Date/Time activities, such as incrementing a date or finding a differential.

This task includes:

- "Increment a date and time" on page 109
- "Find the difference between two date/time expressions" on page 110
- "Format a date or time" on page 111

Increment a date and time

1. Drag the **Increment Date/Time** activity into the canvas.
2. Open the **Input/Checkpoints** view in the Property Sheet.
3. Set the Input property—**Original Date/Time**. Click the arrow in the **Value** column to open the calendar. Click **Today** or select another date. You can also link to the output of another step using the **Link to a data source** button.
4. To set a time unit such as hour, minute, seconds, or milliseconds, edit the expression in the **Original Date/Time** row. For milliseconds, add a colon followed by a three digit millisecond value. For example, 2011-01-01T01:30:00:040
5. Set the Input property—**Unit**. Select a unit by which to increment: Milliseconds, Seconds, Minutes, Hours, Days, Months, or Years.
6. Set the Input property—**Amount**. Use the scroller to set the amount of units to increment.
7. Select the **Result** check box in the **Checkpoints** pane to verify the response. Use the calendar to select the expected date. If you need to set an expected value for a time unit, modify the time units manually.

Find the difference between two date/time expressions

1. Drag the **Date/Time Difference** activity into the canvas.
2. Open the **Input/Checkpoints** view in the Property Sheet.
3. Set the Input property— **Date/Time A**. Click the arrow in the **Value** column to open the calendar. Click **Today** or select another date.
4. To set a time unit such as hour, minute, seconds, or milliseconds, edit the expression in the **Date/Time A** row. For milliseconds, add a colon followed by a three digit millisecond value. For example, 2011-01-01T01:30:00:040
5. Set the Input property—**Date/Time B**. Click the arrow in the **Value** column to open the calendar. Select a date for the second expression.

   To set a time unit such as hour, minute, seconds, or milliseconds, follow the instructions in the above step.
6. Set the Input property—**Unit**. Select the unit by which you want to measure the difference: Milliseconds, Seconds, Minutes, Hours, Days, Months, or Years.
7. To verify the response, select the **Difference** check box in the **Checkpoints** pane. Use the scroller to specify the expected difference.

Format a date or time

1. Drag the **Format Date/Time** activity into the canvas.
2. Open the **Input/Checkpoints** view in the Property Sheet.
3. Set the Input property—**Date/Time**. Click the arrow in the **Value** column to open the calendar. Click **Today** or select another date.
4. To set a time unit such as hour, minute, seconds, or milliseconds, edit the expression in the **Date/Time** row. For milliseconds, add a colon followed by a three digit millisecond value. For example, 2011-01-01T01:30:00:040
5. Set the Input property—**Format**. Select a format type for the expression. If your expression contains milliseconds, select an expression with a time format and add a colon followed by fff. For example, dd/MM/yyyy hh:mm:ss:fff
6. Select the **Result** check box in the **Checkpoints** pane to verify the response's format. Type the expected expression. If you need to set an expected value for a time unit, modify the time units manually.

How to Execute Database Commands or Retrieve Data

The following describes how to use database activities. For details about the database activities, see "Database Activities" on page 145.

This task includes:

- "Open a connection" on page 112
- "Add a Select Data step" on page 112
- "Add an Execute Command step" on page 113
- "Add database transaction activities" on page 113
- "Add a Close Connection step" on page 114

Open a connection

This step is mandatory for all of the following steps.

1. Drag the **Database** > **Open Connection** activity into the canvas.
2. Open the **Input/Checkpoints** view in the Property Sheet.
3. Select the Input property—**Connection string**.
4. Click the **Connection Builder** button in the right side of the **Value** column. The Connection Builder dialog box opens. For details, see "Connection Builder Dialog Box" on page 190.
5. Paste in an existing string into the text area or click the **Connection Builder** button to open Microsoft's Data Link Properties dialog box. Provide the required information and click **OK**. For details, click the dialog box's **Help** button.

Note: The database connection must be an OLE DB type.

6. If you want to validate the connection, set the checkpoint properties - **Results** and **Results message**.

Add a Select Data step

1. Drag the **Database** > **Select Data** activity into the canvas, below an **Open connection** step.
2. Open the **Input/Checkpoints** view in the Property Sheet.
3. Set the Input property—**Connection**. Click the **Link to a data source** button by the right side of the **Value** column. In the Select Link Source dialog box, select an earlier **Open connection** step in the left pane. In the right pane, select the step's result.
4. Set the Input property—**Query string**. Click the **Browse** button in the right side of the **Value** column to open the Query Builder. Paste in a query or use the Query Designer. For details, see the "Query Builder Dialog Box" on page 191.

5 Optionally, set the **Timeout**, the maximum time allowed for the database response. To allow an unlimited amount of time, enter 0.

Add an Execute Command step

1 Drag the **Database** > **Execute Command** activity into the canvas, below the **Open Connection** step.

2 Open the **Input/Checkpoints** view in the Property Sheet.

3 Set the Input property—**Connection**. Click the **Link to a data source** button by the right side of the **Value** column. In the Select Link Source dialog box, select an earlier **Open connection** step in the left pane. In the right pane, select the step's result.

4 Set the Input property—**Command**. Click the arrow to open an edit box, Paste in a command and click **OK**.

5 Optionally, set the **Timeout**, the maximum time allowed for the database response.

Add database transaction activities

You can optionally add transaction activities to your test.

1 Drag the **Database** > **Begin Transaction** activity to the canvas after an **Open Connection** step and before the steps to be included in the transaction.

2 Drag a **Database** > **Commit Transaction** activity to the canvas after the database steps that make up the transaction.

3 Drag a **Database** > **Rollback Transaction** activity to the canvas after the database steps that make up the transaction.

Tip: A common use is to insert a **Condition** step to check a value after the database commands. Set one branch with **Commit Transaction** and the other branch to **Rollback Transaction**. For details, see "Flow Control" on page 21.

Add a Close Connection step

1. Drag the **Database** > **Close Connection** activity on to the canvas, after all of the database steps.
2. Open the **Input/Checkpoints** view in the Property Sheet.
3. Set the Input property—**Connection**. Click the **Link to a data source** button in the right side of the **Value** column In the Select Link Source dialog box, select the **Available steps** option. In the left pane, select the earlier step, **Open Connection**, In the right pane, select the **Connection** node.

How to Send a Multipart HTTP Request

The following describes how to send an HTTP request that uses multiple parts. For details about the properties, see the "Multipart View" on page 75.

This task includes:

- "Add an HTTP Step" on page 115
- "Set the General properties" on page 115
- "Set the properties for the first part" on page 115
- "Set the properties for the next parts" on page 115

1 Add an HTTP Step

Drag the **Network** > **HTTP** activity into the canvas.

2 Set the General properties

Open the **General** view in the Property Sheet. Set the properties as described in the "General View" on page 64.

3 Set the properties for the first part

Open the **Input/Checkpoints** view in the Property Sheet. Set the properties for the first part as described in the "Network Activities" on page 154.

4 Set the properties for the next parts

a Open the **Multipart** view in the Property Sheet.

b Select the **Enable Multipart** option.

c Set the multipart type and global header information.

d Add elements to the Parts array corresponding to the number of parts.

e Set the properties for the parts as described in the "Multipart View" on page 75.

f If you want to validate a response, select the box in the **Validate** column and provide the expected values.

How to Create a Call to a Java Class

The Call Java Class activity lets you to add Java steps to your test script. This feature enables you to incorporate existing Java code into your test.

This task describes how to create the Java call and includes the following steps:

- "Set the global Java settings - optional" on page 116
- "Implement the Service Test Java interface" on page 116
- "Package your custom step - optional" on page 117
- "Add a Call Java Class activity" on page 117
- "Open the Java Class Setting dialog box" on page 117
- "Set the Java Call properties" on page 117
- "Provide Input properties" on page 118

1 Set the global Java settings - optional

To set global VM (Virtual Machine) settings, click in the canvas outside of the Test Flow, and open the **Test Settings view** in the Property Sheet. For details, see the "Test Settings View" on page 77.

2 Implement the Service Test Java interface

Change to the <**ST_INSTALL_HOME**>**addins****ServiceTest****JavaCall****Java Interface****src** folder and run Run **javac.exe** to implement the Service Test interface.

The interface, **ServiceTestCall.java**, is located in the <**ST_INSTALL_HOME**>**addins****ServiceTest****JavaCall****Java Interface****src****hp****st****ext****java** folder. This interface provides the essential information to Service Test: input properties, output properties, and a point of entry.

For example, the following code implements the "Hello World" sample provided with Service Test:

```
javac .\hp\st\ext\java\*.java .\hp\st\ext\java\sample\*.java
```

3 Package your custom step - optional

Package your java classes into a **jar** file. This is optional, since you can also provide a package root for the class.

4 Add a Call Java Class activity

In Service Test, expand the **Java** node in the Toolbox palette, and drag the **Call Java Class** activity into the canvas.

5 Open the Java Class Setting dialog box

Click on the Java step in the canvas, and open the **Input/Checkpoints view** in the Property Sheet. Click the **Select Java File** button to open the Call Java Class Settings Dialog Box.

For general guidelines, see "Java Testing" on page 28.

6 Set the Java Call properties

In the Call Java Class Settings dialog box:

a Provide a classpath. If you packaged your Java step, click the **Jar** button and point to the **jar** file. Alternatively, click the **Package root** button to select a package root folder.

b Click the **Browse** button in the **Selected Java Class** box, to locate the class within the **jar** file or the folder. Make sure it is a class that implements the **ServiceTestCall** interface.

c To provide additional classpaths, click the **Jar** or **Folder** buttons in the **Additional Classpaths** section to Browse to a **jar** file or classpath folder. Click **Add** to move the contents into the list.

d Click **OK** to save the Java Call settings.

For user interface details, see the "Call Java Class Settings Dialog Box" on page 196.

7 Provide Input properties

In the Property Sheet's **Input/Checkpoints** view, provide values for the step's input properties.

How to Retrieve Messages from a JMS Queue

This task describes how to send, receive and browse JMS messages on a JMS queue.

This task includes the following steps:

- "Define the global JMS settings" on page 118
- "Prepare a message to send to the queue" on page 118
- "Add a Send Message step to your test" on page 119
- "Add a Send Message with security and attachments - optional" on page 119
- "Add a Receive Message step to your test - optional" on page 120
- "Browse the message queue - optional" on page 121
- "Set checkpoints- optional" on page 122
- "Run the test and view the run results" on page 123

1 Define the global JMS settings

Define global JMS settings such as the JNDI details according to the specifications of your JMS messaging server. Click in the canvas outside of the Test Flow, and open the **Test Settings** view in the Property Sheet. For details, see the "Test Settings View" on page 77.

2 Prepare a message to send to the queue

Prepare the message you want to send to the queue in one of the following ways:

- Prepare an expression and type it into the **Message** property area.

- Use other Service Test activities to generate the string, for example **Concatenate String**, **Trim String**, and so forth.

3 Add a Send Message step to your test

a In Service Test, expand the **Standard Activities** > **JMS** node in the Toolbox palette. Drag a **Send Message to JMS Queue** or a **Send and Receive Message from JMS Queue** activity onto the canvas.

b Select the step and open the Property Sheet’s **Input/Checkpoints** view. Set the send-related input properties:

- **Send queue name**
- **Message**
- **JMS send properties**

c If you used another step to generate the message text, link its output to the **Message** property.

4 Add a Send Message with security and attachments - optional

To send a Web service message via JMS with attachments and security setting, such as tokens and signatures:

a Drag in or select the Web service step in the canvas and disable its **Send Request to Service** option in the Property Sheet. For details, see "Web Service and SOAP Request Checkpoint Options" on page 73.

b Set the security options for the service. For details, see "How to Set Security for a Web Service on the Port Level" on page 284.

c Include any attachments. For details, see "Attachments View" on page 56.

d Drag in a Send Message to JMS Queue activity onto the canvas.

e In the Property Sheet’s **Input/Checkpoints** view, select the link icon for the **Message** property. The Select Link Source dialog box opens. For details, see the "Select Link Source Dialog Box" on page 395.

f In the Select Link Source dialog box, select the Web service step in the left pane. In the Output property section, double-click on the **Raw Request** property. This attaches the security and attachment data to the message.

g Define any other JMS properties as you normally would. For property details, see "JMS Activities" on page 162.

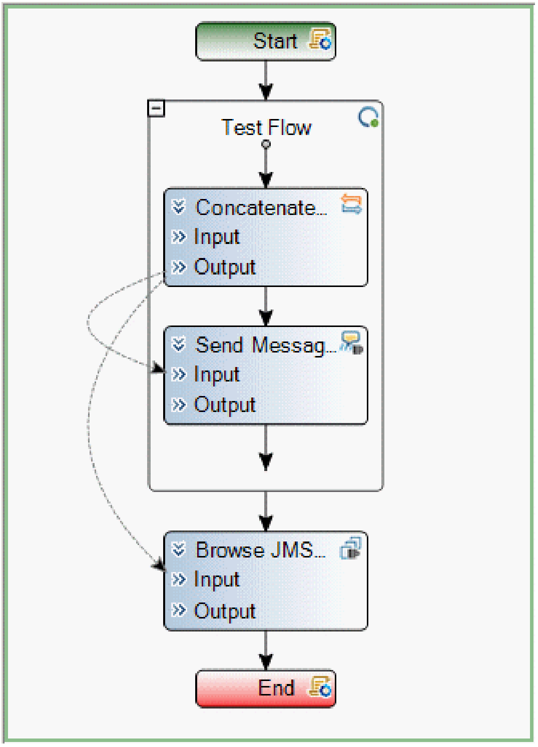
5 Add a Receive Message step to your test - optional

a To retrieve a message from the queue, drag a **Receive Message from JMS Queue** activity onto the canvas. If you added a **Send and Receive Message to JMS Queue** activity in the previous step, you can skip this step.

b Select the **Receive Message from JMS Queue** step and open the Property Sheet's **Input/Checkpoints** view. Set the receive-related input properties: **Receive queue name** and **JMS receive message selector**. For property details, see "JMS Activities" on page 162.

6 Browse the message queue - optional

a To browse the messages in the queue without consuming them, drag a **Browse JMS Queue Messages** activity into the canvas, outside of the Test Flow. Make sure that a **Send (and Receive) Message from JMS Queue** step precedes the **Browse JMS Queue Messages** step.



b Open the Property Sheet's **Input/Checkpoints** view, and select the **Browse JMS Queue Messages** step. Set the browse-related input properties:

- ➤ **Queue name.** Provide a queue name or link to the queue name from an earlier step. For IBM Websphere's MQ, if you specify a queue name that does not exist, a new queue will be created during the test run.
- ➤ **JMS receive message selector**. The selector lets you filter the messages list. For details about these properties, see "JMS Activities" on page 162.

7 Set checkpoints- optional

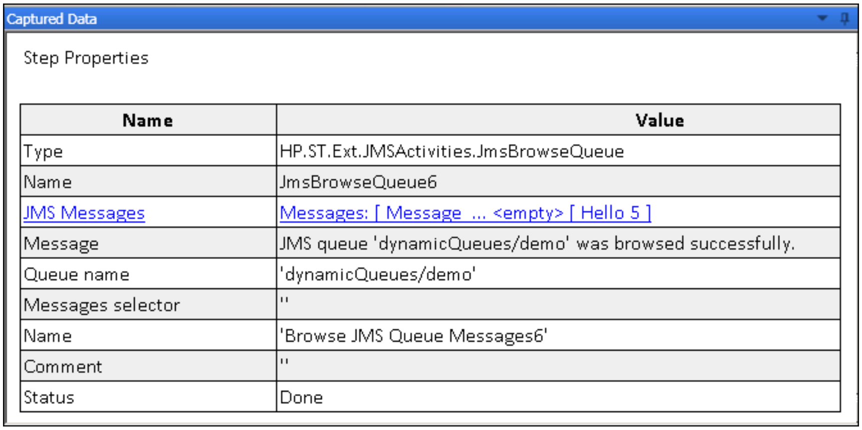
a Select the **Browse JMS Queue Messages** step and click in the Property Sheet's **Checkpoints** section.

b Select the properties you want to validate and provide values.

c Use the **Browse JMS queue messages** output properties to validate the messages on the queue. For example, you can check the value of a specific property or check the number of messages on the queue.

8 Run the test and view the run results

Run the test. In the Run Results Viewer, expand the checkpoint nodes and verify that the actual values match the expected values. Click the link in the report to display the JMS queue messages in a separate browser. Compare these messages with those shown in the queue on the JMS application server's console.



Captured Data

Step Properties

Name	Value
Type	HP.ST.Ext.JMSActivities.JmsBrowseQueue
Name	JmsBrowseQueue6
JMS Messages	Messages: [Message ... <empty> [Hello 5]
Message	JMS queue 'dynamicQueues/demo' was browsed successfully.
Queue name	'dynamicQueues/demo'
Messages selector	''
Name	'Browse JMS Queue Messages6'
Comment	''
Status	Done

How to Receive Messages Through JMS Topics

This task describes how to work with subscriptions to JMS topics.

This task includes the following steps:

- "Set the global JMS settings" on page 124
- "Subscribe to a topic" on page 124
- "Publish a message to the topic" on page 124
- "Include Web service security and attachments - optional" on page 124
- "Receive the message through the topic" on page 125

1 Set the global JMS settings

Set global JMS settings such as the JNDI details according to the specifications of your JMS messaging server. Click in the canvas outside of the Test Flow, and open the **Test Settings** view in the Property Sheet. For details, see the "Test Settings View" on page 77.

2 Subscribe to a topic

Add a **Subscribe to JMS Topic** step and provide values for its input properties as described in "JMS Activities" on page 162.

3 Publish a message to the topic

Add a **Publish Message to JMS Topic** step and provide values for its input properties.

4 Include Web service security and attachments - optional

To publish a Web service message via JMS with attachments and security setting, such as tokens and signatures:

a Drag in or select the Web service step in the canvas and disable its **Send Request to Service** option in the Property Sheet. For details, see "Web Service and SOAP Request Checkpoint Options" on page 73.

b Set the security options for the service. For details, see "How to Set Security for a Web Service on the Port Level" on page 284.

c Include any attachments. For details, see "Attachments View" on page 56.

d Drag a **Publish Message to JMS Topic** step onto the canvas.

e In the Property Sheet's **Input/Checkpoints** view, select the link icon for the **Message** property. The Select Link Source dialog box opens. For details, see the "Select Link Source Dialog Box" on page 395.

f In the Select Link Source dialog box, select the Web service step in the left pane. In the Output property section, double-click on the **Raw Request** property. This attaches the security and attachment data to the message.

g Define any other JMS properties as you normally would. For property details, see "JMS Activities" on page 162.

5 Receive the message through the topic

Drag a **Receive Message from JMS Topic** activity into the canvas. Use the topic and subscription name that you defined in the previous steps.

How to Retrieve Messages from an MQ Queue

This task describes how to work with Put and Get on an IBM Websphere MQ queue.

This task includes the following steps:

- "Prerequisite" on page 126
- "Connect to the MQ Queue Manager" on page 126
- "Put a message on the queue" on page 126
- "Browse the message queue - optional" on page 126
- "Get a message from the queue" on page 127
- "Commit or Backout the actions - optional" on page 127
- "Disconnect from the MQ Queue Manager" on page 127
- "Define Event Handlers - optional" on page 128
- "Set checkpoints - optional" on page 128

1 Prerequisite

You must have the MQ client installed on all machines upon which you want to run the test.

2 Connect to the MQ Queue Manager

A connection step must precede all steps that use the specified Queue Manager. Drag an **IBM Websphere MQ** > **Connect to MQ Queue Manager** step into the canvas and provide the connection details in the Property Sheet's **Input/Checkpoints** view. For details see "Connect to MQ Queue Manager - Input Properties" on page 173.

3 Put a message on the queue

Drag a **Put Message to MQ Queue** step onto the canvas, below the connection step. Service Test automatically links the **MQManager** property to the most recent **Connect to MQ Queue Manager** step. Set input values as described in "Put Messages on MQ Queue - Input Properties" on page 177.

4 Browse the message queue - optional

To browse the messages in the queue without consuming them:

a Drag a **Browse Messages in MQ Queue** activity onto the canvas.

b Select the step in the canvas and open the Property Sheet's **Input/Checkpoints** view.

c Set the browse-related properties. For details, see "Browse Messages in MQ Queue - Input Properties" on page 176.

5 Get a message from the queue

Drag a **Get Message from MQ Queue** step onto the canvas, below the connection step. Set the input values as described in "Get Messages from MQ Queue - Input Properties" on page 178.

6 Commit or Backout the actions - optional

To commit the actions performed until a certain point, drag a **Commit MQ Pending Messages** activity into the canvas. To roll back changes drag a **Backout MQ Pending Messages** activity into the canvas at the relevant location.

7 Disconnect from the MQ Queue Manager

A disconnection step must follow all steps that use the specified Queue Manager. Drag a **Disconnect from MQ Queue Manager** step into the canvas, and provide the connection details in the Property Sheet's **Input/ Checkpoints** view. For details see "Disconnect from MQ Queue Manager - Input Properties" on page 174.

8 Define Event Handlers - optional

To customize or automate the actions against the MQ server, use the MQ event handlers. Click the Events button in the Property Sheet and double-click the appropriate event—a standard event or one of the MQ-specific events, such as **BeforeMQGetMessage** or **AfterMQGetMessage**. Customize the code in the **TestUserCode.cs** tab. For details, see Appendix A, "Coding Service Test Events" and the "Events View" on page 61.

9 Set checkpoints - optional

To validate the response data, select the step and click within the Property Sheet's **Checkpoints** section. Indicate the properties you want to validate and provide values. Run the test and view the run results.

How to Receive Messages Through MQ Topics

This task describes how to retrieve messages published to MQ topics.

This task includes the following steps:

- "Prerequisite" on page 129
- "Connect to the MQ Queue Manager" on page 129
- "Subscribe to a topic" on page 129
- "Publish a message to the topic" on page 129
- "Receive the message through the topic" on page 129
- "Unsubscribe from a topic" on page 129
- "Disconnect from the MQ Queue manager" on page 130
- "Define event handlers - optional" on page 130

1 Prerequisite

You must have the MQ client installed on all machines upon which you want to run the test.

2 Connect to the MQ Queue Manager

A connection step must precede all steps that use the specified Queue Manager. Drag a **Connect to MQ Queue Manager** step onto the canvas, and provide the connection details in the Property Sheet's **Input/ Checkpoints** view. For details see "Connect to MQ Queue Manager - Input Properties" on page 173.

3 Subscribe to a topic

Add a **Subscribe to MQ Topic** step. Service Test automatically links the **MQManager** property to the most recent **Connect to MQ Queue Manager** step. Provide values for its input properties as described in "Subscribe to MQ Topic - Input Properties" on page 182.

4 Publish a message to the topic

Add a **Publish Message to MQ Topic** step and provide values for its input properties as described in "Publish Message to MQ Topic - Input Properties" on page 183.

5 Receive the message through the topic

Drag a **Receive Message from MQ Topic** activity into the canvas. Use the topic and subscription name that you set in the previous steps. For details, see "Receive Message from MQ Topic - Input Properties" on page 185.

6 Unsubscribe from a topic

Add an **Unsubscribe from MQ Topic** step and provide values for its input properties as described in "Unsubscribe from MQ Topic - Input Properties" on page 183.

7 Disconnect from the MQ Queue manager

A disconnection step must follow all steps that use the specified Queue Manager. Drag a Disconnect from MQ Queue manager activity onto the canvas. Service Test automatically links to the most recent opened connection.

8 Define event handlers - optional

To customize or automate the actions against the MQ server, use the MQ event handlers. Click the **Events** button in the Property Sheet and double-click the appropriate event—a standard event or one of the MQ-specific ones. Customize the code in the **TestUserCode.cs** tab. For details, see Appendix A, "Coding Service Test Events" and the "Events View" on page 61.

How to Implement UFT Testing

This task describes how to incorporate tests from other HP applications to provide a Unified Functional Testing solution (UFT). These applications include QuickTest Professional, Virtual User Generator, and Service Test. For details, see "UFT (Unified Functional Testing)" on page 30.

This task includes the following steps:

- "Prerequisites" on page 131
- "Add a QuickTest test activity" on page 132
- "Add a LoadRunner script activity" on page 132
- "Add a Service Test test" on page 133

1 Prerequisites

Make sure you have installed the application whose test/script you want to call:

- **QuickTest test step.** Make sure you have QuickTest Professional 11.00 or later. Create the test in QuickTest Professional and run it at least once.
- **Virtual User Generator step.** Make sure you have HP LoadRunner 11.00 or later. Generate a test with the Virtual User Generator, or use a test that you enabled for load testing in Service Test.
- **Service Test test step.** Make sure you have saved and run the test that you want to call.

Note: The first time you invoke QuickTest in a test step, you may need to wait several seconds for Service Test to invoke QuickTest and load the test.

2 Add a QuickTest test activity

a In Service Test, expand the **Unified Functional Testing** node in the Toolbox palette. Drag the **Call QuickTest Professional Test** activity into the canvas.

Tip: Do not insert a call to a QuickTest test that contains a call to a Service Test test, as this can cause unexpected behavior.

b Open the Property Sheet's **Input/Checkpoints** view, and click the **Select QTP Test** button. Select a QuickTest Professional version 11.00 (or later) test.

c If the QuickTest test changed at its source, you can update it in Service Test. In the **Input/Checkpoints** view, click **Update properties**.

d Service Test imports the properties defined in the QuickTest test. You can edit the properties manually, data drive them, or load response values from a replay.

e Add other relevant steps to your test.

f Save and run the test.

3 Add a LoadRunner script activity

a In Service Test, expand the **Unified Functional Testing** node in the Toolbox palette. Drag the **Call Virtual User Generator Script** activity into the canvas.

b Open the Property Sheet's **General** view, and click the **Select VuGen Script** button. Select a VuGen (Virtual User Generator) **.usr** script file.

c Add other relevant steps to your test.

d Save and run the test.

4 Add a Service Test test

a Make sure the Service Test test you want to call has been saved and run successfully at least once.

b Expand the **Unified Functional Testing** node in the Toolbox palette. Drag the **Call Service Test test** activity into the canvas.

c Open the Property Sheet's **General** view and click the **Select ST Test** button. Select a test version 11.00 (or higher).

d To update a test that has already been loaded, click **Update ST Test**.

e To specify a custom directory for the results, click the **Browse** button in the **Results directory** row in the **General** view tab.

f Open the Property Sheet's **Input/Checkpoints** view and set the property values. The property list remains empty until you select a test as described in step c. For information about selecting an external data source, see "How to Assign Data to Test Steps" on page 365.

g Add other relevant steps to your test. You can link subsequent input properties to the output properties of the Service Test test step. Click the Link to source button in the property's row to create the link. For details, see "Select Link Source Dialog Box" on page 395.

h The Service Test test step input must be a string, so if you want to use the result of a previous step that created XML, add the **XML to String** activity. For details, see "XML Activities" on page 187.

i Save and run the test.

How to Validate an XML file

This task describes how to validate the code in an XML string. The Validate XML activity evaluates an XML string and checks its compliance with an XSD schema.

Since the **Validate XML** activity reads a string, you need to specify the actual XML string—not just a file name. If the string is short, you can copy it into the **Value** column directly. For more complex XML content, you can read the XML file using a **Read from File** activity.

This task includes the following steps:

- "Provide the XML code to validate" on page 134
- "Add a Validate XML activity" on page 135
- "Connect the steps - if using Read from File" on page 135
- "Specify an XSD file" on page 135
- "Set a checkpoint - optional" on page 135
- "Run the test" on page 136

1 Provide the XML code to validate

To provide the XML code, you can paste an XML directly into the **Value** column, or read the contents from the file using the **Read from File** activity.

To enter XML code directly, copy the XML string from the source document and paste it into the **Value** column.

To read the XML from a file:

a Drag the **File System** > **Read from File** activity into the canvas.

b Open the **Input/Checkpoints** view in the Property Sheet. Browse to the **XML file** you want to validate.

2 Add a Validate XML activity

Drag the **XML** > **Validate XML** activity into the canvas. If you used a **Read from File** step, drag this activity beneath the step.

3 Connect the steps - if using Read from File

If you used a **Read from File** step to obtain the XML, follow these steps. Otherwise, skip to step 4.

a Open the **Input/Checkpoints** view in the Property Sheet. Click in the **Value** column of the **XML String** property and click the **Link to a data source** button.

b In the Select Link Source dialog box, select the **Available steps** option. In the right pane, select the **Read from File** step's output property, **Content,** and click **OK**.

4 Specify an XSD file

a Select the **Validate XML** step in the canvas. Open the **Input/ Checkpoints** view in the Property Sheet. Browse to an **XSD file**.

b To import the XSD file into the test's folder, set the **XSD file to test folder** option to true. This is useful if you plan on saving the test on QC/ALM. Setting this option will make the XSD file available to anyone who loads the test.

5 Set a checkpoint - optional

If you want to verify the results:

a Click in the **Checkpoints** section.

b Select the **Valid** check box. Set the value to true to verify that the XML code complies with the XSD. Set the value to false to confirm that the XML code did not comply with the XSD.

c To check for a specific error, set the **Valid** value to false, and specify the expected error in the **Error** row. You can link to a data source containing the expected value.

6 Run the test

Run the test. The Output tab and Run Results Viewer will display the results and indicate whether the XML is in compliance with the XSD and details about the errors.

How to Transform an XML File

This task describes how to transform an XML file to a different structure based on an XSLT file.

Since the Transform XML activity reads a string, you need to specify the actual XML string—not just a file name. If the string is short, you can copy it into the **Value** column directly. For more complex XML content, you can read the XML file using a **Read from File** activity.

This task includes the following steps:

- "Provide the XML code to transform" on page 136
- "Add a Transform XML activity" on page 137
- "Connect the steps - if using Read from File" on page 137
- "Specify an XSLT file" on page 137
- "Set a checkpoint - optional" on page 138
- "Run the test" on page 138

1 Provide the XML code to transform

To provide the XML code, you can paste an XML directly into the **Value** column, or read the contents from the file using the **Read from File** activity.

To enter XML code directly, copy the XML string from the source document and paste it into the **Value** column.

To read the XML from a file:

a Drag the **File System** > **Read from File** activity into the canvas.

b Open the **Input/Checkpoints** view in the Property Sheet. Browse to the **XML file** you want to transform.

2 Add a Transform XML activity

Drag the **XML** > **Transform XML** activity into the canvas. If you used a **Read from File** step, drag this activity beneath the step.

3 Connect the steps - if using Read from File

If you used a **Read from File** step to obtain the XML, follow these steps. Otherwise, skip to step 4.

a Open the **Input/Checkpoints** view in the Property Sheet. Click in the **Value** column of the **XML String** property and click the **Link to a data source** button.

b In the Select Link Source dialog box, select the **Available steps** option. In the right pane, select the **Read from File** step's output property, **Content,** and click **OK**.

4 Specify an XSLT file

a Select the **Transform XML** step in the canvas. Open the **Input/ Checkpoints** view in the Property Sheet. Browse to an **XSLT file**.

b To import the XSLT file into the test's folder, set the **XSLT file to test folder** option to true. This is useful if you plan on saving the test on QC/ALM. Setting this option will make the XSLT file available to anyone who loads the test.

5 Set a checkpoint - optional

If you want to verify the results, select the **Transformed XML** check box in the **Checkpoints** section and specify the expected result. You can link to a data source containing the expected value.

6 Run the test

Run the test. The **Output** tab and the Run Results Viewer will indicate whether the transform operation succeeded.

References

Standard Activities

This section describes the Standard activity groups:

- Flow Control Activities on page 140
- Miscellaneous Activities on page 142
- String Manipulation Activities on page 143
- System Activities on page 143
- Math Activities on page 143
- Date and Time Activities on page 144
- File Activities on page 144
- Database Activities on page 145
- FTP Activities on page 151
- Network Activities on page 154
- Java Activities on page 162
- JMS Activities on page 162
- Load Testing Activities on page 171
- Unified Functional Testing Activities on page 186
- IBM WebSphere MQ Activities on page 172
- Unified Functional Testing Activities on page 186
- XML Activities on page 187

Flow Control Activities

The following activities allow you to control the flow of the test using loops, conditions, breaks, and delays:

- **Condition.** Enables you to use a branching mechanism based on the value of a property.
- **Loop.** A loop frame whose properties can be set independently of the Test Flow. The loop types are **For loop**, **Do While loop**, and **For Each loop**.
- **Break.** Halts the test execution.
- **Continue.** Resumes the test execution after a break.
- **Sleep.** Pauses the test execution for a specified amount of time.
- **Wait.** Waits a specified amount of time for a trigger event before releasing a step for execution

For details, see "Flow Control" on page 21.

Loop - Input Properties

The following iteration settings are available for the Test Flow or other custom loops:

UI Elements (A-Z)	Description
Do While Loop - **Use condition**	Repeats the loop as long as the specified condition is met: ➤ **Variable.** The variable to evaluate. Use the Select Link Source button 🔗 to enter a data source expression. ➤ **Operator.** A comparison operator relevant to the variable such as =, **!=**, **Contains**, **Starts** and **Regex**. ➤ **Value.** The value with which to compare the result.
Do While Loop - **Use event**	Performs iterations until the event returns True. This mode is useful for complex conditions that can be defined in an event handler. When you select this option, the Input Properties grid opens. ➤ Click + to define properties. ➤ Click ⚡ to open the **Events** view. Click **Create a default handler** in the **Handler** column. ➤ Modify or add code to the event handler method that defines your condition.
For Each Loop	Performs an iteration for each element in the associated array or collection of objects. Data is selected using the **Select Link Source** button 🔗 . **Note:** When you delete data from a data table, Service Test continues to run an iteration for that row, with empty values. To remove an entire row of a data, click the row and select **Delete** from the shortcut menu (only with Excel installations).
For Loop	Performs the Test Flow or custom loop the number of times that you specify in the **Number of Iterations** box.

Wait Activity

For asynchronous steps, the **Wait** activity waits a specified amount of time for a trigger event before releasing the associated step. This activity is used in conjunction with the **HTTP Receiver** steps and Web Service calls imported as server response steps. For details, see Chapter 7, "Asynchronous Service Calls."

Wait - Input Properties

To view the Input properties, click the **Input/Checkpoints** view button in the Property Sheet.

Property (A-Z)	Description
Action on timeout	The action to take when the timeout is reached without the completion events: **Fail** or **Continue**.
Completion event names	A list of the completion events that were configured in prior receiver steps.
Start timeout after step	The time after step execution from when to begin measuring the timeout interval.
Timeout	The timeout in milliseconds. Negative values indicate that there is no timeout.

Miscellaneous Activities

This activity group provides access to the following activities:

- **Custom Code.** Enables you to program a step to execute your own activity. Use the **Add** button to define new input or output properties.
- **Set Test Variable.** Defines global variables for your test.
- **Run Program.** Invokes an application on the Service Test machine.
- **End Program.** Closes an application that is running.
- **Report Message.** Sends a custom message to the Run Results.

String Manipulation Activities

This activity group provides access to the following string related activities:

- **Concatenate Strings.** Joins two strings.
- **Replace String.** Replaces part of a string with an alternate string. You can provide an array of replacement strings for use with iterations.
- **Substring.** Extracts the characters between two specified locations of a string.
- **Trim String.** Removes whitespace characters from the beginning or end of a string.

System Activities

This activity group provides access to the following operating system activities:

- **Set OS Environment Variable.** Sets the value of an operating system variable.
- **Get OS Environment Variable**. Retrieves the value of an operating system variable.

Math Activities

This activity group provides access to the following math related activities:

- **Add.** Adds two numbers.
- **Subtract**. Subtracts one number from another.
- **Multiply.** Multiplies two numbers.
- **Divide**. Divides one number by another.

Date and Time Activities

This activity group provides access to the following date and time related activities:

- **Increment Date.** Adds date or time units to a date/time string.
- **Date/Time Difference**. Calculates the difference between two date/time strings.
- **Format Date/Time.** Formats a date/time string.

File Activities

This activity group provides access to the following file related activities:

- **File Exists.** Searches for a specific file, or group of files, if you use a wildcard expression. It returns **true** if the file exists.
- **Folder Exists.** Searches for a specific folder. It returns **true** if the folder exists.
- **File Copy.** Copies a file to a new destination.
- **File Move.** Moves a file to another destination.
- **File Create.** Creates a new file.
- **File Delete.** Deletes a file.
- **File Rename.** Renames a file.
- **Write to File.** Writes to an existing or new file.
- **Read from File.** Retrieves text from a file.
- **Get Folder Contents.** Gets the contents of a folder—file names, folder names, or both.

Database Activities

This activity group provides access to database related activities:

- **Open Connection.** Opens a connection to a database using the specified connection string.
- **Close Connection.** Closes an open database connection.
- **Select Data.** Executes a SELECT type SQL statement that retrieves data.
- **Execute Command.** Executes an SQL statement that does not retrieve data from the database, such as UPDATE, DELETE, and so forth.
- **Begin Transaction.** Begins a database transaction.
- **Commit Transaction.** Commits a database transaction.
- **Rollback Transaction.** Rolls back a database transaction from a pending state.

Open/ Close Connection

This activity opens or closes a connection to a database using the specified connection string.

Open/ Close Connection - Input Properties

Property (A-Z)	Description
Connection String **(for Open Connection)**	An OLE DB database connection string. You can provide a value in one of the following ways: ➤ Type it in manually. ➤ Open the **Connection Builder** [...]. For details, see the "Connection Builder Dialog Box" on page 190. ➤ Use the **Link to a data source** button 🔗 to create a link to the string.
Connection **(for Close Connection)**	A link to the output of an **Open Connection** step. Use the **Link to a data source** button 🔗 to create a link.

Open/ Close Connection and Transaction Activities - Checkpoints

Property (A-Z)	Description
Result	Indicates whether the connection is active (true) or closed (false).
Result Message	A message indicating success or an informational message from the database.

Select Data

This activity executes a SELECT type SQL statement that retrieves data.

Select Data - Input Properties

Property	Description
Connection	A link to the output of a previously opened connection string. Use the **Link to a data source** button 🔗 to create the link.
Query string	An SQL SELECT statement. You can provide a string in one of the following ways: ➤ Type it in manually. ➤ Open the **Query Builder** ... . For details, see the "Query Builder Dialog Box" on page 191. ➤ Use the **Link to a data source** button 🔗 to create a link to the string.
Timeout	The maximum time to allow for executing the database command. A value of zero indicates no time limit. **Default:** 30 seconds

Select Data - Checkpoints

Property (A-Z)	Description
Count	The number of rows returned by the command.
Result	Indicates whether the operation has been successfully completed: true or false.
Result table	An array of returned rows. The row elements are column names. You can set an expected value for each column of each row. **Note:** In order to see the table column, you need to generate the output at least once. You can do this by selecting the **Generate output** option in the Query Builder, or by clicking the **Generate Output** button in the **Checkpoints** pane. **Tip:** Use the **Manage Columns** button to remove or replace columns when: ➤ The columns changed due to parameterization. ➤ A column was removed since the original query. ➤ You don't have access to database when designing the test.

Execute Command

This activity executes a SQL statement that does not retrieve data from the database, such as UPDATE, DELETE, and so forth.

Execute Command - Input Properties

Property (A-Z)	Description
Command	An SQL statement that does not retrieve data, such as UPDATE or DELETE. You can provide a string in one of the following ways: ➤ Type it in manually in the drop-down edit box. ➤ Use the **Link to a data source** button 🔗 to create a link to the string.
Connection	A link to the output of a previously opened connection string. Use the **Link to a data source** button 🔗 to create the link.
Timeout	The maximum time to allow for executing the database command. A value of zero indicates no time limit. **Default:** 30 seconds

Execute Command - Checkpoints

Property (A-Z)	Description
Affected rows	The number of rows affected by the command.
Result	Indicates whether the command executed successfully: true or false.
Result Message	Success or upon failure, a message issued by the database indicating the nature of the failure.

Begin Transaction

This activity begins a database transaction.

Begin Transaction - Input Properties

Property (A-Z)	Description
Connection	A link to the output of a previously opened connection string. Use the **Link to a data source** button 🔗 to create the link.
Isolation level	The isolation level of the transaction: Default, Chaos, Read Committed, Read Uncommitted, Repeatable Read, Serializable, or Snapshot. For details, see http://msdn.microsoft.com/en-us/library/system.data.isolationlevel.aspx.

Begin Transaction - Checkpoints

Property (A-Z)	Description
Result	Indicates whether the connection is active (true) or closed (false).
Result Message	A message indicating success or an informational message from the database.

Commit/Rollback Transaction

These activities commit a database activity and roll back a database activity from a pending state.

Commit/Rollback Transaction - Input Properties

Property (A-Z)	Description
Transaction	A link to an open transaction. Use the **Link to a data source** button 🔗 to create a link to the output of a **Begin Transaction** step.

Commit/Rollback Transaction - Checkpoints

Property (A-Z)	Description
Result	Indicates whether the connection is active (true) or closed (false).
Result Message	A message indicating success or an informational message from the database.

FTP Activities

This activity group provides activities that allow you to perform FTP operations, such as **FTP Upload** and **FTP Download**.

- **FTP Download.** Downloads a file or directory from an FTP server.
- **FTP Upload.** Uploads a file or directory to an FTP server.
- **FTP Rename.** Renames an existing file or directory on an FTP server.
- **FTP File Delete.** Deletes a file on an FTP server.
- **FTP File Get Size.** Gets the size of a file on an FTP server.
- **FTP Directory Delete.** Deletes a empty directory on an FTP server.
- **FTP Directory Create.** Creates a new directory on an FTP server.
- **FTP Directory Get Content.** Lists the content of a directory on an FTP server.

FTP - General Properties

To view the General properties, click the **General** view button in the Property Sheet. The following table describes the FTP-specific properties.

Property (A-Z)	Description
Client certificate	➤ . **Browse Certificates**. Opens the Select Certificate dialog box. To see the icon, click in the top level row of the **Client certificate** section, in the **Value** column. For details, see the "Select Certificate Dialog Box" on page 327. ➤ A Choice element indicating the source of the client certificate for secure FTP connections: ➤ **Use file system certificate**: The expanded node provides the full path of the certificate file. ➤ **Use Windows store certificate**: The expanded node lists the following properties **Store location**, **Store name**, **X509 find type**, and **X509 find value**. ➤ **Password.** The certificate's password.
Enable SSL	Indicates whether to establish a secure FTP connection: true or false.
Proxy	The proxy server information: **Server**, **Username** and **Password**.
Timeout	The FTP request timeout in milliseconds.

FTP - Input Properties

To view the Input properties, click the **Input/Checkpoints** view button in the Property Sheet.

Property (A-Z)	Activity	Description
Directory name	**FTP Directory Create**	A name for the new directory.
Directory URL path	**FTP Upload**	The URL in which the file or directory will be created.
Local file path	**FTP Download** and **FTP Upload**	**FTP Download:** The location in which to download the file. **FTP Upload:** The location from which to upload the file.
New file name	**FTP Rename**	A new name for the file.
Password	All	The password for accessing the FTP server.
URL path	All except **FTP Upload**	The URL of the file or directory on the FTP server.
User ID	All	The username for accessing the FTP server.

FTP - Checkpoints

To view the checkpoint properties, click the **Input/Checkpoints** view button in the Property Sheet and click in the lower **Checkpoints** pane.

Property (A-Z)	Description
File size	The size of the specified file. (**FTP File Get Size** activity)
Result	An indicator whether the operation succeeded: true or false.
Result array	An array of the directory details for all directories under the specified URL path. (**FTP Directory Get Content** activity) The details include: **Name**, **Type**, **Flags**, **Owner**, **Group**, **Size**, and **Date created**.

Network Activities

This activity group provides activities that enable you to send and receive HTTP and SOAP requests.

The **HTTP Receive** activity is useful for asynchronous testing. For task details, see "How to Create a Test for an Asynchronous Web Service" on page 336.

This activity group contains the following activities:

HTTP Request. This activity enables you to send an HTTP request over the network.

HTTP Receiver. This activity enables you to receive an HTTP response from a server.

SOAP Request. This activity enables you to send a SOAP request over the network.

HTTP Request Activity

The HTTP Request activity enables you to send an HTTP request over the network.

HTTP Request - General Properties

To view the General properties, click the **General** view button in the Property Sheet.

Property (A-Z)	Description
Allow redirections	Indicates whether to allow the step to redirect to another URL. **Default**: true
Authentication	The user credentials settings for obtaining a service contract: **Username** and **Password**.

Property (A-Z)	**Description**
Client certificate	A Choice element indicating the source of the client certificate: ➤ **Use file system certificate**: The expanded node provides the full path of the certificate file. ➤ **Use Windows store certificate**: The expanded node lists the following properties **Store location**, **Store name**, **X509 find type**, and **X509 find value**. ➤ **Password.** The certificate's password. **Note:** To use a certificate, make sure to the **Use Client Certificate** property to true.
Connection type	The type of connection: **Keep-Alive** or **Close**. **Default**: Keep-Alive
Maximum automatic redirections	The number of times to attempt accessing a page, including redirection. **Default**: 3
Proxy	The settings for the proxy server hosting the service contract: **Server** (URL and port when required), **Username**, and **Password**.
Reuse cookies	Enables the reusing of cookies for the current step. **Default**: false.
Timeout	The HTTP timeout in milliseconds.
Use Client Certificate	Enables the use of a client certificate. **Default**: false

HTTP Request - Input Properties

To view the Input properties, click the **Input/Checkpoints** view button in the Property Sheet.

Property (A-Z)	Description
HTTP method	The request’s HTTP method: GET, POST, PUT, DELETE, TRACE, OPTIONS, HEAD, and CONNECT.
HTTP version	The HTTP version: 1.0 or 1.1.
RequestHeaders	An array of the HTTP request header with **Key** and **Value** entries.
URL	The URL of the HTTP request.

HTTP Request - Checkpoints

To view the checkpoint properties, click the **Input/Checkpoints** view button in the Property Sheet and click in the lower **Checkpoints** pane.

Property (A-Z)	Description
HTTP version	The HTTP version of the response.
Response body as a Base64 string	The body of the HTTP response in a raw Base64 format.
Response body as a UFT-8 string	The body of the HTTP response in UFT-8 format.
Status code	The status code of the HTTP response.
Status description	A description of the HTTP status.

HTTP Request - Multipart Input Properties

To view the HTTP multipart properties, open the **Multipart** view in the Property Sheet and select **Enable Multipart**. The view displays a hierarchy of the HTTP parts including the header and body, beginning with the second part.

You set the header information for the first part in the **Input/Checkpoints** view and its body in the **HTTP** view.

UI Elements (A-Z)	Description
Headers	Global headers that apply to the entire message—not to a specific part. This field uses an array to display **Name** and **Value** properties.
Parts	An array of the parts to include with the HTTP request, beginning with the second part. Each part consists of: ➤ **Headers.** An array of headers for the part. This field uses an array to display the **Name** and **Value** properties. ➤ **Path.** The path of the part. The **Browse from file** button in the **Value** column enables you to load a non-XML file containing the request body.
Type	The multipart subtype to be used in the request's content-type header: Mixed, Digest, Alternative, Related, Report, Signed, Encrypted, FormData, or Parallel.

HTTP Request - Multipart Checkpoints

The **Checkpoints** pane shows a hierarchy of the parts of the HTTP response, beginning with the second part. You set checkpoints for the first part in the **Input/Checkpoints** view.

UI Elements (A-Z)	Description
Headers	Global headers that apply to the entire message—not to a specific part. This field uses an array to display **Name** and **Value** properties.
Parts	An array of the parts to include with the HTTP request, beginning with the second part. Each part consists of: ➤ **Headers.** An array of headers for the part. This field uses an array to display **Name** and **Value** properties. ➤ **Body.** The file content's checksum value. The checksum is computed by applying the MD5 hash function to the specified file. The **Calculate file checksum** button ... in the **Value** column, enables you to load a file containing the response body.
Type	The multipart subtype expected in the response: Mixed, Digest, Alternative, Related, Report, Signed, Encrypted, FormData, or Parallel.

HTTP Receiver Activity

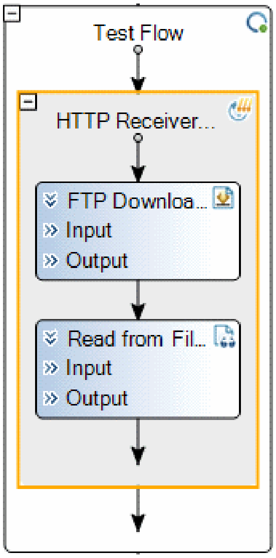
Overview

The **HTTP Receiver** activity receives an HTTP message from a server. This activity is used with asynchronous messaging. For details, see Chapter 7, "Asynchronous Service Calls."

Receiver activities are activities that act as receiver for a server response. This category includes the built-in **HTTP Receiver** activity and Web Service operations that were imported as a server response. For more information, see the "Select WSDL Dialog Box" on page 228 or "Select WSDL Dialog Box" on page 228.

All receiver activities are composite activities. This means that they serve as a wrapper for all activities inside the container whose responses are sent to the HTTP Receiver step—not the Test Flow.

For example, if an HTTP Receiver step contains the **FTP Download** and **Read from File** steps, these internal steps send their response to the HTTP Receiver step—not to the Test Flow loop.



Note:

- The internal activities cannot be data driven from an external data source, such as an Excel or XML file. They can, however, link to step properties in the Receiver container or properties of the Receiver activity itself. You cannot link to step properties outside of the Receiver container.
- To run an HTTP Receiver step, the logged in user must be an administrator.

HTTP Receiver - General Properties

To view the General properties, click the **General** view button in the Property Sheet.

Property (A-Z)	Description
Completion event name	The name of the event associated with a following **Wait** step, allowing the step to receive the server request.
Listen on port	The port upon which to listen for the server request.
SSL Certificate	Information about the SSL certificate: ➤ **Subject**. The certificate's subject string. ➤ **Store location**. The location of the certificate—LocalMachine or Windows store. ➤ **Store name.** The name of the store hosting the certificate. ➤ **Thumbprint.** The certificate's thumbprint or hash code.
Use SSL	Secures the connection with SSL: **true** or **false.**

HTTP Receiver - Output Properties

You can link to the **HTTP Receiver** output property, its response body, through the Select Link Source dialog box. For details, see "Select Link Source Dialog Box" on page 395.

Property (A-Z)	Description
Response body as a UFT-8 string	The body of the HTTP response in UFT-8 format.

SOAP Request Activity

The **SOAP Request** activity sends a manual SOAP request to the server, usually in XML format. You can import a schema and load XML for this activity. For details, see "Input/Checkpoints View" on page 70.

SOAP Request - General Properties

To view the General properties, click the **General** button in the Property Sheet.

Property (A-Z)	Description
ContentType	The type of content: For example text/xml; charset=utf-8.
Endpoint Address	The endpoint location of the service as derived from the WSDL.
IsOneWay	Indicates whether the service is a one way service: true or false.
SoapAction	An expression indicating the SOAP action, for example, HP.SOAQ.SampleApp/IHPFlights_Service/DeleteFlightOrder.
Timeout	The maximum time in milliseconds to wait for the response. Enter -1 to disable the timeout and wait for the response as long as required.

SOAP Request - Input Properties

To view the Input properties, click the **Input/Checkpoints** button in the Property Sheet.

Property (A-Z)	Description
	Imports a schema XSD file.
	Loads XML with values for the schema.

Property (A-Z)	Description
✖	Deletes the current schema.
Standard Schema	A schema for the SOAP request.

Java Activities

This activity group contains the **Call Java Class** activity. It enables you to set up and configure a call to a Java class.

For task details, see "How to Create a Call to a Java Class" on page 116.

For user interface details, see the "Call Java Class Settings Dialog Box" on page 196.

JMS Activities

This activity group provides steps that handle JMS messages. For details, see the "JMS Transport Overview" on page 30.

For task details, see "How to Retrieve Messages from a JMS Queue" on page 118 or "How to Receive Messages Through JMS Topics" on page 123.

This activity group contains the following activities:

- **Publish Message to JMS Topic.** Publishes a message to multiple subscribers using a JMS topic.
- **Receive Message from JMS Queue.** Receives a message from a JMS queue.
- **Receive Message from JMS Topic.** Receives published messages to a specific JMS topic for a subscription. Place this step after **Subscribe to JMS Topic**.
- **Send Message to JMS Queue.** Sends a message to a JMS queue.
- **Send and Receive Message from JMS Queue.** Sends a message to a specified queue and receives a message from a specified queue.

- **Subscribe to JMS Topic.** Creates a subscription for a JMS topic. Use this step before any **Receive Message from Topic** steps for the subscription.
- **Browse JMS Queue Messages.** Retrieves messages from the JMS queue without consuming them.

Publish Message to JMS Topic

This activity publishes a message to multiple subscribers using a JMS topic.

Publish Message to JMS Topic - Input Properties

Property (A-Z)	Description
JMS send properties	JMS properties with the key/value form. You can use the key to modify JMS header or message properties.
Message	The message to publish.
Topic name	The name of the queue from which to receive the message.

Publish Message to JMS Topic - Checkpoints

Property (A-Z)	Description
Result	A boolean variable indicating whether the step succeeded.

Receive Message from JMS Queue

This activity receives a message from a JMS queue.

Receive Message from JMS Queue - Input Properties

Property (A-Z)	Description
JMS receive message selector	An SQL expression to filter the received message. For more information on the syntax for defining selectors, see the **Message Properties** section in http://download.oracle.com/javaee/1.3/api/javax/jms/Message.html. For example, a key JMSCorrelationID, with a value of 4566636, receives only messages whose correlation ID is 4566636.
Receive queue name	The name of the queue from which to receive the message. If the value is empty, Service Test uses a temporary queue.

Receive Message from JMS Queue - Checkpoints

Property (A-Z)	Description
JMS properties	An array of message properties in the structure of keys and values. **Tip:** Use the **Number of elements** drop -down to specify the number of properties, or click the **Add** button to add elements.
JMSCorrelationID	The message's correlation ID. **Tip:** Use in conjunction with the JMS receive message selector.
JMSDeliveryMode	The message's delivery mode. Use the scroller to select a value.
JMSDestination	The message's destination.
JMSExpiration	The message's expiration date.
JMSMessageID	A unique ID for the message.

Property (A-Z)	Description
JMSPriority	The message's priority in comparison to other messages. Use the scroller to select a value.
JMSRedelivered	Indicates whether the message was redelivered. False by default.
JMSReplyTo	The contents of the **Reply To** field.
JMSTimeStamp	The time and date of the message.
JMSType	A string describing the JMS type.
Message body	The message content.

Receive Message from JMS Topic

This activity receives published messages to a specific JMS topic for a subscription. Place this step after a **Subscribe to JMS Topic** step.

Receive Message from JMS Topic - Input Properties

Property (A-Z)	Description
Subscription name	The name of the subscription. Use the same subscriber name value from the previously-called **Subscribe to JMS Topic** step.
Topic name	The name of the topic from which to receive the message.

Receive Message from JMS Topic - Checkpoints

Property (A-Z)	Description
JMS properties	An array of message properties in the structure of keys and values. **Tip:** Use the **Number of elements** drop -down to specify the number of properties, or click the **Add** button to add elements.
JMSCorrelationID	The message's correlation ID. **Tip:** Use in conjunction with the JMS receive message selector.
JMSDeliveryMode	The message's delivery mode. Use the scroller to select a value.
JMSDestination	The message's destination.
JMSExpiration	The message's expiration date.
JMSMessageID	A unique ID for the message.
JMSPriority	The message's priority in comparison to other messages. Use the scroller to select a value.
JMSRedelivered	Indicates whether the message was redelivered. False by default.
JMSReplyTo	The contents of the **Reply To** field.
JMSTimeStamp	The time and date of the message.
JMSType	A string describing the JMS type.
Message body	The message content.

Send Message to JMS Queue

This activity sends a message to a JMS queue.

This activity receives published messages to a specific JMS topic for a subscription. Place this step after a **Subscribe to JMS Topic** step.

Send Message to JMS Queue - Input Properties

Property (A-Z)	Description
JMS send properties	JMS properties with the key/value form. You can use the key to modify JMS header or message properties.
Message	The message to send.
Send queue name	The name of the queue from which to receive the message.

Send Message to JMS Queue - Checkpoints

Property (A-Z)	Description
Result	A boolean variable indicating whether the step succeeded.

Send and Receive Message from JMS Queue

This activity sends a message to a specified queue and receives a message from a specified queue.

This activity receives published messages to a specific JMS topic for a subscription. Place this step after a **Subscribe to JMS Topic** step.

Send and Receive Message from JMS Queue - Input Properties

Property (A-Z)	Description
JMS receive message selector	An SQL expression to filter the received message. For details on the syntax for defining selectors, see the **Message Properties** section in http://download.oracle.com/javaee/1.3/api/javax/jms/Message.html. For example, a key JMSCorrelationID, with a value of 4566636, receives only messages whose correlation ID is 4566636. **Tip:** To automatically generate a selector, use the **Automatically generate selector** option in the Property Sheet's **Test Settings** tab. This selector uses a correlation ID that corresponds to the request's message ID.
JMS send properties	JMS properties with the key/value form. You can use the key to modify JMS header or message properties.
Message	The message to send.
Receive queue name	The name of the queue from which to receive the message. If the value is empty, Service Test uses a temporary queue.
Send queue name	The name of the queue to which to send the message.

Send and Receive Message from JMS Queue - Checkpoints

Property (A-Z)	Description
JMS properties	An array of message properties in the structure of keys and values. **Tip:** Use the **Number of elements** drop -down to specify the number of properties, or click the **Add** button to add elements.
JMSCorrelationID	The message's correlation ID. **Tip:** Use in conjunction with the JMS receive message selector.
JMSDeliveryMode	The message's delivery mode. Use the scroller to select a value.
JMSDestination	The message's destination.
JMSExpiration	The message's expiration date.
JMSMessageID	A unique ID for the message.
JMSPriority	The message's priority in comparison to other messages. Use the scroller to select a value.
JMSRedelivered	Indicates whether the message was redelivered. False by default.
JMSReplyTo	The contents of the **Reply To** field.
JMSTimeStamp	The time and date of the message.
JMSType	A string describing the JMS type.
Message body	The message content.

Subscribe to JMS Topic

This activity creates a subscription for a JMS topic. Use this step before any **Receive Message from Topic** steps for the subscription.

Subscribe to JMS Topic - Input Properties

Property (A-Z)	Description
JMS receive message selector	An SQL expression to filter the received message. For details on the syntax for defining selectors, see the **Message Properties** section in http://download.oracle.com/javaee/1.3/api/javax/jms/Message.html.
Subscription name	The name of the subscription. To retrieve messages on the subscription created by this step, insert a **Receive Message from Topic** step using the same **Subscription name** value.
Topic name	The name of the topic from which to receive the message.

Subscribe to JMS Topic - Checkpoints

Property (A-Z)	Description
Result	A boolean variable indicating whether the step succeeded.

Browse JMS Queue Messages

This activity retrieves messages from the JMS queue without removing them from the queue.

Browse JMS Queue Messages - Input Properties

Property (A-Z)	Description
Messages selector	An optional SQL expression to filter the received messages. For more information on the syntax for defining selectors, see the **Message Properties** section in http://java.sun.com/j2ee/sdk_1.3/techdocs/api/javax/jms/Message.htm.
Queue name	The name of the queue upon which to browse for a collection of messages. This field is mandatory. **Note:** When using IBM ActiveMQ, you must use the format dynamicQueues/<queue_name>. If the specified queue does not exist, it will be created dynamically.

Browse JMS Queue Messages - Checkpoints

Property (A-Z)	Description
JMS messages	An array of JMS messages and their properties on the specified queue. The array of messages corresponds to the filter used in the **Messages selector** property.

Load Testing Activities

This activity group contains activities that allow you prepare the test for load testing:

- **Start Transaction.** Marks the beginning of a LoadRunner transaction.
- **End Transaction.** Marks the end of a LoadRunner transaction.
- **Think Time**. Emulates a time delay, in seconds, between steps.

For details, see "Prepare for load testing - optional" on page 423.

IBM WebSphere MQ Activities

This activity group enables you to perform actions on an IBM Websphere MQ application server.

The activities in this group are:

- **Connect to MQ Queue Manager.** Connects to a specific MQ Queue Manager and maintains an open connection with the server.
- **Disconnect from MQ Queue Manager.** Disconnects from the specific MQ Queue Manager and closes the connection with the MQ server.
- **Commit MQ Pending Messages.** Commits the last changes made for all messages since the last point of synchronization.
- **Backout MQ Pending Messages.** Performs a Backout operation from the last point of synchronization. All PUT messages will be cancelled and GET messages will be reinstated to the queue.
- **Browse Messages in MQ Queue.** Browses the messages on the MQ Queue via the Queue Manager.
- **Put Message to MQ Queue.** Puts a message on the MQ queue via the Queue Manager.
- **Get Message from MQ Queue.** Gets the most recent message from the MQ queue via the Queue Manager.
- **Put and Get Message from MQ Queue.** Puts a message on the MQ queue and then gets a message from the MQ queue via the Queue Manager.
- **Subscribe to MQ Topic.** Creates a subscription for an MQ topic. From this point on, a subscriber can receive messages from a specified topic.
- **Unsubscribe to MQ Topic.** Cancels a subscription for the specified MQ topic.
- **Publish Message to MQ Topic.** Publishes a message to subscribers using an MQ topic.
- **Receive Message from MQ Topic.** Receives messages for the active subscription, that were published to a specific MQ topic.

For more information about each of the activities and a description of their input and output properties, see the sections below.

For task details, see "How to Retrieve Messages from an MQ Queue" on page 125 or "How to Receive Messages Through MQ Topics" on page 128.

Connect to MQ Queue Manager

This activity connects to the specified MQ Queue Manager and maintains an open connection until it is closed or until the end of the test.

Connect to MQ Queue Manager - Input Properties

Property (A-Z)	Description
Channel	The channel through which to connect. For most configurations, use SYSTEM.DEF.SVRCONN.
Host name	The name or IP address of the Queue Manager's host machine.
Password	An optional password for connecting to the host machine.
Port	The port through which to connect, by default 1414.
Queue manager name	An property indicating the name of the Queue Manager.
SSL	Enables or disables SSL. When you enable SSL, you can set values for the following properties: ➤ **SSLCipherSpec.** The SSL Cipher Specification, SSLCIPH. This specification indicates which data encryption algorithm and key size to use, such as DES_SHA_EXPORT or RC2_MD5_EXPORT. ➤ **SSLKeyRepository.** The path of the SSL key repository on the client machine.
User ID	An optional identification property for connecting to the host machine.

Connect to MQ Queue Manager - Checkpoints

Property (A-Z)	Description
MQManager	An automatically generated connection expression. **Notes:** ➤ Although this does not appear in the Checkpoint grid, it is visible as an output property in the Select Link Source dialog box. For details, see the "Select Link Source Dialog Box" on page 395. ➤ When you add steps, they automatically use the connection expression from the most recent connection step.
Result	A boolean variable indicating whether the step succeeded.

Disconnect from MQ Queue Manager

This activity disconnects from the specified MQ Queue Manager and closes the connection with the MQ server.

Disconnect from MQ Queue Manager - Input Properties

Property (A-Z)	Description
MQManager	A connection expression linked to a **Connect to MQ Queue Manager** step. **Note:** When you add a **Disconnect to MQ Queue Manager** step, Service Test automatically creates a link to the most recent connection step.

Disconnect from MQ Queue Manager - Checkpoints

Property (A-Z)	Description
Result	A boolean variable indicating whether the step succeeded.

Commit/Backout MQ Pending Messages

These activities commit or rollback the changes made for all messages since the last point of synchronization.

Commit/Backout MQ Pending Messages - Input Properties

Property (A-Z)	Description
MQManager	A connection expression linked to a **Connect to MQ Queue Manager** step. **Note:** When you add this step, Service Test automatically creates a link to the most recent connection step.

Commit/Backout MQ Pending Messages - Checkpoints

Property (A-Z)	Description
Result	A boolean variable indicating whether the step succeeded.

Browse Messages in MQ Queue

This activity browses the messages on the MQ queue via the Queue Manager, without removing them from the queue.

Browse Messages in MQ Queue - Input Properties

Property (A-Z)	Description
Match Conditions	An array of match conditions in a key/value format. Select a key from the drop down box in the Key's **Value** column and provide a value. MQMO_NONE does not require a value.
Message Get Options	A tree with several built-in MQ Get options. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."
MQManager	A connection expression linked to the most recent **Connect to MQ Queue Manager** step.
Queue Access Options	A tree with several built-in MQ queue access options. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."
Queue name	The name of the MQ queue to browse.
Wait interval	The maximum time in milliseconds to wait for the message to arrive, using the following values: ➤ -1: Unlimited wait time ➤ 0: No wait ➤ A positive number: The time to wait in milliseconds.

Browse Messages in MQ Queue - Checkpoints

Property (A-Z)	Description
Message	An array of the message and its properties on the MQ message queue, that matched the specified conditions. Each array element contains the following message properties: ➤ **MessageId.** The message identifier of the retrieved message. ➤ **CorrelationId.** The correlation identifier of the retrieved message. ➤ **GroupId.** An identifier of the message group to which the physical message belongs. ➤ **MsgSeqNumber.** The sequence number of a logical message within a group. ➤ **Put Time.** The date and time the PUT action was executed for the message. ➤ **Priority.** The priority of the message from 0 to 9. ➤ **UserId.** The UserId of the user who submitted the message. ➤ **MessageBody.** A string representing the UTF content of the retrieved message.

Put Message on MQ Queue

This activity puts a message on the MQ queue via the Queue Manager.

Put Messages on MQ Queue - Input Properties

Property (A-Z)	Description
CorrelationId	The correlation ID of the message.
Message Body	The body of the message to put on the queue.
Message Properties	An array of Put message properties in a key/value format.
Message Put options	A drop down of built-in message put options. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."

Property (A-Z)	Description
MQManager	A connection expression linked to the most recent **Connect to MQ Queue Manager** step.
Priority	The priority of the message rated from 0 through 9 (highest). A message with a higher priority will be taken from the queue before messages with a lower priority.
Put queue name	The name of the MQ queue on which to put the message.
Queue Access options	A drop down of built-in MQ queue access options. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."

Put Messages on MQ Queue - Checkpoints

Property (A-Z)	Description
MessageId	A message identifier of the message being sent.
PutTime	The date and time the message was put.
UserId	The sender's user ID.

Get Message from MQ Queue

This activity gets a message from the MQ queue via the Queue Manager.

Get Messages from MQ Queue - Input Properties

Property (A-Z)	Description
Get queue name	The name of the MQ queue from which to get the message.
Match condition	An array of match conditions in a key/value format. Select a key from the drop down box in the Key's **Value** column and provide a value. MQMO_NONE does not require a value.

Property (A-Z)	Description
Message Get options	A collection of built-in Message get options. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."
MQManager	A connection expression linked to the most recent **Connect to MQ Queue Manager** step.
Queue Access options	A drop down of built-in MQ queue access options. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."
Wait interval	The maximum time in milliseconds to wait for the message to arrive, using the following values: ➤ -1: Unlimited wait time ➤ 0: No wait ➤ A positive number: The time to wait in milliseconds.

Get Messages from MQ Queue - Checkpoints

Property (A-Z)	Description
CorrelkationId	The correlation identifier of the retrieved message.
GroupId	An identifier of the message group to which the physical message belongs.
MessageBody	A string representing the UTF content of the retrieved message.
MessageId	The message identifier of the retrieved message.
MsgSeqNumber	The sequence number of a logical message within a group.
Priority	The priority of the message rated from 0 through 9 (highest). A message with a higher priority will be taken from the queue before messages with a lower priority.
PutTime	The date and time the PUT action was executed for the message.
UserId	The Userid of the user who submitted the message.

Put and Get Message from MQ Queue

This activity puts a message on the MQ queue and retrieves a message from the MQ queue.

Put and Get Messages from MQ Queue - Input Properties

Property (A-Z)	Description
Get Queue Access options	A collection of built-in MQ queue access options. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."
Get queue name	The name of the MQ queue from which to get the message.
Match Condition	An array of Get Message match conditions n a key/ value format. Select a key from the drop down box in the Key's **Value** column and provide a value. MQMO_NONE does not require a value.
Message Body	A string representing the UTF content of the submitted message.
Message Get options	A collection of built-in options that control the Get operation. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."
Message properties	An array of Put message properties in a key/value format.
Message Put options	A collection of built-in message put options. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."
MQManager	A connection expression linked to the most recent **Connect to MQ Queue Manager** step.

Property (A-Z)	Description
Put Queue Access options	A collection of built-in MQ queue access options. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."
Put queue name	The name of the MQ queue upon which to put the message.
PutCorrelationId	A correlation identifier for the message to be submitted.
PutPriority	The priority of the message to be submitted.
Wait interval	The maximum time in milliseconds to wait for the message to arrive, using the following values: ➤ -1: Unlimited wait time ➤ 0: No wait ➤ A positive number: The time to wait in milliseconds.

Put and Get Messages from MQ Queue - Checkpoints

Property (A-Z)	Description
CorrelkationId	The correlation identifier of the retrieved message.
GroupId	An identifier of the message group to which the physical message belongs.
MessageBody	A string representing the UTF content of the retrieved message.
MessageId	The message identifier of the retrieved message.
MsgSeqNumber	The sequence number of a logical message within a group.
Priority	The priority of the message rated from 0 through 9 (highest). A message with a higher priority will be taken from the queue before messages with a lower priority.

Property (A-Z)	Description
PutTime	The date and time the PUT action was executed for the message.
UserId	The Userid of the user who submitted the message.

Subscribe to MQ Topic

This activity creates a subscription for an MQ topic. From this point on, a subscriber can receive messages that were published to a specific topic using the **Receive Message from MQ Topic** activity.

Subscribe to MQ Topic - Input Properties

Property (A-Z)	Description
MQManager	A connection expression linked to the most recent **Connect to MQ Queue Manager** step.
Subscription name	An automatically generated subscription name.
Topic name	The name of the MQ topic from which subscribers can access the message.

Subscribe to MQ Topic - Checkpoints

Property (A-Z)	Description
Result	The Subscription name entered manually or generated automatically. **Notes:** ➤ Although this does not appear in the Checkpoint grid, it is visible as an output property in the Select Link Source Dialog Box. ➤ This property can be used as an input value for the subscription name in the **Unsubscribe from MQ Topic** and **Receive Message from MQ Topic** steps.

Unsubscribe from MQ Topic

This activity cancels the subscription to an MQ topic.

Unsubscribe from MQ Topic - Input Properties

Property (A-Z)	Description
MQManager	A connection expression linked to the most recent **Connect to MQ Queue Manager** step.
Subscription name	The subscription from which to unsubscribe. This can be a literal string or an expression linked to the output of a **Subscribe to MQ Topic** step.

Unsubscribe from MQ Topic - Checkpoints

Property (A-Z)	Description
Result	A boolean variable indicating whether the step succeeded.

Publish Message to MQ Topic

This activity publishes a message to subscribers using an MQ topic. The **Receive Message from MQ Topic** activity retrieves the message.

Publish Message to MQ Topic - Input Properties

Property (A-Z)	Description
CorrelationId	The UserId of the user who submitted the message.
Message Body	The message to publish.
Message Properties	An array of message properties in a key/value format.
Message Put Options	A drop down of built-in options that control the Put operation, such as MQPMO_SYNCPOINT. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."

Property (A-Z)	Description
MQManager	A connection expression linked to the most recent **Connect to MQ Queue Manager** step.
Priority	The priority of the message rated from 0 through 9 (highest). A message with a higher priority will be taken from the queue before messages with a lower priority.
Topic Access Options	A drop down of built-in options that control the opening of the topic. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."
Topic name	The name of the topic on which to publish the message.

Publish Message to MQ Topic - Checkpoints

Property (A-Z)	Description
MessageId	A message identifier of the submitted message.
PutTime	The date and time the message was put.
UserId	The UserId of the user who submitted the message.

Receive Message from MQ Topic

This activity receives messages for subscribers, that were published to a specific MQ topic.

Receive Message from MQ Topic - Input Properties

Property (A-Z)	Description
Match Condition	An array of match conditions n a key/value format. Select a key from the drop down box in the Key's **Value** column and provide a value. MQMO_NONE does not require a value.
Message Get Options	A drop down of built-in message get options. **Note:** To access additional options, use an event handler. For details, see Appendix A, "Coding Service Test Events."
MQManager	A connection expression linked to the most recent **Connect to MQ Queue Manager** step.
Subscription name	The subscription through which to receive topic messages. This can be a literal string or an expression linked to the output of a **Subscribe to MQ Topic** step.
Wait interval	The maximum time in milliseconds to wait for the message to arrive, using the following values: ➤ -1: Unlimited wait time ➤ 0: No wait ➤ A positive number: The time to wait in milliseconds.

Receive Message from MQ Topic - Checkpoints

Property (A-Z)	Description
CorrellationId	The correlation identifier of the retrieved message.
GroupId	An identifier of the message group to which the physical message belongs.
MessageBody	A string representing the UTF content of the retrieved message.
MessageId	The message identifier of the retrieved message.

Property (A-Z)	Description
MsgSeqNumber	The sequence number of a logical message within a group.
Priority	The priority of the message rated from 0 through 9 (highest). A message with a higher priority will be taken from the queue before messages with a lower priority.
PutTime	The date and time the message was put.
UserId	The Userid of the user who submitted the message.

Unified Functional Testing Activities

This activity group contains activities that allow you implement unified testing plan. For task details, see "How to Implement UFT Testing" on page 131.

- **Call Service Test test.** Invokes a Service Test test when the current Test Flow or loop reaches this step.
- **Call QuickTest Professional test.** Invokes a QuickTest Professional test when the current Test Flow or loop reaches this step. Do not insert a call to a QuickTest test that contains a call to a Service Test test, as this can cause unexpected behavior.
- **Call VuGen script.** Runs a VuGen (LoadRunner's Virtual User Generator) script.

Unified Functional Testing - General Properties

The following section describes the general properties for the UFT activities.

Test path. The path of the Service Test or QuickTest test, or VuGen (LoadRunner's Virtual User Generator) script to run.

XML Activities

This activity group contains activities related to XML files:

- **Transform XML.** Converts an XML file to another structure based on the specified XSLT.
- **XML to String.** Converts an XML file to a text string.
- **String to XML.** Converts a string to XML structure.
- **Validate XML.** Validates an XML file against an XSD schema.

This **XML to String** and **String to XML** activities are useful when you need to access the output in a specific format—either as string or XML.

For example, suppose your test contains a Web Service call whose output is XML. However, you need to use the output as an input for the next step, a Service Test test step, which requires a textual string—not XML.

You can use the **XML to String** activity to create a string that is compatible with the Service Test test step.

After the Service Test test step, you can use a **String to XML** activity to convert the output to XML, making it available for linking, and checkpoints.

XML - Input Properties

To view the Input properties, click the **Input/Checkpoints** view button in the Property Sheet.

Property (A-Z)	Activity	Description
<XML>	**XML to string**	The XML to convert to a string. This can be displayed in Text or Grid views.
Import XSD/XSLT to folder	**Validate XML** and **Transform XML**	When true, copies the XSD/XSLT to the test's folder, contributing to the test's portability.
Source string	**String to XML**	The string to convert to XML.
XML string	**Validate XML** and **Transform XML**	The XML string to validate or transform.
XSD/XSLT file	**Validate XML** and **Transform XML**	The path of the source XSD/XSLT file.

XML - Checkpoints

To view the checkpoint properties, click the **Input/Checkpoints** view button in the Property Sheet and click in the lower **Checkpoints** pane.

Property (A-Z)	Activity	Description
<XML>	**String to XML**	The XML representation of the response. For details, see "XPath Checkpoint Options" on page 74.
Output string	**XML to String**	The string representation of the XML document.
Result array	**Validate XML**	An array with the following properties: ➤ **Valid.** A boolean variable indicating whether the source XML was valid. ➤ **Errors.** The contents of an error string, if one was issued.
Transformed XML	**Transform XML**	The transformed XML string.

The **String to XML** step contains an additional output property, **Result**, visible from the Output Result view int he Property Sheet.

Property (A-Z)	Description
Result	A boolean variable indicating whether the string had the correct structure to be converted into XML.

Activity-Specific Dialog Boxes

Several activities provide separate dialog boxes to assist you in creating and assigning Input property data.

This section includes:

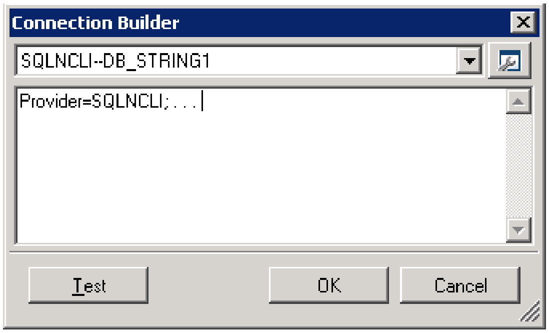
- "Connection Builder Dialog Box" on page 190
- "Query Builder Dialog Box" on page 191

➤ "Query Designer Dialog Box" on page 193

➤ "Call Java Class Settings Dialog Box" on page 196

Connection Builder Dialog Box

This dialog box helps you create a database connection expression for the **Database** > **Open Connection** activity.



SQLNCLI--DB_STRING1

Provider=SQLNCLI;...

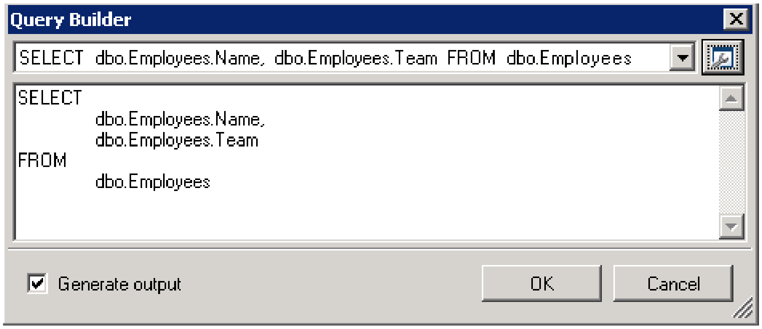
To access	Do the following: **1** Drag a **Database** > **Open Connection** activity into the canvas. **2** Open the **Input/Checkpoints** view in the Property Sheet. **3** Select the Input property—**Connection string**. **4** Click the **Connection Builder** button ... in the right side of the **Value** column.
Relevant tasks	"How to Execute Database Commands or Retrieve Data" on page 111

User interface elements are described below:

UI Elements (A-Z)	Description
	Connection Builder. Opens the Microsoft Data Link Properties dialog box to help you create a new string or edit an existing one. **Tip:** For details, click **Help** in the Data Link Properties dialog box.
<connection string area>	An editable area for pasting in existing strings, or for editing the connection string selected in the drop-down list.
Connection string	A drop-down list of previously defined connection strings.
Test	Checks the database connection using the string shown in the text area. If it succeeds to connect using the string, Service Test issues a message indicating that the connection opened successfully. After you test a connection, it remains open until after the test is complete or when you close it manually using a **Close Connection** step.

Query Builder Dialog Box

This dialog box helps you create an SQL statement for the **Query string** property of the **Database** > **Select Data** activity.



SELECT dbo.Employees.Name, dbo.Employees.Team FROM dbo.Employees

```
SELECT
        dbo.Employees.Name,
        dbo.Employees.Team
FROM
        dbo.Employees
```

☑ Generate output

To access	Do the following: **1** Drag a **Database** > **Select Data** activity into the canvas. **2** Open the **Input/Checkpoints** view in the Property Sheet. **3** Select the Input property—**Query string**. **4** Click the **Query Builder** button ... in the right side of the **Value** column.
Relevant tasks	"How to Execute Database Commands or Retrieve Data" on page 111

User interface elements are described below:

UI Elements (A-Z)	Description
	Query Designer. Opens the Query Designer dialog box.
<query string area>	An editable area for pasting in existing strings, or for editing the query string selected in the drop-down list.
Generate output	Automatically retrieves table information from the database when you click **OK,** and sets the structure of the output in the Property Sheet's **Checkpoints** area.
Query string	A drop-down list of previously defined query strings.

Query Designer Dialog Box

This dialog box helps you design an SQL statement for the **Query string** property of the **Database** > **Select Data** activity.

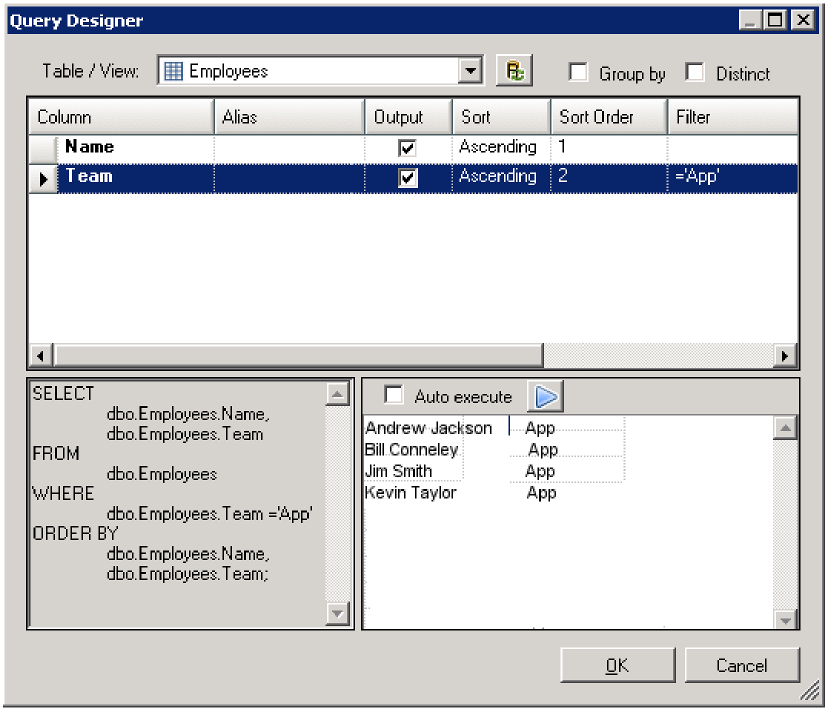


Table / View: Employees □ Group by □ Distinct

Column	Alias	Output	Sort	Sort Order	Filter
Name		☑	Ascending	1	
Team		☑	Ascending	2	='App'

```
SELECT
          dbo.Employees.Name,
          dbo.Employees.Team
FROM
          dbo.Employees
WHERE
          dbo.Employees.Team ='App'
ORDER BY
          dbo.Employees.Name,
          dbo.Employees.Team;
```

□ Auto execute

Andrew Jackson	App
Bill Conneley	App
Jim Smith	App
Kevin Taylor	App

To access	➤ In the **Input/Checkpoints** view, when setting the Query string property for the **Select Data** step: **1** Open the Query Builder Dialog Box. **2** Click the **Query Designer** button . ➤ In the **Data Window**, when defining a new Database type data source using the "Add New Database Data Source Wizard" on page 403: **1** In the Add New Database Data Source wizard, proceed to the second screen, **Define the query statement**. **2** Click the **Query Designer** button to the right of the **SQL statement** box.
Relevant tasks	"How to Execute Database Commands or Retrieve Data" on page 111 "Add a Database data source" on page 361

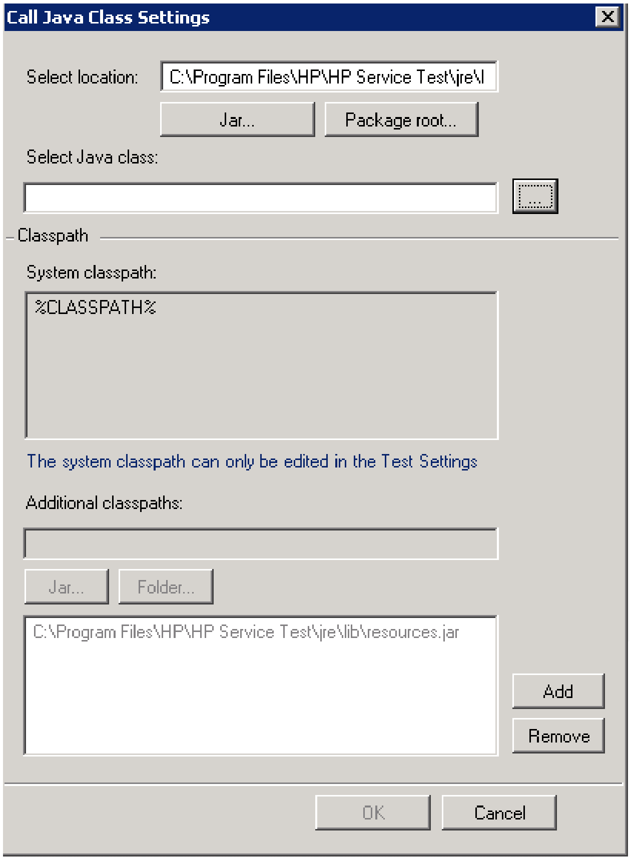
User interface elements are described below:

UI Elements (A-Z)	Description
	Reset Query. Resets the query to its original state and discards all changes.
▶	**Execute query.** Executes the query shown in the **Preview pane**. Use this when **Auto execute** is disabled. **Tip:** If the **Returned rows** pane is grayed out, this indicates that the results are not current.
<returned rows pane>	The rows returned by the query. **Tip:** If you enable **Autoexecute**, these rows display the current query results.
<SQL statement preview pane>	A preview of the SQL statement generated by your selections.

UI Elements (A-Z)	Description
<table/view columns grid>	A list of the columns in the selected table or view. The grid contains the following columns: ➤ **Column.** The name of the column in the table or view. ➤ **Alias.** An alias name for the column, if applicable. ➤ **Output**. When enabled, it includes the column in the SELECT statement. ➤ **Sort.** Enables you to sort the results in ascending or descending order. ➤ **Sort Order.** When working with multiple sorted columns, this indicates the sorting order beginning with 1. ➤ **Filter.** Enables you to filter the results of the query, by adding a WHERE <column_name> = <filter text> to the SQL statement.
Auto execute	Automatically executes the SQL statement in the **Preview pane** whenever you make a change in the upper panes of the dialog box. **Tip:** If you notice that the query takes a long time to execute, you can disable this option and click **Execute query** to manually run it.
Distinct	Adds a DISTINCT term to the SQL statement, instructing the query to retrieve only distinct record sets.
Group by	Adds a **GroupBy** column to the grid, allowing you to select a grouping method such as: Sum, Avg, Min, Max, Count, and so forth. It adds GROUP BY to the SQL statement. If you select a **GroupBy** criteria, it also adds it to the SQL expression.
Table/View	A list of the tables and views in the database. The tables and views are distinguishable by different icons.

Call Java Class Settings Dialog Box

This dialog box enables you to configure the settings for a call to a Java class.



Call Java Class Settings

Select location: C:\Program Files\HP\HP Service Test\jre\l

System classpath: %CLASSPATH%

The system classpath can only be edited in the Test Settings

Additional classpaths: C:\Program Files\HP\HP Service Test\jre\lib\resources.jar

To access	Do the following: **1** Add a **Call Java Class** step to the canvas. **2** In the Property Sheet, open the Java Call Input Output Input/Checkpoints view . **3** Click the **Select Java File** button.
Relevant tasks	"How to Create a Call to a Java Class" on page 116

User interface elements are described below:

UI Elements (A-Z)	Description
<additional classpath list>	A list of **jar** files or folders containing the additional classes. ➤ **Add** Adds the contents of the **Additional Classpath** box to the additional classpath list. ➤ **Remove** Removes the selected entry from the list.
Additional classpaths box	Additional classpaths to associate with the **Call Java Class** step. ➤ **Jar** Opens the **Select Jar File** dialog box. ➤ **Folder** Opens the **Browse for Folder** dialog box to select a folder containing the **.class** file.
Select Java class	The Java class to associate with the **Call Java Class** step. When you click **Browse**, Service Test shows the classes in the specified **jar** file.
Select location	The location of the Java class. ➤ **Jar** Opens the **Select Jar File** dialog box. ➤ **Package root** Opens the **Browse for Folder** dialog box to select a root folder.
System classpath	The paths you defined in the Test Settings for system classpaths. To modify this setting, click in the canvas (outside the Test Flow or Loop and open the Property Sheet's **General** view. Modify the Test Setting's **JVM** > **Classpath** node.

Troubleshooting and Limitations - Activities

This section describes troubleshooting and limitations for working with activities.

System Activities

- **End Program.** You cannot specify **Window Title** as an input method for a windowless process, even if you are using a wildcard expression.
- **End Program.** If Service Test is running on a 64-bit machine, the **End Program** activity will not be able to terminate 64-bit applications. However, it can terminate other 32-bit applications.

Java Activities

- **Call Java Class.** Supports only Java primitive types.
- **Call Java Class.** Java code loaded by the JVM (Java Virtual Machine) cannot be modified or updated when the JVM is running.

Network Activities

- **HTTP Request/Receiver.** Service Test does not support nested transactions. **Workaround**: Add a new loop activity within an existing transaction. Add the new transactions steps to the newly created loop. Make sure to set the loop iteration to 1.

- **HTTP Request/SOAP Request**. XML file that use XSL, are not supported.
- **SOAP Request.** If you add an array to a SOAP Request step's schema and add a link to one of the array's elements, the link may be lost if you switch to Text view.
- **SOAP Request.** Switching between **Text** and **Grid** views, may cause the grid to display an element added below the Body's **Any** node, under the Header's **Any** node.
  Workaround: Open the **Text** view to view the correct XML.

Database Activities

- Service Test does not support nested transactions in database transaction activities.
  Workaround: Add a new loop activity within an existing transaction. Add the new transactions steps to the newly created loop. Make sure to set the loop iteration to 1.

FTP Activities

- **FTP Upload:** When setting the **Local file path** property in the Property Sheet, the **Browse** button only enables you to select a file, but not a folder.
  Workaround: To specify a folder to be uploaded, select a file in the folder and truncate the file name from the expression.

IBM Websphere MQ Activities

- **Get Message from MQ Queue.** The MQGMO_MARK_SKIP_BACKOUT option is not supported.
- **Put Message to MQ Queue, Publish Message to MQ Topic.** The message body should not exceed 64K bytes. If it exceeds this size, Service Test issues a MQRC_CONVERTED_STRING_TOO_BIG status. This is a limitation of IBM MQ.

Unified Functional Testing Activities

- **Call Service Test test.** JMS transport is not supported for tests containing the **Call Service Test test** activity.
- **Call Quick Test Professional test.** When calling a QuickTest Professional test, all of the actions are executed, including the non-reusable ones.

- **Call Quick Test Professional test.** Calling a QuickTest Professional test may cause QuickTest Professional to display the test in read-only mode.

XML Activities

- When loading an XML file through the **Load XML** button, the grid does not show XML comments (text enclosed within the <!-- --> tags). The comment text cannot be accessed or checked.
- When loading an XML file through the **Load XML** button, the parser removes the line-breaking characters, r\n\. Therefore, if you convert XML to a string (**XML to String** activity) and attempt to validate it with the original XML code, the validation will fail.

4

Local Activities

This chapter includes:

Concepts

Tasks

References

Concepts

Local Activity Overview

In addition to the **Standard** activities built in to Service Test, you can create **Local Activities** type activities. These activities, displayed under the Toolbox's **Local Activities** node, are Web Service, REST Service, or .NET assembly operations, whose service contract or DLL you import.

The activity groups—**REST Services**, **Web Services**, and **.NET Assemblies**—are displayed only after importing or defining at least one service or assembly.

REST Service Activities

Service Test enables you to define REST services, its resources, and their methods. You define the metadata manually by modelling the service and defining your own methods.

You create a simple test by dragging the REST methods that you defined on to the canvas, just as you would with other Toolbox activities. For task details, see "How to Create a Simple Test for a REST Service" on page 211.

The Property Sheet enables you to set a method's HTTP settings and use the configuration as a prototype for all test steps using that method. For details, see "How to Create a Prototype REST Method" on page 214.

Service Test enables you to update REST service definitions through the "Resolve REST Method Steps Wizard" on page 268.

Web Service Activities

Service Test lets you import Web service contracts such as WSDL files, for the purpose of creating high-level tests.

You typically begin creating a test by importing a WSDL file. This file provides a structure for the test, since it describes the service in terms of its elements, argument values and properties. For information on importing a WSDL, see "How to Import a WSDL-Based Web Service" on page 206.

If your service changed during development, Service Test provides a mechanism for updating the service. For details, "Updating Services and Assemblies" on page 245.

Service Test enables you to import both Document/Literal and RPC type Web services.

In **Document/Literal** Web services, the client sends standard XML documents to the server. The server application is responsible for mapping the server objects (properties, method calls, and so forth) and the values in XML documents. The data is serialized according to a given schema, so it can be validated against the schema. For Document/Literal type Web services, Service Test displays the input and output properties in a grid, allowing you to assign values for each property independently.

In **RPC** type Web services, the WSDL file and SOAP body contain the complete operation name, its input and output properties, and their values. There is no schema for this type of service and it is not supported by the WS-I conformance standard. Service Test does not display the input and output properties for RPC type services.

If your service document is unique and cannot be imported in the normal way, you can use the SOAP Request activity to send a manual SOAP request to the server.

Service Test lets you validate imported services by checking their conformance with the WS-I standard. For details, see "Validate the WSDL file - optional" on page 208.

After you import a Web service, the tree hierarchy displays its components in several levels:

- **Level 1.** Service name
- **Level 2.** Port number
- **Level 3.** Operation name

For details about importing a Web service, see "How to Import a WSDL-Based Web Service" on page 206.

.NET Assembly Activities

Service Test enables you to create activities for testing APIs in the form of .NET assemblies. You can interface with the types defined in the assembly.

You begin by importing the .NET assembly into your test. The Toolbox displays the assembly as an activity. You drag the .NET activity on to the canvas as you would with any other activity.

You can define input and output properties and link them to other steps within your script. For example, you can design a test that retrieves an object through the .NET assembly. This object can be an input property for a Web service step.

When you import a .NET assembly, Service Test saves a local copy of the assembly with the test, making the test portable should you copy it to another machine. If the assembly, however, calls other assemblies, the test may not run until you copy the additional assemblies to the new machine. When running the test, Service Test uses the local copy of the assembly, and any dependent assemblies are referenced at their original locations.

For task details, see "How to Create a .NET Assembly Test Step" on page 208.

For user interface details, see "Import .NET Assembly Dialog Box" on page 236.

Activity Sharing

Service Test provides activity sharing capabilities. This feature enables you to save locally stored services to a repository, so that they will be available for other tests.

You can specify a repository on the file system or in ALM/QC. The next time you create a test, you can access the service’s activities from the repository instead of reimporting or recreating them.

If the resource (WSDL or REST service) becomes unavailable, Service Test displays alerts on the steps in the canvas that use the resource. If you run the test when its resource is not available from its original source, Service Test uses a copy of the test stored in its cache. By clicking the alert, you can reload the steps when the resource becomes available again.

If you created test steps with activities stored in a repository, you can use the **Save Test with Resources** option to save all dependent services with the test. This can be useful when copying the test to another machine.

Service Test also detects version updates for activities stored in a repository. When Service Test detects a discrepancy between the step and the Toolbox activity, it displays an alert on the step. By clicking the alert, you can automatically update the resource from its source.

Tasks

How to Import a WSDL-Based Web Service

This task describes how to import a WSDL file into your test.

This task includes the following steps:

- "Prerequisites" on page 206
- "Open the Import WSDL dialog box" on page 206
- "Select a source" on page 207
- "Set connection settings for URL/UDDI imports - optional" on page 207
- "Mark the WSDL as a server response - optional" on page 207
- "Complete the import" on page 208
- "Validate the WSDL file - optional" on page 208

1 Prerequisites

If you intend to import a WSDL stored on ALM/QC, the ALM project to which you are connecting, must have the Service Test Management extension enabled. For details, see the "HP ALM/QC Connection Dialog Box" on page 500.

2 Open the Import WSDL dialog box

- To import a WSDL from the file system or ALM/QC, click Import WSDL ▾ > **Import WSDL from File or ALM/QC Application Component**. For details, see the "Select WSDL Dialog Box" on page 228.
- To import a WSDL from a Web site or UDDI repository, click Import WSDL ▾ > **Import WSDL from URL or UDDI**.
  - For a URL, select **Import from: URL**
  - For a UDDI, select **Import from: UDDI**

For details, see the "Import WSDL from URL or UDDI Dialog Box" on page 230.

3 Select a source

- For **File System** or **ALM/QC Application Components** imports, click the appropriate button in the left pane. Navigate to the WSDL in the file system or the ALM/QC repository.
- For a **URL** import, click the **Browse** button adjacent to the **Address** field. This opens a browser window. Navigate to the WSDL and close the browser. Service Test automatically places the URL in the **Address** field.
- For a **UDDI**, click the **Browse** button adjacent to the **Address** field. This opens the Select Service from UDDI dialog box. Specify a UDDI address and select the service to import. For details, see the "Select Service from UDDI Dialog Box" on page 232.

4 Set connection settings for URL/UDDI imports - optional

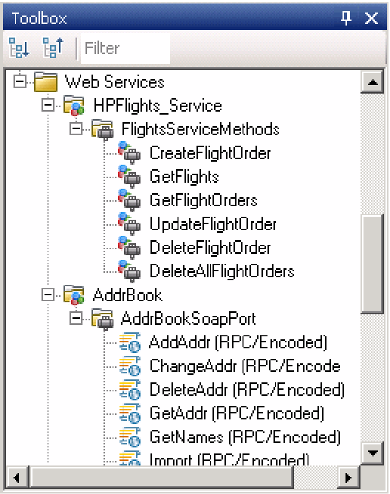
For URL or UDDI imports, if your WSDL must be accessed through a secure server or proxy machine, click **Connection Settings** to expand the dialog box. Enter the authentication information or the proxy server details.

5 Mark the WSDL as a server response - optional

You can mark the imported WSDL as a server response method. This is useful when working with asynchronous Web services. Click **Connection Settings** to expand the dialog box and select the **Import as server** option. For more information about working with asynchronous services, see "Asynchronous Services" on page 332.

6 Complete the import

Click **OK**. If Service Test succeeds in importing the WSDL, it displays the service, its ports, and operations in the Toolbox under the **Web Services** node. In the Toolbox, Service Test differentiates between Document/Literal and RPC type services with different icons, and an RPC suffix.



7 Validate the WSDL file - optional

To check the WSDL's compliance with the WS-I standard, right-click the service and select **Validate WS-I Compliance** from the shortcut menu. The Output window shows the WS-I validation results. These validations apply only to Document/Literal type services, but not RPC.

How to Create a .NET Assembly Test Step

This task describes how to create a test step for verifying the functionality of a .NET assembly.

This task includes the following steps:

- "Prerequisite" on page 209
- "Open the Import .NET Assembly dialog box" on page 209
- "Select a GAC assembly - optional" on page 209

➤ "Import a .NET assembly" on page 209

➤ "Add a .NET assembly step" on page 209

➤ "Add properties - optional" on page 209

➤ "Customize the code - optional" on page 210

1 Prerequisite

Prepare a DLL assembly file and store it in a location accessible from your Service Test computer.

2 Open the Import .NET Assembly dialog box

Click the **Import .NET Assembly** button on the toolbar. For user interface details, see "Import .NET Assembly Dialog Box" on page 236.

3 Select a GAC assembly - optional

Each computer where the common language runtime is installed has a machine-wide code cache called the GAC (Global Assembly Cache). The GAC stores assemblies specifically designated to be shared by several applications on the computer.

In the **GAC** tab, select one or more GAC assemblies and click **Select** to add them to the **Selected References** list.

4 Import a .NET assembly

Click the **.NET Assembly Browser** tab. Locate the assembly **.dll** or **.exe** file. Select the file and click **Select** to add it to the **Selected References** list. Click **OK** to add the .NET assemblies to the Toolbox.

5 Add a .NET assembly step

Expand the **.NET Assemblies** category in the Toolbox and drag a .NET activity into the canvas.

6 Add properties - optional

In the Property Sheet’s Input/Output tab, click the **Add Input/Output Property** button to define new input and output properties.

In the **Add Input/Output Property** dialog box, specify a property name and data type.

- ➤ To add a simple type property, select a type from the drop down.
- ➤ To add an advanced type, click **Advanced** and select a type. All .NET types and DLLs referenced by the test, and all types from the imported assemblies, are available. To filter the types, enter a keyword into the **Type** field.

Click **OK** to add the property. Repeat this for all of the required input and output properties.

7 Customize the code - optional

In the Property Sheet, click the **Events** button. Double-click in the ExecuteEvent's **Handler** column. The **TestUserCode.cs** tab opens.

Edit the Todo area. You can access input and output properties that you defined earlier, using autocompletion.

The comments indicate the syntax to use for accessing the properties. For example:

```
/// Use this.CodeActivity4 to access the CodeActivity4 Activity's context, including
input and output properties.
      public void CodeActivity4_OnExecuteEvent(object sender,
STActivityBaseEventArgs args)
      {
          this.CodeActivity4.Input.Property1…
…
```

How to Create a Simple Test for a REST Service

This task describes how to model a REST service and create a simple test. Preferably, you should create a prototype for each method, that enables you to reuse the method without reentering its configuration settings. For details, see "How to Create a Prototype REST Method" on page 214.

This task includes the following steps:

- "Prerequisite" on page 212
- "Open the REST service designer" on page 212
- "Name the REST service" on page 212
- "Add a resource" on page 212
- "Add a method" on page 212
- "Add the method to the Toolbox" on page 212
- "Create a test step" on page 212
- "Locate the endpoint URL" on page 213
- "Enter the property values in the Property Sheet - optional" on page 213
- "Copy and Paste the Request body to the Property Sheet" on page 214
- "Run the test and view the report" on page 214

1 Prerequisite

Study the structure of your REST service and determine which resources and methods you need to define.

2 Open the REST service designer

Click the **Add REST Service** toolbar button Add REST Service. The Design REST Service dialog box opens. For details, see the "Design REST Service Dialog Box" on page 238.

3 Name the REST service

Provide a meaningful name for the service in the left pane. For details, see the "Design REST Service Dialog Box" on page 238.

4 Add a resource

Click the **Add Resource** button in the toolbar to add a resource to the REST service and provide a meaningful name for the resource. For details, see the "Design REST Service Dialog Box" on page 238.

5 Add a method

Click the **Add Method** button in the toolbar to add a method, and provide a meaningful name for the method. For details, see the "Design REST Service Dialog Box" on page 238.

6 Add the method to the Toolbox

Click **OK** in the Design REST Service dialog box. Service Test adds the REST service, along with its resources and methods to the Toolbox, under the **Local Activities** category.

7 Create a test step

a Drag the method you created in 6, into the **Test Flow** frame in the canvas.

b Expand the REST service step and click on the **HTTP Request** box.

8 Locate the endpoint URL

Locate your REST service design document and copy the URL to the clipboard.

Note: The canvas will display an alert indicating differences in the REST method properties between the Toolbox and canvas. You can run the test as is, without resolving the differences. These alerts are most relevant to the prototype REST methods. For details, see the "How to Create a Prototype REST Method" on page 214.

9 Enter the property values in the Property Sheet - optional

For methods that require input, such as **PUT** or **POST**, add the required input properties. For methods that provide an output such as **GET**, add the required output properties.

To add the property values:

a Open the **Input/Checkpoints** view in the Property Sheet.

b Paste the clipboard contents that you copied in step 8, the endpoint URL, into the **URL** row.

c Select the **HTTP Method**: GET, PUT, POST and so forth.

d Expand the **Request Headers** node to show the **Name** and **Value** pairs and enter the relevant values. For example, you may enter *Content-Type* in the **Name** row and *text/xml* in the **Value** row. To add more pairs, click the green plus sign in the parent node to add array elemets.

10 Copy and Paste the Request body to the Property Sheet

a Return to the design document for the REST service and copy the Request body onto the clipboard.

b In the Property Sheet, open the **HTTP** view and select a **Request Body** type from the drop down list.

- ➤ To paste plain text, select the **Text** type. Copy the Request body from the design document to the clipboard and then click within the **Body** section and press CTRL-V to paste the contents of the request. You can then modify the element values within the body as required.
- ➤ For an **XML** type, click **Import Schema** to load an **.xsd** file or click **Load XML** to load an **.xml** file. You can then edit the values in either the **Grid** or **Text** views.
- ➤ For a **File** type, browse to the file with the Request body.
- ➤ For a **Post Form** type, enter the names and their values.

11 Run the test and view the report

a Click the **Run** button or press F5 to compile and run the test. After the test run, the Run Results Viewer opens.

b In the left pane of the Run Results Viewer window, select **Expand All** from the shortcut menu. Select the **HTTP Request** node. In the **Captured Data** pane, verify that the **Response Body** values are correct.

How to Create a Prototype REST Method

This task describes how to set up a prototype method for a REST service. You define the request body and properties in the Toolbox before dragging it onto the canvas. After you create a prototype for a REST method, you can incorporate it into many tests with the properties already configured.

This task includes the following steps:

- ➤ "Prerequisite" on page 216
- ➤ "Open the REST service designer" on page 216

- "Name the REST service" on page 216
- "Add a resource" on page 216
- "Add a method" on page 216
- "Set the general properties" on page 216
- "Set the input properties" on page 217
- "Define custom properties - optional" on page 217
- "Enter the request body directly - optional" on page 217
- "Link the body Request to a REST Input parameter - optional" on page 218
- "Add the method to the toolbar" on page 219
- "Use the REST activity" on page 219
- "Expose input and output properties - optional" on page 219
- "Resolve conflicts between the pretape and the test step - optional" on page 220

1 Prerequisite

Study the structure of the REST Service body and determine which resources and methods you need to define.

2 Open the REST service designer

Click the **Add REST Service** toolbar button Add REST Service. The Design REST Service dialog box opens. For details, see the "Design REST Service Dialog Box" on page 238.

3 Name the REST service

Provide a meaningful name for the service in the left pane. For details, see the "Design REST Service Dialog Box" on page 238.

4 Add a resource

Click the **Add Resource** button in the toolbar to add a resource to the REST service and provide a meaningful name for the resource. For details, see the "Design REST Service Dialog Box" on page 238.

5 Add a method

Click the **Add Method** button in the toolbar to add a method, and provide a meaningful name for the method. For details, see the "Design REST Service Dialog Box" on page 238.

6 Set the general properties

a In the left pane, select the method you want to use as a prototype.

b In the right pane, open the **General** view.

c Enter values for the properties. For details, see the "General View" on page 64.

7 Set the input properties

a Open the **HTTP Input/Checkpoints** view in the right pane.

b In your REST Service design document, determine the endpoint URL and copy it onto the clipboard. Paste the clipboard contents, the endpoint URL, into the **URL** row.

c Enter values for all other relevant properties.

d Add name and value pairs for the request header.

For details, see the "HTTP Input/Checkpoints View" on page 68.

8 Define custom properties - optional

For methods that require input, such as **PUT** or **POST**, you can add custom input properties. For methods that provide an output such as **GET**, you add the required output properties. To create these properties:

a Open the **Custom Input/Checkpoints** view in the right pane.

b Expand the plus button and select **Add Input/Output Property**.

c Provide a name, data type, and description (optional) for each property.

d Enter the property values in the **Value** column.

9 Enter the request body directly - optional

You can enter the request body directly or link to a data source. To link to a data source, see step 10.

a Return to the design document for the REST service and copy the Request body onto the clipboard.

b In the right pane of the Design REST Service window, open the **HTTP** view. Make sure the **Request Body** type in the drop down is set to **Text**, and click within the **Body** section (you may need to expand the Property Sheet window to see this drop down). Press CTRL-V to paste the contents of the request into the pane. Make sure that there are no extra spaces before or after the body text.

c Modify the element values within the XML body as required.

10 Link the body Request to a REST Input parameter - optional

This step describes how to enter the Request body through a data source. For details on entering the Request body directly, see step 9.

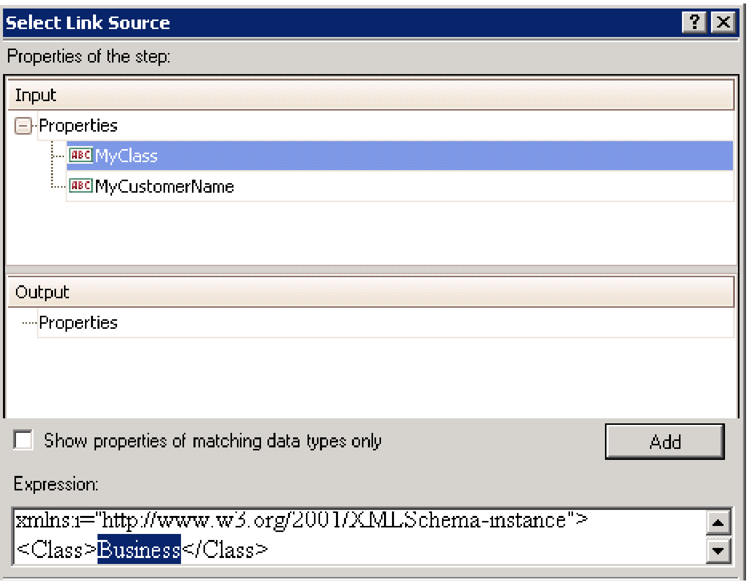
a Return to the design document for the REST service and copy the request body to the clipboard.

b In the right pane of the Design REST Service window, open the **HTTP** view. Make sure the **Request Body** type in the drop down is set to **Text**, and click within the **Body** section (you may need to expand the Property Sheet window to see this drop down).

c Click the **Link Body** button to the right of the pane, to open the Select Link Source dialog box. For details, see "Select Link Source Dialog Box" on page 395.

d In the Select Link Source dialog box, click **More** to expand the dialog box. Paste the clipboard contents, the Request body, into the **Expression** area.

e In the **Expression** area, highlight the value of the element you want to link. In the upper pane, double-click on the custom parameter you defined in step 8. The property is now linked to a value.



□ Show properties of matching data types only

```
xmlns:i="http://www.w3.org/2001/XMLSchema-instance">
<Class>Business</Class>
```

f The expression added in the **Expression** area in the bottom pane.

```
<Class>{Step.MyClass}</Class>
<CustomerName>{Step.MyCustomerName}</CustomerName>
```

g Click **OK**. Service Test places the data in the **HTTP body** pane.

11 Add the method to the toolbar

Click **OK** in the Design REST Service dialog box. Service Test adds the REST service along with its resources and methods to the Toolbox, under the **Local Activities** category.

12 Use the REST activity

You have now created a prototype for a REST method, complete with input parameters and HTTP information. You can now drag the activity, whose primary properties are already defined, onto the canvas.

13 Expose input and output properties - optional

You can forward built-in HTTP properties to the REST method wrapper. This is useful for making specific HTTP properties available at the wrapper level.

a Select a REST method in the canvas.

a Click a property in the Property Sheet and select **Expose as Input Property** or **Expose as Output Property** from the right-click menu.

b Provide a name for the property in the New Exposed Property dialog box.

c Click the REST method wrapper in the canvas, and view the newly exposed property in the Property Sheet.

For details, see "Exposing Properties" on page 352.

14 Resolve conflicts between the pretape and the test step - optional

If you created a test step using a prototype REST method and then change the test step's properties, use the Resolve REST Method wizard to resolve any conflicts. For details, see the "Resolve REST Method Steps Wizard" on page 268.

For an example of creating a REST Service with data driving and data tables, see the *HP Service Test Tutorial* provided with the product.

How to Send a JSON Request to a REST Service

This task describes how to send a JSON request for a REST service.

This task includes the following steps:

- "Create an HTTP Request step" on page 222
- "Set the HTTP properties" on page 222
- "Add a Request Header" on page 222
- "Prepare to paste the request body" on page 222
- "Paste the request body" on page 222
- "Data drive or link to fields - optional" on page 223

Note: The following tasks show how to send a single JSON request. To create a reusable model, create a prototype. For details, see "How to Create a Prototype REST Method" on page 214.

1 Create an HTTP Request step

Drag an **HTTP Request** activity onto the canvas, into the Test Flow.

2 Set the HTTP properties

In the Property Sheet's **Input/Checkpoints** view, set the destination **URL** and the **HTTP method**, usually POST or PUT.

3 Add a Request Header

In the same view, click the plus sign to add a **RequestHeader** array element. Add a custom request header named Content-type with the value application/json.

4 Prepare to paste the request body

Open the Property Sheet's **HTTP** view. Keep the default Request Body type set to **Text**.

5 Paste the request body

Paste the JSON fragment that you want to send, into the Request Body area. If you intend to dynamically assign values to the JSON body from links, make sure to add an escape character, \, for each occurrence of a square or curly bracket ({, }, [, and]). Do not use an escape character for link expressions enclosed by curly brackets. For example:

```
\{"results":  \[
      \{"name": "John", "id": 873829904, location: "NY"\},
      \{"name": "Linda", "id": 726371109, location: "LA"\},
      \{"name": "Mike", "id": 711029345, location: "NY"\},
    \]
\}
```

When no links are used, this is not required.

6 Data drive or link to fields - optional

To data drive or link to specific JSON fields, highlight the value in the body text, click the **Link Body** button, and select a data source. For details, see "Select Link Source Dialog Box" on page 395.

How to Receive a JSON Response from a REST Service

This task describes how to receive a JSON response from a REST service. All HTTP Request activities are capable of receiving JSON responses.

This task includes the following steps:

- "Locate an HTTP Request step" on page 224
- "Add a request header - optional" on page 224
- "Add checkpoints - optional" on page 224

Note: The following tasks show how to receive a single JSON request. To create a reusable model, create a prototype. For details, see "How to Create a Prototype REST Method" on page 214.

1 Locate an HTTP Request step

Locate an **HTTP Request** step on the canvas.

2 Add a request header - optional

If your server requires you to specify JSON during content negotiation, you need to set the request header. In the Property Sheet's **Input/ Checkpoints** view, click the plus sign to add a **RequestHeader** array element. Add a custom request header named Accept with the value application/json.

3 Add checkpoints - optional

If you require checkpoints:

a Open the Property Sheet's **HTTP** view.

b Keep the default Response Body type set to **Text**.

c In the checkpoint list, add regular expressions for each value that you want to validate within the response.

How to Perform Activity Sharing

This task describes how to save activities to a repository, update them, and view their properties.

This task includes the following steps:

- "Connect to ALM/QC" on page 225
- "Set up the repository paths" on page 225
- "Import a WSDL or create a REST service" on page 226
- "Move the activity to a repository" on page 226
- "View the service properties - optional" on page 226
- "Refresh the activity - optional" on page 226
- "Update the activity - optional" on page 226
- "Save the test with its resources - optional" on page 226

1 Connect to ALM/QC

If you want to work with a repository on ALM/QC, connect to the desired ALM/QC server. For details, see the "HP ALM/QC Connection Dialog Box" on page 500.

2 Set up the repository paths

a Select **Edit** > **Settings** > **Activity Repositories**.

b In the Activity Repositories dialog box, click the **Browse** button and navigate to the location in the file system or in ALM/QC.

c Click **OK**.

3 Import a WSDL or create a REST service

Import a WSDL file or create a REST service method. Service Test adds the services to the **Local Activities** branch in the Toolbox. By default, the test stores these activities in its **EmbeddedResources** subfolder.

4 Move the activity to a repository

Right-click the service node, and select **Move To** > **File System Activities** or **ALM/QC Activities**. Service Test moves the service from **Local Activities** to **File System Activities** or **ALM/QC Activities** in the Toolbox. The service is also removed from the test's **EmbeddedResources** subfolder and placed in the repository folder. The next time you create a test, these activities will be accessible from the **File System Activities** or **ALM/QC Activities** nodes.

5 View the service properties - optional

Right-click the service's parent node, and select **Properties**. The Properties window shows the service's significant properties. For details see "Web Services Properties Dialog Box" on page 233.

6 Refresh the activity - optional

To reload the WSDL from its stored location, right-click the service node, and select **Refresh** or click the **Refresh** button in the Toolbox. This is useful in cases when the WSDL is stored in a shared location and may have been updated by another user.

7 Update the activity - optional

To reimport the WSDL from its original location, for example to revert back to the original version, right-click the service node and select **Update WSDL**, or click the **Update WSDL** button in the Toolbox.

8 Save the test with its resources - optional

If you want the test to be portable together with its activities, select **File** > **Save Test with Resources**. Service Test stores the resources in the test's folder. If you then remove these services from the Toolbox, the test will still be able to run. This only applies to services whose activities are on the canvas.

References

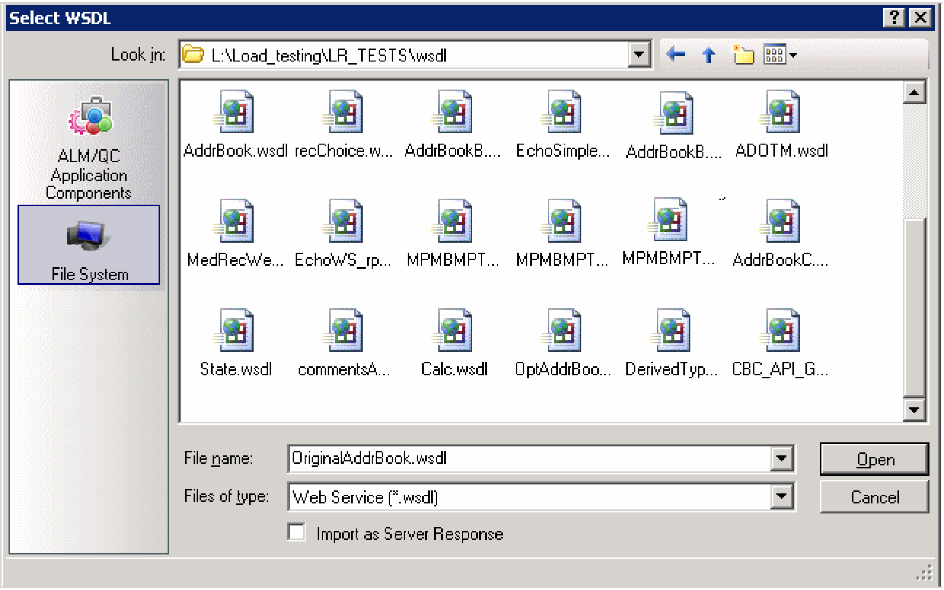
Testing Activities User Interface

This section includes:

- Select WSDL Dialog Box on page 228
- Import WSDL from URL or UDDI Dialog Box on page 230
- Select Service from UDDI Dialog Box on page 232
- Web Services Properties Dialog Box on page 233
- Import .NET Assembly Dialog Box on page 236
- Design REST Service Dialog Box on page 238
- Add Input/Output Property Dialog Box on page 240

Select WSDL Dialog Box

This dialog box enables you to import WSDLs from a file system or Service Test Management, the ALM/QC extension for working with application components.



Look in: L:\Load_testing\LR_TESTS\wsdl

File name: OriginalAddrBook.wsdl

Files of type: Web Service (*.wsdl)

□ Import as Server Response

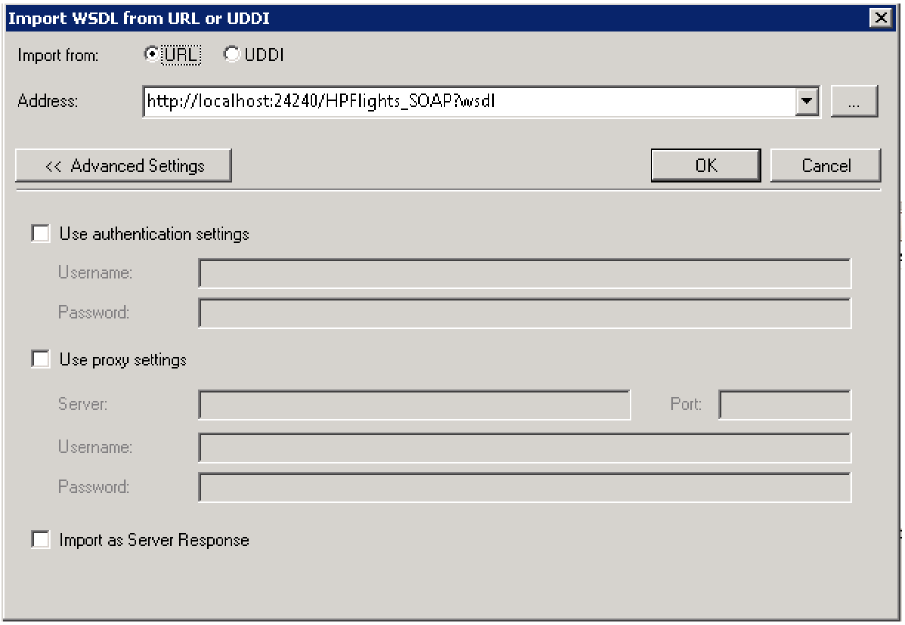
To access	Select **Import WSDL** > **Import WSDL from File or ALM/QC Application Component.**
Relevant tasks	"How to Import a WSDL-Based Web Service" on page 206

The following elements are included:

UI Elements (A-Z)	Description
ALM/QC Application Components	Displays WSDLs in the ALM/QC repository. **Note:** Available only if there is an open connection to ALM/QC with the Service Test Management extension.
File name	The contract name: ➤ **File System.** The file name of the WSDL. ➤ **ALM/QC Application Components.** The name of the application component or service.
File System	Displays WSDLs in the file system.
Files of type	The document type: **WSDL** extension or **All files**.
Import as Server Response	Imports the WSDL as a server response. Its methods will be server responses—not requests. This is useful for asynchronous type Web services.

Import WSDL from URL or UDDI Dialog Box

This dialog box enables you to import WSDLs using a URL or UDDI.



Import WSDL from URL or UDDI

Import from: ● URL ○ UDDI

Address: http://localhost:24240/HPFlights_SOAP?wsdl

□ Use authentication settings

Username:

Password:

□ Use proxy settings

Server: Port:

Username:

Password:

□ Import as Server Response

To access	Select **Import WSDL** > **Import WSDL from URL or UDDI.**
Relevant tasks	"How to Import a WSDL-Based Web Service" on page 206

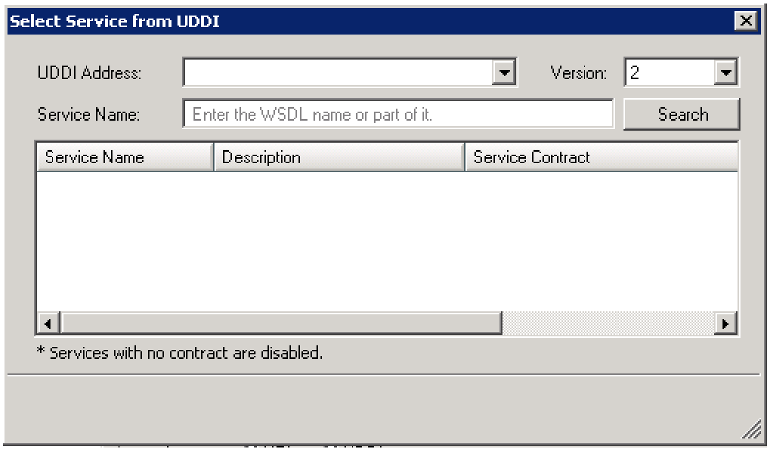
The following elements are included:

UI Elements (A-Z)	Description
...	**Browse.** ➤ For **URL** imports: Opens a browser to allow you to navigate to a URL. ➤ For **UDDI** Imports: Opens the Select Service from UDDI Dialog Box.
Address	The URL or UDDI path of the WSDL.

UI Elements (A-Z)	Description
Advanced Settings	Expands the dialog box to show the authentication and proxy settings.
Import as Server Response	Imports the WSDL as a server response. Its methods will be server responses—not requests. This is useful for asynchronous type Web services.
Use authentication settings	The authentication settings by which to access the WSDL: **Username** and **Password**.
Use proxy settings	The authentication settings for the proxy server hosting the WSDL: **Server**, **Port**, **Username**, and **Password**.

Select Service from UDDI Dialog Box

This dialog box enables you to select and import WSDLs from a UDDI (Universal Description, Discovery, and Integration) server.



Version: 2

Service Name: Enter the WSDL name or part of it.

* Services with no contract are disabled.

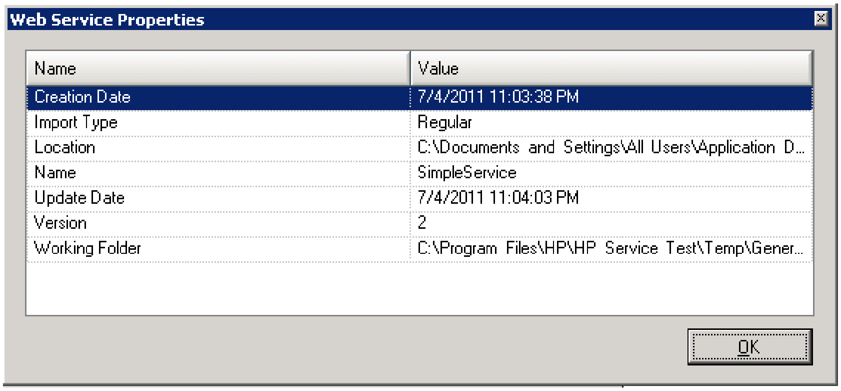
To access	Do the following: **1** Select **Import WSDL** > **Import WSDL from URL or UDDI**. **2** Select **Import from**: **UDDI**. **3** Click the ... button.
Relevant tasks	"How to Import a WSDL-Based Web Service" on page 206
See also	"Import WSDL from URL or UDDI Dialog Box" on page 230

The following elements are included (unlabeled UI elements are shown in angle brackets):

UI Elements (A-Z)	Description
<list of services>	A list of the services that match the filter criteria. The grid shows the following information: ➤ **Service Name** ➤ **Description** ➤ **Service Contract** ➤ **Service ID**
Search	Retrieves the list of services that match the string in the **Service name** field. If no string is specified, it retrieves all available services.
Service Name	A string in the WSDL name by which to filter the list.
UDDI Address	The name or IP address of the UDDI server inquiry API. **For Example:** http://mysite.com:8080/uddi/inquiry.
Version	The UDDI version.

Web Services Properties Dialog Box

This dialog box displays the properties of imported Web services.



Web Service Properties

Name	Value
Creation Date	7/4/2011 11:03:38 PM
Import Type	Regular
Location	C:\Documents and Settings\All Users\Application D...
Name	SimpleService
Update Date	7/4/2011 11:04:03 PM
Version	2
Working Folder	C:\Program Files\HP\HP Service Test\Temp\Gener...

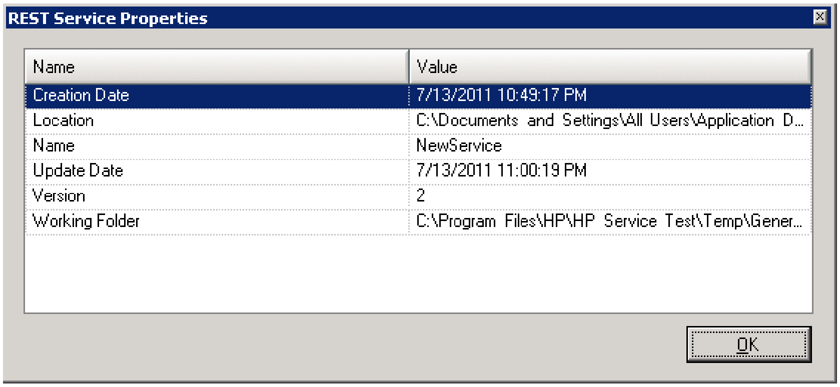
To access	Perform the following steps: **1** Import a WSDL. Select **Import WSDL** > **2** Select the parent node of the WSDL in the Toolbox. **3** Select **Properties** from the right-click menu.
Relevant tasks	"How to Import a WSDL-Based Web Service" on page 206

The following elements are included:

UI Elements (A-Z)	Description
Creation Date	The date and time in which the WSDL was first imported.
Import Type	The way in which the WSDL was imported: **Regular** or **As Server**. For details about importing the WSDL as a server response, see the "Select WSDL Dialog Box" on page 228.
Location	The current location of the WSDL. If it was updated from a location other than the original, it will indicate the new location.
Name	The name of the Web service as defined in the WSDL file.
Update Date	The date and time of the latest update. If no updates were done, this value is the same as the **Creation Date**.
Version	The WSDL version.
Working Folder	The folder in which Service Test creates a local, working copy of the WSDL. By default, this is **C:\Program Files\HP\HP Service Test\Temp\GeneralWorkingFolder**.

REST Services Properties Dialog Box

This dialog box displays the properties of REST services.



Name	Value
Creation Date	7/13/2011 10:49:17 PM
Location	C:\Documents and Settings\All Users\Application D...
Name	NewService
Update Date	7/13/2011 11:00:19 PM
Version	2
Working Folder	C:\Program Files\HP\HP Service Test\Temp\Gener...

To access	Perform the following steps: **1** Create a REST Service. For details, see "Design REST Service Dialog Box" on page 238. **2** Select the parent node of the service in the Toolbox. **3** Select **Properties** from the right-click menu.
Relevant tasks	"How to Create a Simple Test for a REST Service" on page 211

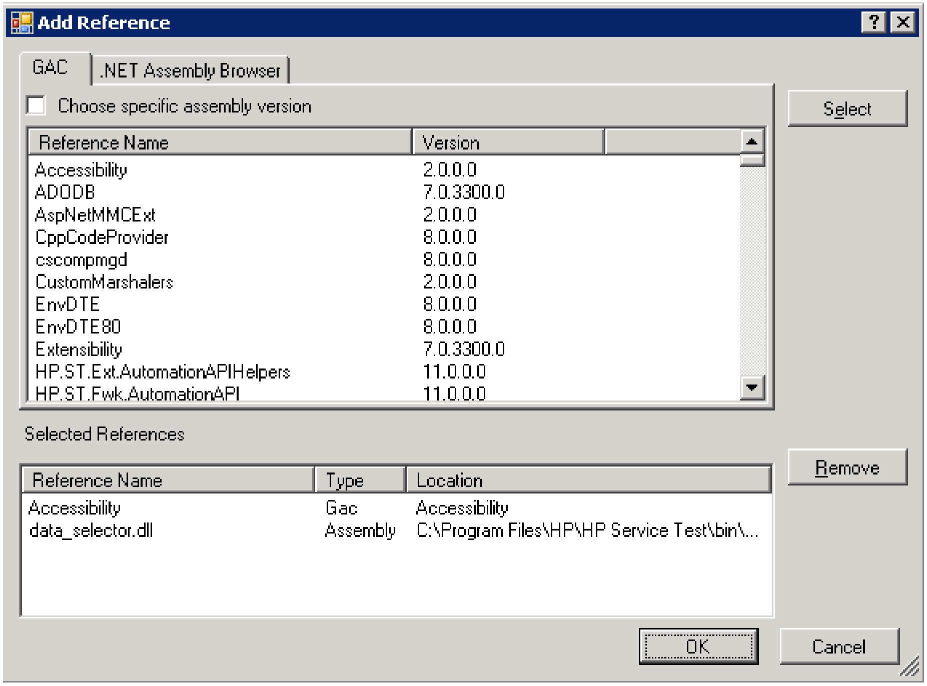
The following elements are included:

UI Elements (A-Z)	Description
Creation Date	The date and time in which the service was created.
Location	The current location of the REST service files.
Name	The name of the REST service as defined in the REST Service Designer.
Update Date	The date and time of the latest change and refresh. If no updates were done, this value is the same as the **Creation Date**.

UI Elements (A-Z)	Description
Version	The current version of the REST service.
Working Folder	The folder in which Service Test creates a local, working copy of the service's files. By default, this is **C:\Program Files\HP\HP Service Test\Temp\GeneralWorkingFolder**.

Import .NET Assembly Dialog Box

This dialog box enables you to import .NET assemblies in order to use them as activities from the Toolbox.



□ Choose specific assembly version

Reference Name	Version
Accessibility	2.0.0.0
ADODB	7.0.3300.0
AspNetMMCExt	2.0.0.0
CppCodeProvider	8.0.0.0
cscompmgd	8.0.0.0
CustomMarshalers	2.0.0.0
EnvDTE	8.0.0.0
EnvDTE80	8.0.0.0
Extensibility	7.0.3300.0
HP.ST.Ext.AutomationAPIHelpers	11.0.0.0
HP.ST.Fwk.AutomationAPI	11.0.0.0

Selected References

Reference Name	Type	Location
Accessibility	Gac	Accessibility
data_selector.dll	Assembly	C:\Program Files\HP\HP Service Test\bin\...

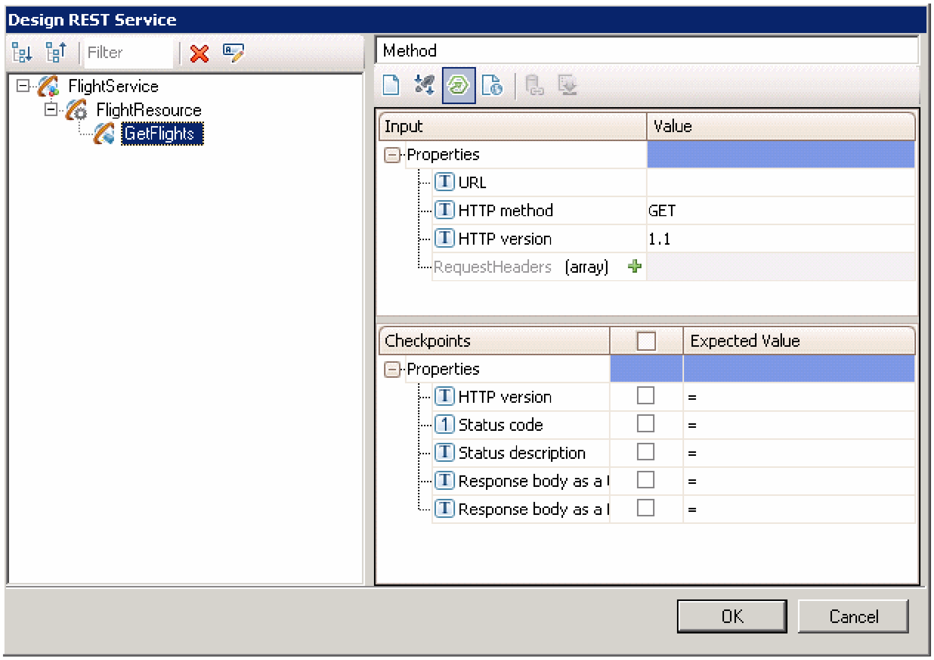
To access	Click the **Import .NET Assembly** button on the toolbar.
Relevant tasks	"How to Create a .NET Assembly Test Step" on page 208

The following elements are included:

UI Elements (A-Z)	Description
.NET Assembly Browser tab	Enables you to browse for an assembly to import.
GAC tab	Displays a list of the GAC (Global Assembly Cache) assemblies. **Choose specific assembly version.** Shows all versions of the GAC assemblies as separate entries. This enables you to add a specific version of a GAC assembly.
Remove	Removes the selected assemblies from the **Selected References** list.
Select	Adds the selected assemblies to the **Selected References** list.
Selected References	A list of the GAC assemblies that you selected. The grid shows the following information: ➤ **Reference Name.** The name of the reference as it will appear in the toolbox. ➤ **Type.** GAC or Assembly ➤ **Location**. For GAC types, the class; For Assembly types, the full path of the DLL.

Design REST Service Dialog Box

This dialog box enables you to design a REST service in the Toolbox.



FlightService
FlightResource
GetFlights

Input	Value
Properties	
URL	
HTTP method	GET
HTTP version	1.1
RequestHeaders (array)	

Checkpoints	□	Expected Value
Properties		
HTTP version	□	=
Status code	□	=
Status description	□	=
Response body as a l	□	=
Response body as a l	□	=

To access	Click the **Add REST Service** button on the toolbar.
Relevant tasks	"How to Create a Simple Test for a REST Service" on page 211

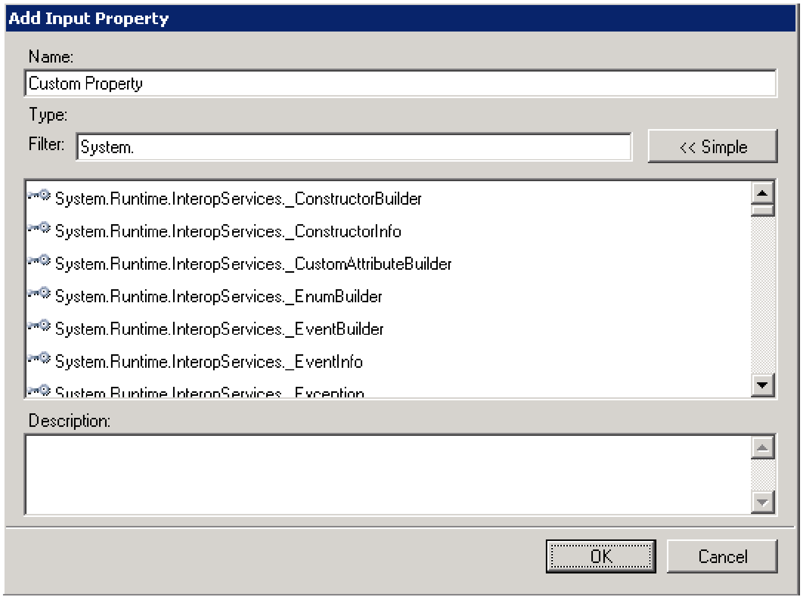
The following elements are included:

UI Elements (A-Z)	Description
	Expand All. Expands all of the nodes of the parent REST service.
	Collapse All. Collapses all of the children nodes of the parent REST service.

UI Elements (A-Z)	Description
⊕	**Add Method.** Adds a method to the selected REST service node.
⚙	**Add Resource.** Adds a resource to the selected REST service or resource.
✎	**Rename.** Renames the selected REST service, resource, or method.
✕	**Delete.** Deletes the selected REST service, resource, or method.
<properties pane>	The properties of the REST service methods. For details, see the "Property Sheet" on page 51.
<REST Services tree>	Displays a list of the REST services that match the filter condition.
Filter box	Filters the display by the entered text.

Add Input/Output Property Dialog Box

This dialog box enables you to define custom input or output properties for the current step.



Add Input Property
Name:
Custom Property
Type:
Filter:
System.
<< Simple
System.Runtime.InteropServices._ConstructorBuilder
System.Runtime.InteropServices._ConstructorInfo
System.Runtime.InteropServices._CustomAttributeBuilder
System.Runtime.InteropServices._EnumBuilder
System.Runtime.InteropServices._EventBuilder
System.Runtime.InteropServices._EventInfo
System.Runtime.InteropServices._Exception
Description:
OK
Cancel

To access	**1** Add a Custom Code or .NET Assembly activity to the canvas. **2** Open the Property Sheet's **Input/Checkpoints** view. **3** Click the **Add** button and select one of the following: ➤ **Add Input Property** ➤ **Add Output Property**
Relevant tasks	➤ "How to Create a .NET Assembly Test Step" on page 208 ➤ "Create a Custom Code activity - optional" on page 32 ➤ "How to Define Test Properties or User/System Variables" on page 94

The following elements are included (unlabeled UI elements are shown in angle brackets):

UI Elements (A-Z)	Description
<list of properties>	A list of the types, including .NET types, types from DLLs referenced by the test, and all types of the imported assemblies.
Advanced	Shows an extensive list of types, including all .NET types and DLLs referenced by the test, and all types from the imported assemblies.
Description	A description of the property.
Filter	For **Advanced** types, a textual expression by which to filter the displayed assemblies. For example, to show only those assemblies that begin with the **system** prefix, enter system.
Name	A name for the property.
Simple	Shows the simple data types, such as String, Integer, and so forth.
Type	For **Simple** types, A drop down list of simple data types, such as String, Integer, and so forth.

Troubleshooting and Limitations - Services

This section describes troubleshooting and limitations for working with Web and REST services.

Web Services

- Service Test cannot import WSDL files with names that are restricted by the Windows operating system. This list includes: CON, PRN, AUX, NUL, COM1, COM2, COM3, COM4, COM5, COM6, COM7, COM8, COM9, LPT1, LPT2, LPT3, LPT4, LPT5, LPT6, LPT7, LPT8, and LPT9. **Workaround**: Rename the WSDL file before the import.
- The following WSDLs are not supported:

  - WSDL version 2.0
  - WSDLs containing a <**appInfo**> element.
  - RPC Encoded WSDLs configured as Asynchronous Web services.
  - WSDLs authenticated by HTTP digest on Apache servers.

- For a Web service imported as a server response.
  - RPC type WSDLs cannot be imported as a server response. If you attempt to update a service from an RPC encoded WSDL, it will create a duplicate entry.
  - If you end a **ServiceTest.exe** process during the listening stage, after the binding was added, the binding will not be removed from the system.
    Workaround: Remove the binding manually using a utility such as httpcfg.exe or netsh.exe.
  - When working with SSL, certificates from a file are not supported. If you move the test to another machine, the certificate will not be saved with the test.
    Workaround: Add the certificate to the local machine store before the listener starts, and remove it at the end of the listening process.

REST Services

- Importing a schema to a REST, HTTP, or SOAP checkpoint may remove the links of the input properties.
- Copy and Paste is not supported for REST services.
- XPath checkpoints are not supported for HTTP and REST activities.
- Links that are defined in the toolbox are deleted on the canvas.
- A link defined in the toolbox cannot be deleted.
- Links between input and output properties of the same REST method in which the source property is deleted without removing the link, the link expression still remains in the destination property. If you save the test in this state, you may be unable to reopen it.
  Workaround: Delete the link explicitly either before or immediately after deleting its source property.

- When defining a REST method prototype in the toolbox - in order to use the **Trim**, **Ignore**, or **Stop test** options, select the check box in the **Validate** column, in the Checkpoints pane.

.NET Assemblies

- .NET 4 assemblies are not supported. They cannot be imported or referenced within Service Test.

5

Updating Services and Assemblies

This chapter includes:

Concepts

Tasks

Reference

Concepts

Updating Web Services

You can update Web services that exist in the toolbox, from their original locations or from alternate locations.

When you update a service, first Service Test compares the service and port names. If the port names match, Service Test transfers all of the data from the updated service, including new security information. If the new version of the service contains a port that was not present in the original service, it adds it to the toolbox, as an additional port for the service.

If the port paths (<service name:port name> combination) do not match, Service Test opens the **Update Service and Port Wizard**. For details, see the "Update WSDL and Port Wizard" on page 257.

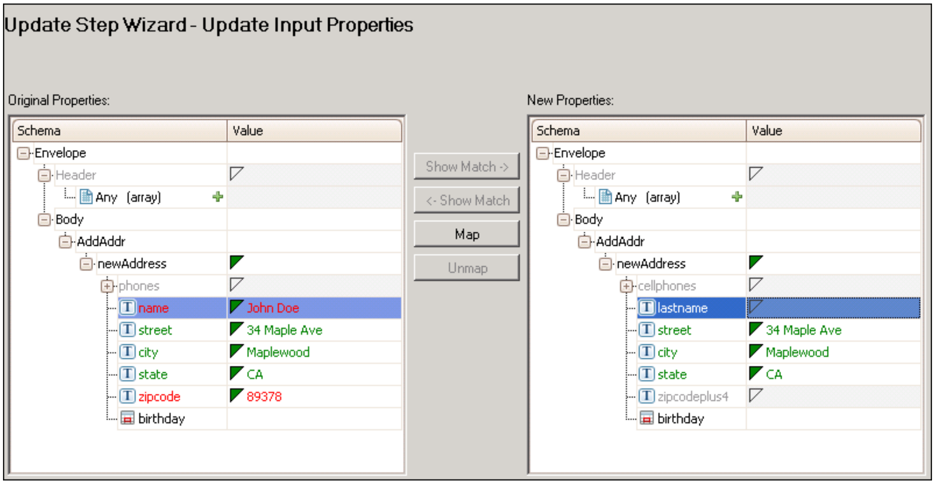
If HTTP transport information such as the endpoint was changed, Service Test will update this automatically, as long as the port path is the same.

In the next step of the update, Service Test compares the operations and properties of the current test steps. Service Test tries to match up the properties that were assigned values between the original service and the updated version.

If the operation names do not match, the Update Step wizard enables you to map the new operation name to the original name.

If the operation names match, but the property names do not, the Update Step wizard enables you to map the new property names to the original ones. Matching properties are ones that have the same XPaths and types.

The wizard screen marks resolved properties in green and unresolved properties in red.



Update Step Wizard - Update Input Properties

Original Properties:

Schema	Value
Envelope	
Header	
Any (array)	
Body	
AddAddr	
newAddress	
phones	
name	John Doe
street	34 Maple Ave
city	Maplewood
state	CA
zipcode	89378
birthday	

New Properties:

Schema	Value
Envelope	
Header	
Any (array)	
Body	
AddAddr	
newAddress	
cellphones	
lastname	
street	34 Maple Ave
city	Maplewood
state	CA
zipcodeplus4	
birthday	

If you originally imported a service from ALM/QC through Service Test Management, you must update the service in ALM/QC—you will not be able to update the service through Service Test.

When you update an RPC Web service, as long as the operation names match, the properties are marked as resolved. If the operation names cannot be resolved, Service Test opens the wizard. If there is no operation available to map to the original, the wizard suggests that you delete the affected step.

For task details, see "How to Update a Web Service" on page 249.

REST Service Conflicts

Prototype REST methods allow you to create REST service tests with minimal configurations. You drag the prototype method from the Toolbox onto the canvas as you would with any other activity. For details, see "How to Create a Prototype REST Method" on page 214.

However, if you modify a REST step's properties after incorporating it into your test, it will no longer match the prototype method. You may want to keep the change, or you may want to remove the conflicts so that your step will match the prototype.

You may encounter conflicts in the following areas:

- Adding or removing an input or output property
- Renaming an input or output property
- A change in the REST service URL
- A change in the HTTP request/response body type or schema
- Internal links between a REST property and its inner HTTP elements
- HTTP methods

The Resolve REST Method Steps wizard enables you to view the conflicts and decide what to do with the conflicts in your test step—keep, remove, or map them. The wizard lets you resolve property-related conflicts. Other conflicts, such as discrepancies in the URL values, the HTTP body, and so forth, are resolved automatically.

For wizard details, see the "Resolve REST Method Steps Wizard" on page 268.

For task details, see "How to Resolve Conflicts in a Prototype-Based REST Step" on page 254.

Tasks

How to Update a Web Service

This task describes how to update a WSDL-Based Web Service that was already imported and incorporated into a test.

This task includes the following steps:

- "Prerequisites" on page 249
- "Update the service" on page 249
- "Accept the warning" on page 250
- "Run the Update Service and Port wizard" on page 250
- "Run the Update Step wizard" on page 251

1 Prerequisites

If you want to update the WSDL from ALM/QC, make sure you have an open connection to the ALM/QC server. For details, see the "HP ALM/QC Connection Dialog Box" on page 500.

2 Update the service

- To update a service from its original location, select its main node in the **Toolbox**. Choose **Update WSDL** from the shortcut menu.
- To update the service from a different location, or if the **Update WSDL** option is not available:
  a. Select the service's main node in the **Toolbox**.
  b. Choose **Update WSDL from** > **URL or UDDI** or **Update from** > **File or ALM/ QC Application Component** from the shortcut menu.
  c. Navigate to the WSDL and click **OK**.

Note: The **Update WSDL** option may not be available if the user credentials changed or if the service was imported with an earlier version of Service Test.

3 Accept the warning

Service Test issues a warning message that the service was updated. Click **Yes** to accept the update.

4 Run the Update Service and Port wizard

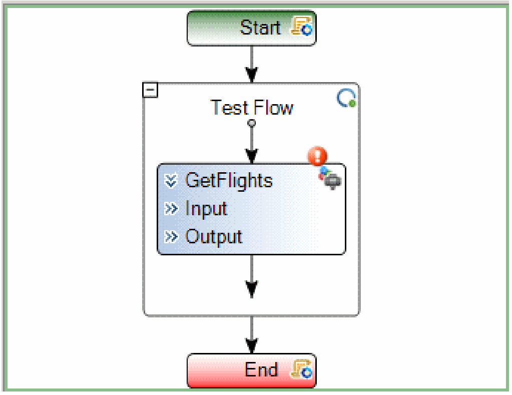
If Service Test detects a change in the port path (<service name:port name> combination) the **Update Service and Port** Wizard opens. Follow the steps of the wizard to resolve all of the Service/Port conflicts. For details, see "Update WSDL and Port Wizard" on page 257.

Note:

- The wizard imports all of the services defined in the WSDL, even those deleted manually before the update. To remove them from the toolbox, delete them again manually, after the update.
- If you manually remove a service with conflicts from the Toolbox, you will no longer be able to resolve the conflicts using the wizard.

5 Run the Update Step wizard

If a test step became invalid because an operation name changed or properties with values were changed, then the canvas marks the step with a warning marker.

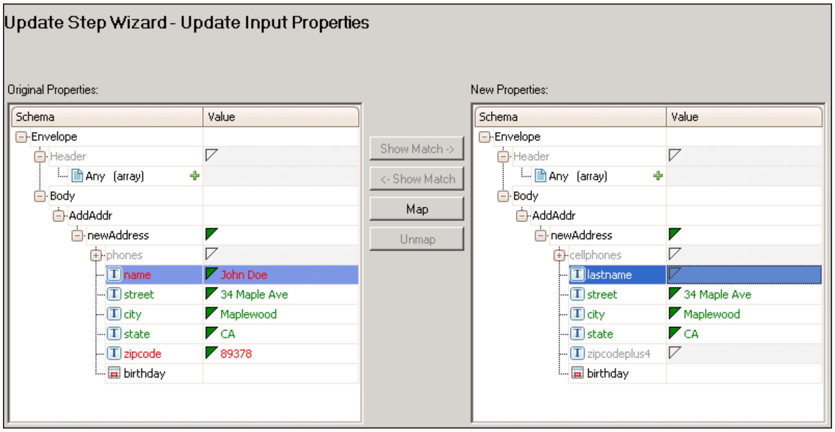


a Click the warning marker to display the message **The step must be resolved. Resolve step** Click on the message text. The **Update Step** Wizard opens.

Note that the step's properties become read-only, until you resolve them with the help of the wizard.

b In the **Select Operation** page, click in the **New operation** pane and select the operation that corresponds to the original one in the upper pane. Click **Next**. Properties that had been assigned values in the Property Sheet and were affected by the upgrade, are highlighted in red.

c In the **Update Input Properties** page, in the **Original Properties** pane, select a property for which there is a conflict, highlighted in red. In the right pane, **New Properties**, select a property to map.



Update Step Wizard - Update Input Properties

Original Properties:

Schema	Value
Envelope	
Header	
Any (array)	
Body	
AddAddr	
newAddress	
phones	
name	John Doe
street	34 Maple Ave
city	Maplewood
state	CA
zipcode	89378
birthday	

New Properties:

Schema	Value
Envelope	
Header	
Any (array)	
Body	
AddAddr	
newAddress	
cellphones	
lastname	
street	34 Maple Ave
city	Maplewood
state	CA
zipcodeplus4	
birthday	

Click **Map**. The wizard adds the mapping to the list in the bottom pane. Repeat this for all properties that you want to map. Click **Next**.

d In the **Update Output Properties** page, select a property for which there is a conflict, highlighted in red. In the right pane, **New Properties**, select the property to which you want to map. Click **Map**. The wizard adds the mapping to the list of mappings in the bottom pane. Repeat this for all properties that you want to map. Click **Next**.

e Click **Finish** to save your changes and close the wizard.

For details about the wizard, see the "Update Step Wizard" on page 261.

How to Update a .NET Assembly

This task describes how to update a .NET assembly with a newer version. The updating of .NET assembly is similar to the importing of an assembly described in "How to Create a .NET Assembly Test Step" on page 208.

This task includes the following steps:

- "Select the assembly to update" on page 253
- "Open the Import .NET Assembly dialog box" on page 253
- "Import a .NET assembly" on page 253
- "Handle warnings - optional" on page 253
- "Modify custom code - optional" on page 254

1 Select the assembly to update

In the Toolbox, expand the **.NET Assemblies** node and select the assembly you want to update.

2 Open the Import .NET Assembly dialog box

Click the **Import .NET Assembly** button on the toolbar. For user interface details, see "Import .NET Assembly Dialog Box" on page 236.

3 Import a .NET assembly

Click the **.NET Assembly Browser** tab. Click **Browse** and locate the **.dll** or **.exe** file. Click **Open** in the Open dialog box to add it to the **Selected References** list. Click **OK** to begin the update.

4 Handle warnings - optional

If the updated .NET assembly is missing types that are in use by existing activities, you will need to modify the step properties. The canvas displays warning icons adjacent to the steps whose properties use the missing type.

5 Modify custom code - optional

If you wrote custom code in an event handler, you may need to modify the step properties. If the updated .NET assembly is missing types that are used by the custom code, make sure to modify the code to use only the types that are available.

How to Resolve Conflicts in a Prototype-Based REST Step

This task describes how to update a prototype-based REST method step that was changed.

This task includes the following steps:

- "Prerequisites" on page 254
- "Modify the step as required" on page 254
- "Open the wizard" on page 254
- "Run the wizard" on page 255

1 Prerequisites

Create one or more prototype methods for REST services. Drag them onto the canvas to create REST method steps. For details, see "How to Create a Prototype REST Method" on page 214.

2 Modify the step as required

Modify the REST service step as required: add or remove properties, change property values, and so forth.

3 Open the wizard

- To resolve conflicts for the selected step, click the warning icon in the top right corner of the REST method step in the canvas. Select **This step should be resolved. Resolve step.** The Resolve REST Method Steps wizard opens.
- To resolve conflicts for all steps created with the prototype, right-click the method in the Toolbox and select **Apply Changes to all Steps**.

4 Run the wizard

a Select the steps that you want to resolve (only relevant when opening the wizard through the Toolbox).

The left pane, **Before Changes**, shows the step's properties before they were resolved. The right pane, **After Changes**, shows the step's properties after they were resolved.

b Proceed with the wizard, resolving or keeping the detected differences.

For details about the wizard, see the "Resolve REST Method Steps Wizard" on page 268.

Reference

Update Service and Resolve Interface

Service Test provides shortcut menu options for updating Web services that were imported into the Toolbox.

This section includes:

- "Update WSDL and Port Wizard" on page 257
- "Update Step Wizard" on page 261
- "Resolve REST Method Steps Wizard" on page 268

For task details, see "How to Update a Web Service" on page 249.

For more information, see "Updating Web Services" on page 246.

Update WSDL and Port Wizard

This wizard enables you to update ports that became invalid as a result of an Update Service action. The steps became invalid because the port path (<service name:port name> combination) changed. The wizard enables you to map old port names to new ones.

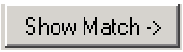
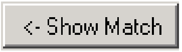
To access	**1** Import a WSDL using the Import Service toolbar button. **2** Configure the port security from the right-click menu. **3** Select the WSDL node in the Toolbox **4** Select **Update** (or **Update from)** from the right-click menu. **Note:** This wizard only opens if there is a discrepancy between the service or port names, and if the port's security settings were configured.
Relevant tasks	"How to Update a Web Service" on page 249.
Wizard map	This wizard contains: <WSDL Name> Page > Finish Page
See also	"Updating Web Services" on page 246

<WSDL Name> Page

This wizard page enables you to map a port or service from the new WSDL, with the original WSDL's service name and port. This page is repeated for each of the services for which there is a conflict.

Important information	General information about this wizard is available here: "Update Step Wizard" on page 261.
Wizard map	This wizard contains: **<WSDL Name> Page** > Finish Page

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

UI Elements (A-Z)	Description
	Shows the service/port in the **Available Services and Ports** pane, that is mapped to the service/port selected in the **Original Service and Ports** pane.
	Shows the service/port in the **Original Service and Ports** pane, that is mapped to the service/port selected in the **Available Services and Ports** pane.
<mapped property list>	A list of all the mapped services and ports—the ones mapped automatically by Service Test and the ones mapped manually. **Tip:** Click on a set of services and ports to highlight them in the upper panes.
Available Services and Ports	A tree hierarchy of all of the available services and ports. The services and ports displayed in green text did not change in the update.
Map	Maps the selected service/port in the **Original Service and Ports** pane, to a service/port in the **Available Services and Ports** pane. After you map a service/port, the grid displays it in green. **Note:** This button is enabled only if you select a red or black service/port in the **Original Service and Ports** pane, and a service/port in the **Available Services and Ports** pane.

UI Elements (A-Z)	Description
Original Service and Ports	A tree hierarchy of the first service or port for which a conflict was found. As you click **Next**, the wizard proceeds to the next conflict. The wizard displays the services and ports in the following colors: **Green.** A service or port that did not change in the update or that was resolved through mapping. **Red.** A services or port that changed during the update and requires mapping. **Black.** A service or port that was resolved automatically during the update, but you chose to unmap it.
Unmap	Removes the mapping of the selected service/port in the **Original Service and Ports** pane, from a service/port in the **Available Services and Ports** pane. **Note:** This button is only enabled if you select the mapped service/port in both panes. To find the mapped service/port, use the **Show Match** buttons.

Finish Page

This wizard page indicates whether you successfully resolved the conflicts between your original services and ports and those from the updated service.

Important information	General information about this wizard is available here: "Update WSDL and Port Wizard" on page 257.
Wizard map	This wizard contains: <WSDL Name> Page > **Finish Page**

User interface elements are described below:

UI Elements (A-Z)	Description
Finish	Closes the wizard and applies your changes to the test. **Note:** Enabled when you successfully map all unresolved services and ports, or when you choose to ignore unresolved conflicts.
Ignores unresolved services/ports	Ignores unresolved conflicts. If you intend to remove the unresolved steps, you can enable this option. **Tip:** To return to the wizard screens to resolve all of the services or ports, click **Back**.

Update Step Wizard

This wizard enables you to update test steps that became invalid as a result of an Update Service action. The steps became invalid because the operation was removed or changed, or property names were modified. The wizard enables you to map old operations and properties to new ones.

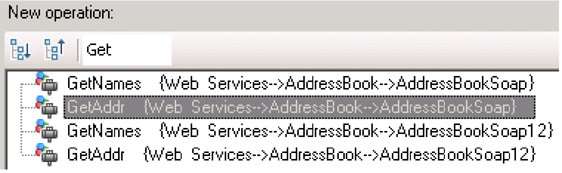
To access	Do the following: **1** Import a Web service using the **Import Service** toolbar button. **2** Drag a Web service from the **Toolbox** to the canvas and set input values. **3** Select a service’s parent node and select **Update** from the shortcut menu. Accept any warning popup messages. **4** Click on the alert adjacent to the step ❗ . **5** Click on the text **The step must be resolved. Resolve step** **Note:** The wizard will open only when there is a change in property names that were assigned values.
Relevant tasks	"How to Update a Web Service" on page 249.
Wizard map	This wizard contains: Select Operation Page > Update Input Properties Page > Update Output Properties Page > Finish Page
See also	"Updating Web Services" on page 246

Select Operation Page

This wizard page enables you to map an operation from the new service, with the original service's operation.

Important information	General information about this wizard is available here: "Update Step Wizard" on page 261.
Wizard map	This wizard contains: **Select Operation Page** > Update Input Properties Page > Update Output Properties Page > Finish Page

User interface elements are described below:

UI Elements (A-Z)	Description
↓	**Expand All.** Expands all nodes of the new service.
↑	**Collapse All.** Collapses all nodes of the new service.
Apply to all steps of this type	Converts all test steps using the original operation, to steps using the new operation name, selected in the **New Operation** pane. If you do not select this option, you will need to repeat the selection of an operation, for conflicts in other test steps. **Note:** This option is visible only when Service Test detects a conflict in the operation names.
Filter	Enables you to filter the operations in the service. For example to display only those operations containing the term Get, type Get into the **Filter** box. The filter results show the entire path of the operation in the toolbox.  New operation: Get GetNames {Web Services-->AddressBook-->AddressBookSoap} GetAddr {Web Services-->AddressBook-->AddressBookSoap} GetNames {Web Services-->AddressBook-->AddressBookSoap12} GetAddr {Web Services-->AddressBook-->AddressBookSoap12}

UI Elements (A-Z)	Description
New Operation	A tree hierarchy of the new service, its ports, and its operations.
Original Operation	A tree hierarchy of the operation in the selected test step.
Update the step	Instructs the wizard to update the step according to your choice in the **New Operation** pane. The **Next** button will proceed to the next conflict. To apply this mapping to all steps using the selected operation in the **Original Operation** pane, select **Apply to all steps of this type**. **Note:** This option is visible only when Service Test detects a conflict in the operation names.

Update Input Properties Page

This wizard page enables you to map new input properties with the original input properties.

Important information	General information about this wizard is available here: "Update Step Wizard" on page 261.
Wizard map	This wizard contains: Select Operation Page > **Update Input Properties Page** > Update Output Properties Page > Finish Page

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

UI Elements (A-Z)	Description
Show Match ->	Shows the property in the **New Properties** pane, that is mapped to the property selected in the **Original Properties** pane.
<- Show Match	Shows the property in the **Original Properties** pane, that is mapped to the property selected in the **New Properties** pane.

UI Elements (A-Z)	Description
Map	Maps the selected property in the **Original Properties** pane, to a property in the **New Properties** pane. After you map a property, the grid displays it in green. **Tip:** This button is enabled only if you select a red or black property in the **Original Properties** pane, and a property in the **New Properties** pane. **Note:** When mapping to an operation from another WSDL, the new WSDL must have the same SOAP version as the original.
Unmap	Removes the mapping of the selected property in the **Original Properties** pane, from a property in the **New Properties** pane. **Note:** This button is enabled only if you select the mapped properties in both panes. To find the mapped properties, use the **Show Match** buttons.
Original Properties	A tree hierarchy of all of the original step's input properties. The text color indicates the status: **Green.** Properties that did not change in the update or that were already mapped. **Red.** Properties that changed during the update and require mapping. **Black.** Properties that were resolved automatically during the update, but you chose to unmap them.
New Properties	A tree hierarchy of all of the new operation's input properties. The properties displayed in green text, are properties that did not change in the update.

UI Elements (A-Z)	Description
Show only unmapped properties	Hides all non-red properties. The red properties are the ones that Service Test was unable to resolve automatically during the update, and that you did not previously resolve.
<mapped property list>	A list of all the mapped properties—the ones mapped automatically by Service Test and the ones mapped manually. **Tip:** Click on a set of properties to highlight them in the upper panes.

Update Output Properties Page

This wizard page enables you to map new output properties with the original output properties. If the step has no output properties, the wizard skips this step.

Important information	General information about this wizard is available here: "Update Step Wizard" on page 261.
Wizard map	This wizard contains: Select Operation Page > Update Input Properties Page > **Update Output Properties Page** > Finish Page

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

UI Elements (A-Z)	Description
	Shows the property in the **New Properties** pane, that is mapped to the property selected in the **Original Properties** pane.
	Shows the property in the **Original Properties** pane, that is mapped to the property selected in the **New Properties** pane.

UI Elements (A-Z)	Description
<mapped property list>	A list of all the mapped properties—the ones mapped automatically by Service Test and the ones mapped manually. **Tip:** Click on a set of properties to highlight them in the upper panes.
Map	Maps the selected property in the **Original Properties** pane, to a property in the **New Properties** pane. After you map a property, the grid displays it in green. **Note:** This button is enabled only if you select a red or black property in the **Original Properties** pane, and a property in the **New Properties** pane.
New Properties	A tree hierarchy of all of the new operation's output properties. The properties displayed in green text, are properties that did not change in the update.
Original Properties	A tree hierarchy of all of the original step's output properties. The text color indicates the status: **Green.** Properties that did not change in the update or that were already mapped. **Red.** Properties that changed during the update and require mapping. **Black.** Properties that were resolved automatically during the update, but you chose to unmap them.
Show only unmapped properties	Hides all non-red properties. The red properties are the ones that Service Test was unable to resolve automatically during the update.
Unmap	Removes the mapping of the selected property in the **Original Properties** pane, from a property in the **New Properties** pane. **Note:** This button is enabled only if you select the mapped properties in both panes. To find the mapped properties, use the **Show Match** buttons.

Finish Page

This wizard page indicates whether you successfully resolved the conflicts between your original properties and the new ones.

Important information	General information about this wizard is available here: "Update Step Wizard" on page 261.
Wizard map	This wizard contains: Select Operation Page > Update Input Properties Page > Update Output Properties Page > **Finish Page**

User interface elements are described below:

UI Elements (A-Z)	Description
Finish	Closes the wizard and applies your changes to the test. **Note:** Enabled when you successfully map all unresolved properties, or when you choose to ignore unresolved properties.
Ignore unresolved properties	Ignores all unresolved input and output properties. If you intend to remove the step with the unresolved properties from your step, you can enable this option. **Tip:** To return to the wizard screens to resolve all of the properties, click **Back**.

Resolve REST Method Steps Wizard

This wizard enables you to resolve differences between REST service steps and the prototype method upon which they were based. The wizard detects changes such as added, removed, or renamed properties and helps you resolve them. For more details about the conflict types, see "REST Service Conflicts" on page 248.

To access	As a prerequisite: **1** Create a prototype for a REST service method. For details, see "How to Create a Prototype REST Method" on page 214. **2** Drag one or more REST service methods from the **Toolbox** to the canvas. **3** Customize the step by modifying its properties and their values. To start the wizard: ➤ **For the selected step only:** Click on the alert in the top right corner of the REST method step ⚠ and click the text **The step should be resolved. Resolve step** ➤ **For all steps using the prototype:** In the Toolbox, right-click the method and select **Apply Changes to all Steps.**
Relevant tasks	"How to Resolve Conflicts in a Prototype-Based REST Step" on page 254.
Wizard map	This wizard contains: Select Steps Page > Resolve Conflicts Page > Finish Page

The wizard’s global interface elements are described below:

UI Elements (A-Z)	Description
Cancel	Closes the wizard, discarding all resolutions that you made until this point.
Finish	Does the following: ➤ Performs the automatic resolutions for remaining test steps whose conflicts were not resolved manually. ➤ Ignores all remaining conflicting properties, by applying the **Keep** action to all of them. ➤ Advances to the wizard’s **Finish** page.
Next	Proceeds to the conflicts of the next step. The wizard displays a separate **Resolve Conflicts** page for each step.

Select Steps Page

When you start the wizard from the Toolbox, it enables you to resolve conflicts for all steps that use the selected method. This wizard page enables you to include or exclude specific steps in which to apply the resolutions.

This

Important information	➤ General information about this wizard is available here: "Resolve REST Method Steps Wizard" on page 268. ➤ The ability to select the steps to resolve, is only available when you open the wizard from the Toolbox—not from the alert on the canvas. ➤ The wizard only checks those REST steps that are based on the prototype selected in the Toolbox.
Wizard map	This wizard contains: **Select Steps Page** > Resolve Conflicts Page > Finish Page

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

UI Elements (A-Z)	Description
<test tree>	A tree hierarchy of the test steps. The following steps of the wizard will only affect the selected steps.
Check All	Selects all test steps in which a conflict was detected.
Uncheck All	Clears the check box for all test steps in which a conflict was detected, excluding them from the wizard.

Resolve Conflicts Page

This wizard page enables you to map new input/output properties with the original input/output properties.

Important information	➤ General information about this wizard is available here: "Resolve REST Method Steps Wizard" on page 268. ➤ The wizard repeats this page for each of the methods selected in the previous step.
Wizard map	This wizard contains: Select Steps Page > **Resolve Conflicts Page** > Finish Page

User interface elements are described below (unlabeled UI elements are shown in angle brackets). The **Keep**, **Remove**, and **Map** buttons relate to both the Input and Output properties.

UI Elements (A-Z)	Description
<conflict resolutions>	A list of all the resolved conflicts—the type of conflict, and the resolution. The text color indicates the conflict status: ➤ **Green.** Conflicts that were resolved automatically or resolved by a **Keep**, **Map**, or **Remove** action. ➤ **Red.** Conflicts that were not yet resolved or removed.
Input Properties / Output Properties	A list of all of the step's input/output properties. ➤ **Before Change**. A list of the step's original properties ➤ **After Change**. A list of the step's properties after the conflicts were resolved. The text color indicates the property status: **Green.** Properties that were resolved automatically or resolved by a **Keep**, **Map**, or **Remove** action. **Red.** Properties for which a conflict was found, and not yet resolved. **Black.** Properties for which no conflict was found.
Keep	Accepts the conflict for use within the test. The resulting test step's properties do not correspond to the prototype.
Map	Assigns the value of the selected property in the **Before Changes** pane, to the property in the **After Changes** pane After you map a property, the grid displays it in green. **Note:** This button is enabled only if you select a red or green property in the **Before Changes** pane, and a black or green property in the **After Changes** pane.
Remove	Removes the selected conflicting property from the current test step.

Finish Page

This wizard page indicates whether you successfully resolved the conflicts between the prototype and the test steps.

Important information	General information about this wizard is available here: "Resolve REST Method Steps Wizard" on page 268.
Wizard map	This wizard contains: Select Steps Page > Resolve Conflicts Page > **Finish Page**

User interface elements are described below:

UI Elements (A-Z)	Description
Finish	Closes the wizard and applies the resolutions to the test step. **Note:** If you click the **Finish** button before resolving the conflicts, the wizard applies a **Keep** action to all conflicts, and performs an automatic resolution for non-property related conflicts.

Troubleshooting and Limitations - Updating

This section describes troubleshooting and limitations for updating services and assemblies.

REST Services

- When comparing a REST step to its prototype - a difference in the request/ response body contents is not considered a conflict. Therefore, when resolving a REST step whose contents do not match the body contents of the prototype, the body contents will not be affected.

6

Web Service Security

This chapter includes:

Concepts

Tasks

Reference

Concepts

Setting Security Overview

When building Web Service applications, there is a challenge in building scalable applications that are secure. You can secure Web Services by having the message sent over a secure transport, such as Secure Sockets Layer (SSL), or by applying security at the message level, also known as **WS-Security**.

For testing a secured service, answering the following questions will help you define your security scenario.

- Is there transport security, such as SSL? What is the HTTPS URL?
- Is basic authentication required?
- Is mutual authentication required?
- What type of security is required in the SOAP header?

For task details, see "How to Set Security for a Specific Web Service Operation" on page 286.

Security Levels

Service Test lets you set the security for a service on two levels—port or operation. If you define a security for a port, all of its operations use these settings, by default. When working in the canvas on an operation, you can override the default port security and customize the security for a particular operation.

For user interface details, see "Security User Interface" on page 304.

Security Scenarios Overview

Service Test provides several built-in scenarios for configuring security in Web Service calls.

A security scenario represents a typical security implementation for a Web Service. It contains information such as authentication, encoding, proxy, certificates, and so forth.

A default **Web Service** scenario can be used for most Web services. It enables you to configure both transport and message-level security. Service Test support for message-level security lets you manually configure the security elements such as tokens, message signatures, and encryption. For details, see "Web Service Security Scenario" on page 276.

WCF scenarios enables you to configure security for HTTP or custom bindings and work with advanced specifications, such as **WS-SecureConversation**.

The built-in security scenarios are:

- Web Service Security Scenario
- WCF Service (CustomBinding) Scenario Overview
- WCF Service (Federation) Scenario Overview
- WCF Services (WSHttpBinding) Scenario Overview

Use the default Web Service scenario for:

- Simple Web Services where no advanced standards are required.
- Web services using HTTP transport level security.
- Web services using message level security (WS-Security) for SOAP 1.1

Use a WCF scenario for:

- WCF Services that utilize advanced security and WS-Specifications.
- Web services using message level security (WS-Security) for SOAP 1.2

Such services can be written in various platforms such as WCF (Windows Communication Foundation), Metro (WSIT), and Axis2. Service Test also supports proprietary standards and transports.

Web Service Security Scenario

The default Web Service scenario is based on the WS-Security specification. This scenario lets you place security credentials in the actual SOAP message.

When a SOAP message sender sends a request, the security credentials, known as **tokens**, are placed in the SOAP message. When the Web server receives the SOAP request, it does not need to send additional requests to verify the integrity of the sender. The server verifies that the credentials are authentic before letting the Web Service execute the application. By not having to go back to the source of the credentials, the application's scalability improves significantly.

To further secure Web Services, it is common to use digital signatures or encryption for the SOAP messages. Digitally signing a SOAP message verifies that the message has not been altered during transmission. Encrypting a SOAP message helps secure a Web Service by making it difficult for anyone other than the intended recipient to read the contents of the message.

The Security Settings dialog box provides the following tabs for the Web Service scenario: **HTTP**, **WS-Security**, and **WS-Addressing**. The **HTTP** tab lets you configure the transport security, the **WS-Security** tab handles the message-level security, and the **WS-Addressing** tab sets the addressing version.

For user interface details, see "Security Settings View" on page 75.

Transport Level Security

The transport level security includes the authentication and proxy server information. You can also specify Keep Alive preferences and connection timeout. For user interface details, see "Security Settings View" on page 75.

Message Level Security

The **WS-Security** tab lets you set the message level security through tokens, signatures and encryption.

To support WS-Security, Service Test enables you to create security tokens for your script. You can create multiple tokens and set their properties. After creating a token, you use it to sign or encrypt a SOAP message.

The Web Services security mechanism associates security tokens with messages. This mechanism supports several security token formats to accommodate a variety of authentication requirements. For example, a client might need to provide a proof of identity or a security certificate.

The available tokens are: **UserName**, **X509 Certificate**, **Kerberos**, **Kerberos2,** and **SAML**.

- **UserName.** The **User Name** token contains user identification information for the purpose of authentication: **User Name** and **Password**. You can also specify Password Options, indicating how to send the password to the server for authentication: **Text**, **None**, or **Hash**. and indicate whether to include a timestamp.
- **X509 Certificate.** This token is based on an X.509 certificate. To obtain a certificate, you can either purchase it from a certificate authority, such as VeriSign, Inc. or set up your own certificate service to issue a certificate. Most Windows servers support the public key infrastructure (PKI), which enables you to create certificates. You can then have it signed by a certificate authority or use an unsigned certificate.
- **Kerberos /Kerberos2.** (For Windows 2003 or XP SP1 and later) The Kerberos protocol is used to mutually authenticate users and services on an open and unsecured network. Using shared secret keys, it encrypts and signs user credentials. A third party, known as a KDC (Kerberos Key Distribution Center), authenticates the credentials. After authentication, the user may request a service ticket to access one or more services on the network. The ticket includes the encrypted, authenticated identity of the user. The tickets are obtained using the current user’s credentials.

  The primary difference between the Kerberos and Kerberos2 tokens, is that Kerberos2 uses the Security Support Provider Interface (SSPI), so it does not require elevated privileges to impersonate the client's identity. In addition, the Kerberos2 security token can be used to secure SOAP messages sent to a Web Service running in a Web farm.
- **SAML Token.** SAML is an XML standard for exchanging security-related information, called assertions, between business partners over the Internet. The assertions can include attribute statements, authentication, decision statements, and authorization decision statements.

SAML uses brokered authentication with a security token issued by STS (Security Token Service). The STS is trusted by the client and the Web Service to provide interoperable security tokens. SAML tokens are important for Web Service security because they provide cross-platform interoperability and a means of exchanging information between clients and services that do not reside within a single security domain.

Message Signatures and Encrypted Data

When you add a security token to a SOAP message, it is added to the SOAP message in the form of an XML element in the WS-Security SOAP header.

The message, however, is exposed and therefore requires additional security. This is especially true when the credentials, including the password, are sent in plain text as it is with role-based security.

The two methods used to secure the data are message signatures and message encryption.

- **Message Signatures.** Message Signatures are used by the recipients to verify that messages were not altered since their signing. The signature is in the form of XML within the SOAP message. The recipient checks the signature to make sure it is valid.
- **Message Encryption.** Although the XML message signature offers a mechanism for verifying that the message has not been altered since it was signed, it does not encrypt the SOAP message—the message is still plain text in XML format. To secure the message in order that it should not be exposed, you encrypt it, making it difficult for an intruder to view and obtain a user's password.

For task details, see "How to Set Security for a Specific Web Service Operation" on page 286.

WCF Scenario Settings

This section describes the WCF security scenarios. It includes:

- "WCF Service (CustomBinding) Scenario Overview" on page 279
- "WCF Service (Federation) Scenario Overview" on page 280
- "WCF Services (WSHttpBinding) Scenario Overview" on page 281

WCF Service (CustomBinding) Scenario Overview

The **WCF Service (CustomBinding)** scenario enables the highest degree of customization. Since it is based upon WCF customBinding standard, it enables you to test most WCF services, along with services on other platforms such as Java-based services that use the WS **-** <*spec_name*> specifications.

Use the **WCF Service (CustomBinding)** scenario to configure a scenario that does not comply with any of the predefined security scenarios. You can customize the transport and encoding settings:

- **Transport.** HTTP, HTTPS, TCP, or NamedPipe
- **Encoding.** Text, MTOM, or WCF Binary

You can also provide additional security information:

- **Authentication mode.** The type of authentication, such as **None**, **AnonymousForCertificate**, and so forth. The options are available from the drop down list.
- **Bootstrap policy.** For the **SecureConversation** authentication mode, you can specify a bootstrap policy.
- **Net security.** The network security for **TCP** and **Named Pipe** type transports. Typical values are **None**, **Windows stream security**, or **SSL stream security** available from the field's drop down list. For services with HTTP transport, you should set the value to **None**. To enable SSL for HTTP, select **HTTPS transport**.

For task details, see "How to Set Security for a WCF Service" on page 289.

For user interface details, see "WCF Service (Federation) Scenario" on page 315.

Note: For WSE3 security configurations, use the **WCF Service (CustomBinding)** Scenario. For details, see "How do I test a WCF service?" on page 296.

WCF Service (Federation) Scenario Overview

In the **WCF Service (Federation)** scenario, the client authenticates against the STS (Security Token Service) to obtain a token. The client uses the token to authenticate against the application server.

Therefore, two bindings are needed, one against the STS and another against the application server.

You define the bindings in two stages:

- Define an STS binding in the **Referenced binding** field.
- Provide security details for the application server's security scenario in the following areas:
  - **Server.** The transport and encoding methods.
  - **Security.** The authentication mode, such as IssuedToken, SecureConversation, and so forth.
  - **Identity.** Information about the server certificate and expected DNS.
  - **STS.** Settings related to the STS, such as the endpoint address and binding.

For task details, see "How to Set Security for a WCF Service" on page 289.

For user interface details, see "WCF Service (Federation) Scenario" on page 315.

WCF Services (WSHttpBinding) Scenario Overview

Note: The **WCF Service (WSHttpBinding)** scenario only supports the testing of WCF services which utilize *wsHttpBinding* and incorporate some level of security. To test WCF services that use *wsHttpBinding* but have no security, use the **WCF Service (CustomBinding)** scenario.

In the **WCF Service (WSHttpBinding)** scenario, you can select from several types of authentication: None, Windows, Certificate, or Username (message protection).

For all of the authentication types, you can apply advanced settings as described in "Advanced Security Settings" on page 283.

For user interface details, see "WCF Service (WSHttpBinding) Scenario" on page 317.

No Authentication (Anonymous)

In this scenario, the client uses the server's certificate to encrypt a message; there is no client authentication. Use this scenario to test Web Services where the:

- Client uses the server’s X.509 certificate for encryption
- Client is not authenticated
- Communication may utilize advanced standards such as secure conversation or MTOM.

Windows Authentication

This scenario uses Windows Authentication. If you are testing a WCF service that has not been customized and uses the default configuration, use this type of scenario.

Use this scenario to test Web Services where the:

- Client and server use Windows authentication
- Security is based on Kerberos or SPNEGO negotiations
- Communication may utilize advanced standards such as secure conversation or MTOM.

Certificate Authentication

In this **WCF WSHttpBinding** scenario, the client uses the server's X.509 certificate to encrypt the message and its own certificate for a signature.

Use this scenario to test Web Services where the:

- Client uses the server's X.509 certificate for encryption.
- Client uses its own X.509 certificate for signatures.
- Communication may utilize advanced standards such as secure conversation or MTOM.

Username Authentication (Message Protection)

In the **WCF WSHttpBinding** scenario, the client uses the server's X.509 certificate to encrypt the message, and sends a user name and password to authenticate itself.

Use this scenario to test Web Services where the:

- Client uses the server's X.509 certificate for encryption.
- Client is authenticated with a username and password.
- Communication may utilize advanced standards such as secure conversation or MTOM.

Advanced Security Settings

This scenario’s settings let you customize a **WCF Service (CustomBinding)** scenario in the areas of **Encoding**, **Advanced Standards**, **Security**, or **HTTP and Proxy**.

Not all settings are relevant for all scenarios, so some of them might be disabled or hidden depending on the scenario.

For details, see the "Advanced Settings Dialog Box" on page 321.

Tasks

How to Set Security for a Web Service on the Port Level

This task describes how to configure security settings for a Web service on the port level. You can override this by modifying the settings for a specific test step. For details, see "How to Set Security for a Specific Web Service Operation" on page 286.

This task includes the following steps:

- "Prerequisites" on page 285
- "Open the Security Setting dialog box" on page 285
- "Load existing settings - optional" on page 285
- "Create a new security scenario" on page 285
- "Save the settings - optional" on page 285

1 Prerequisites

Import at least one Web service.

2 Open the Security Setting dialog box

Select a Web service's port node in the toolbox and select **Security Settings** from the shortcut menu. Select a Web service in the Application Components tree and click the **Interaction** tab. Click the **Security** toolbar button.

3 Load existing settings - optional

To load an existing set of Service Test security settings, click **Import** and locate the **.stss** (Service Test Security Scenario) file.

4 Create a new security scenario

Use the Security Settings dialog box to create a new security scenario or modify a loaded one:

a In the Service Details box, select a scenario type: Web Service, WCF Service, and so forth.

b Configure the security settings for the selected scenario. For details, see the "Security Settings for Port <Port_Name> Dialog Box" on page 305.

c For Web Service type scenarios, add tokens, signatures, and encryption. For details, see "Web Service Scenario" on page 307.

5 Save the settings - optional

Click **Save** to save the settings to an **.stss** file.

How to Set Security for a Specific Web Service Operation

This task describes how to configure security settings for Web Services.

This task includes the following steps:

- "Prerequisites" on page 286
- "Open the Security Setting view" on page 286
- "Enable the Service Settings details" on page 286
- "Specify a scenario type" on page 286

1 Prerequisites

Import a Web Service and drag an operation into the canvas.

2 Open the Security Setting view

Open the **Security Setting** view 🔒 in the Property Sheet.Select a Web service in the Application Components tree and click the **Interaction** tab. Expand the port in the bottom pane, and select an operation. Click the **Web Service Call** button. In the Web Service Call window, click the **Security** button.

3 Enable the Service Settings details

Clear the **Use the port's security settings** option.

4 Specify a scenario type

In the **Service Details** list, select a scenario type: Web Service, WCF Service, and so forth.

5 Configure the security settings

Configure the security settings for the selected scenario. For task details, see one of the following sections

- "How to Set Security for a Standard Web Service" on page 287
- "How to Set Security for a WCF Service" on page 289

For user interface information, see the "Security Settings for Port <Port_Name> Dialog Box" on page 305.

How to Set Security for a Standard Web Service

This task describes how to configure security settings for a standard Web Service. This mode lets you define the HTTP transport information and security elements such as tokens. For UI details, see "Web Service Scenario" on page 307.

This task includes the following steps:

- "Create a Web Service scenario" on page 288
- "Configure the HTTP settings" on page 288
- "Define security elements (optional)" on page 288
- "Set the WS-Addressing version (optional)" on page 289

1 Create a Web Service scenario

Open the Service Settings dialog box or the **Security Settings** view in the Property Sheet and select **Web Service** In the **Service Details** list (default). For details, see the "Security Settings for Port <Port_Name> Dialog Box" on page 305.

2 Configure the HTTP settings

Open the **HTTP** tab, and set the transport and proxy information. For details, see the "HTTP tab" on page 307.

3 Define security elements (optional)

Click the **WS-Security** tab. Add tokens, message signatures, and encryption.

- To add a token, click and select a token type. Provide the token details in the lower pane. The fields differ based on the token type. For details, see "Message Level Security" on page 276.

Note: When adding a SAML token, if you have the complete SAML token string, you can paste it directly into the **AssertionIDReference** field. If you do not have the complete token string and you want to configure the token manually, make sure that the first row in the schema contains the **Assertion** property—not the **AssertionIDReference**. You can change this using the grid's drop down menu.

- To add a message signature, (you must first add at least one token), click and select a token in the **Signing token** box, usually an X.509 token. Provide the other required information: For details, see the "WS-Security tab" on page 308
- To add a message encryption, (you must first add at least one token), click and select the token that will do the encryption in the **Encryption token** box. Provide any other required information or accept the defaults.

- Organize the security elements in their order of priority. Use the **Up** ↑ and **Down** ↓ arrows to set the priorities. The basic order is tokens, followed by message signatures, and then encryption. In addition, your service may also require a specific order for the tokens.

4 Set the WS-Addressing version (optional)

Click the **WS-Addressing** tab. Select the relevant version or None if WS-Addressing is not used.

For details about the security elements. see the "Web Service Security Scenario" on page 276.

For user interface details see the "Security Settings for Port <Port_Name> Dialog Box" on page 305.

How to Set Security for a WCF Service

This task describes how to configure security settings for a Web Service using WCF. For guidelines about selecting a WCF service scenario, see "WCF Scenario Settings" on page 279.

This task includes the following steps:

- "Create a WCF scenario" on page 289
- "Configure the security settings" on page 290
- "Configure advanced settings - optional" on page 290
- "Save the scenario - optional" on page 290

1 Create a WCF scenario

- For port level security, click on the service's port in the Toolbox and and select **Security Settings** from the shortcut menu.
- For step level security, open the **Security Settings** view in the Property Sheet. Clear the **Use the port's security settings** option.

Select the desired **WCF Service** in the **Service Details** list.

2 Configure the security settings

Configure the settings as described in the "Security Settings for Port <Port_Name> Dialog Box" on page 305.

3 Configure advanced settings - optional

Click the **Advanced** button to configure advanced security settings. For details, see the "Advanced Settings Dialog Box" on page 321.

4 Save the scenario - optional

Your security scenario is automatically saved with the test. If, however, you also want to use the settings for another test, without having to redefine the scenario, you can save it to an **.stss** file.

To save the scenario, click the **Save** button. Specify a location for the scenario file. To use the file in another test, click **Import**.

How to Set up Common Web Services Security Scenarios

This section illustrates several common security scenarios. The examples apply when using the default Web Service security scenario. For WCF- based services, the **WCF Service (Custom Binding)** scenario is recommended. For additional examples, see "How to Customize Security for WCF Type Web Services" on page 296.

You can set security for all operations in a Web service port or for a specific step in your test.

To set security for a port, see "How to Set Security for a Specific Web Service Operation" on page 286.

This section includes the following:

- "Authenticating with a Username Token" on page 291
- "Signing with an X.509 Certificate" on page 291
- "Signing a Specific Element with an X.509 Certificate" on page 292
- "Encrypting with a Certificate" on page 292
- "Authenticating with a Username Token and Encrypting with an X.509 Certificate" on page 293
- "Encrypting and Signing a Message" on page 294
- "Removing a TimeStamp" on page 295

Authenticating with a Username Token

To send a message level username/password token (a UserName token):

1. Select the **Web Service** scenario from the **Service Details** list, and click the **WS-Security** tab.
2. Click the **Add Token** button and add a **Username** token.
3. Customize the token details, such as username and password.

Signing with an X.509 Certificate

To send a message using a X.509 certificate for a digital signature.

1. Select the **Web Service** scenario from the **Service Details** list, and click the **WS-Security** tab.
2. Select **X509 Certificate** token from the **Security Token** drop down list.
3. Fill in the token details to reference your private certificate. Make sure to enter a value in the **Token name** field.
4. Select a **Reference type**. Since this token is used for a signature, the most common type is BinarySecurityToken.
5. Click the **Add Message Signature** button. In the **Signing Token** drop down, select the token you created in the previous steps.

Note: The certificate needs to be installed in the Windows certificate store. In the example above, you need to set the actual store name, store location, and subject name of your certificate.

Signing a Specific Element with an X.509 Certificate

It is possible to sign only a specific element in a message. The following example signs a specific element using an XPATH expression.

To send a message using an X.509 certificate for a digital signature:

1. Select the **Web Service** scenario from the **Service Details** list, and click the **WS-Security** tab.
2. Select **X509 Certificate** token from the **Security Token** drop down list.
3. Fill the token details to reference your private certificate. Make sure to enter a value in the **Token name** field.
4. Select a **Reference type**. Since this token is used for a signature, the most common type is BinarySecurityToken.
5. Click the **Add Message Signature** button. In the **Signing Token** drop down, select the token you created in the previous steps.
6. Scroll down to the **XPath** field. Enter an XPath expression, for example:, // *[local-name(.)='Body'].

Encrypting with a Certificate

To encrypt a message using the service's X.509 certificate:

1. Select the **Web Service** scenario from the **Service Details** list, and click the **WS-Security** tab.
2. Select **X509 Certificate** token from the **Security Token** drop down list.
3. Fill in the token details to reference the server's public certificate. Make sure to enter a value in the **Token name** field.

4. Since this token is used for encryption, use Reference as the **Reference type**.
5. Click the **Add Message Encryption** button. In the drop down list, select the token you created in the previous steps.
6. Scroll down to the **XPath** field. Enter an XPath expression, for example:, // *[local-name(.)='Body'].

Authenticating with a Username Token and Encrypting with an X.509 Certificate

The following section describes how to send a **Username** token to the service and encrypt it with the server's **X.509** certificate:

1. Select the **Web Service** scenario from the **Service Details** list, and click the **WS-Security** tab.
2. Select **Username Token** from the **Security Token** drop down list. Provide the token details.
3. Select **X509 Certificate Token** from the **Security Token** drop down list.
4. Fill the token details to reference the server's public certificate. Make sure to enter a value in the **Token name** field. Since this token is used for encryption, use Reference as the **Reference type**.
5. Click the **Add Message Encryption** button. In the drop down list, select the X.509 token you created in Step 3.
6. To encrypt a specific message, scroll down to the **XPath** field. Enter an XPath expression, for example:, // *[local-name(.)='Body'].

Encrypting and Signing a Message

This example shows how to sign a message using a private key and then encrypt it using the service's public key.

1 Select the **Web Service** scenario from the **Service Details** list, and click the **WS-Security** tab.

2 Select **X509 Certificate Token** from the **Security Token** drop down list. Fill the token details to reference your private certificate. Make sure to enter a value in the **Token name** field. Select BinarySecurityToken as a **Reference type**, since this token is used for a signature.

3 Select **X509 Certificate Token** from the **Security Token** drop down list to add another X.509 token. Fill the token details to reference your private certificate. Make sure to enter a value in the **Token name** field. Select Reference as a **Reference type**, since this token is used for a encryption.

4 Click the **Add Message Signature** button. In the drop down list, select the X.509 token you created in Step 2.

5 Click the **Add Message Encryption** button. In the drop down list, select the token you created in Step 3.

Removing a TimeStamp

To remove the timestamp element from a request:

1. Add a default handler for the **AfterProcessRequestSecurity** event,.
2. Add the following code:

```
public void StServiceCallActivity4_OnAfterProcessRequestSecurity(object sender,
HP.ST.Ext.WebServicesActivities.ActivityProcessXmlMessageEventArgs args)
    {
        var securityNode = args.Message.SelectSingleNode(@"/
            *[local-name(.)='Envelope'][1]/*[local-name(.)='Header'][1]/
            *[local-name(.)='Security'][1]");
        var timeStamp = args.Message.SelectSingleNode(@"/
            *[local-name(.)='Envelope'][1]/*[local-name(.)='Header'][1]/
            *[local-name(.)='Security'][1]/*[local-name(.)='Timestamp'][1]");

        if (securityNode != null && timeStamp != null)
          securityNode.RemoveChild(timeStamp);
    }
```

Note: This code does not affect the **Timestamp format** property of the Username token. It only removes the timestamp from the SOAP header.

How to Customize Security for WCF Type Web Services

This section describes how to customize the security settings for Web services using WCF.

This section describes:

- "How do I test a WCF service?" on page 296
- "How do I test a WCF service that uses WSHttpBinding?" on page 296
- "How do I test a WCF service that uses CustomBinding?" on page 297
- "How do I test a WCF service that uses netTcp or namedPipe transport?" on page 297
- "How do I test a Federation scenario that uses an STS (Security Token Service)?" on page 297
- "How do I test a scenario that uses a WSE3 security configuration with a server certificate?" on page 298
- "How do I test a scenario that uses mutual certificate authentication?" on page 299
- "How do I configure a WCF binding with TCP transport to require an X.509 client certificate?" on page 299

How do I test a WCF service?

In the **Service Details** list, select a WCF scenario.

If the Federation or WSHttpBinding scenarios are not appropriate, select the **WCF Service** (C**ustom Binding)** scenario, as it can handle all other bindings.

How do I test a WCF service that uses WSHttpBinding?

WSHttpBinding is one of the most popular bindings in WCF. In order to use this binding, select the **WCF Service (Http Binding)** scenario from the **Scenario Details** list.

In the Client Authentication box, select the client credential type that you use in your binding—Windows, Certificate, or Username. This value corresponds to the **MessageClientCredentialType** property of the WCF's WSHttpBinding.

Windows authentication is the most common value for a WCF services. If you are using the WCF default settings for your service, use this option. Other options are username, certificate, or none.

For some scenarios you should indicate whether to use the WCF proprietary negotiation mechanism to get the service credentials.

Use the Advanced scenario properties to control the usage of a secure session.

For details, see "WCF Services (WSHttpBinding) Scenario Overview" on page 281.

How do I test a WCF service that uses CustomBinding?

Open the **Security View** in the Property Sheet and select the **WCF Service** (C**ustom Binding)** scenario.

You can then customize many binding elements, such as your transport method, encoding, security, and reliable messaging.

For details, see "Configure the security settings" on page 290.

How do I test a WCF service that uses netTcp or namedPipe transport?

Select the **WCF Service (**C**ustom Binding)** scenario from the **Scenario Details** list.

Configure the transport to **TCP** or **NamedPipe**.

For details, see "Configure the security settings" on page 290.

How do I test a Federation scenario that uses an STS (Security Token Service)?

For this scenario, you must define the communication properties for both the STS and the service. Use the built-in Federation scenario.

Select the **WCF Service (Federation)** scenario from the **Scenario Details** list.

For this scenario, you must to define the communication properties for both the STS and the application server.

For details, see "WCF Service (Federation) Scenario" on page 315.

How do I test a scenario that uses a WSE3 security configuration with a server certificate?

The following procedure describes how to set up a security scenario for WSE3.

1. Create a new test, import the WSDL for the W3ES service, and drag the operation into the canvas.
2. Open the **Security View** in the Property Sheet or from the port's shortcut menu. Select the **WCF Service** (C**ustom Binding)** scenario.
3. Set the Transport to **HTTP**, and the Encoding to **Text**.
4. Provide a username and password in the **Identities** section.
5. Click the **Browse** button adjacent to the Server Certificate field and specify the **Store Location**, **Store Name** and **Search text** (optional). Click **Find**, select the certificate, and click **Select**.
6. Provide the **Expected DNS**.
7. Click the **Advanced** button and configure the following settings:
   - a **Encoding** tab— Encoding: Text, WS-Addressing: WSA 04/08 (for example).
   - b **Security** tab:
     - ➤ **Enable secure session:** Enabled
     - ➤ **Negotiate service credentials:** Enabled
     - ➤ **Protection level:** Encrypt and Sign
     - ➤ **Message protection order:** Sign Before Encrypt
     - ➤ **Message security version:** WSSecurity11WSTrustFebruary2005WSSecureConversationFebruary2005 (first entry)
     - ➤ **Require Derived keys**: Enabled

For all other fields, use the default settings.

For details, see "Configure the security settings" on page 290.

How do I test a scenario that uses mutual certificate authentication?

The following procedure describes how to set up a security scenario for mutual certificates and how to comply with a WSE3 security configuration.

1. Select the **WCF Service (CustomBinding)** scenario from the **Scenario Details** list.
2. Set the **Transport** to HTTP, and the **Encoding** to Text.
3. Set the authentication mode to MutualCertificate.
4. In the **Identities** section, select server and client certificates. For details, see "Select Certificate Dialog Box" on page 327.
5. Provide the **Expected DNS**.
6. Click the Advanced button and configure the following settings:
   a. **Encoding** tab— **Encoding**: Text, **WS-Addressing**: WSA 04/08 (for a WSE3 security configuration).
   b. **Security** tab—**Require Derived keys**: Disabled

For all other fields, use the default settings.

For details, see "Configure the security settings" on page 290.

How do I configure a WCF binding with TCP transport to require an X.509 client certificate?

The following procedure describes how to configure a WCF custom scenario to require an X.509 client certificate in **nettcp.**

1. Select the **WCF Service (Custom Binding)** scenario from the **Scenario Details** list.
2. Set the Transport to **TCP** and the Net Security to **SSL stream security**.
3. Open the Property Sheet’s Event view.

4. Select the **BeforeApplyProtocolSettings** event. Click in the **Handler** column and select **Create a default handler** from the drop-down. Service Test opens the **TestUserCode.cs** tab.

5. In the **TestUserCode.cs** file, add a reference to the following assembly "<*Installation_Folder*>\addins\ServiceTest\WSImportTechnology\HP.ST.Ext.CommunicationChannels.dll".

6. Add the following definitions to the implementation section of the **TestUserCode.cs** file.

```
var wcf = (HP.ST.Ext.CommunicationChannels.Models.WcfChannelBinding)args[1];
var ssl =
  (HP.ST.Ext.CommunicationChannels.Models.WcfSslStreamSecurityChannel)wcf.
    Protocols.Channels[1];
ssl.RequireClientCertificate = true;
```

   For all other fields, use the default settings.

7. Save the test and run it.

How to Test Web Services that use WS-Security or SSL

This section provides a summary of using Service Test for general security testing.

This section includes:

- "How do I test a Web Service that uses SSL?" on page 301
- "How do I test a Web Service that requires Windows authentication at the HTTP level?" on page 301
- "How do I test a Web Service that uses WS-Security?" on page 302
- "How do I configure the low-level details of my WS-Security tokens?" on page 302

How do I test a Web Service that uses SSL?

Testing a secure site does not require any special configuration. If your service URL begins with **https**, SSL is automatically used.

If in addition to SSL you are using message-level security (for example a username) then you must configure the security for the message separately.

You can use the basic Web Services security scenario and specify the message-level security such as tokens and signatures.

You can also use the **WCF Service** (C**ustom Binding)** scenario, or the **WCF Service (Http Binding)** scenario with the transport credentials.

How do I test a Web Service that requires Windows authentication at the HTTP level?

1 Select the **Web Service** scenario from the **Scenario Details** list.

2 In the **HTTP** tab, specify the credentials.

For details, see "How to Set Security for a Standard Web Service" on page 287.

How do I test a Web Service that uses WS-Security?

Use the basic **Web Services** security scenario and open the **WS-Security** tab. Add the message-level security such as tokens, signatures, and encryption.

How do I configure the low-level details of my WS-Security tokens?

In most cases, you can configure the low-level details as described in "Advanced Settings Dialog Box" on page 321.

How to Set up Advanced Standards Testing

This section provides guidelines for using Service Test in advanced standards testing.

This section includes:

- "How do I test a Web Service that uses MTOM?" on page 302
- "How do I change the WS-Addressing version of a service?" on page 303
- "How do I enable support for a service or activity that uses 256-bit SSL encoding?" on page 303

How do I test a Web Service that uses MTOM?

1. Select the **WCF Service (Custom Binding)** scenario from the **Scenario Details** list.
2. Configure the **Encoding** to **MTOM**.

If your service requires advanced settings, click the **Advanced** button. For details, see the "Advanced Settings Dialog Box" on page 321.

For more information about the scenario, see "Configure the security settings" on page 290.

How do I change the WS-Addressing version of a service?

1 Select the **Web Service** scenario from the **Scenario Details** list.

2 Click the **WS-Addressing** tab and select a version.

For details, see "How to Set Security for a Web Service on the Port Level" on page 284.

If your service uses WCF, use the appropriate scenario and configure the addressing version from the Advanced window's **Encoding** tab. For details, see the "Advanced Settings Dialog Box" on page 321.

How do I enable support for a service or activity that uses 256-bit SSL encoding?

Change the SSL cipher order in Windows Vista so that AES256 precedes AES128 in the cipher list.

Tip: Check with an IT professional before performing the following actions.

To change the cipher order:

1 Type **gpedit.msc** at a command prompt to open your group policy editor.

2 Choose **Computer Configuration** > **Administrative Templates** > **Network** > **SSL Configuration Settings**.

3 Open the only item—**SSL Cipher Suite Order**.

4 Select **Enabled**.

5 The first item in the list is TLS_RSA_WITH_AES_128_CBC_SHA

And the second item is TLS_RSA_WITH_AES_256_CBC_SHA

6 Change the first 128 to 256. Then move the cursor forward and change the 256 to 128.

7 Move the cursor through the list and change the cipher priorities as in the above step.

8 Close the group policy editor and reboot.

Reference

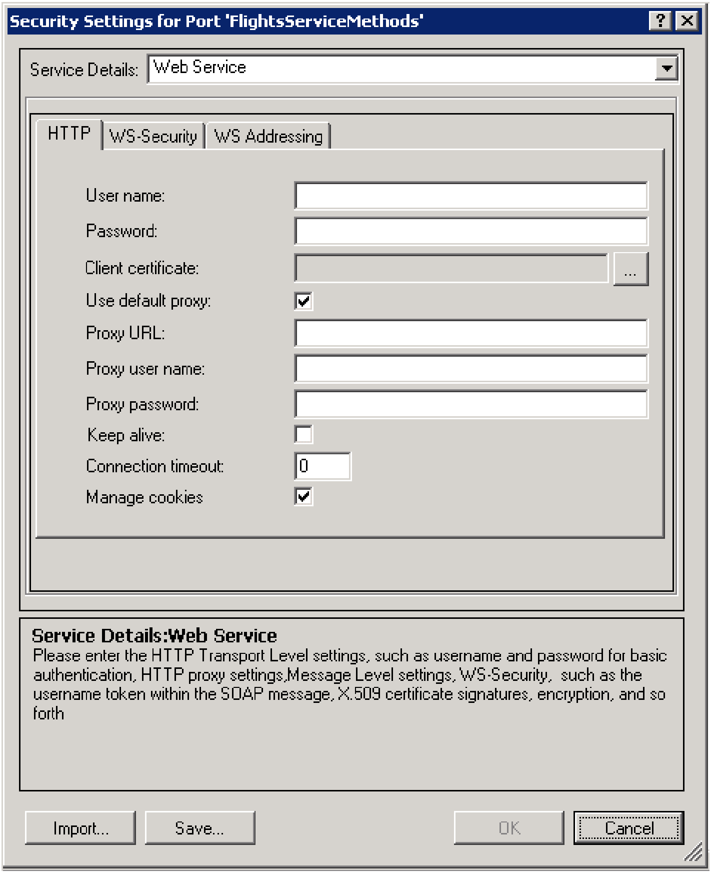
Security User Interface

This section includes:

- Security Settings for Port <Port_Name> Dialog Box on page 305
- Advanced Settings Dialog Box on page 321
- Select Certificate Dialog Box on page 327

Security Settings for Port <Port_Name> Dialog Box

Using the Security Settings dialog box, you can configure security settings for all operations in a Web service port. To set the security for a specific step within your test, use the **Security Settings** view in the Property Sheet. For details, see "Security Settings View" on page 75.



Service Details: Web Service

User name:

Password:

Client certificate:

Use default proxy: ☑

Proxy URL:

Proxy user name:

Proxy password:

Keep alive: □

Connection timeout: 0

Manage cookies ☑

Service Details:Web Service
Please enter the HTTP Transport Level settings, such as username and password for basic authentication, HTTP proxy settings,Message Level settings, WS-Security, such as the username token within the SOAP message, X.509 certificate signatures, encryption, and so forth

To access	Select a Web Services port node in the Toolbox palette and select **Security Setting** from the shortcut menu.
Important information	➤ For details about choosing a security scenario type, see "Security Scenarios Overview" on page 275. ➤ For examples, see "How to Set up Common Web Services Security Scenarios" on page 290.
Relevant tasks	"How to Set Security for a Specific Web Service Operation" on page 286

User interface elements are described below:

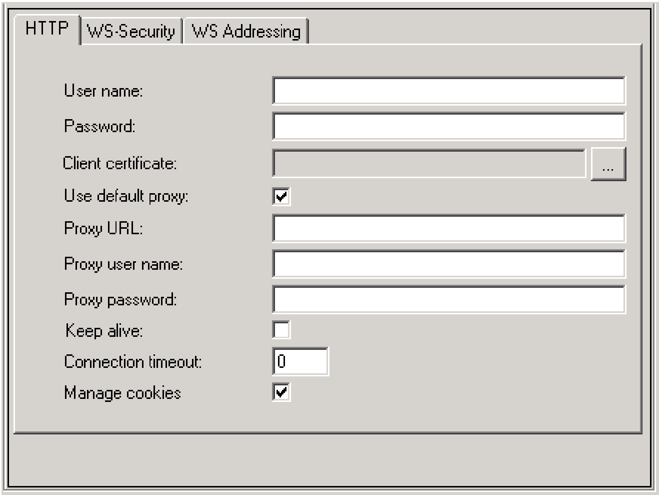
UI Elements (A-Z)	Description
Advanced	Opens the Advanced Settings dialog box. For details, see the "Advanced Settings Dialog Box" on page 321. **Note**: Available only for WCF type Web services.
Import	Loads security settings from a previously saved **.stss** file.
Save	Saves the security scenario settings to an **.stss** (Service Test Security Scenario) file, for use in other tests. If you are connected to ALM/QC, it saves the file together with the test.
Service Details	The type of Web service. After selecting a type, Service Test provides an interface for modifying the relevant security settings. The service types are: ➤ "Web Service Scenario" on page 307 ➤ "WCF Service (Custom Binding) Scenario" on page 313 ➤ "WCF Service (Federation) Scenario" on page 315 ➤ "WCF Service (WSHttpBinding) Scenario" on page 317

Web Service Scenario

The simple Web Service scenario provides the **HTTP**, **WS-Security**, and **WS-Addressing** tabs.

HTTP tab

The **HTTP** tab lets you provide the HTTP transport level settings such as user credentials for sending a message with basic authentication, proxy settings, message-level settings, encryption, and so forth.



User name:
Password:
Client certificate:
Use default proxy: ☑
Proxy URL:
Proxy user name:
Proxy password:
Keep alive: □
Connection timeout: 0
Manage cookies ☑

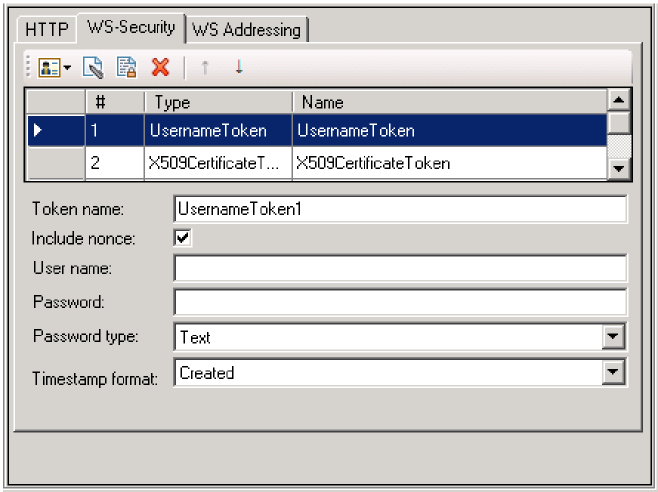
The user interface elements are described below.

UI Elements (A-Z)	Description
Client certificate	The client credentials required for client certificate authentication when using two-way SSL scenarios. The **Browse** button opens the "Select Certificate Dialog Box" on page 327.
Connection timeout	The time threshold in which to connect through the proxy server or with authentication.
Keep alive	Keeps the connection persistent.

UI Elements (A-Z)	Description
Manage cookies	Enables the writing of cookie information.
Proxy URL	The URL and port of the proxy server through which the message must pass. For example, http://myProxy:8888/. To use the default, select **Use default proxy**.
Proxy user name, Proxy password	The credentials for the proxy server through which the message must pass.
User name, Password	The credentials for HTTP authentication such as basic authentication, digest, or NTLM. For example, **User name**: myDomain\myUser **Password**: myPassword

WS-Security tab

The **WS-Security** tab provides an interface to add message level security using tokens, message signatures, and encryption.



#	Type	Name
1	UsernameToken	UsernameToken
2	X509CertificateT...	X509CertificateToken

Token name: UsernameToken1

Include nonce: ☑

User name:

Password:

Password type: Text

Timestamp format: Created

The user interface elements are described below. (Unlabeled elements are shown in angle brackets).

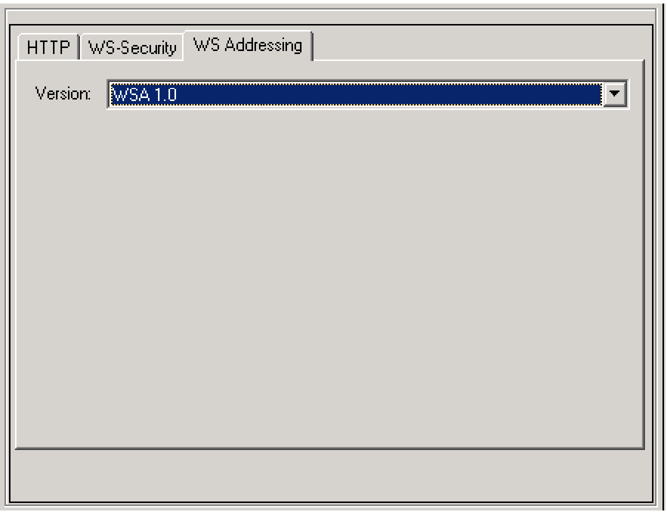
UI Elements (A-Z)	Description
🪪▾	**Security Tokens.** Enables you to add one of the following tokens: **User Name**, **X509**, **Kerberos**, **Kerberos2**, or **SAML**.
✎	**Add Message Signature.** Adds a signature to the message. This requires a token.
🔒	**Add Message Encryption.** Adds encryption to the message. This requires a token.
✗	**Delete.** Removes the security element from the list.
↑ ↓	**Up/Down.** Positioning tools that allow you to set the priority of the security elements. **Important:** Make sure the security elements are positioned in order of their priority.
<Encryption details pane>	The details of the encryption token. ➤ **Encrypting token.** The token to use for encryption, usually an X.509 type. You can select from a list of all previously created tokens. ➤ **Encrypting type.** Indicates whether to encrypt the whole destination Element or only its Content. ➤ **Key algorithm.** The algorithm to use for the encryption of the session key: RSA15 or RSAOAEP. ➤ **Session algorithm.** The algorithm to use for the encryption of the SOAP message. You can select from a list of common values. ➤ **XPath (optional).** An XPath that indicates the parts of the message to encrypt. If left blank, only the SOAP body is encrypted. ➤ **Token (optional).** The name of the encrypted token. A drop down box provides a list of all added tokens. With most services, this field should be left empty.
<security element list>	A list of the tokens, message signatures, and encryptions.

UI Elements (A-Z)	Description
<Signature details pane>	The details of the digital signature used to secure the token. ➤ **Signing token.** The token to use for signing, usually an X.509 type. Select from the list of all added tokens. ➤ **Canonicalization algorithm.** A URL for the algorithm to use for canonicalization. A drop down list provides common algorithms. If you are unsure which value to use, keep the default. ➤ **Transform algorithm.** A URL for the Transform algorithm to apply to the message signature. A drop down list provides common algorithms. If you are unsure which value to use, keep the default. ➤ **Inclusive namespaces list.** A list of comma-separated prefixes to be treated as inclusive (optional). ➤ **What to sign.** The SOAP elements to sign: SOAP Body, Timestamp, and WS-Addressing. ➤ **XPath (optional).** An XPath that specifies which parts in the message to sign. If left blank, the elements selected in the **Signature options** field are signed. For example, //*[local-name(.)='Body']. ➤ **Token (optional).** The target token you want to sign. Select from the drop down list of all added tokens. With most services, this field should be left empty.
<Token details pane> - Kerberos tokens	Token details for **Kerberos** tokens: ➤ **Token Name.** A meaningful name for the token. ➤ **Host**. The host name of the server against which you want to authenticate. In most cases, it is the host portion of the service URL. ➤ **Domain.** The Windows domain of the server against which you want to authenticate.

UI Elements (A-Z)	**Description**
<Token details pane> - Username tokens	Token details for **Username** tokens. ➤ **Token name.** A meaningful name for the token (you can use the default value). ➤ **Include nonce**. Includes a nonce in the token. ➤ **User name, Password** ➤ **Password type**: Text, Hash, or None. ➤ **Timestamp format:** Full, Created, or None.
<Token details pane> - X509 Certificate tokens	Token details for **X509 Certificate** tokens: ➤ **Token name.** A meaningful name for the token. ➤ **Certificate**. The path of the server certificate file. The **Browse** button opens the Select Certificate Dialog Box. ➤ **Reference type**: How the token should be referenced: BinarySecurity Token or Reference. When the certificate is used for encryption, for example, a service certificate, use Reference. When using it for a signature (for example, a certificate with your private key) select BinarySecurity Token.
<Token details pane> -SAML tokens	Token details for **SAML** tokens: ➤ **Load from file.** Enables you to browse to a SAML certificate. ➤ **Certificate**. The path of the certificate file. The **Browse** button opens the Select Certificate Dialog Box. ➤ **Certificate reference type.** How the certificate should be referenced— by X509 Data or RSA.

WS-Addressing tab

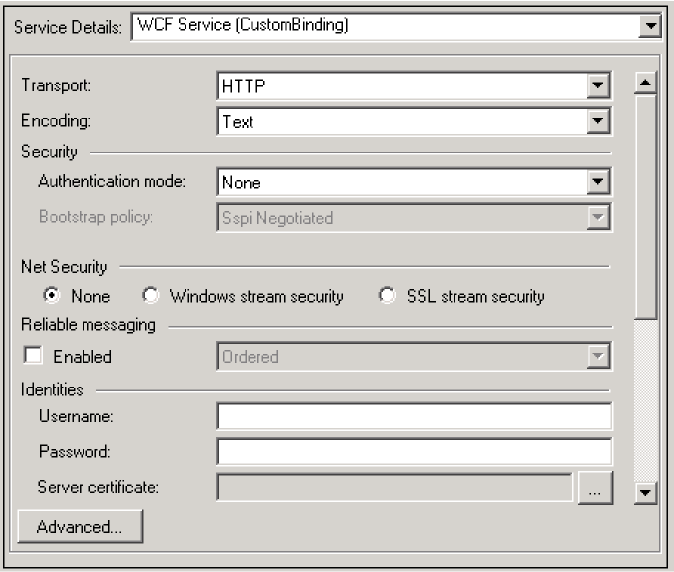
The **WS-Addressing** tab indicates whether WS-Addressing is used by the service, and if so, its version number.



Version: WSA 1.0

WCF Service (Custom Binding) Scenario

Use this scenario to test WCF services which require security or transport configurations. For general details, see "WCF Service (CustomBinding) Scenario Overview" on page 279.



Service Details: WCF Service (CustomBinding)

Transport: HTTP

Encoding: Text

Security

Authentication mode: None

Bootstrap policy: Sspi Negotiated

Net Security

● None ○ Windows stream security ○ SSL stream security

Reliable messaging

□ Enabled Ordered

Identities

Username:

Password:

Server certificate:

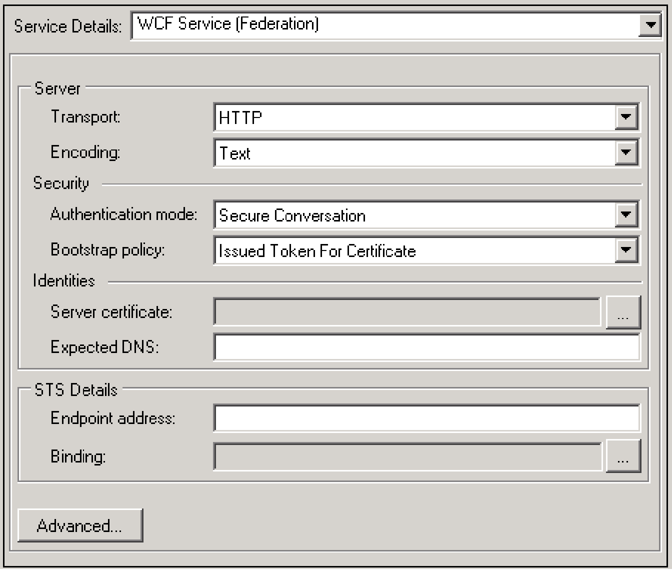
User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements (A-Z)	Description
Advanced	Opens the Advanced Settings dialog box. For details, see "Advanced Settings Dialog Box" on page 321.
Client Windows Identity	The identity information for the client windows: ➤ **Current User.** The identity of the user logged onto the machine. ➤ **Custom User.** A user with the following credentials: **Username**, **Password**, and **Domain.**
Encoding	**Encoding.** Text, MTOM, or WCF Binary

UI Elements (A-Z)	Description
Identities	The identity information for the bindings and certificate: ➤ **Username** and **Password** ➤ **Server /Client certificate.** A certificate that provides identity information for the server or client. Use the **Browse** button to open the Select Certificate Dialog Box. ➤ **Expected DNS**, **SPN**, and **UPN.** The expected identity of the server in terms of its DNS, SPN, or UPN. This can be localhost, an IP address, or a server name.
Net Security	The type of stream security: **None, Windows stream security**, or **SSL stream security.**
Reliable Messaging	Enables **Reliable Messaging** in Ordered or Non-ordered format.
Security	➤ **Authentication mode.** A drop down list of possible modes of authentication, such as AnonymousForCertificate, MutualCertificate, and so forth. ➤ **Bootstrap Policy.** A drop down list of possible bootstrap policies for Secure Conversation authentication., such as SspiNegotiated, UserNameOverTransport, and so forth.
Transport	**Transport type.** HTTP, HTTPS, TCP, NamedPipe, or AutoSecuredHTTP.

WCF Service (Federation) Scenario

In the **WCF Service (Federation)** scenario, the client authenticates against the STS (Security Token Service) to obtain a token. The client uses the token to authenticate against the application server.



Service Details: WCF Service (Federation)

Server

Transport: HTTP

Encoding: Text

Security

Authentication mode: Secure Conversation

Bootstrap policy: Issued Token For Certificate

Identities

Server certificate:

Expected DNS:

STS Details

Endpoint address:

Binding:

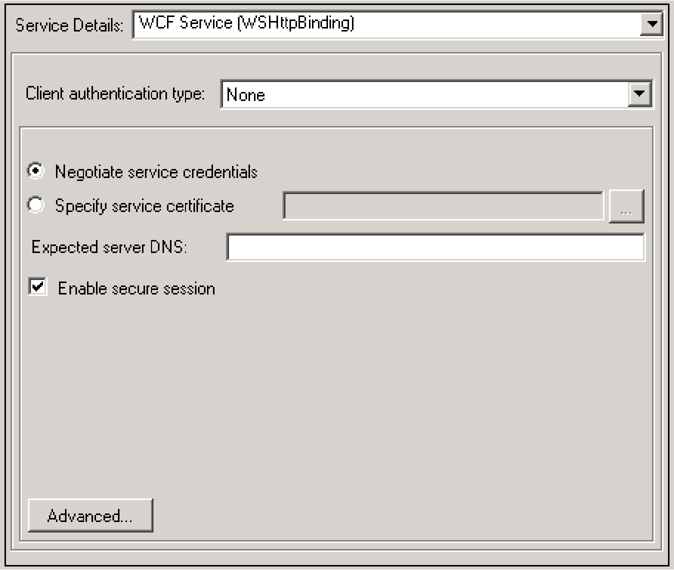
User interface elements are described below (unlabeled elements are shown in angle brackets). For details, see "WCF Service (Federation) Scenario Overview" on page 280.

UI Elements (A-Z)	Description
Advanced	Opens the Advanced Settings dialog box. For details, see "Advanced Settings Dialog Box" on page 321.
Identities	The identity information for the bindings and certificate: ➤ **Server certificate.** A certificate that provides identity information for the server. Use the **Browse** button to open the Select Certificate Dialog Box. ➤ **Expected DNS.** The expected identity of the server in terms of its DNS. This can be localhost, an IP address, or a server name.

UI Elements (A-Z)	Description
Security	➤ **Authentication mode.** A drop down list of possible modes of authentication, such as AnonymousForCertificate, MutualCertificate, and so forth. ➤ **Bootstrap Policy.** A drop down list of possible bootstrap policies for Secure Conversation authentication., such as SspiNegotiated, UserNameOverTransport, and so forth.
Server	➤ **Transport.** The transport type: HTTP or HTTPS. ➤ **Encoding.** The server's encoding policy: Text or MTOM.
STS (Security Token Service) Details	Information about the STS: ➤ **Endpoint address.** The endpoint address of the STS. This can be localhost, an IP address, or a server name. ➤ **Binding.** The scenario which references the binding that contacts the STS.

WCF Service (WSHttpBinding) Scenario

In the **WCF Service (WSHttpBinding)** scenario, you can select from several types of authentication: None, Windows, Certificate, or Username (message protection). For details, see "WCF Services (WSHttpBinding) Scenario Overview" on page 281.



Service Details: WCF Service (WSHttpBinding)

Client authentication type: None

● Negotiate service credentials

○ Specify service certificate

Expected server DNS:

☑ Enable secure session

User interface elements are described below (unlabeled elements are shown in angle brackets) by the client authentication types:

UI Elements (A-Z)	Description
Advanced	Opens the Advanced Settings dialog box. For details, see "Advanced Settings Dialog Box" on page 321.
Client authentication type	Authentication type: **None**, **Windows**, **Certificate**, or **Username**. For details, see below.

Client Authentication Types:

- "Client Authentication Type — None" on page 318
- "Client Authentication Type — Windows" on page 318
- "Client Authentication Type — Certificate" on page 319
- "Client Authentication Type — Username (message protection)" on page 320

Client Authentication Type — None

UI Elements (A-Z)	Description
Expected server DNS	The expected identity of the server in terms of its DNS. This can be **localhost**, an IP address, or a server name. It can also be the common name by which the certificate was issued.
Negotiate server credentials	Negotiates the Web Service's certificate with the server. You can also provide the server's DNS information.
Specify service certificate	The location of the service's certificate. If you select this option, the **Negotiate service credentials** option is not relevant. For more information, see the "Select Certificate Dialog Box" on page 327.

Client Authentication Type — Windows

UI Elements (A-Z)	Description
Client Windows identity	The identity information for the client windows: ➤ **Current User.** The identity of the user logged onto the machine ➤ **Custom User.** A user with the following credentials: **Username**, **Password**, and **Domain**

UI Elements (A-Z)	Description
Enable secure session	Enables a secure session using Windows type authentication.
Expected server identity	The expected server identity method: SPN or UPN.

Client Authentication Type — Certificate

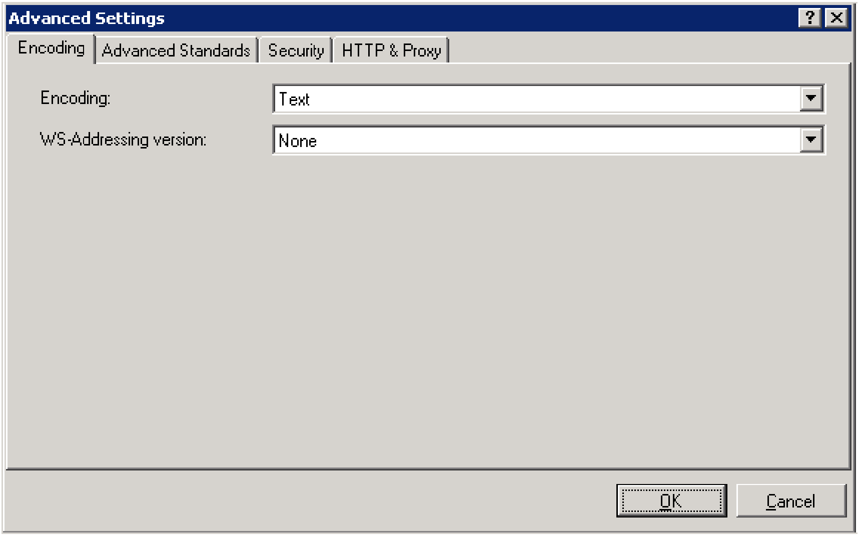
UI Elements (A-Z)	Description
Client certificate	The location of the client certificate. The **Browse** button opens the Select Certificate Dialog Box.
Enable secure session	Enables a secure session using Certificate type authentication.
Expected server DNS	The expected identity of the server in terms of its DNS. This can be localhost, an IP address, or a server name. It can also be the common name by which the certificate was issued.
Negotiate server credentials	Negotiates the Web Service's certificate with the server. You can also provide the server's DNS information.
Specify service certificate	The location of the service's certificate. If you select this option, the **Negotiate server credentials** option is disabled. For more information, see the "Select Certificate Dialog Box" on page 327.

Client Authentication Type — Username (message protection)

UI Elements (A-Z)	Description
Enable secure session	Enables a secure session using Username type authentication.
Expected server DNS	The expected identity of the server in terms of its DNS. This can be **localhost**, an IP address, or a server name. It can also be the common name by which the certificate was issued.
Negotiate server credentials	Negotiates the Web Service's certificate with the server. You can also provide the server's DNS information.
Specify service certificate	The location of the service's certificate. If you select this option, the **Negotiate server credentials** option is disabled. For more information, see the "Select Certificate Dialog Box" on page 327.
Username, Password	The authentication credentials of the client.

Advanced Settings Dialog Box

This dialog box enables you to customize the security settings for your test.



Encoding: Text

WS-Addressing version: None

To access	Do the following: **1** Open the Security Settings for Port <Port_Name> Dialog Box. **2** Select a WCF Service scenario type from the **Service Details** list. **3** Click **Advanced**.
Important information	➤ For details, see "Advanced Security Settings" on page 283.
Relevant tasks	➤ "How to Set Security for a Web Service on the Port Level" on page 284 ➤ "How to Set Security for a Specific Web Service Operation" on page 286 ➤ "How to Set Security for a WCF Service" on page 289

This section includes:

- "Encoding Tab" on page 322
- "Advanced Standards Tab" on page 322
- "Security Tab" on page 323
- "HTTP and Proxy Tab" on page 326

Encoding Tab

The Encoding tab lets you indicate the type of encoding to use for the messages: **Text**, **MTOM**, or **WCF Binary**. The default is **Text** encoding.

The user interface elements are described below:

UI Elements (A-Z)	Description
Encoding	The encoding type to use for the messages: Text, MTOM, or WCF Binary.
WS-Addressing version	The version of WS-Addressing for the selected encoding: None, WSA 1.0, or WSA 04/08.

Advanced Standards Tab

This tab lets you configure advanced WS- standards, such as Reliable Messaging and the Via address option.

The user interface elements are described below:

UI Elements (A-Z)	Description
Reliable messaging	Enables reliable messaging for services that implement the **WS-ReliableMessaging** specification. The encoding type to use for the messages: Text, MTOM, or WCF Binary.
Reliable messaging ordered	Indicates whether the reliable session should be ordered.

UI Elements (A-Z)	Description
Reliable messaging version	The version to apply to the messages: WSReliableMessagingFebruary2005 or WSReliableMessaging11.
Specify via address	Sends a message to an intermediate service that submits it to the actual server. This may also apply when you send the message to a debugging proxy. This corresponds to the **WCF clientVia** behavior. This is useful to separate the physical address to which the message is actually sent, from the logical address for which the message is intended.
Via address	The logical address to which to send the message. It may be the physical of the final server or any name. It appears in the SOAP message as follows: <wsa:Action>http://myLogicalAddress<wsa:Action> The logical address is retrieved from the user interface. By default, it is the address specified in the WSDL. You can override this address using this field.

Security Tab

The Advanced security settings correspond to the **WS-Security** specifications.

WCF Service (WSHttpBinding) Scenarios

UI Element (A-Z)	Description
Enable secure session	Establish a security context using the WS-SecureConversation standard.
Negotiate service credentials	Allow WCF proprietary negotiations to negotiate the service's security.

WCF Service (CustomBinding) Scenarios

UI Element (A-Z)	Description
Allow serialized signing token on reply	Enables the reply to send a serialized signing token.
Default algorithm suite	The algorithm to use for symmetric/ asymmetric encryption. The algorithm drop down list gets its values from the **SecurityAlgorithmSuite** configuration in WCF. **Default:** Basic256
Include timestamp	Includes a timestamp in the header.
Key entropy mode	The entropy mode for the security key. The possible values are: Client Entropy, Security Entropy, and Combined Entropy. **Default:** Combined Entropy
Message protection order	The order for signing and encrypting. Choose from: ➤ Sign Before Encrypt ➤ Sign Before Encrypt-And Encrypt Signature ➤ Encrypt Before Sign
Message security version	The WS-Security security version. You can also indicate whether to **Require derived keys** for the message.
Protection level	Indicates whether the SOAP Body be encrypted/ signed. The possible values are: None, Sign, and Encrypt And Sign (default) **Default:** Encrypt And Sign
Require security context cancellation	Indicates whether to require the cancellation of the security context. If you disable this option, stateful security tokens will be used in the **WS-SecureConversation** session, if they are enabled.
Require signature confirmation	Instructs the server to send a signature confirmation in the response.

UI Element (A-Z)	Description
Security header layout	The layout for the message header: Strict, Lax, Lax Timestamp First, or Lax Timestamp Last.
X509 Inclusion Mode	When to include the X.509 certificate: ➤ Always to Recipient ➤ Never ➤ Once ➤ Always To Initiator **Note:** This and the next three options only apply when using an X.509 certificate.
X509 key identifier clause type	The type of clause used to identify the X.509 key. ➤ Any ➤ Thumbprint ➤ Issuer Serial ➤ Subject Key Identifier ➤ Raw Data Key Identifier
X509 Reference Style	How to reference the certificate: ➤ Internal ➤ External
X509 require derived keys	Indicates whether X.509 certificates should require derived keys.

HTTP and Proxy Tab

This tab lets you set the HTTP and Proxy information for your test.

HTTP (S) Transport

The following table describes the HTTP(S) Transport options:

UI Element (A-Z)	Description
Allow cookies	Indicates whether to enable or disable cookies.
Authentication scheme	The HTTP authentication method: None, Digest, Negotiate, NTLM, Integrated Windows Authentication, Basic, or Anonymous.
Bypass proxy on local	Indicates whether to ignore the proxy when the service is on the local machine.
Keep-Alive enabled	Indicates whether to enable or disable keep-alive connections.
Max response size (KB)	The maximum size of the response before being concatenated. **Default:** 65 KB
Proxy address	The URL of the proxy server.
Proxy authentication scheme	HTTP authentication method on Proxy: Digest, Negotiate, NTLM, Basic, or Anonymous.
Realm	The realm of the authentication scheme in the form of a URL.
Require client certificate	Indicates whether to require a certificate for SSL transport.
Transfer mode	The transfer method for requests/responses. The possible values are Buffered, Streamed, Streamed Request, and Streamed Response.
Use default web proxy	Indicates whether to use machine's default proxy settings.

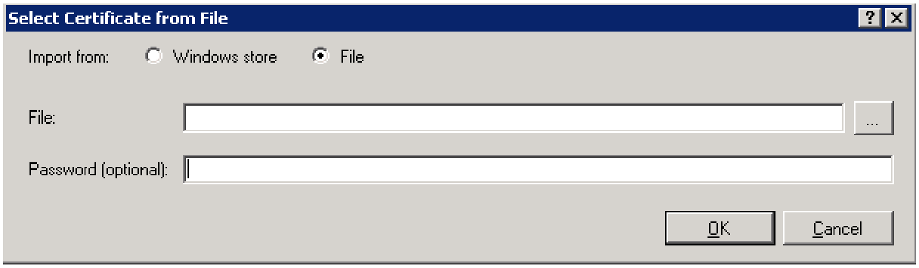
Select Certificate Dialog Box

This dialog box enables you to search and locate a certificate from a file or Windows store.

To access	Do the following: **1** Open the Security Settings for Port <Port_Name> Dialog Box. **2** Select a WCF Service scenario type from the **Service Details** list. **3** Click the **Browse** button adjacent to the **Server Certificate** box.
Relevant tasks	"Configure the security settings" on page 290.

Select Certificate from File

When you select **Import from: File**, the dialog box shows the relevant user elements.



Select Certificate from File

Import from: ○ Windows store ● File

File:

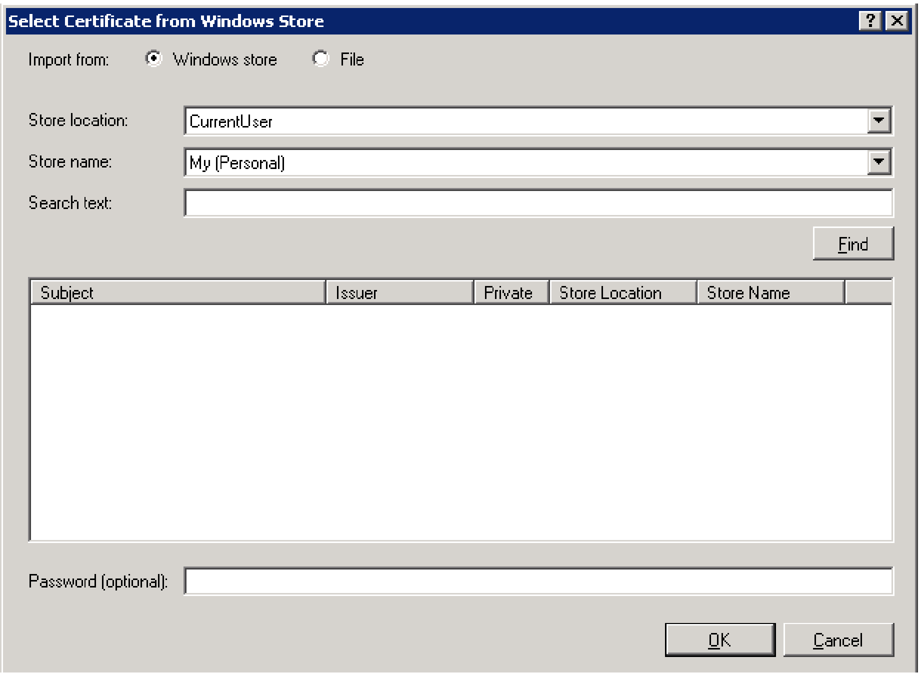
Password (optional):

The user interface elements are described below:

UI Elements (A-Z)	**Description**
...	**Browse.** Enables you to locate the certificate file with a **.cer** or **.pfx** extension.
File	The complete path of the certificate file.
Import from	The source of the certificate file: **Windows store** or **File**.
Password (optional)	The password required to access the certificate.

Select Certificate from Windows Store

When you select **Import from** > **Windows Store**, the dialog box shows the Windows Store related user elements:



Select Certificate from Windows Store

Import from: ● Windows store ○ File

Store location: CurrentUser

Store name: My (Personal)

Search text:

Password (optional):

The user interface elements are described below:

UI Elements (A-Z)	Description
<certificate list>	A list of the certificates in the Windows store sorted by **Subject**, **Issuer**, **Private**, **Store Location**, and **Store Name**.
Find	Begins the search for the certificate based on the Search text.
Import from	The source of the certificate file: **Windows store** or **File**.
Password (optional)	The password required to access the certificate.
Search text	The text to match in the certificate name. If left blank, the **Find** action retrieves all available certificates.

UI Elements (A-Z)	**Description**
Store location	The store location, for example **Current User.**
Store name	The store name, for example, **AuthRoot**.

Troubleshooting and Limitations - Web Service Security

This section describes troubleshooting and limitations for working with Web services security.

- Authentication and proxy security are not supported for Web Services imported from a UDDI.
- For Web Service configured with WCF settings: Configuring different security settings for operations residing on the same port is not supported.
- For Web Service configured with WCF settings, user event handlers cannot be used.
- When testing Web Services that require message-level security, the Web Service security scenario only supports SOAP version 1.1. For SOAP 1.2 use a WCF type scenario.
- When using a SAML security token for Web services security, user-provided content may contain creation and expiration timestamps. To extend the life of the test, we recommend that you hard-code an expiration date in the distant future. In this is not possible, change the timestamp by implementing the **OnBeforeApplyProtocolSettings** event.
- When using a SAML security token for Web services security, if you edit the values in Grid mode, they may not be updated in Service Test. **Workaround:** To update the values, switch to **Text** mode and save the test.
- Web Service steps are not supported when using a SAML token with a certificate from the file system.
  Workaround: Install the certificate to the Windows store and select the certificate from the store.

- The **AfterProcessRequestSecurity** and the **BeforeProcessResponseSecurity** events are not supported for Web Service activities configured with WCF type scenarios.
- When working with Federation type scenarios that use STS (Security Token Service), you cannot change the SOAP version.
- The **OnSendRequest** and the **OnReceiveResponse** events are not supported for Web Service activities configured with WCF type scenarios.

7

Asynchronous Service Calls

This chapter includes:

Concepts

Tasks

Concepts

Asynchronous Services

You can use Service Test to emulate asynchronous services. Asynchronous services can be Web Services, REST services, HTTP requests, JMS/MQ-based services, and so forth.

In synchronous messaging, the replay engine blocks step execution until the server responds. The client sends a request and receives a response immediately, using the same connection. During the waiting time, the replay engine is blocked and does not perform any other activity. If the timeout was reached without a response from the server, the client returns an error.

In asynchronous mode, the replay engine executes the step without waiting for server's response from previous requests.

Wait Steps

When sending asynchronous calls with HTTP or HTTPS, you use a **Wait** step to instruct the test to wait for the response of earlier asynchronous requests before continuing with its execution.

You do not have to place the **Wait** step directly after the Receive step. The test can proceed with other steps, but the **Wait** step will instruct the test to wait for a response before ending the test, or before continuing to execute any steps that follow the **Wait** step.

Checkpoints

When sending a request to a server, you use checkpoints to verify the **Output** property values.

When getting a request from a server, as in most of the asynchronous patterns, you use checkpoints to verify the **Input** properties.

Service Test provides a solution for the following asynchronous patterns:

- "WS-Addressing" on page 333
- "HTTP Receiver" on page 333
- "Web Service Publish Subscribe" on page 334
- "Web Service Solicit Response" on page 334
- "Dual WSDL Files" on page 335

For task details, see "How to Create a Test for an Asynchronous Web Service" on page 336.

WS-Addressing

WS-Addressing is a specification that enables Web services to communicate addressing information. You can instruct the server to respond to any location, and not necessarily to the machine that issued the request. To do this, you use the WS-Addressing **replyTo** attribute.

In this implementation, Service Test pauses the test and uses a listener mechanism to verify that the response arrived at the specified address. After the listener acknowledges that the server responded to the address or if it reaches the timeout, the test resumes. Upon the completion of the test, you can validate the response with the standard Service Test checkpoints.

For user interface details, see the "Asynchronous View" on page 55.

HTTP Receiver

In the **HTTP Receiver** pattern, the **server** sends an HTTP request to the client, reversing the typical roles of the client and server.

This is useful, for example, if you want to test a service which publishes information over HTTP to a client. You define a receiver, which waits for a request from the server, sent over HTTP.

After a trigger, the receiver captures the request. The trigger can be an HTTP client request, a call to a Web service, an email, or any other event that will trigger the server.

Using the Service Test interface, you can insert the necessary logic and validate the checkpoints in the captured request.

For details about the properties, see the "HTTP Receiver Activity" on page 158.

Web Service Publish Subscribe

In the **Web Service Publish Subscribe** pattern, the **server** sends an HTTP request to the client, reversing the typical roles of the client and server. it is similar to the HTTP Receiver, except that the request is sent to the client through a Web Service call instead of exclusively via HTTP.

Using Service Test, you test the publishing of messages to the client. You set up a receiver, which waits for a server request, sent from the server as a Web service call.

After a trigger, the receiver captures the request. The trigger can be an HTTP client request, a call to a Web service, an email, or any other event that will trigger the server.

Using the Service Test interface, you can validate the response with standard Service Test checkpoints.

Web Service Solicit Response

The **Web Service Solicit Response** pattern is a variation of the **Web Service Publish Subscribe** pattern. It enables you test a a service which publishes information through a Web Service to a client.

In this pattern, however, the client is expected to send a response to the server request. The response can be a simple acknowledgement or a full SOAP message.

You set up a receiver activity, which waits for a server request. This server request is sent from the server as a Web service call. The receiver then sends a client response back to the server.

After the trigger, the receiver captures the request. The trigger can be an HTTP client request, a call to a Web service, an email, or any other event that will trigger the server.

Using the Service Test interface, you can validate the response with standard Service Test checkpoints.

Dual WSDL Files

The Dual WSDL technique is a standard request-response pattern. In this pattern, however, the client request is defined by one WSDL, and the server response is defined by another WSDL.

You implement this scenario in two stages:

➤ Import the Request WSDL file, using the **Import WSDL from** import command.

➤ Import the Response WSDL file, using the **Import WSDL from** import command, enabling the **Import as Server Response** option. For details, see the "Import WSDL from URL or UDDI Dialog Box" on page 230 or "Select WSDL Dialog Box" on page 228.

Tasks

How to Create a Test for an Asynchronous Web Service

This task describes how to create a test for testing an asynchronous Web service.

For an overview of the asynchronous patterns supported by Service Test, see "Asynchronous Services" on page 332.

The following section describes the following tasks:

- "Create a test for WS-Addressing" on page 336
- "Create a test for HTTP Receiver" on page 337
- "Create a test for a Web service publish subscribe pattern" on page 337
- "Create a test for Dual WSDL Files" on page 338

Create a test for WS-Addressing

To use WS-Addressing for a Web Service call:

1. Import a Web Service using **Import WSDL** > **Import WSDL from** and drag an operation into the canvas. For details, see "How to Import a WSDL-Based Web Service" on page 206.
2. Open the **Asynchronous** view in the Property Sheet and select **This is an asynchronous call** box.
3. Specify a value for the **Listen for response on** property. This is the port to which you expect the server to respond.
4. Open the **Security** view in the Property Sheet. Select the **WS Addressing** tab.
5. Select a WS-Addressing **Version** and provide and a URL and port (same port as in step 3) in the **Reply to** box, to indicate the destination of the server response.

6. Run the test and perform checkpoint validations as you would with any step.

For more details, see the "Asynchronous View" on page 55.

Create a test for HTTP Receiver

To create a test for an HTTP Receiver in which the client receives the response:

1. Drag a **Network** > **HTTP Receiver** step onto the canvas.
   - **a** Specify the **General** properties. For details, see the "HTTP Receiver Activity" on page 158.
   - **b** Set the **HTTP Receiver** properties. For details, see "HTTP Receiver View" on page 69.
   - **c** Set a filter for the HTTP message. For details, see "Filter Settings View" on page 63.
2. Drag a **Flow Control** > **Wait** step onto the canvas. Specify timeout information and one or more completion events. You can link to the completion event from a prior **HTTP Receiver** step.
3. If required, drag additional activities from the Toolbox in the **HTTP Receiver** flow.
4. Run the test and apply the trigger for the server. For details, see the "HTTP Receiver" on page 333.

Create a test for a Web service publish subscribe pattern

To create a test to check that messages are properly published to the client:

1. Import a WSDL as a server by enabling the **Import as server** option. For details, see "How to Import a WSDL-Based Web Service" on page 206. This Web Service should have a receiver type pattern. Drag an operation into the canvas.
2. Set the input or output properties. For details, see the "Input/Checkpoints View" on page 70.

3. Drag a **Flow Control** > **Wait** step onto the canvas. Specify timeout information and one or more completion events. You can link to the completion event from a prior **HTTP Receiver** step.
4. Run the test and activate the trigger for the server. For details, see "Web Service Publish Subscribe" on page 334.

Create a test for Dual WSDL Files

To create a test for a dual WSDL pattern, using one WSDL for the request and another for the response:

1. Import the request WSDL file using the standard import command, **Import WSDL from**. The imported operations can send client requests and receive server responses.
2. Import the response WSDL file as a server by enabling the **Import as Server Response** option in the Select WSDL Dialog Box or the Import WSDL from URL or UDDI Dialog Box (for URL and UDDI imports, click **Advanced Settings** to show the option). The imported operations first receive server requests and then send client responses.
3. Drag a Web service operation with the request onto the canvas.
4. Drag a Web service operation with the response onto the canvas, after the request step.

For details, see "Dual WSDL Files" on page 335.

🔍 Troubleshooting and Limitations - Asynchronous Testing

This section describes troubleshooting and limitations for creating asynchronous tests.

For a Web service imported as a server response:

- When enabling the SSL option, Service Test temporarily binds the SSL certificate to the specified port on a system, **http.sys**, level. If you end the **ServiceTest.exe** process from the Task Manager during the listening stage after the binding was added, the binding will not be automatically removed from the system.
  Workaround: Remove the binding manually using a utility such as httpcfg.exe or netsh.exe.
- When working with SSL, certificates from a file are not supported. If you move the test to another machine, the certificate will not be available.
  Workaround: Add the certificate to the local machine store before running the test. If desired, remove it after you finish working with the test.

8

Data Handling

This chapter includes:

Concepts

Tasks

Reference

Concepts

Data Handling Overview

Before running a test, you may assign input and checkpoint data and specify how the data should be used.

Service Test's Data window lets you view and maintain data for your test steps. You can import data from Excel files, create local data tables, or define XML files as sources for your data. For details, see "How to Assign Data to Test Steps" on page 365.

You can data-drive the properties of a step or the SOAP request/response body. Data-driving is the mechanism by which Service Test automatically creates data expressions that refer to data in a new, editable table. For details, see the "Data Driving Dialog Box" on page 385.

Defining Data

Service Test enables you to assign data to your steps in several ways. You can enter values manually, link to existing data, or data drive the values.

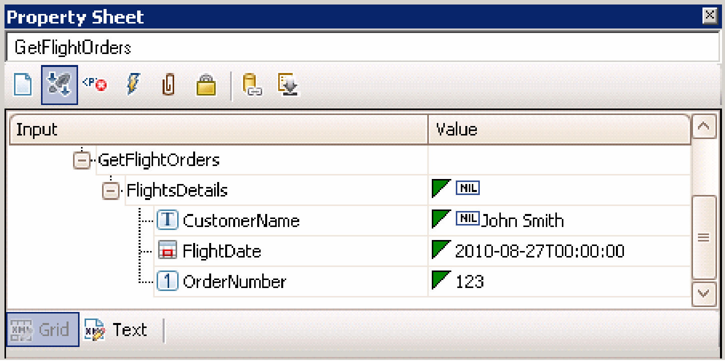
This section also includes:

- "Populating Data Tables Manually" on page 343
- "Linking to a Data Source" on page 344
- "Retrieving Data from a Database" on page 346
- "Outgoing Links" on page 348
- "Data Driving" on page 349
- "Exposing Properties" on page 352

Note: For machines with Excel, the data tables follow standard Excel behavior—when you delete data from a table, the row remains without data. To remove a data row, select **Delete** from the row's shortcut menu. Otherwise, Service Test will run an iteration for that row, with empty values.

Populating Data Tables Manually

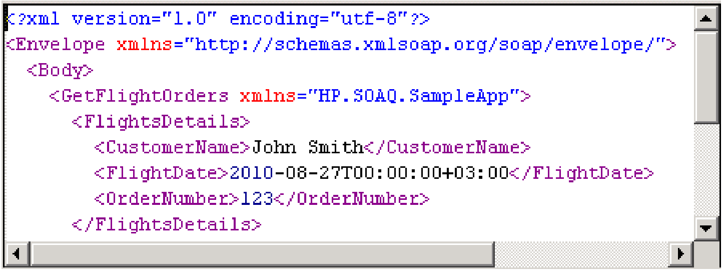
The Input/Checkpoints View grid enables you to view and edit the values of each input property. You can manually insert values into the grid for both simple properties and arrays.



GetFlightOrders

Input	Value
GetFlightOrders	
FlightsDetails	NIL
CustomerName	NIL John Smith
FlightDate	2010-08-27T00:00:00
OrderNumber	123

You can also edit the values in the XML text mode. The editor also enables you to discard changes and return to the original XML using the **Revert** button.



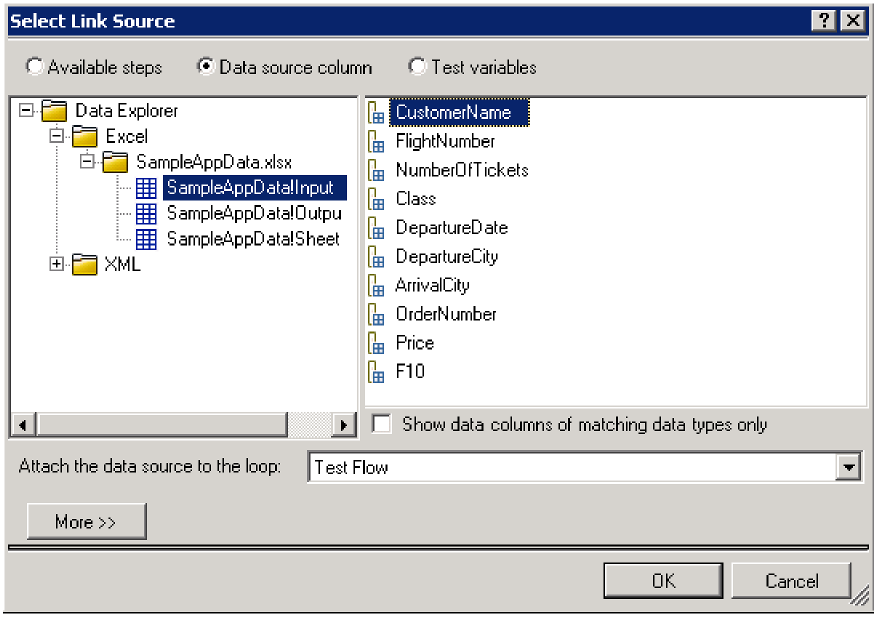
```
<?xml version="1.0" encoding="utf-8"?>
<Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
  <Body>
    <GetFlightOrders xmlns="HP.SOAQ.SampleApp">
      <FlightsDetails>
        <CustomerName>John Smith</CustomerName>
        <FlightDate>2010-08-27T00:00:00+03:00</FlightDate>
        <OrderNumber>123</OrderNumber>
      </FlightsDetails>
```

You can also populate the checkpoint values manually. In addition, after running the test at least once, you can load the replay values directly into the checkpoint using the **Load from Replay** button.

Linking to a Data Source

The recommended way to define data for a step is by linking it to a data source. The Select Link Source dialog box enables you to link to data in several ways:

- ➤ Specify a constant value
- ➤ Reference the output of a another step
- ➤ Use data from a data source, such as an Excel file or database table
- ➤ Use a test variable



○ Available steps ● Data source column ○ Test variables

- Data Explorer
  - Excel
    - SampleAppData.xlsx
      - SampleAppData!Input
      - SampleAppData!Outpu
      - SampleAppData!Sheet
  - XML

CustomerName
FlightNumber
NumberOfTickets
Class
DepartureDate
DepartureCity
ArrivalCity
OrderNumber
Price
F10

☐ Show data columns of matching data types only

Attach the data source to the loop: Test Flow

You can also use a combination of these types: for example, **Data source column** and **Test variable** expressions combined to make a single expression.

To use data source columns, you import an existing data file, such as an Excel spreadsheet or XML file. Alternatively, you can use a wizard to create a custom local table. For details, see the relevant section:

- "Add an Excel data source" on page 358
- "Add a local data table" on page 359
- "Add an XML data source" on page 360.
- "Add a Database data source" on page 361

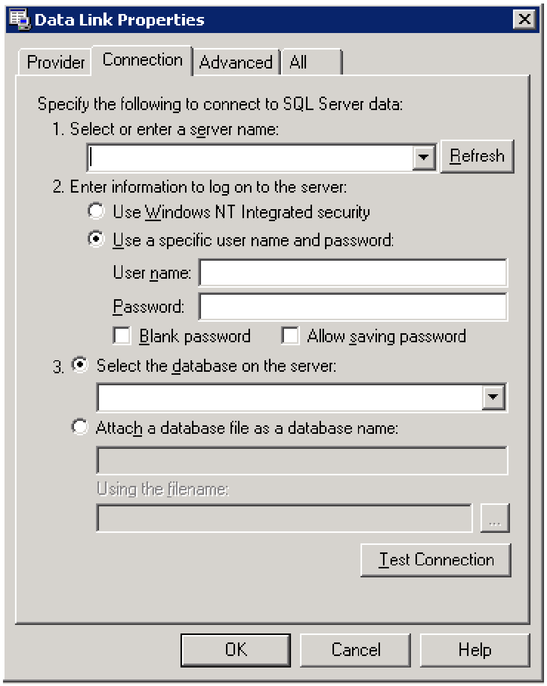
When preparing scripts for load testing, the Select Link Source dialog box also lets you select the way in which to retrieve the data and what to do when the data has run out. For details, see "Data Retrieval Options for Load Test Enabled Tests" on page 398.

For task details, see "How to Assign Data to Test Steps" on page 365.

Retrieving Data from a Database

Service Test lets you retrieve data from a standard database. A wizard guides you through connecting to a database and creating an SQL query statement. After you complete the wizard, the Data Window tab displays the database's data tables.

You provide a connection string or create one through Microsoft's Link Data Properties dialog box.



Specify the following to connect to SQL Server data:

1. Select or enter a server name:

2. Enter information to log on to the server:

○ Use Windows NT Integrated security

● Use a specific user name and password:

User name:

Password:

□ Blank password □ Allow saving password

3. ● Select the database on the server:

○ Attach a database file as a database name:

Using the filename:

Once you are connected to the database, you can use Service Test's Query Designer to create a custom SQL statement, based on the tables and views in your database.

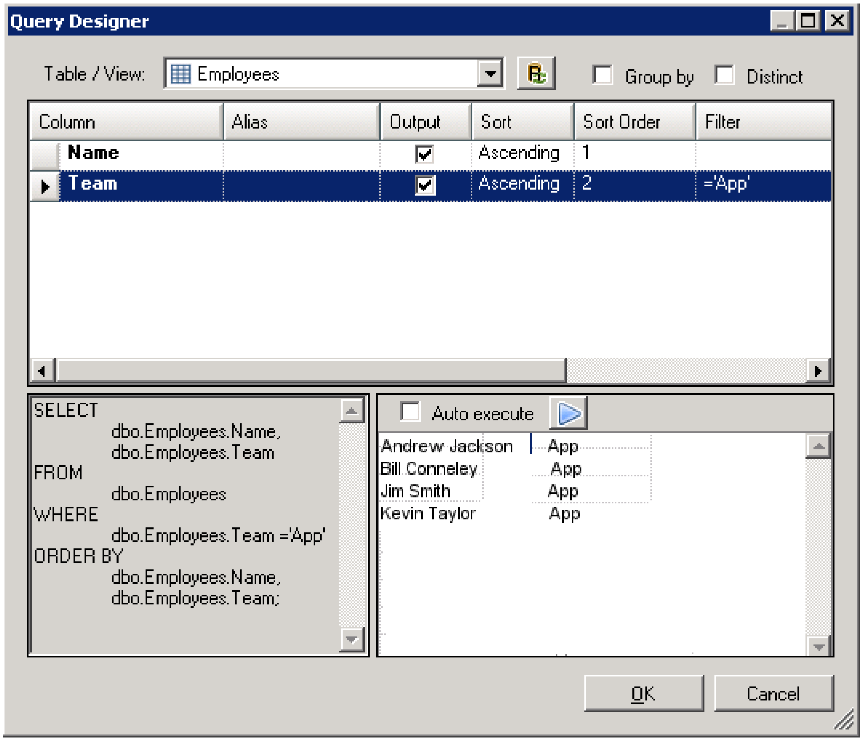


Table / View: Employees

□ Group by □ Distinct

Column	Alias	Output	Sort	Sort Order	Filter
Name		☑	Ascending	1	
Team		☑	Ascending	2	='App'

```
SELECT
          dbo.Employees.Name,
          dbo.Employees.Team
FROM
          dbo.Employees
WHERE
          dbo.Employees.Team ='App'
ORDER BY
          dbo.Employees.Name,
          dbo.Employees.Team;
```

□ Auto execute

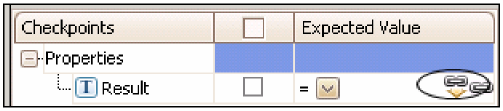
Andrew Jackson	App
Bill Conneley	App
Jim Smith	App
Kevin Taylor	App

For details on how to use the Query Designer, see the "Query Designer Dialog Box" on page 193.

To learn more about using the wizard, see "Add a Database data source" on page 361.

Outgoing Links

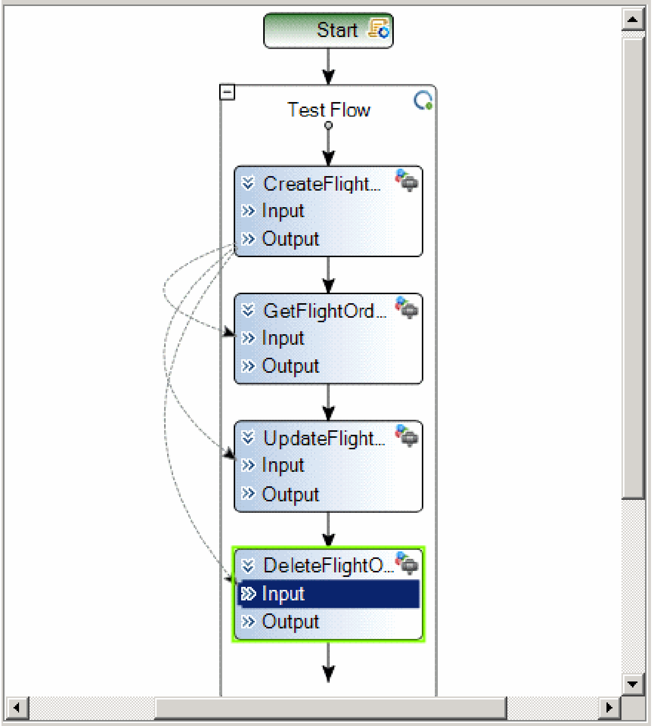
When you link a property to another step's output property, Service Test indicates this with a **Outgoing Links** button in the Property Sheet's **Input/ Checkpoints** view.



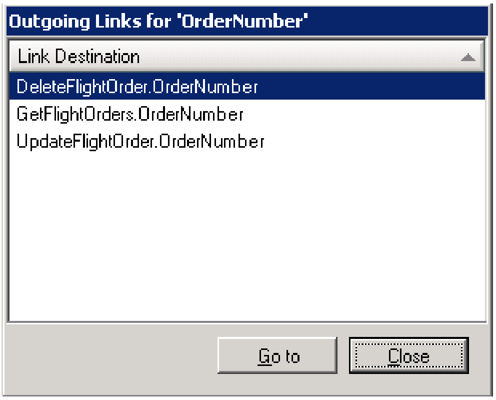
Checkpoints	□	Expected Value
⊟ Properties		
Result	□	=

By clicking on the button, you can open a list of the properties that link to this output property. This is especially helpful when linking to an output property multiple times.

The following example shows three steps linking to a single output property of the CreateFlightOrder step.



When you click the **Outgoing Links** button, Service Test opens a list of the target properties that link to this value. Using the **Go to** button, you can navigate directly to the linked property.

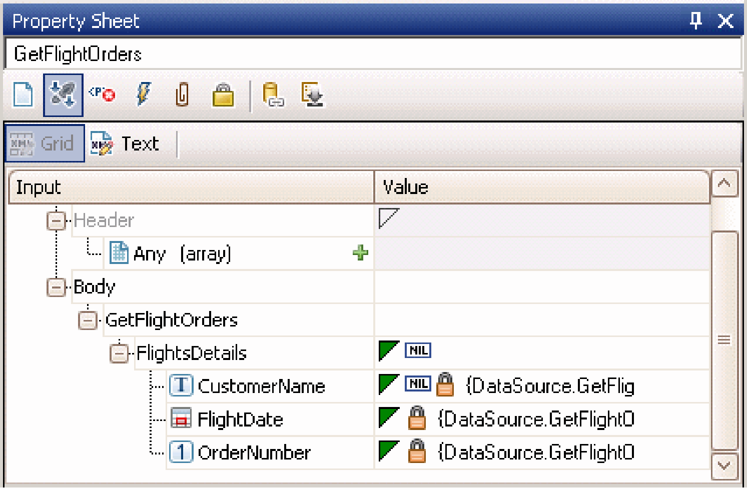


Outgoing Links for 'OrderNumber'

Link Destination
DeleteFlightOrder.OrderNumber
GetFlightOrders.OrderNumber
UpdateFlightOrder.OrderNumber

Data Driving

Data-driving is the mechanism by which Service Test automatically creates data expressions for properties. When you data drive a step, Service Test adds data expressions to the step's value fields.



Property Sheet

GetFlightOrders

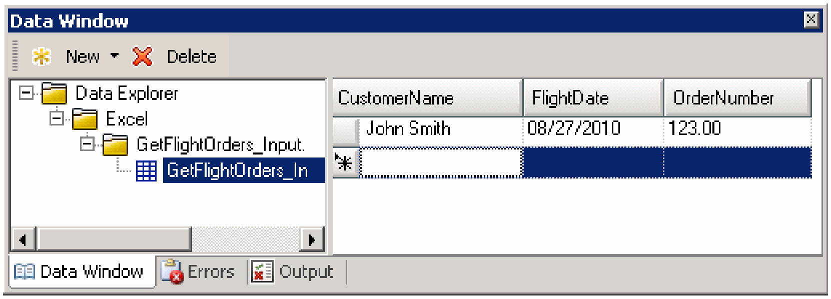
Input	Value
Header	
Any (array)	
Body	
GetFlightOrders	
FlightsDetails	NIL
CustomerName	NIL {DataSource.GetFlig
FlightDate	{DataSource.GetFlightO
OrderNumber	{DataSource.GetFlightO

These expressions refer to data in a new editable Excel table or XML structure, depending on the type of provider you specified during the data driving.

You can customize data-driving in the following ways:

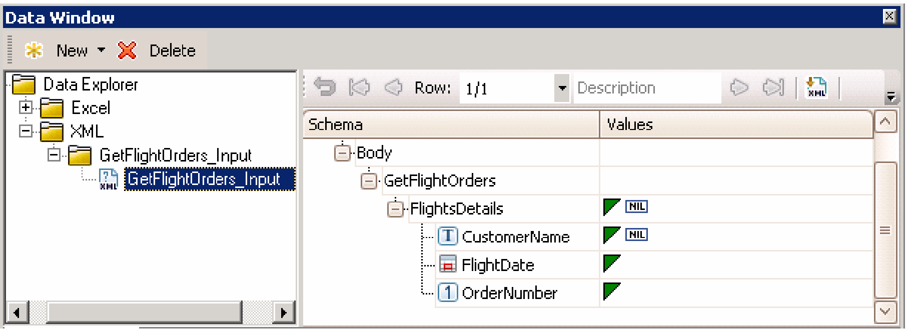
- Specify the type of data source to create—Excel or XML
- Indicate which properties to data drive:
    - For standard input and output (checkpoint) properties: **Input**, **Checkpoints**, or both.
    - For XSD files, loaded for the HTTP or SOAP Request steps: **Request Body**, **Response Body**, or both.
    - For additional types such as HTTP multipart and SOAP Fault properties, see the "Data Driving Dialog Box" on page 385.
- Set the loop type. This overrides the regular Loop - Input Properties property.

For Excel type tables, you can manually add to and edit the data in the Data Window.



CustomerName	FlightDate	OrderNumber
John Smith	08/27/2010	123.00

For XML data sources, you can manually edit the XML root.



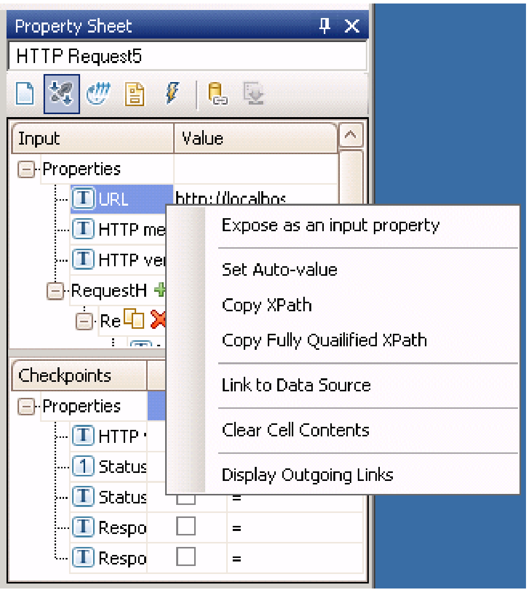
For task details, see "How to Data Drive a Test Step" on page 375.

For user interface details, see "Data Driving Dialog Box" on page 385.

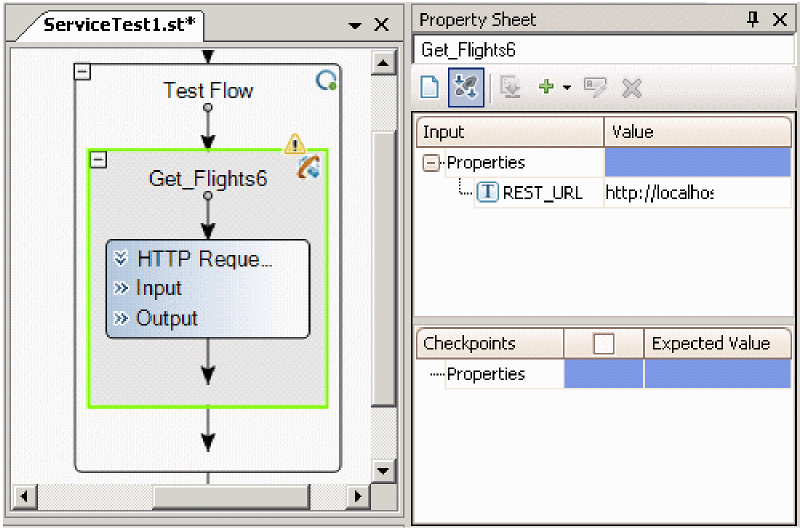
Exposing Properties

When working with REST service methods, the Property Sheet enables you to expose input and output HTTP properties. Exposing HTTP properties means that you make them available at the REST method wrapper level instead of just the inner HTTP level. You can expose properties that are available from the **General**, **Input/ Checkpoint**, **HTTP**, and **Multipart** views.

The following example shows the shortcut menu item, **Expose as an input property**. This option prompts you to provide a name for the property as it should appear in the REST wrapper level.



The property, which was named in this example **REST_URL**, will be available in the REST method wrapper.



Input	Value
Properties	
REST_URL	http://localhos

Checkpoints	□	Expected Value
Properties		

Note:

- ➤ When exposing a property with incoming links, the links are redirected to the newly created property.
- ➤ When exposing a complex property, the new property will be created as a **String** type.

Unique Data

When you add data tables in the Data Window, this does not automatically associate the data with a step property.

You associate a step’s properties with data in the following ways:

- Use the Select Link Source dialog box. For details see "How to Assign Data to Test Steps" on page 365.
- Data Driving. For details, see "How to Data Drive a Test Step" on page 375.

Service Test lets you add data sources to your Test Flow or loop, without attaching it directly to a specific step property. This is especially useful if you want to use event handler coding to access your data.

When you define a new data source, Service Test assigns it a unique ID, called the **Query ID**. Each **Query ID** indicates a separate instance of the data. Two data sources may use the same data from the same table, but since they have different **Query IDs**, they do no affect one another.

For details, see "Add data as a data source" on page 365.

Data Relations and Navigation

Service Test lets you indicate how to use the data source, how many times to loop through the data.

You can also define relations between data tables and data sources.

This section also includes:

- "Navigating within the Data" on page 355
- "Child Relations" on page 356
- "Data Keywords" on page 356

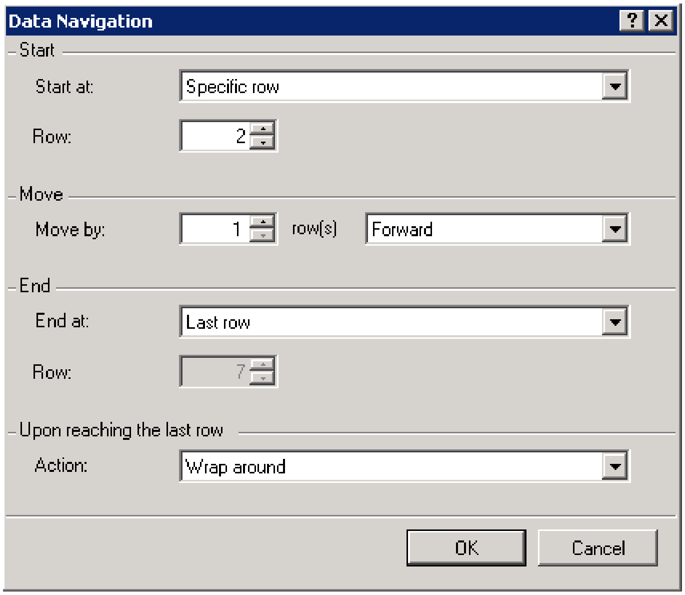
Navigating within the Data

Using the Data Navigation dialog box, you control the way you use the values in the data tables.

The Data Navigation settings work together with the loop settings described in "Loop - Input Properties" on page 141.

If the loop is configured as a **ForEach** type, and you designate a specific data source as the loop's collection, then the Data Navigation settings affect the number of iterations of the loop.

For data sources that are not designated as the loop collection, but whose values are fetched by steps within the loop, the Data Navigation policy affects the data differently. It indicates the order in which the values are fetched from the data source, and assigned to steps within the loop.



Data Navigation

Start

Start at: Specific row

Row: 2

Move

Move by: 1 row(s) Forward

End

End at: Last row

Row: 7

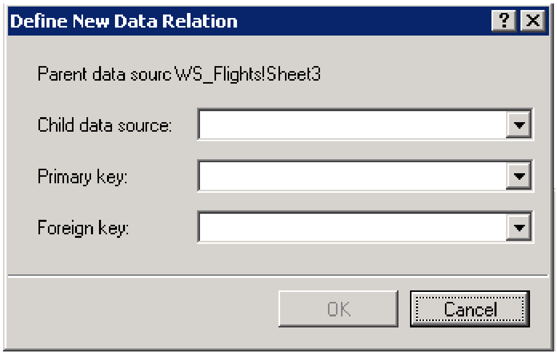
Upon reaching the last row

Action: Wrap around

For user interface details, see "Data Navigation Dialog Box" on page 399.

Child Relations

You can define data relations for all of your data tables. You can then use this relation as data for test properties. This is useful in cases where some property values are in one table, and other property values are in another table.



Define New Data Relation

Parent data sourc WS_Flights!Sheet3

Child data source:

Primary key:

Foreign key:

For task details, see "Create a new child relation" on page 364.

For user interface details, see the "Define/Edit New Data Relation Dialog Box" on page 402.

Data Keywords

You can use keywords to customize the test run and validation. To use a keyword, type it into the **Value** column or table row. Enclose the keyword with the # character. The keyword names are not case-sensitive.

Service Test provides keywords for both Input properties and checkpoints.

Input Keywords

For input properties, you can enter a keyword into one or more data provider sources, such as a data table or XML code.

Keyword	Description
#SKIP#	Omits this element from the XML of the request.
#NIL#	Adds a **nil=true** attribute to the property’s XML in the request. **Example:** <name John Doe nil="true"></name> If the XML element is not nillable, Service Test reports this to the log.

Checkpoint Keywords

You can use keywords for checkpoints, by entering the keyword into the data table or XML associated with the checkpoint. Service Test provides the following keywords for checkpoints.

Keyword	Description
#SKIP#	The checkpoint with the #SKIP# value will not be validated.
#NIL#	During the test run, Service Test checks that the element has a **nil=**"**true**" attribute in its response.
#NOT_FOUND#	Indicates that the element should not be found in the XML of the response. This setting ignores the comparison operator—it only checks for the absence of a value.
#EXISTS#	Indicates that the element should be found in the XML of the response. This setting ignores the comparison operator—it only checks for the presence of a value.

Tasks

How to Create Data Sources

This task describes how to define data sources before selecting a test step. After creating a test step, you link it to an existing data source. The following steps provide you with four options for creating a data source. To create a data source for your properties, you only need to add data using one of these options.

This task includes the following steps.

- "Add an Excel data source" on page 358
- "Add a local data table" on page 359
- "Add an XML data source" on page 360
- "Add a Database data source" on page 361
- "Create a new child relation" on page 364
- "Add data as a data source" on page 365

Add an Excel data source

1. Make sure the Data Window is visible. If not, select **View** > **Data Window**.
2. In the Data Window pane, select **New** > **Excel File**.
3. In the Add New Excel File Data Source dialog box, Browse to the file and indicate if the first row is a header row.
4. Specify a data source name.
5. Select an import mode: **Referenced** or **Embedded**. The Data Explorer shows the table in the right pane.
6. Click **OK**.
7. In the Data Explorer tree, select the data source. In the right pane, use the keyboard arrows to navigate within the table and set values.

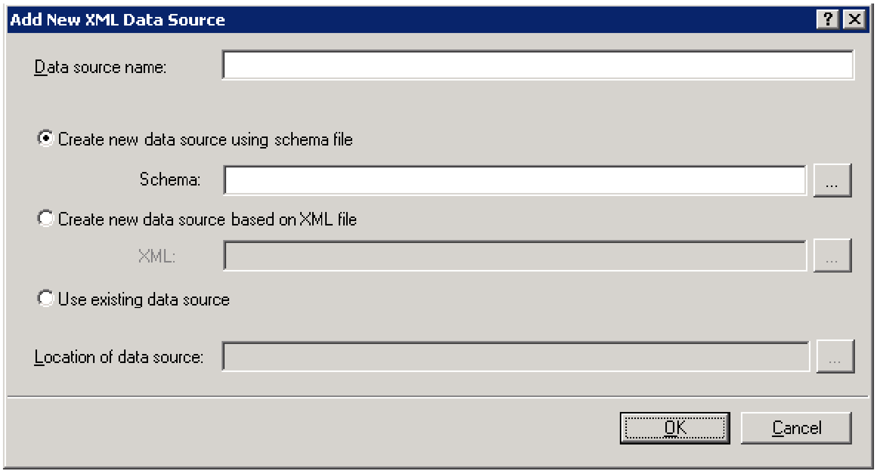
For user interface details, see the "Add New Excel File Data Source Dialog Box" on page 388.

Add a local data table

1. Show the Data Window. Select **View** > **Data Window**.
2. In the Data Window pane, select **New** > **Local Table**. The **Add New Local Table Data Source Wizard** opens.
3. Click **Add** to create a column for the data table.
4. In the Add Columns dialog box, specify a column name and description. Select a data type from the drop-down list. Click **OK**.
5. Repeat steps **3** and **4** for each column you want to create.
6. Use the arrows to reorder the columns as required.
7. Click **Next** to specify a name for the data source. Click **Finish**.
8. In the Data Explorer, select the table's node and move within the table using the keyboard arrows. Click the grid cells to manually set values.

Add an XML data source

1. Show the Data Window. Select **View** > **Data Window.**
2. In the Data Window pane, select **New** > **XML**. The Add New XML Data Source dialog box opens. For user interface details, see the "Add New XML Data Source Dialog Box" on page 392.


Add New XML Data Source
?
Data source name:
● Create new data source using schema file
Schema:
...
○ Create new data source based on XML file
XML:
...
○ Use existing data source
Location of data source:
...
OK
Cancel

3. Provide a **Data source name**.
4. Select a source or schema option:

   ➤ **Create new data source using schema file.** Browse to the **Schema File Path**.

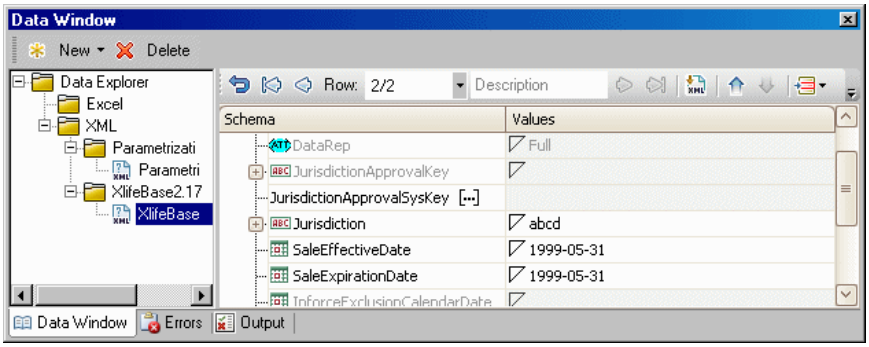
   ➤ **Create new data source based on XML file.** Browse to the **XML File Path** representing the structure of the data. You can add data at a later time.

   ➤ **Use existing data source.** Browse to the **Location of data source**. Each data source is stored as a subfolder of the test's **DataQueries** folder. Make sure to use the data source name as it appears in the folder, without the suffix. For example, for the file **MyXSD_0.xsd** file, enter *MyXSD* in the **Data source name** field.

Tip: Choose **Test** > **Open Containing Folder** to access the test folder.

5 Click **OK**.

6 Expand the data source's node in the Data Window.



Schema	Values
DataRep	Full
JurisdictionApprovalKey	
JurisdictionApprovalSysKey [...]	
Jurisdiction	abcd
SaleEffectiveDate	1999-05-31
SaleExpirationDate	1999-05-31
InforceExclusionCalendarDate	

7 Edit the XML data in the grid. Add rows as described in the "XML Data Source - Toolbar" on page 383.

8 To load XML values, click the **Load data from an XML file** button.

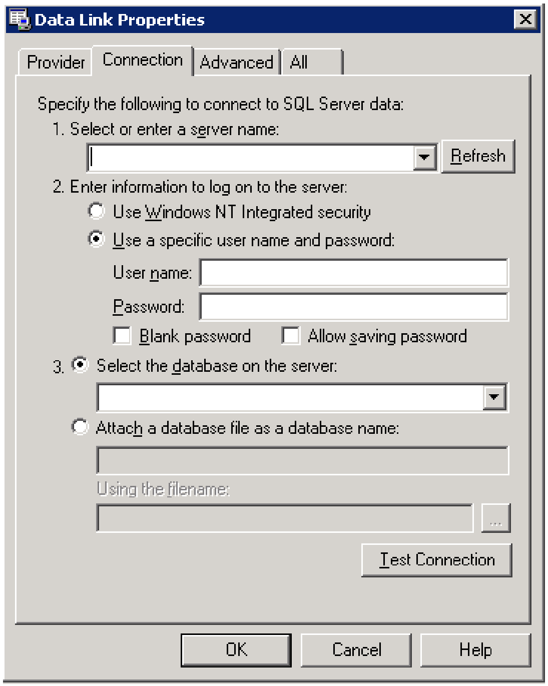
Add a Database data source

1 Show the Data Window. Select **View** > **Data Window**.

2 In the Data Window pane, select **New** > **Database**. The **Add New Database Data Source Wizard** opens. For user interface details, see the "Add New Database Data Source Wizard" on page 403.

3 In the **Define the connection string** screen:

a Paste an OLE DB connection string into the text area, or click the **Browse** button to use Microsoft's Data Link Properties dialog box. For details, click the **Help** button in the Data Link Properties dialog box.



Specify the following to connect to SQL Server data:

1. Select or enter a server name:

2. Enter information to log on to the server:

○ Use Windows NT Integrated security

● Use a specific user name and password:

User name:

Password:

□ Blank password □ Allow saving password

3. ● Select the database on the server:

○ Attach a database file as a database name:

Using the filename:

b Click **Check Connection** to verify that the connection string is valid.

c Click **Next**. This button will be available only for valid connections.

4 In the **Define the query statement** page:

a Provide a unique name for the data source, not used by another data source.

b Create an SQL statement. You can paste an existing string into the text area or click the **Browse** button to open the **Query Designer**. For details, see the "Query Designer Dialog Box" on page 193.

c If you are using the **Query Designer**:

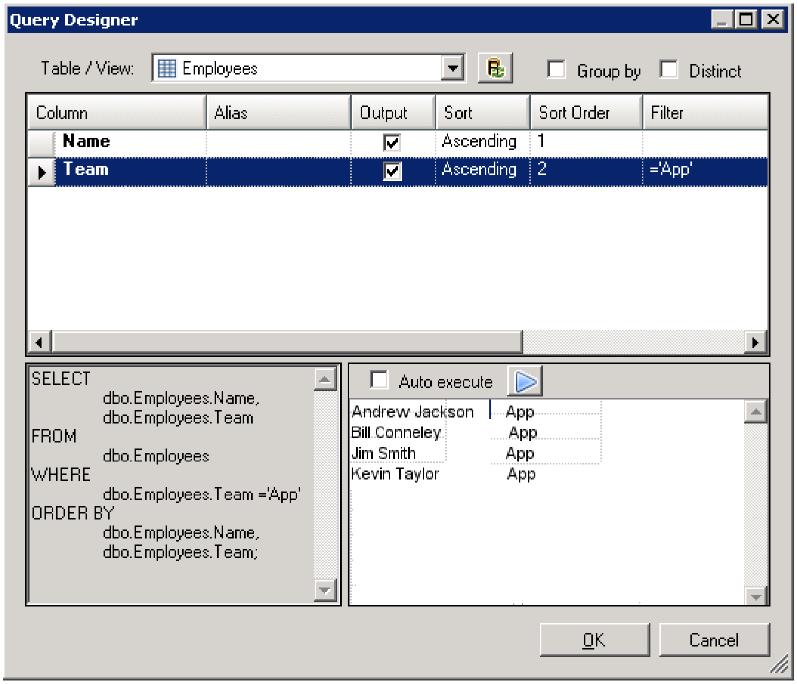


Table / View: Employees

□ Group by □ Distinct

Column	Alias	Output	Sort	Sort Order	Filter
Name		☑	Ascending	1	
Team		☑	Ascending	2	='App'

```
SELECT
        dbo.Employees.Name,
        dbo.Employees.Team
FROM
        dbo.Employees
WHERE
        dbo.Employees.Team ='App'
ORDER BY
        dbo.Employees.Name,
        dbo.Employees.Team;
```

□ Auto execute

Andrew Jackson	App
Bill Conneley	App
Jim Smith	App
Kevin Taylor	App

- ➤ Select a table or view. The **Query Designer** lists all of the rows in the pane below and displays the corresponding SQL statement in the preview pane.
- ➤ Enable **Auto execute** to view the results of your query as you make changes in the upper pane.
- ➤ By default, the **Query Designer** selects all columns in the table. To remove a column from the query, clear the **Output** check box for that column.
- ➤ To set a sorting order, select Ascend or Descend from the **Sort** column drop-down. If you have multiple rows that you are sorting, provide the **Sort Order** beginning with 1. The **Query Designer** adds an ORDER BY clause to the preview pane.
- ➤ To filter the returned results, enter the text to match in the **Filter** column.

➤ To add a GROUP BY or DISTINCT clause to your statements select the appropriate check box.

Click **OK** to accept the query and return to the wizard.

d In the wizard's **Define the query statement** page, click the **Check SQL Statement** button. A **Query Preview** dialog box opens. Click **Close** to return to the wizard.

e Click **Finish**. Service Test shows the query details in the Property Sheet and the data in the **Data Window** tab. For details, see the "Database Data Source Properties View" on page 59.

f To update the data at a later stage, click **Refresh** in the **Data Window** tab. For details, see the "Data Window Tab" on page 382.

Create a new child relation

This step lets you add child relations using primary and foreign keys. This applies to **Excel**, **Local Table**, and **Database** type data sources.

1. Add at least two Excel files or one file with two worksheets, containing the foreign and primary keys.
2. In the Data Window, select the parent table in the Data Explorer tree.
3. Click in the Property Sheet to open the **Data Source Properties** view.
4. Click the **Add** button. The Define New Data Relation dialog box opens.
5. Specify the details of the new relation. You can specify a relation to a different data source type, provided that is either an **Excel**, **Local Table**, or **Database** type data source. For user interface details, see the "Define/Edit New Data Relation Dialog Box" on page 402.
6. To edit a data relation, double-click the entry or click **Edit**.
7. To delete a data relation, select the entry and click **Remove**.

Add data as a data source

This step lets you define data as a data source, even without linking to a property. This will allow you to access the data source easily and use it in event handler coding. For details, see "Unique Data" on page 354

1. In the Data Window, select the parent table in the Data Explorer tree.
2. In the canvas, select the Test Flow or loop frame.
3. Click in the Property Sheet to open the **Data Sources** view.
4. Click **Add**. The Attach Data Source to Loop dialog box opens.
5. Select a data source from the list and click **OK**.
6. To set a navigation policy, double-click the data source or click **Edit** in the Property Sheet.

Tip: The data source is available only to steps within the current loop. To allow access to the data source from all steps, add it to the parent loop, such as Test Flow.

How to Assign Data to Test Steps

This task describes how to link the test step properties to data sources through the following steps:

- "Open the Select Link Source dialog box" on page 366
- "Select a linking option" on page 366
- "Assign array data from a data source - no leaf nodes" on page 368
- "Assign data from an array output" on page 369

1 Open the Select Link Source dialog box

a Display the step’s properties. Select **View** > **Property Sheet** and open the **Input/Checkpoints** view.

b Click the **Link Source** button in the right corner of the row.

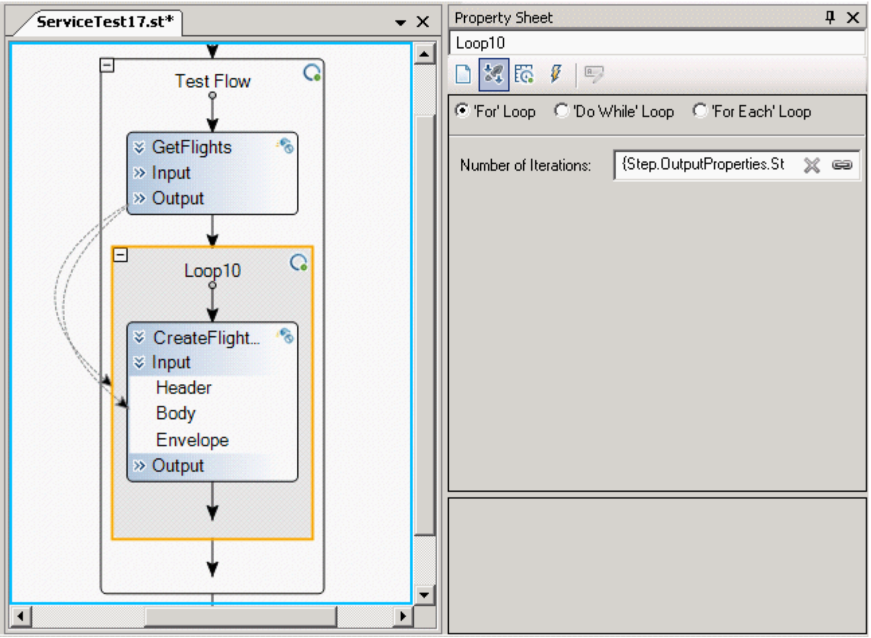
2 Select a linking option

a In the Select Link Source dialog box, select a data source option:

- **Available steps**. Select a step in the left pane, **Available Steps**, and a property in the right pane, **Properties of the Step**.
- **Data source column.** For properties with simple data structures or with both leaf nodes and arrays—in the left pane’s Data Explorer tree, select a data source. In the right pane, which lists the data columns or elements, double-click on an entry. For properties that only have arrays, see step 3 on page 368.
- **Test variables**. Select a user or system variable. For information on defining user variables and profiles, see "Define user variables" on page 94.

b To use a combination of multiple data source types for a property value, click **More** to expand the Select Link Source dialog box. Select the data sources one-by-one and click **Add**. If necessary, edit the expression manually.

c If the source to which you want to link is an array element or descendant of an array, Service Test prompts you to create a loop around the current step. This enables you to iterate through all of the array elements. Click on the **Loop** frame to set the loop settings. For details, see "Loop - Input Properties" on page 141.



Loop10

● 'For' Loop ○ 'Do While' Loop ○ 'For Each' Loop

Number of Iterations: {Step.OutputProperties.St

If you do not need to run through the array elements, click **No**. Service Test then links to the data for the first array element and applies the data to the next elements according to the availability of the data. For example, if the Excel table contains three rows of data for the parent row, it will populate three array elements.

d Click **OK** to complete the linking of the data. Service Test copies the values or expressions into the **Value** column of the grid.

Note:

- You can only properties to data sources if the steps are within a loop, such as **Test Flow** or custom loops.
- Linking a leaf node to a complex XML node is only supported for string type data.

For user interface details, see the "Select Link Source Dialog Box" on page 395.

3 Assign array data from a data source - no leaf nodes

Follow these steps if the property only contains an array, and there are there are no leaf nodes outside the array.

a Create a data relation (if required) as described in "Create a new child relation" on page 364.

b Click within the frame of Test Flow, or the relevant loop, and open the **Data Sources** view in the Property Sheet.

c Click the **Add** button. The Attach Data Source to Loop dialog box opens.

d Select the parent data source from the list. Click **OK**.

e To edit the data navigation properties, click **Edit**. Set the preferences and click **OK**.

f Select the step in the canvas. In the Property Sheet's **Input/Parameter's** view, click within the row of the array element you want to assign.

g Click the **Link Source** button in the right corner of the row. Select the **Data source column** option and select the desired node.

4 Assign data from an array output

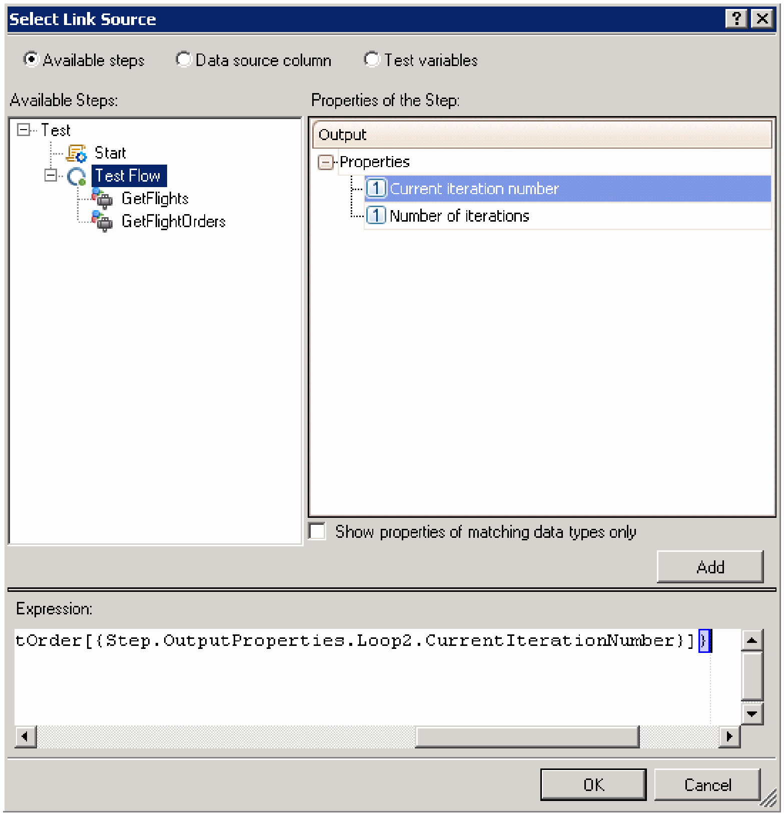
Follow these steps if you want to assign data to a simple variable from an output array element.

a Open the Select Link Source dialog box for the simple property. Click **More** to expand the dialog box.

b Select the **Available steps** option. In the left pane, select the step whose output value you want to use. In right pane, select an array element.

c Click **Add** to transfer the data source string to the **Expression** area.

d To set the index of the array to a variable, select the index number, in the **Expression** area, for example, 1, and select a variable from the upper pane. Click **Add**. The following example uses the **Current iteration number** from the **Test Flow** node, as a variable for the array's index.



Select Link Source

● Available steps ○ Data source column ○ Test variables

Available Steps:

- Test
  - Start
  - Test Flow
    - GetFlights
    - GetFlightOrders

Properties of the Step:

- Output
  - Properties
    - Current iteration number
    - Number of iterations

□ Show properties of matching data types only

Expression:

```
tOrder[{Step.OutputProperties.Loop2.CurrentIterationNumber}]}
```

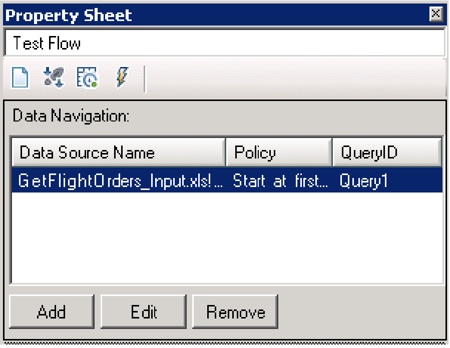
How to Access Data Through Event Handler Coding

This task describes how to access data sources through event handler coding through the following steps:

- ➤ "Prerequisite" on page 371
- ➤ "Open an event handler window for the test step" on page 372
- ➤ "Edit the code" on page 372
- ➤ "Retrieve a specific row - optional" on page 373
- ➤ "Retrieve the current row - optional" on page 372
- ➤ "Set input properties for a Web Service call - optional" on page 373

1 Prerequisite

Make sure you defined at least one data source for the loop containing the step. Determine your data source's Query ID, for example Query1, Query2 and so forth. For details, see "Add data as a data source" on page 365.



Data Source Name	Policy	QueryID
GetFlightOrders_Input.xls!...	Start at first...	Query1

2 Open an event handler window for the test step

Select a test step and open the **Events** view in the Property Sheet. Double-click an event to open the **TestUserCode.cs** tab. For details, see Appendix A, "Coding Service Test Events."

3 Edit the code

Locate the **Todo** section. Use the Query ID for obtaining a value from a data cell. Use the following syntax:

```
this.<activity_instance>.<property_name>=this.<QueryID>.
                              GetValue(row_number>"<col_name>").ToString();
```

Note: Make sure to place the code in the relevant event handler. For example, code that sets input properties should be placed in the **BeforeExecuteStepEvent** handler, while code that sets output properties should be placed in the **AfterExecuteStepEvent** handler.

---

4 Retrieve the current row - optional

To retrieve values from the current row, using the active data navigation policy, leave out the row number.

The following example using the **Add** activity, retrieves the **A** and **B** properties from the data source with an ID of Query2, using the current row. Since the values are numbers, there is no need to convert them to a string.

```
this.AddActivity4.A=this.Query2.GetValue("Field1");
this.AddActivity4.B=this.Query2.GetValue("Field2");
```

5 Retrieve a specific row - optional

To retrieve a specific row, follow this example which illustrates the **Concatenate Strings** activity retrieving property values from a specific row. It retrieves the **Prefix** and **Suffix** properties from the data sources with a Query ID of Query1, using the first and third rows. The **ToString** function converts the text to a string.

```
this.ConcatenateStringsActivity5.Prefix=this.Query1.GetValue(1,"Field1").ToString();
this.ConcatenateStringsActivity5.Suffix=this.Query1.GetValue(3,"Feld2").ToString();
```

This code overrides the navigation policy, since you specifically instructed Service Test to take the get data from a specific row.

6 Set input properties for a Web Service call - optional

Web Service calls store their property information in separate XML documents. Therefore, when working with Web Service calls, you cannot access the input or output properties directly using auto-complete. Instead, you need to parse the XML using an XPath expression.

To retrieve a property's XPath expression, click on the property in the Property Sheet and select **Copy XPath** from its shortcut menu. The **InputEnvelope** object contains all of the input properties of the Web service call. The **OutputEnvelope** object contains all of the Web service's output properties.

The following example using the sample application's **GetFlights** activity, sets the DepartureCity property to Denver. The XPath is copied from the Property Sheet.

```
XmlNode DepartureCity =
this.StServiceCallActivity5.InputEnvelope.SelectSingleNode("/
*[local-name(.)='Envelope'][1]/*[local-name(.)='Body'][1]/
*[local-name(.)='GetFlights'][1]/*[local-name(.)='DepartureCity'][1]");
if (DepartureCity!=null)
{
        DepartureCity.InnerText="Denver";
}
```

How to Set the Navigation Properties

This task describes how to set the navigation preferences for data stored in tables. You can set different navigation properties for each data source. For details, see "Navigating within the Data" on page 355.

This task includes the following steps:

➤ "Open the Data Sources view" on page 374

➤ "Select a data source" on page 374

➤ "Open the Data Navigation dialog box" on page 374

➤ "Set the navigation properties" on page 374

1 Open the Data Sources view

In the canvas, click within the loop frame, but not within a test step. In the Property Sheet, click the **Data Sources** view button (visible only for steps within a loop).

2 Select a data source

Click **Add** to select a data source. The Attach Data Source to Loop dialog box opens. Double-click a data source.

3 Open the Data Navigation dialog box

in the **Data Sources** view, select the data source with your data. Click **Edit** to open the Data Navigation dialog box.

4 Set the navigation properties

a In the Data Navigation dialog box, specify the **Start** and **End** rows.

b Indicate the direction in which to move when retrieving data from the table: **Forward** or **Backward**, and the number of rows by which to advance for each iteration.

c Specify the action to do when reaching the last row- **Wrap around** or **Keep using that row**. Click **OK**.

For user interface details, see the "Data Navigation Dialog Box" on page 399.

How to Data Drive a Test Step

This task describes how to data drive a test step. Data driving is Service Test's mechanism for automatically creating data expressions for step properties.

For further details, see "Data Driving" on page 349.

This task includes the following steps:

- "Prerequisites" on page 375
- "Open the Input Properties view" on page 375
- "Include the data" on page 375
- "Data drive the test step" on page 375
- "Enter values" on page 376

1 Prerequisites

Create a step in the canvas. For details, see "Create the test flow" on page 32.

2 Open the Input Properties view

Display the step's properties grid. Select **View** > **Property Sheet** and open the **Input/Checkpoints** view.

3 Include the data

To include optional properties in the data driving, toggle the triangle icon adjacent to the property. A filled-in triangle indicates an included property.

4 Data drive the test step

a Click the **Data Drive** button. The Data Driving dialog box opens.

b Choose a Data provider: **Excel** or **XML.**

c Select the properties upon which you want to apply data driving: input properties, checkpoints, or both.

d Indicate whether you want to **Configure 'Test Flow' as a For Each loop using the new data source**. This option repeats the test steps according to the number of data rows in the Excel or XML data source. If you disable this option, you can manually set the number of iterations through the loop properties. This setting overrides the general loop properties. For details, see "Loop - Input Properties" on page 141.

e Click **OK**.

f Service Test prompts you to confirm the action. Click **OK**.

Service Test populates the value column with data expressions. The expressions are preceded by informational icons, indicating read-only status or unmatching data types.

Note: If your checkpoints are within an array, you must create at least one array element before data driving. To add an array element, select the array's parent node and click the **Add** button.

For user interface details, see the "Data Driving Dialog Box" on page 385.

5 Enter values

In the Data Window (**View** > **Data Window**), edit the columns of the newly created data tables or XML source.

How to Parameterize XML Data

This task describes how to parameterize XML data. Suppose you pasted or loaded an XML file as the request body for your step. Using the parameterization capabilities, you can replace a constant value with a data source expression.

This task includes the following steps:

- "Prerequisites" on page 378
- "Add the XML body text" on page 378
- "Select the text to parameterize" on page 378
- "Select a link source" on page 379
- "Verify the value in the Property Sheet" on page 380

1 Prerequisites

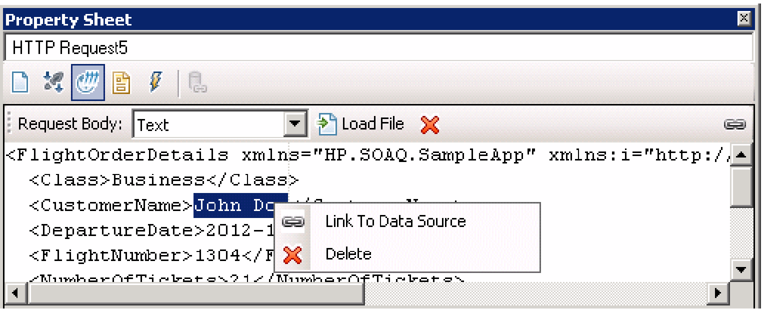
Create a test step that uses XML text in the request body. This applies to Network and XML type activities. If you intend to parameterize the data with a data source, import or create the data source. For details, see "How to Create Data Sources" on page 358.

2 Add the XML body text

Using the Property Sheet, load an XML file or paste XML code directly into the Body area.

3 Select the text to parameterize

In the Body area, right-click the constant value you want to replace and select **Link to Data Source**.



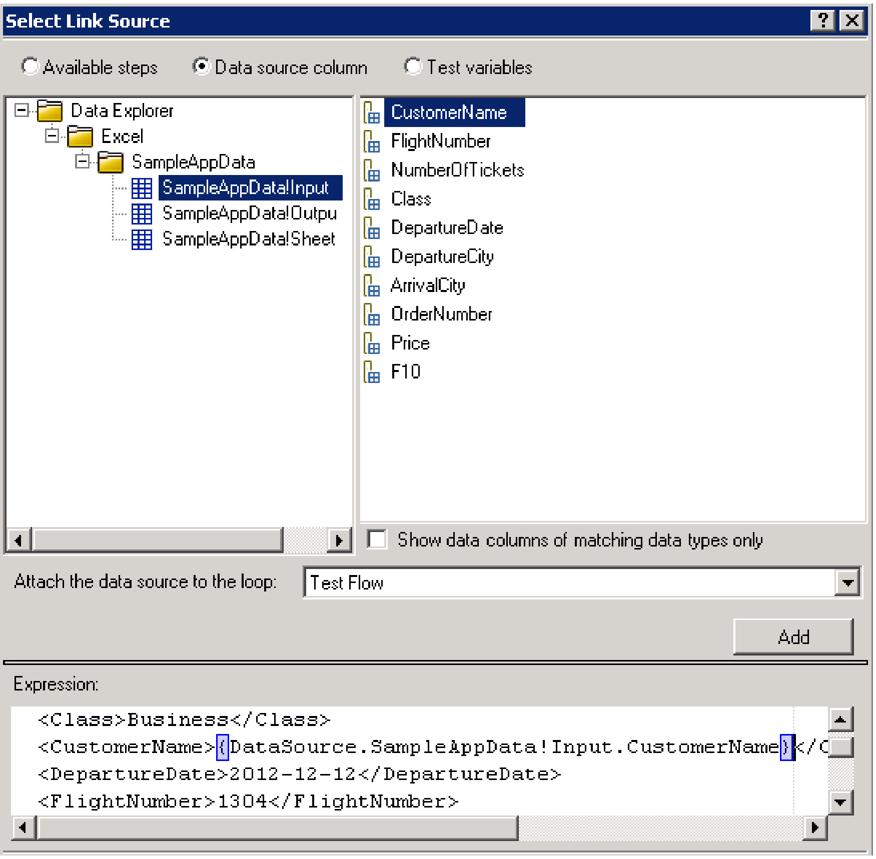
HTTP Request5

Request Body: Text

```
<FlightOrderDetails xmlns="HP.SOAQ.SampleApp" xmlns:i="http:/,
  <Class>Business</Class>
  <CustomerName>John Do
  <DepartureDate>2012-1
  <FlightNumber>1304</F
  <NumberOfTickets>21</NumberOfTickets>
```

4 Select a link source

In the Select Link Source dialog box, select a data source type, such as **Available steps** or **Data source column**. Select the node that you want to use for parameterization. Click **Add**. Note that the expression changed.



○ Available steps ● Data source column ○ Test variables

□ Show data columns of matching data types only

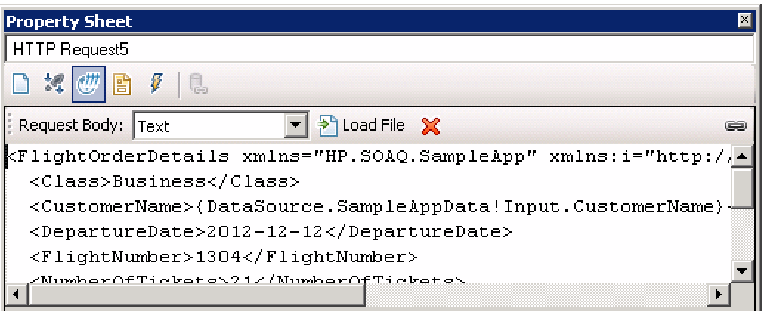
Attach the data source to the loop: Test Flow

Expression:

```
<Class>Business</Class>
<CustomerName>{DataSource.SampleAppData!Input.CustomerName}</C
<DepartureDate>2012-12-12</DepartureDate>
<FlightNumber>1304</FlightNumber>
```

5 Verify the value in the Property Sheet

In the Property Sheet, check the Body area, and verify that the constant value was replaced with the data source expression.



```
<FlightOrderDetails xmlns="HP.SOAQ.SampleApp" xmlns:i="http:/,
  <Class>Business</Class>
  <CustomerName>{DataSource.SampleAppData!Input.CustomerName}
  <DepartureDate>2012-12-12</DepartureDate>
  <FlightNumber>1304</FlightNumber>
  <NumberOfTickets>21</NumberOfTickets>
```

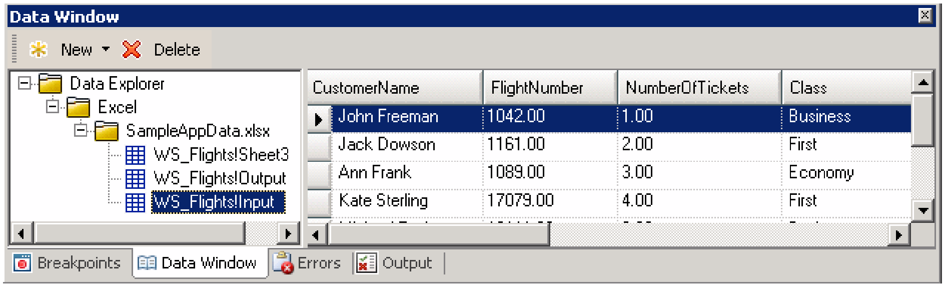
Reference

Data Handling User Interface

This section includes:

Data Window Tab

Enables you to view the output messages that were generated while compiling and running the test.



CustomerName	FlightNumber	NumberOfTickets	Class
John Freeman	1042.00	1.00	Business
Jack Dowson	1161.00	2.00	First
Ann Frank	1089.00	3.00	Economy
Kate Sterling	17079.00	4.00	First

To access	Select **View** > **Data Window** (CTRL+ALT+D).
Important information	Click on a data source to see its contents.
Relevant tasks	➤ How to Create Data Sources on page 358 ➤ How to Assign Data to Test Steps on page 365

User interface elements are described below:

UI Elements (A-Z)	Description
✗	**Remove.** Removes the selected data source, selected in the data source pane.
<data source content>	The data associated with the selected node. You can edit the values directly from this pane.
<data source tree>	A hierarchy of the data sources and their subnodes. The subnodes indicate the parameter designation, such as Input or Output parameters. For Excel files, each sheet represents another parameter.
New	Creates a new data source. Expand the drop down to select s data source type: **Excel, Local Table, XML,** or **Database.**

XML Data Source - Toolbar

The following controls are available when selecting an XML data source in the **Data Window** tab.

UI Elements (A-Z)	Description
↩	**Go back.** Go back to previous view.
⏮	**Go to start.** Go to the first row.
◁	**Go to previous row.** Go to the previous row (one row up).
▷	**Go to next.** Go to the next row (one row down).
⏭	**Go to last.** Go to the last row.
XML	**Import data from an XML file.** Loads data from an XML file.
XML	**Export data from an XML file.** Exports the current data to an XML file.
⇧	**Move up.** Moves the current row up one position.
⇩	**Move down.** Moves current row down one position.
☰ ▾	Adds a new empty row at one of the following locations. ➤ **Add after current** ➤ **Add at start** ➤ **Add at end**
⧉ ▾	Duplicates the current row at one of the following locations. ➤ **Duplicate after current** ➤ **Duplicate at start** ➤ **Duplicate at end**
✕	Deletes the current row.

UI Elements (A-Z)	Description
Description	A title for the row currently displayed.
Row	The current row number out of the total rows, such as **1/3** and so forth.

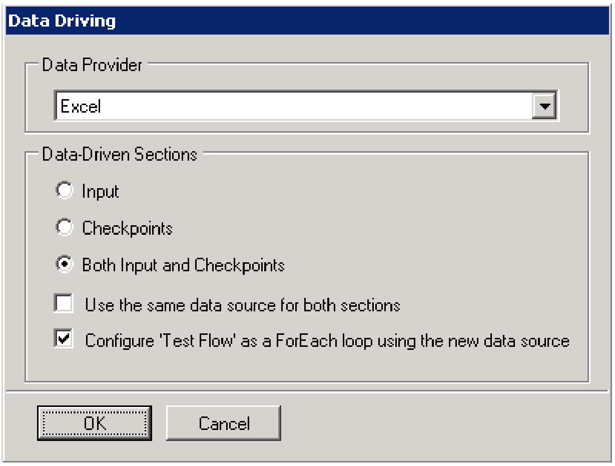
Database Data Source Nodes

The following controls are available when selecting a database type data source in the **Data Window** tab.

UI Element (A-Z)	Description
	Refresh. Updates the data from the database.
	Count. Opens a message box with a row count.

Data Driving Dialog Box

Enables you to populate the input property and checkpoint values for a step, with data expressions.



Data Driving

Data Provider

Excel

Data-Driven Sections

○ Input

○ Checkpoints

● Both Input and Checkpoints

☐ Use the same data source for both sections

☑ Configure 'Test Flow' as a ForEach loop using the new data source

To access	Click in the Property Sheet's toolbar.
Relevant tasks	"How to Data Drive a Test Step" on page 375
See also	"Add New Excel File Data Source Dialog Box" on page 388

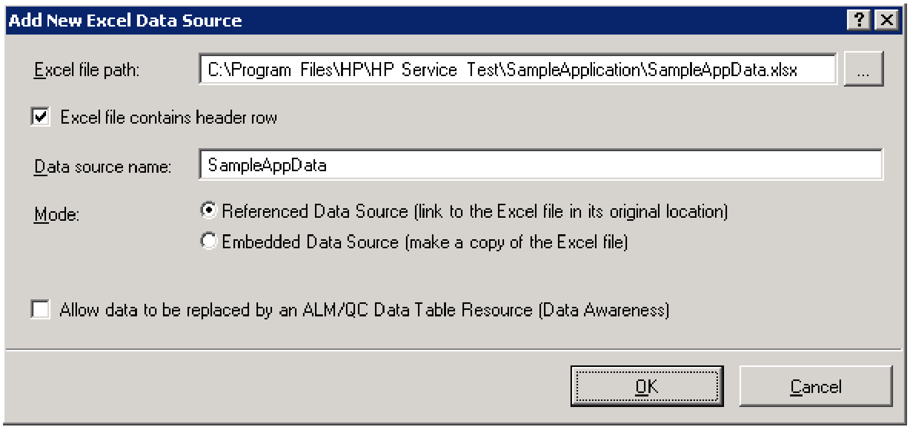
The following elements are included:

UI Elements (A-Z)	Description
Configure 'Test Flow/ Loop' as a ForEach loop using the new data source	Runs the steps in the Test Flow or Loop using a **For Each** type loop, with the values from the newly created data source. The number of iterations is determined by the number of rows in the data source—it performs one iteration for each row. **Note:** This option overrides the configuration that you may have set for the Test Flow/Loop settings. For details, see "Loop - Input Properties" on page 141.
Data Driven Sections - for properties	The section upon which to apply the data driving. These options are available when data driving standard input and output checkpoints properties. ➤ **Input**. All input properties listed in the grid. ➤ **Checkpoints**. All checkpoints listed in the grid. For array type Output properties, you must create at least one array element in order to enable data driving. ➤ **Both Input and Checkpoints**. All properties. **Note:** Activities that do not have output parameters, such as **Report Message** and **System** type activities, will only show the **Input** option.
Data Driven Sections - for schemas	The schema to data drive. These options are available when data driving XSD schema files for an **HTTP**, **SOAP Request**, or **REST** step. ➤ **Request Body**. All input properties associated with the request body. ➤ **Response Body**. All output properties associated with the response body. For array type properties, you must create at least one array element in order to enable data driving. ➤ **Both Request Body and Response Body**. All entities in both schemas. **Note:** For HTTP steps, these options are only available after importing a schema into the **Input** and/or **Checkpoints** sections.

UI Elements (A-Z)	Description
Data Driven Sections - for SOAP Fault properties	**Fault Properties.** The SOAP Fault properties to data drive. This option is available when invoking data driving in the Property Sheet's **SOAP Fault** view.
Data Driven Sections - for SOAP Fault properties	The multipart properties to data drive. These options are available for an HTTP step with a multipart message. ➤ **Request MultipartInfo**. Only Request multipart properties. ➤ **Response MultipartInfo**. Only Response multipart properties. ➤ **Both Request MultipartInfo and Response MultipartInfo**. All multipart properties.
Data Provider	The source type of the data: **Excel** or **XML**.
Use the same data source for both sections	Uses the same data source for the Input/Checkpoint properties or Request/Response body. When selected, Service Test creates a single Excel worksheet with columns for both the Input and Output properties. For example, for the sample application's **CreateFlightOrder** step, Service Test creates a single worksheet with columns for the Input properties: Class, CustomerName, DepartureDate, FlightNumber, NumberofTickets, and the Output properties: OrderNumber, and TotalPrice. **Note**: This option is available only when selecting the **Both** option, for an Excel Data Provider type.

Add New Excel File Data Source Dialog Box

Enables you to add a new Excel data source to the Data Explorer within the **Data Window** tab.



Add New Excel Data Source

Excel file path: C:\Program Files\HP\HP Service Test\SampleApplication\SampleAppData.xlsx

☑ Excel file contains header row

Data source name: SampleAppData

Mode:
● Referenced Data Source (link to the Excel file in its original location)
○ Embedded Data Source (make a copy of the Excel file)

□ Allow data to be replaced by an ALM/QC Data Table Resource (Data Awareness)

To access	Select **View** > **Data Window** and select **New** > **Excel File**.
Relevant tasks	"Add an Excel data source" on page 358

User interface elements are described below:

UI Elements (A-Z)	Description
...	**Browse.** Enables you to locate the Excel file containing the data.
Allow the data to be replaced by an ALM/ QC Data Table Resource	Enables you to overwrite the data from the imported Excel file with values from an ALM Data Resource. For details, see "Data Awareness in ALM/QC" on page 489. **Note:** This option is only enabled when: ➤ You have an open connection with an ALM project. ➤ The version of ALM is 11.00 or higher. ➤ The **Excel file contains header row** option is enabled. **Tip**: If you did not enable this option when you imported the Excel file, you can enable it in the **Data Source Properties** tab in the Property Sheet. For details, see the "Data Source Properties View" on page 58.
Data source name	The name of data source as it will appear in the Data Window's Excel file node. **Default:** The name of the file.
Excel file contains header row	Indicates whether the data in the Excel table contains a header row. Header rows are ignored when running the test.
Excel file path	The complete path of an Excel file on the file system, containing the data.
Mode	The mode of storage for the data source: ➤ **Referenced Data Source.** Links to the Excel file at its original location. If the data changes at its source, it will affect your test. In addition, if you modify the data in Service Test, it will affect the data at its source. ➤ **Embedded Data Source.** Copies the Excel file locally. If the data changes at its source, it will not affect your test.

Add New Local Table Data Source Wizard

Enables you to create local tables in the **Data Window** tab for use with your test.

To access	Select **View** > **Data Window** and select **New** > **Local Table**.
Relevant tasks	"Add a local data table" on page 359
See also	➤ "Add New Excel File Data Source Dialog Box" on page 388 ➤ "Add New XML Data Source Dialog Box" on page 392

User interface elements are described below:

UI Elements (A-Z)	**Description**
⇧ ⇩	Raises/lowers the selection in the column list.
Add	Opens the **Add Columns** dialog box for providing a new column's properties.
Columns	A list of the columns in the local data table.
Delete	Deletes the selected data table column.
Edit	Opens the **Edit Columns** dialog box for modifying the properties of the selected column.

Add/Edit Columns Dialog Box

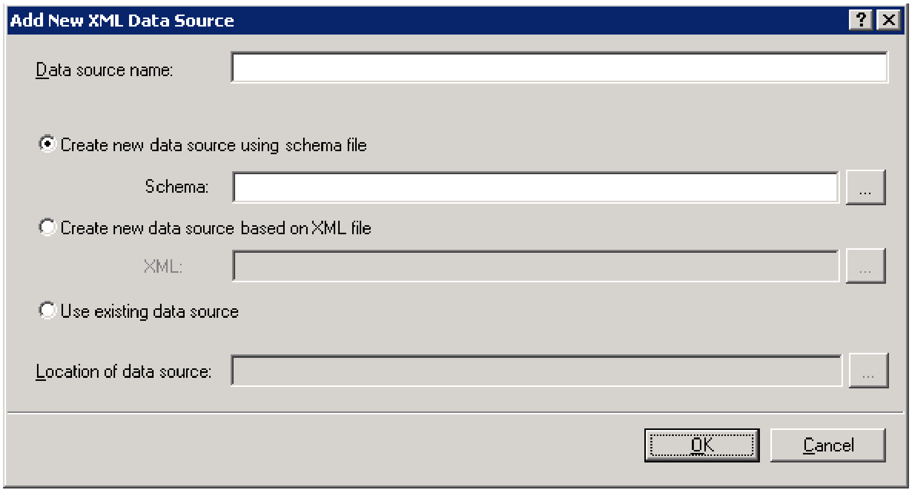
The Add/Edit Columns dialog box lets you define the properties for a new column or edit the properties of an existing one.

User interface elements are described below:

UI Elements (A-Z)	Description
Column Name	An arbitrary name for the column.
Data Type	The type of data in the column: ➤ String ➤ Integer ➤ Double ➤ Date
Description	A description of the data in the column.

Add New XML Data Source Dialog Box

Enables you to add new XSD or XML data sources to the Data Explorer within the **Data Window** tab.



Add New XML Data Source

Data source name:

● Create new data source using schema file

Schema:

○ Create new data source based on XML file

XML:

○ Use existing data source

Location of data source:

To access	Select **View** > **Data Window** and select **New** > **XML**.
Relevant tasks	"Add an XML data source" on page 360
See also	➤ "Add New Excel File Data Source Dialog Box" on page 388 ➤ "Add New Local Table Data Source Wizard" on page 390

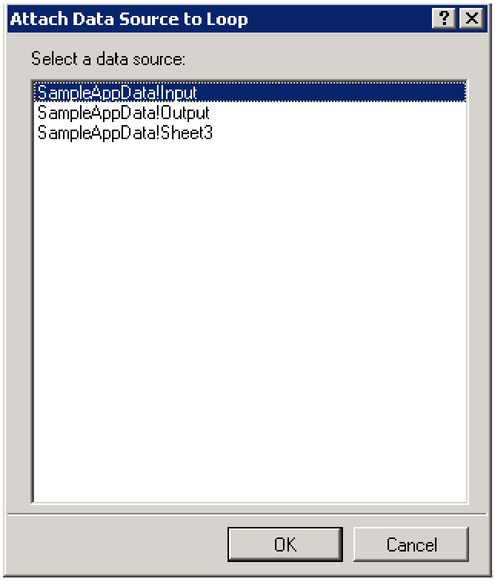
User interface elements are described below:

UI Elements (A-Z)	Description
Create new data source based on XML file	Creates a new schema based on the XML file specified in the **XML file path** box.
Create new data source using Schema file	Loads the specified schema into the Data Explorer window as a basis for the new data source.

UI Elements (A-Z)	Description
Data source name	The display name of the data source.
Use existing data source	Uses an existing data source specified in the **Location of data source** box. Since this data source is referenced, changes made to it will be reflected in all tests using the data source.

Attach Data Source to Loop Dialog Box

This dialog box enables you to add a data source to the current loop.



Attach Data Source to Loop

Select a data source:

SampleAppData!Input
SampleAppData!Output
SampleAppData!Sheet3

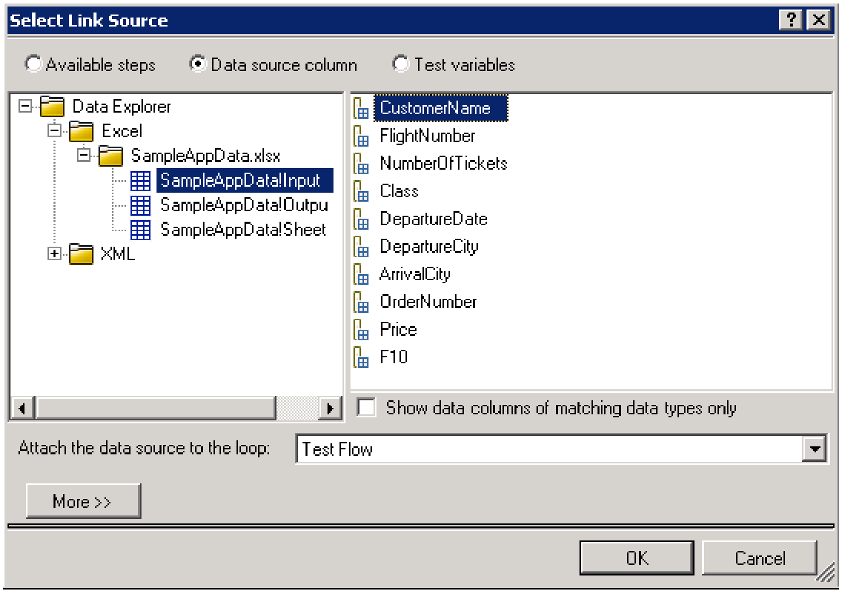
To access	Do the following: **1** In the canvas, click in a loop, but not within a step. **2** In the Property Sheet, select the **Data Sources** view. . **3** Click **Add**.
Important	You must first define data in the Data Window before you generate a list of data sources. When you link any step in the loop to the data, it automatically adds a data source to the loop. For details, see "How to Assign Data to Test Steps" on page 365.
Relevant tasks	"How to Set the Navigation Properties" on page 374
See also	"Data Navigation Dialog Box" on page 399

User interface elements are described below:

UI Element (A-Z)	Description
Select a data source	A list of the available data sources.

Select Link Source Dialog Box

This dialog box enables you to select a data source for the step’s properties.



Select Link Source

○ Available steps ● Data source column ○ Test variables

□ Show data columns of matching data types only

Attach the data source to the loop: Test Flow

To access	Click in the **Value** column of the property for which you want to select a data source.
Important information	➤ To see the icon, click in the property row and move the cursor to the right of the cell. ➤ A step property not contained within a loop, cannot be linked to a data source. For example, the For Loop's **Number of Iterations** property, cannot be linked to a data source, since it is not contained within the Test Flow loop.

Relevant tasks	"How to Assign Data to Test Steps" on page 365
See also	➤ "How to Create Data Sources" on page 358 ➤ "How to Set the Navigation Properties" on page 374

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

UI Elements (A-Z)	Description
<available step list>	A list of the steps whose properties are available as data for the current step. This list could include: ➤ Previous steps. ➤ An input value of the current step, when selecting data for a property in the **Checkpoints** section. ➤ For loop type steps, previous steps or other steps within loop. **Note:** Visible only when choosing **Available steps**.
<data source>	The source for the property value: ➤ **Available steps**. A property value from another step. ➤ **Data source column.** A value from a data source—Excel, XML, local table, or database. ➤ **Test variables.** A value of an test variable—either user or system.
<data sources and their columns>	A list of the Excel, XML, local table, or database data sources in the left pane, and their columns or schema (for XML) in the right pane. **Note:** Visible only when choosing the **Data source column** option.
<step properties grid>	A schema view of the selected step's properties. **Note:** Visible only when choosing **Available steps**.

UI Elements (A-Z)	Description
<system variable grid>	A list of the system environment variables and their values: ControllerHostName, IsLoadTest, ScenarioID, SystemTempDir, GroupName, TestDir, TestName, LocalHostName, OS, OSVersion, ProductDir, ProductName, ProductVer, and UserName. **Note:** Visible only when choosing the **Test variables** option.
<user variable grid>	A list of the user-defined test variables and their values in the current profile. **Note:** Visible only when choosing the **Test variables** option.
Attach the data source to the loop	A drop-down list of the loops in the test containing the activity. The data source is only associated with the selected loop. **Note:** Visible only when choosing the **Data source column** option.
More	Expands the dialog box to allow you to use multiple data sources for an expression, and edit the expression manually.
Show data columns of matching data types only	Hides all columns (or schema rows for XML data sources whose data types do not match the input property whose value you want to set. **Note:** Visible only when choosing the **Data source column** option.
Show properties of matching data types only	Hides all properties whose data types do not match the one whose value you want to set. **Note:** Visible only when choosing the **Available steps**.

Data Retrieval Options for Load Test Enabled Tests

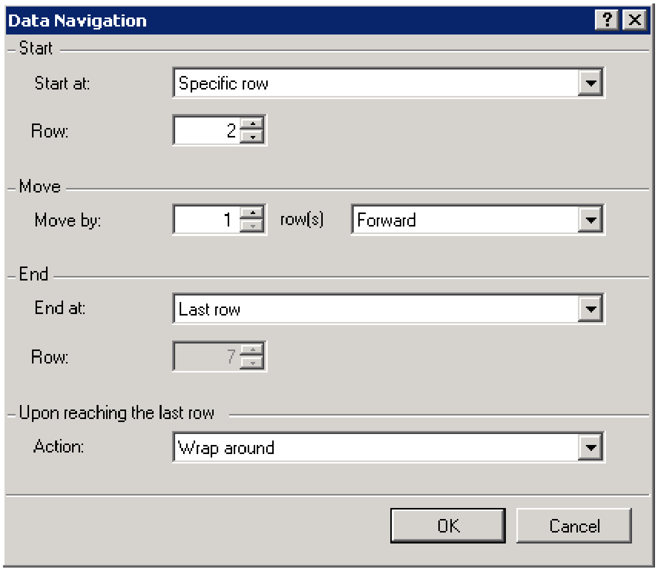
For Load Test Enabled tests, the Select Link Source dialog box provides additional controls for the Input properties, when choosing the **Data source column** option.

User interface elements are described below:

UI Elements(A-Z)	Description
Allocate Virtual User values in the Controller	Allocates a specific amount of values from the data table for the Virtual User: ➤ **Automatically allocate block size**. Automatically allocates a block size from the data based on the number of iterations and Virtual Users (only for Update value on **Each Iteration).** ➤ **Allocate** *<amount>* **values for each Virtual User.** Allocates a specific number of values for each Virtual User. **Note:** Allocation is only possible when choosing Update value on **Each Occurrence** or **Each Iteration.** For details, see the *HP LoadRunner Controller User Guide*.
Attach the data source to the loop	The loop with which to associate the data source (for future implementations).
Use a unique value for each Virtual User when load testing	Assigns a unique value to each Virtual User, from the data table, with the following properties: ➤ **Data source parameter**. The parameter to use as a source of values for the selected input property. ➤ **Update value on**. The frequency by which LoadRunner will update the values: **Each Iteration**, **Each Occurrence** (of the parameter), or **Once**. ➤ **When out of values.**The action to do when reaching the end of the data table: ➤ **Abort Vuser.** End the test run for the Virtual User. ➤ **Continue Cyclic**. Return to the top of the data table and use the data in a cyclic manner. ➤ **Continue with Last.** Use the last value retrieved from the data table for all subsequent occurrences.

Data Navigation Dialog Box

This dialog box enables you to set the data navigation properties for your test loop. You can set the direction in which to use the data, from where to begin, and the condition for selecting data.



Data Navigation

Start

Start at: Specific row

Row: 2

Move

Move by: 1 row(s) Forward

End

End at: Last row

Row: 7

Upon reaching the last row

Action: Wrap around

To access	Do the following: **1** In the canvas, click inside the loop frame—not on a test step. **2** In the Property Sheet, select the **Data Sources** view . **3** Click **Add**. The Attach Data Source to Loop dialog box opens. **4** Select a data source to attach and click **OK**. The data source is added to the grid. **5** Click **Edit**.
Relevant tasks	"How to Set the Navigation Properties" on page 374
See also	"Navigating within the Data" on page 355

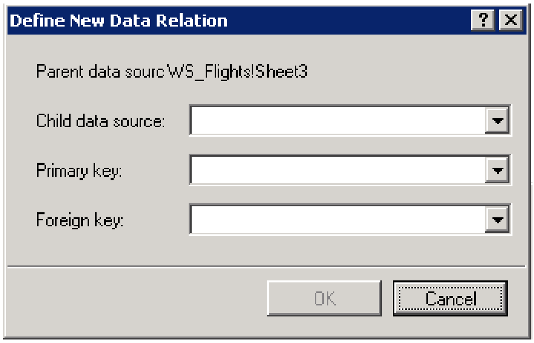
User interface elements are described below:

UI Elements (A-Z)	Description
End at	When to stop the looping through the data: **First row**, **Last row**, **Specific row**, or **First row matching.** ➤ **Row.** The row number in which to end (only available when selecting **Specific row**). ➤ **Condition**. The condition the data row must meet in order to end the looping (only available when selecting the **First row matching** option): ➤ **Column.** One of the data source's columns. ➤ **Comparison operator.** =, !=,>, >=, <, <=, Starts, Ends, Contains, or Regex (depending on row's data type). ➤ **Value.** The value to be matched in order to use this row of data. **Note:** This setting stops the looping only when the loop type is set to '**For Each**' (see "Loop - Input Properties" on page 141) and the current data source whose navigation settings you are editing, is the same data source that is linked to the loop. **Tip:** This setting is only relevant when the **Move** direction is set to **Forward** or **Backward**. For a **Random** direction, each row is visited once in random order. The navigation ends after all of the rows were visited.
Move	The direction and amount of rows by which to advance within the data. ➤ **Move by.** The number of rows to advance. ➤ **Direction.** The direction in which to move: **Forward**, **Backward,** or **Random.**

UI Elements (A-Z)	Description
Start at	The location from where to begin taking data from the data source. ➤ **Start at.** The row of data from which to begin: **First row**, **Last row**, **Specific row**, **Random row,** or **First row matching.** ➤ **Row.** The row number from which to begin (only available when selecting **Specific row**). ➤ **Condition**. The condition the data row must meet in order to start the looping (only available when selecting the **First row matching** option): ➤ **Column.** One of the data source's columns. ➤ **Comparison operator.** =, !=,>, >=, <, <=, Starts, Ends, Contains, or Regex (depending on the row's data type). ➤ **Value.** The value to be matched in order to use this row of data.
Upon reaching the first row - Action: (Backward direction)	The action to take when reaching the first row of data. ➤ **Keep using that row**. Keep using the first row of data for all subsequent loops. ➤ **Wrap around.** Start again from the last row of data.
Upon reaching the last row - Action: (Forward direction)	The action to take when reaching the last row of data. ➤ **Keep using that row**. Keep using the last row of data for all subsequent loops. ➤ **Wrap around.** Start again from the first row of data.

Define/Edit New Data Relation Dialog Box

This dialog box enables you to define or edit a new data relation for a data source. The following is an example of the Define New Data Relation dialog box:



Parent data sourc WS_Flights!Sheet3

To access	Do the following: **1** Make sure you have at least one data source in the **Data Window** tab. **2** Select a data source in the **Data Window's** left pane. **3** Click in the Property Sheet pane. The **Data Source Properties** view opens. **4** Click **Add** or **Edit**.
Relevant tasks	"Create a new child relation" on page 364

User interface elements are described below:

UI Elements (A-Z)	Description
Child data source	The name of the parent data source, selected in the Property Sheet (read-only).
Child data source	The sheet or table to use for the data source.

UI Elements (A-Z)	Description
Foreign key	The column in the child data source to use as a foreign key for the child relation.
Primary key	A column in the parent data source to use as a primary key for the child relation.

Database Data Source User Interface

Service Test enables you to work with standard database providers to retrieve data for your step's properties.

Add New Database Data Source Wizard

This wizard enables you to retrieve data rows from a standard database provider. You specify a connection string and an SQL statement to retrieve the data.

To access	Do the following: **1** Make sure the Data Window is visible. If not, select **View** > **Data Window**. **2** In the Data Window pane, select **New** > **Database**.
Relevant tasks	"Add a Database data source" on page 361
Wizard map	This wizard contains: **Define the Connection String Page** > **Define the Query Statement Page**
See also	"Query Designer Dialog Box" on page 193

Define the Connection String Page

This wizard page enables you to define a connection string for connecting to the database.

Important information	General information about this wizard is available here: "Add New Database Data Source Wizard" on page 403.
Wizard map	This wizard contains: **Define the Connection String Page** > **Define the Query Statement Page**

User interface elements are described below:

UI Elements (A-Z)	Description
	Create New String. Opens the Microsoft Data Link Properties dialog box.
<connection string area>	An editable area for pasting in existing strings, or for editing the connection string selected in the drop-down list. **Tip:** To add a string to the drop-down list, click **Check Connection**.
Check Connection	Checks the database connection for the string shown in the text area. If it is a valid string, the wizard adds it to the list of Connection strings and changes the status to Connected Connected .
Connection string	A drop-down list of previously defined connection strings.

Define the Query Statement Page

This wizard page enables you to provide a query statement for retrieving your data.

Important information	General information about this wizard is available here: "Add New Database Data Source Wizard" on page 403.
Wizard map	This wizard contains: Define the Connection String Page > Define the Query Statement Page

User interface elements are described below:

UI Elements (A-Z)	Description
	Opens the Query Designer. For details, see the "Query Designer Dialog Box" on page 193.
<SQL statement area>	An editable area for pasting existing SQL strings or for editing the SQL string selected in the drop-down list. **Tip:** To add an SQL statement pasted into the text area to the drop-down list, click **Check SQL Statement**.
Check SQL Statement	Executes the SQL statement shown in the text area and opens the results in a **Query Preview** window. If the statement is valid, the wizard adds it to the drop-down list of SQL statements and changes the status to Query executed successfully Query executed successfully. .
Data source name	The name of the data source as it will be referenced by your test.
SQL Statement	A drop-down list of the available SQL statements.

Troubleshooting and Limitations - Data

This section describes troubleshooting and limitations for working with data.

- If a specified data source is or becomes inaccessible, the test will not fail. The Output window, however, indicates that there was an error in retrieving the data.
- The copying and pasting of data source links is not supported. When providing a link for a property, use the Select Data Source dialog box—do not copy the expression from the **Value** column.
- Keywords such as **#NIL#**, **#Skip#**, and so forth, are not supported in the checkpoint grid. They are supported in the Data Window's data sources.
- If Microsoft Office is not installed, changes made to an Excel data source that uses columns with different data types, will not be saved.
- Data driving for arrays within checkpoints, using Excel data sources, is not supported.
- You cannot import an Excel file as a data source if it is currently open in Excel.
- Working with an imported Excel file as a data source, may temporarily disable an open Excel document on the same machine.
- When adding a referenced Excel data source, if the file requires special credentials (for example, a location on another domain or a drive requiring authentication), you must verify that the operating system will allow access to the file.
- Data sources with parent-child relationships, should not be accessed together in the same loop, unless the child data source is used for data-driving array elements. Accessing parent-child data sources in the same loop, may corrupt the test.
- Excel data with column headers beginning with digits or containing symbols, such as !@#, are not supported.
- XML data sources: XML file that use XSL, are not supported.

- When linking between an activity and its containing step, such as **Test Flow**, the canvas does not show the link. The property's **Value** column contains the link expression.
- Linking to file names is not supported for **HTTP Request** and **HTTP Receiver** activities that use the **File** type message body.

9

Running Tests

This chapter includes:

Concepts

Tasks

Reference

Concepts

Running Tests Overview

You can run tests directly from the Service Test interface or from the command line. The test run enables you to determine if the activities are functional and if they are performing as expected.

Before running the test, you can select a location in which to store the results, and set input parameter values specifically for this test run. For details, see "How to Run a Test" on page 417.

For details about the command line, see "Command Line Syntax" on page 427.

The Run Results Viewer provides a detailed report about each step and its checkpoints. For details, see Chapter 10, "Run Results Viewer."

When you run custom code from the user interface, you can also use breakpoints and other tools to debug your code.

Service Test enables you set the run configuration—**Debug** or **Release**. The **Release** mode is more efficient, and is recommended for Load Testing.

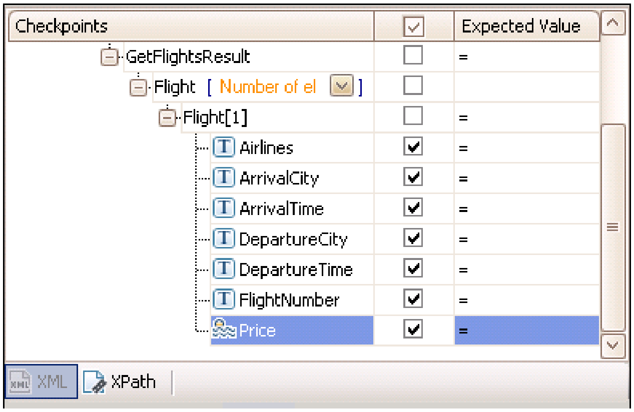
When a test step fails, Service Test continues to run the other test steps. The exception to this is if you enabled the **Stop test if checkpoint fails** option and the checkpoint failed. For details, see "Input/Checkpoints View" on page 70.

For Web Service steps, you can instruct Service Test to validate the SOAP response against a schema or WS-I standards. For details, see "Input/Checkpoints View" on page 70.

Checkpoint Validation

In functional testing, it is necessary to check the response from the server to confirm that your service performed the actions correctly. The response can contain several properties, each containing several data items. The **Checkpoints** section is a central point for defining the required response values for your test.

Before replaying a test, you set expected values for the test properties. You can enter the values manually, link them to a data source, or load values that were captured during replay. This is useful when you have many argument values—instead of manually entering values, you automatically load them.



Checkpoints	☑	Expected Value
GetFlightsResult	□	=
Flight [Number of el]	□	
Flight[1]	□	=
Airlines	☑	=
ArrivalCity	☑	=
ArrivalTime	☑	=
DepartureCity	☑	=
DepartureTime	☑	=
FlightNumber	☑	=
Price	☑	=

To include a checkpoint in the test, you select its check box. If you loaded replay values, you can select only those properties that you loaded.

For WSDL-based Web Services and SOAP Requests, Service Test includes two built-in checkpoints for the purpose of validation. One checkpoint validates the XML structure and the other checks its compliance with WS-I.

Additional checkpoint settings let you trim the string, ignore case inconsistencies, and indicate whether to stop on failed checkpoints.

For details, see the "Input/Checkpoints View" on page 70.

After the test run, the Run Results Viewer displays the checkpoint status in its own sub-node. For details, see "HTTP Checkpoint Response" on page 447.

XPath Checkpoints

For steps with XML output properties, such as **Web Service** and **SOAP Request**, **String to XML**, and so forth, you can validate the test results against XPath expressions.

You can specify a fully qualified XPath expression, or you can instruct Service Test to ignore the namespaces and prefixes during the test run. By ignoring the namespaces, you can use a simpler expression.

In the following example, to retrieve the contents of the second node, B, you would need to write an expression that also indicates the namespace, such as //*[local-name(.)='Node' and namespace-uri(.)='ns2'].

```
<Root>
  <Body>
      <Node xmlns="ns1">A </Node>
      <Node xmlns="ns2">B </Node>
  </Body>
</Root>
```

When working with simple XPath expressions, you can further simplify the XPath expression by selecting **Ignore namespaces**. In the above example, the expression //Node[2] is sufficient to evaluate the value B in the second node.

You can type in the XPath expressions manually, or use the shortcut menu to retrieve the simplified or fully qualified XPath.

Service Test also enables you to evaluate XML with namespace prefixes. For example, if the XML contains the prefix definition xmlns:T="ns1", you can specify the prefix in the XPath expression: //T:*NodeName*. To evaluate namespace prefixes, disable the **Ignore namespaces** option.

XPath checkpoints can only be used when the XPath query returns a scalar value —not XML.

For task details, see "How to Set XPath Checkpoints" on page 421.

Negative Testing

When performing a functional test for your Web Service, you should approach the testing in a variety of ways. The most common type of testing is called **Positive Testing**—checking that the service does what it was designed to do.

In addition, you should perform **Negative Testing**, to confirm that the application did not perform a task that it was not designed to perform. In those cases, you need to verify that the application issued an appropriate error—a SOAP Fault.

To illustrate this, consider a form accepting input data—you apply positive testing to check that your Web Service has properly accepted the name and other input data. You apply negative testing to make sure that the application detects an invalid character, for example a letter character in a telephone number.

When your service sends requests to the server, the server responds in one of the following ways:

- **SOAP Result.** A SOAP response to the request.
- **SOAP Fault.** A response indicating that the SOAP request was invalid. Negative Testing applies only to SOAP faults.
- **HTTP Error.** An HTTP error, such as Page Not Found, unrelated to Web Services.

Service Test can check for a standard SOAP result or a SOAP fault response. For example, if your Web Service attempts to access a Web page that cannot be found, it will issue a 404 HTTP error. Using negative testing you indicate that you expect a SOAP fault. In this case, the test run will fail if the service accesses a *valid* Web page.

Service Test's Property Sheet lets you provide values for the SOAP fault header and body. You can enter **faultcode**, **faultstring**, and **faultactor** values as well as custom properties using **Any** type parameters. Using the Checkpoint mechanism, you can validate these values and view the results in the Run Results Viewer.

For details on setting up the SOAP fault values, see "SOAP Fault View" on page 76.

Load Testing

You can add load testing capabilities to your test, that will allow you to measure performance under load.

When you have a full LoadRunner installation on the Service Test machine, Service Test provides a custom template, **Service Test Enabled for Load Test**.

For tests created with the standard **Service Test** template, Service Test provides a conversion utility which converts the script into a LoadRunner compatible script, with a **.usr** extension.

Note: Tests created in Service Test and converted into LoadRunner scripts, cannot be edited in LoadRunner's Virtual User Generator (VuGen). To edit a test, modify it in Service Test.

To measure performance within LoadRunner, you can insert **Start** and **End Transaction** markers. During execution, LoadRunner measures the execution time of all the actions between the transaction markers.

The **Think Time** activity lets you emulate the way a true user operates, pausing between actions. You specify a duration in seconds, for which to wait between test steps.

When working with data tables, you can use the standard data retrieval methods that are available in LoadRunner. For details, see "Data Retrieval Options for Load Test Enabled Tests" on page 398.

For task details, see "How to Prepare and Run a Load Test" on page 422.

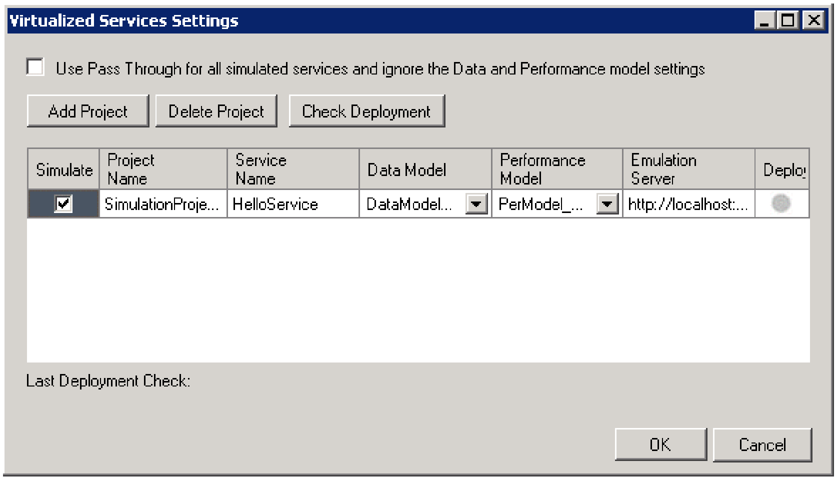
For more information, see the *HP LoadRunner Controller User Guide*.

Using Virtualized Services

Service Test integrates with HP Service Virtualization. This integration enables you to run virtual services that simulate actual services. This is especially useful where running a service incurs a cost, such as credit card processing. In addition, it is useful when development is incomplete for the service you need to test.

In HP Service Virtualization, you create simulation projects. These projects contain information about the virtualized services that simulate actual services.

In Service Test, you can load one or more simulation projects. A dialog box indicates if and when the service was deployed, and information about the virtualization server. For details, see the "Virtualized Services Settings Dialog Box" on page 434.



□ Use Pass Through for all simulated services and ignore the Data and Performance model settings

Simulate	Project Name	Service Name	Data Model	Performance Model	Emulation Server	Deplo
☑	SimulationProje...	HelloService	DataModel...	PerModel_...	http://localhost:...	●

Last Deployment Check:

Once you deploy the project, its services will be available from the Toolbox, and you can drag its activities onto the canvas.

Data and Performance Models

You can select the Data and/or Performance models to use with the virtualized service in test execution.

The Data Model enables you to record actual requests and responses for the real service and then use this data for simulation using the virtual service. You can edit the data, add service calls, and model the behavior.

The Performance Model enables you to record the performance for the real service and then use this as performance criteria for the service.

You define these models when you create the Simulation project in HP Service Virtualization. You should select at least one Data or Performance model. If you select None for both models, it is equivalent to working in Pass Through mode.

For details, refer to the *HP Service Virtualization* user guide.

Tasks

How to Run a Test

This task describes how to run a test through the user interface and view its results.

For information on running a test through the command line, see "Command Line Syntax" on page 427.

This task includes the following steps:

- "Configure checkpoints" on page 417
- "Select a build configuration - optional" on page 419
- "Save the test in ALM/QC - optional" on page 419
- "Add external references - optional" on page 419
- "Select a location for the run results - optional" on page 419
- "Set values for the test variables- optional" on page 420
- "Validate the structure of the SOAP response" on page 420
- "Run the test" on page 420
- "Debug the test - optional" on page 420
- "Results" on page 420

1 Configure checkpoints

Checkpoints let you validate the results. For details, see "Checkpoint Validation" on page 411.

a Open the **Input/Checkpoints** view. By default, Service Test displays the **XML** tab. Provide an expected value for each row in one of the following ways:

- Manually
- Select Link Source dialog box.

➤ **Load from replay** button.

b Select a comparison operator, such as =, >, or Regex. These may differ depending on the data type.

c Select the **Validate** check boxes in the rows of the properties that you want to validate. Clear the check boxes for the properties you are not validating.

d To validate against an XPath expression, click the **XPath** tab and provide the expression. For details, see "How to Set XPath Checkpoints" on page 421:

e To halt the test run if the response does not return the expected value select **Stop test if checkpoint fails**.

Tip: You can customize and override the checkpoint settings using an event handler. For details, see "How to Write Checkpoint Events" on page 517.

For user interface details, see the "Input/Checkpoints View" on page 70.

2 Select a build configuration - optional

Choose a build configuration. Select **Build** > **Set Configuration** to select a configuration: **Debug** or **Release**. During development, it is preferable to use the **Debug** option to allow you access to detailed output information. To conserve resources, such as in Load Testing, use the **Release** option.

3 Save the test in ALM/QC - optional

To save results in ALM/QC, you need to first save the actual test in ALM/QC. Select **File** > **HP ALM/QC Connection**.

4 Add external references - optional

You can add one or more references to external DLL files. To add an external reference, select **Test** > **Add Reference**. Browse for the file and click **OK**.

5 Select a location for the run results - optional

a Click the Run button on the toolbar and select the **Results Location** tab.

To show and hide this dialog box, select **Edit** > **Settings** > **Show Run Dialog Box.**

b For test saved on the File System, select a location in which to store the run results—**New run results folder** or **Temporary run results folder**. Choose the latter if you do not expect to use and analyze the results. For details, see "Results Location" on page 430.

c For tests saved test in ALM/QC, specify a Run name. If relevant, select a **Test set** and **instance**.

6 Set values for the test variables- optional

Select the test properties or user/system variables. For details, see "How to Define Test Properties or User/System Variables" on page 94.

7 Validate the structure of the SOAP response

For Web Service steps, you can instruct Service Test to validate the SOAP response against the schema or WS-I standards. For details, see the "Input/ Checkpoints View" on page 70.

8 Run the test

Click the **OK** button in the Run dialog box.

9 Debug the test - optional

Use the Break mode and other debug tools to solve any runtime issues.

For user interface details, see the "Service Test Main Window" on page 37 or the "Debug Menu" on page 431.

10 Results

View the results in the Run Results Viewer. The viewer opens automatically after a test run.

- A green check mark indicates success.
- A red **X** mark indicates a failure in one of the steps. Expand the nodes of the report to view details about each step and checkpoint.

To view the report at a later stage, select **Test** > **View Test Results**.

How to Set XPath Checkpoints

This task describes how to validate your test results against XPath expressions. For conceptual information, see "XPath Checkpoints" on page 412.

This task includes the following steps:

- "Add a step with XML output" on page 421
- "Set the namespace setting" on page 421
- "Copy the XPath" on page 421
- "Add an XPath checkpoint" on page 422
- "Provide the XPath expression" on page 422
- "Set up the validation" on page 422
- "Run the test" on page 422

1 Add a step with XML output

Add a test step with XML output, such as **String to XML**. Open the **Input/Checkpoints** view. Paste a source string into the **Value** column.

2 Set the namespace setting

Click the **XPath** tab, to indicate whether or not to ignore namespaces. By default, the **Ignore namespaces** option is enabled. If you plan to validate against a fully qualified expression, or if you need to specify a namespace prefix, disable the option. For details, see "XPath Checkpoint Options" on page 74.

3 Copy the XPath

Copy an XPath expression to the clipboard. If you intend to enter the XPath expression manually, skip this step.

- To retrieve a simple XPath, click in the **Value** column, and select **Copy XPath** from the shortcut menu.
- To retrieve a complete qualified XPath, click in the **Value** column, and select **Copy Fully Qualified XPath** from the shortcut menu.

4 Add an XPath checkpoint

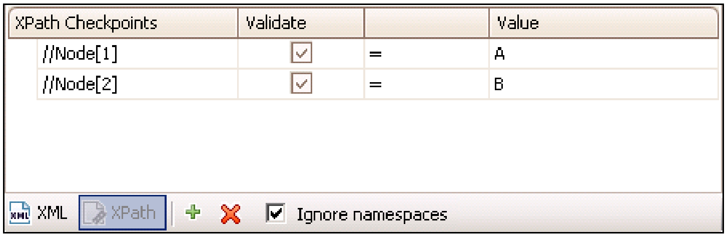
Click the **XPath** tab in the Checkpoints section. Click the **Add** button to add a new XPath checkpoint.

5 Provide the XPath expression

Type or paste the expression into the **XPath Checkpoints** column.

6 Set up the validation

Select the check box in the **Validate** column, select a comparison operator, and provide an expected value.



XPath Checkpoints	Validate		Value
//Node[1]	☑	=	A
//Node[2]	☑	=	B

☑ Ignore namespaces

7 Run the test

Run the test and check the results.

How to Prepare and Run a Load Test

This task describes how to prepare a test for load testing in LoadRunner. For an explanation about load testing, see "Load Testing" on page 414.

This task includes the following steps:

- "Prerequisite" on page 423
- "Create a load test" on page 423
- "Add test steps" on page 423
- "Prepare for load testing - optional" on page 423
- "Assign data to the test - optional" on page 425

- "Set the data retrieval properties - optional" on page 425
- "Set the run configuration to Release" on page 426
- "Run the test in Load Testing mode to validate the test" on page 426
- "Incorporate the test into LoadRunner" on page 426

1 Prerequisite

Make sure that HP LoadRunner or a standalone version of VuGen (HP Virtual User Generator) is installed. Without this installation, the Load Testing template will not be available.

2 Create a load test

Create a new test with the **Service Test Enabled for Load Testing** template.

If you have a test that was created with the standard Service Test template, select **Test** > **Enable Test for Load Testing** or click the **Enable Test for Load Testing** button.

3 Add test steps

Drag activities from the toolbox into the canvas to add steps to the test.

4 Prepare for load testing - optional

To measure the performance of a group of steps, define a transaction.

a Mark the beginning of a transaction.

- Drag the **Start Transaction** activity from the Toolbox's **Load Testing** category, into the canvas. Place it before the first step of the group of steps that you want to measure.
- Open the **Input/Checkpoints** view in the Property Sheet. Enter a **Transaction name**. This name will be used in LoadRunner Analysis.

b Mark the end of a transaction.

- Drag the **End Transaction** activity to the end of the group of steps you want to measure.

- ➤ In the Property Sheet’s **Input/Checkpoints** view, type a transaction name. The name must be one that was already used for a prior **Start Transaction** step.
- ➤ In the End Transaction’s **Input** properties, select a **Status** for reporting: PASS, FAIL, AUTO, or STOP.

Note: The End Transaction status is only the LoadRunner transaction's status—not the status of step in Service Test. For example, if you assign a **Failed** status to the transaction, Service Test can still issue a **Passed** status for the test step.

---

c Set the think time.

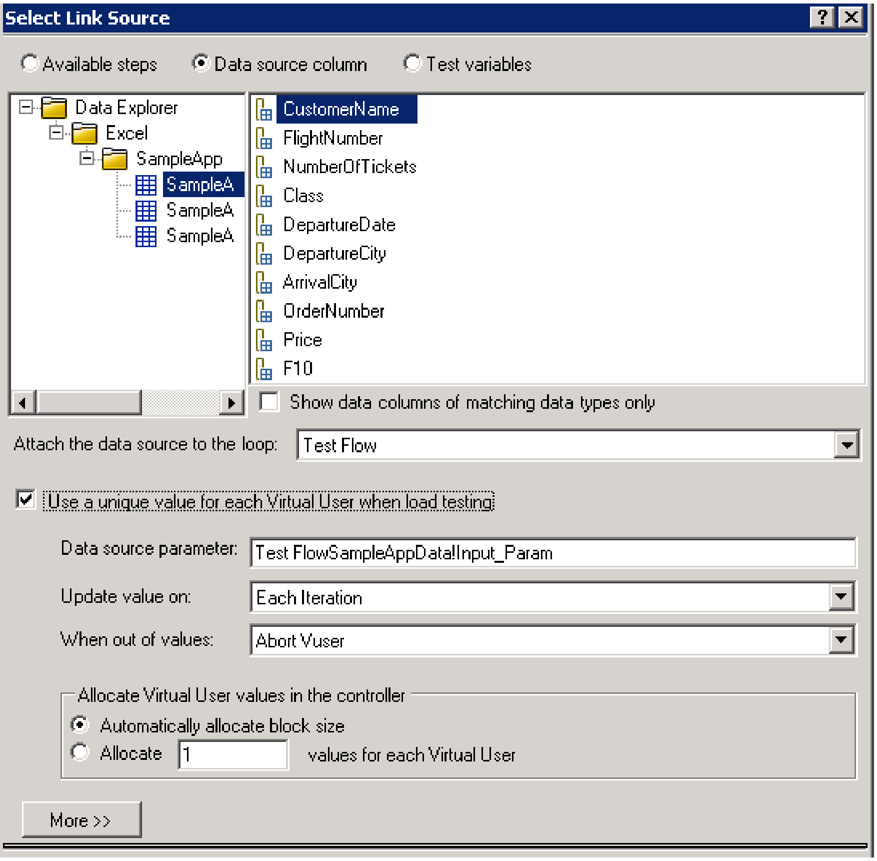
- ➤ If you want to emulate think time, drag the **Load Testing** > **Think Time** activity between the relevant steps.
- ➤ In the Property Sheet’s **Input/Checkpoints** view, click in the **Duration (sec)** row and specify a think time in seconds.

5 Assign data to the test - optional

Import or create data tables for the input properties. For details, see "How to Assign Data to Test Steps" on page 365.

6 Set the data retrieval properties - optional

If you have data in the **Data Window** pane, set the data retrieval properties. Click the **Link to a data source** button. For details, see the "Data Retrieval Options for Load Test Enabled Tests" on page 398.



Select Link Source

○ Available steps ● Data source column ○ Test variables

Data Explorer
Excel
SampleApp
SampleA
SampleA
SampleA

CustomerName
FlightNumber
NumberOfTickets
Class
DepartureDate
DepartureCity
ArrivalCity
OrderNumber
Price
F10

□ Show data columns of matching data types only

Attach the data source to the loop: Test Flow

☑ Use a unique value for each Virtual User when load testing

Data source parameter: Test FlowSampleAppData!Input_Param

Update value on: Each Iteration

When out of values: Abort Vuser

Allocate Virtual User values in the controller

● Automatically allocate block size

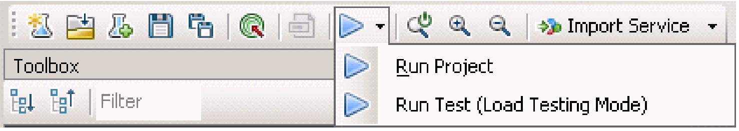
○ Allocate 1 values for each Virtual User

7 Set the run configuration to Release

Select **Build** > **Set Configuration** and select **Release**. The **Release** mode conserves resources, thus enhancing the load testing capabilities.

8 Run the test in Load Testing mode to validate the test

Expand the **Run** button and select **Run test (Load Testing mode)**. This run is only for debugging purposes, to verify that the test is functional.



Note: When you run a test in Load Testing mode, the **Output** tab does not contain data and the Run Results Viewer does not open. To view the results, select **Run Project** to run the test in functional mode.

---

9 Incorporate the test into LoadRunner

Add the test to the LoadRunner Controller console to include it in a load test. For more information, see the *HP LoadRunner Controller User Guide*.

Reference

Running Test and Debug User Interface

This section describes the options for running Service Test from the command line and the dialog boxes used for text execution.

This section includes:

Command Line Syntax

The Service Test executable, **ServiceTestExecuter.exe**, is located in the product's **bin** directory.

The following table describes the command line options for **ServiceTestExecuter.exe**:

UI Elements (A-Z)	Description
-inParams	The full path of an XML file containing the input property values (optional).
-outParams	The full path of an XML file containing the output property values (optional).
-profile	The name of an Test profile (optional). For details, see "How to Define Test Properties or User/System Variables" on page 94.

UI Elements (A-Z)	Description
-report	The folder in which to store the report.
-test	The full path of the test (required). Specify the test directory—not the solution directory.

Tip: To retrieve a list of all of available parameters, run **ServiceTestExecuter.exe** without any parameters.

The following example runs Test1 using input properties from inParams.xml and output properties from outParams.xml:

```
C:\Program Files\HP\HP Service Test\bin> ServiceTestExecuter.exe -test
"c:\MyTests\Test1\Test1" -inParams "c:\MyData\inParams.xml" -outParams
"c:\MyData\outParams.xml"
-profile Profile1
```

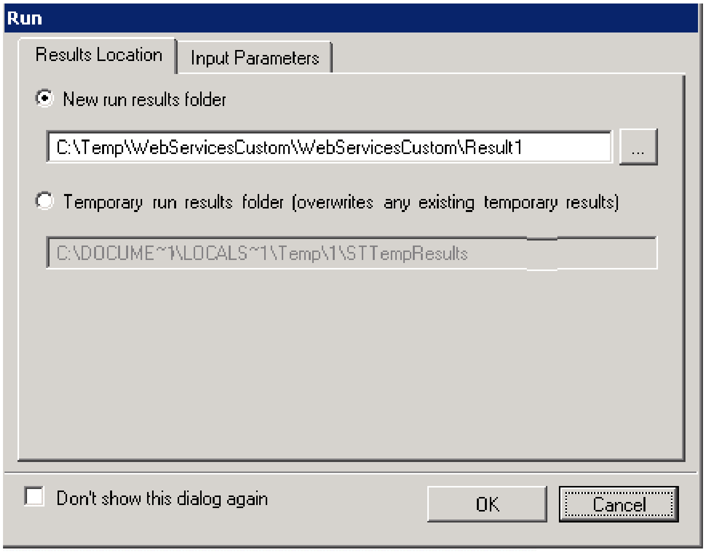
where the input property file, InParams.xml, has, for example, this structure:

```
<Arguments>
    <a>1</a>
     <b>2</b>
</Arguments>
```

Note: To run a test from the command line, you must save and run the test at least once.

Run Dialog Box

The Run Dialog box enables you to set the results location and add input parameters for the run session.



● New run results folder

C:\Temp\WebServicesCustom\WebServicesCustom\Result1

○ Temporary run results folder (overwrites any existing temporary results)

C:\DOCUME~1\LOCALS~1\Temp\1\STTempResults

□ Don't show this dialog again

To access	Select **Debug** > **Run** or click ▷ .
Relevant tasks	"How to Run a Test" on page 417

The Run dialog box has the following tabs:

- "Results Location" on page 430
- "Input Parameters" on page 431

Results Location

This tab lets you specify a location for the Run Results. The fields differ for a test saved on the file system and one saved in an ALM/QC project. The user elements are described below.

UI Element (A-Z)	Description
Don't show this dialog again	Bypasses the Run dialog box in future test runs, using your last selection. **Tip**: To show this dialog box again, select **Edit** > **Settings** > **Show Run Dialog Box**.
New run results folder	Stores the run results in a specific folder (Available when there is no connection to an ALM/QC server). Click the Browse button to select a location. The default path is **C:\Documents and Settings\%USERPROFILE%\My Documents\ServiceTestProjects\<Test Name Folder\<TestName>.**
New run results in HP ALM/QC Project	Stores the run results in the current ALM/QC project. You cannot change the destination **Project name** (Available when there is a connection to an ALM/QC server). The following fields are editable: ➤ **Run name.** A custom name for the test run. ➤ **Test set.** The name of the test set in ALM/QC. ➤ **Instance.** The instance number of the run.
Temporary run results folder	Stores the run results in a temporary folder, overwriting any existing results. This folder uses the **TEMP** variable defined for the current user, **%USERPROFILE%\Local Settings\Temp\STTempResults.**

Input Parameters

This tab lets you view and specify values for Input parameters that you defined earlier.

UI Element (A-Z)	Description
Schema	The name of the parameter.
Value	An editable column containing the parameter values.

For details about defining user variables, see "Test Variables View - Action Buttons" on page 80.

Debug Menu

The Debug menu enables you to control the running of the test and run it step-by-step.

To access	Expand the Service Test **Debug** menu.
Relevant tasks	"Debug the test - optional" on page 420

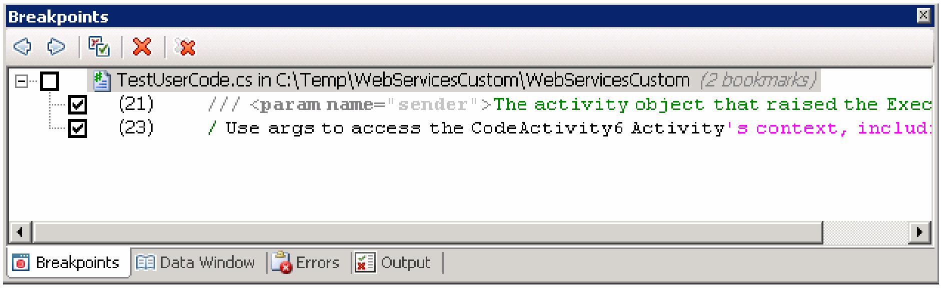
The user interface elements are described below.

UI Element (A-Z)	Description
▷	**Run.** Runs and compiles the test.
■	**Stop Process.** Stops the test execution.
⏸	**Break.** Pauses the test run and enters Break mode in order to allow you to edit the code.
❙▷	**Continue Debugging.** Resumes the test run from the point of the break.

UI Element (A-Z)	Description
↷	**Step Over.** Executes the current statement and enters Break mode in order to allow you to edit the code. If the statement calls another procedure, Service Test will not step into that procedure. It will run the procedure, and advance to the next statement in the current procedure. **Step Into.** Executes the current statement and enters Break mode in order to allow you to edit the code. If the statement calls another procedure, Service Test will step into that procedure. **Step Out.** If you used **Step Into** and the control moved to a called procedure, Step Out automatically runs the current procedure, and returns to the procedure from which it was called.
→	**Step Into.** Executes the current statement and enters Break mode in order to allow you to edit the code. If the statement calls another procedure, Service Test will step into that procedure.
↶	**Step Out.** If you used **Step Into** and the control moved to a called procedure, Step Out automatically runs the current procedure, and returns to the procedure from which it was called.
Toggle Breakpoint	Inserts or removes a breakpoint at the location of the cursor. **Note:** This applies when working in a code window, such as an event, but not in the canvas. **Tip:** The shortcut key for toggling a breakpoint is **F7**.

Debug Output Window

The Debug Output window enables you to view the run's debug information and breakpoints.



```
☐ TestUserCode.cs in C:\Temp\WebServicesCustom\WebServicesCustom (2 bookmarks)
   ☑ (21)    /// <param name="sender">The activity object that raised the Exec
   ☑ (23)    / Use args to access the CodeActivity6 Activity's context, includ:
```

To access	Select **View** > **Debug** > **<sub-item>.**
Relevant tasks	"Debug the test - optional" on page 420

The following tabs are included:

UI Elements (A-Z)	Description
Breakpoints tab	A list of the breakpoints in the test, for each open buffer. This tab provides the following controls: ◁ . **Go to Previous Bookmark.** Jumps to previous bookmark in the list. ▷ . **Go to Next.** Jumps to next bookmark in the list. ☑ . **Enable/Disable.** Enable or disable all bookmarks. ✖ . **Delete.** Delete the selected bookmark. ✖ . **Delete All.** Delete all bookmarks in all buffers. **Tip:** To create a bookmark, click on a line within a buffer and press **F7**.
Callstacks tab	A list of the calls in the stack sorted by **Name** or **Language.**
Console tab	A console allowing you to manually enter debug commands.

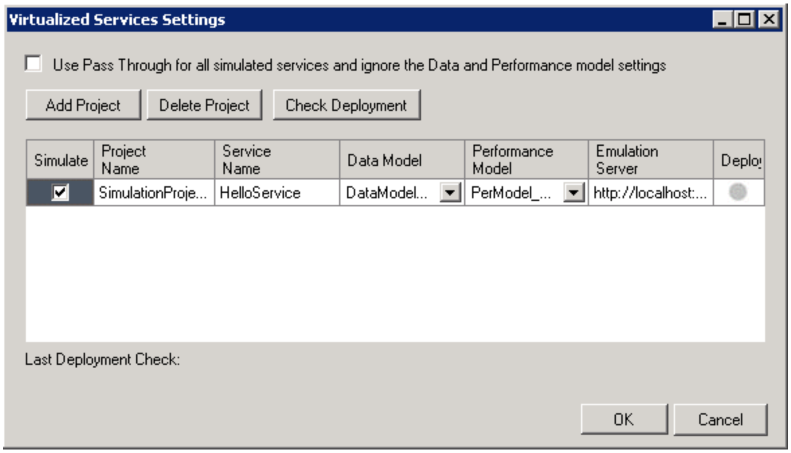
UI Elements (A-Z)	Description
Loaded modules tab	A list of the currently loaded modules by **Name, Address, Path**, **Order**, and **Symbols.**
Local variables tab	A list of the local variables by **Name, Value**, and **Type.**
Threads tab	A list of the currently loaded modules by **ID**, **Name, Location**, **Priority**, and **Frozen.**
Watch tab	A list of watched expressions. The shortcut menu provides the following controls: ➤ **Add watch.** Enables you to add an expression to be watched. ➤ **Remove Watch.** Removes the selected watched item. ➤ **Remove all.** Removes all items from the watch list.

Virtualized Services Settings Dialog Box

The Virtualized Service user interface provides integration with HP Service Virtualization. This integration enables you to test services with virtualized servers instead of actual servers.

For details, see "Using Virtualized Services" on page 415.

This dialog box enables you load HP Service Virtualization projects.



□ Use Pass Through for all simulated services and ignore the Data and Performance model settings

Simulate	Project Name	Service Name	Data Model	Performance Model	Emulation Server	Deplo
☑	SimulationProje...	HelloService	DataModel...	PerModel_...	http://localhost:...	●

Last Deployment Check:

To access	Click the **Virtualized Service Settings** toolbar button .
Relevant tasks	"How to Run a Test" on page 417

The user elements are described below (unlabeled UI elements are shown in angle brackets).

UI Element (A-Z)	Description
<emulated services>	A list of the virtualized services showing the following information: ➤ **Simulate.** Includes the virtual service when executing the test. ➤ **Project Name.** The name of the **HP Service Virtualization**project containing the virtual service. ➤ **Service Name.** The name of the virtual service to use during test execution. ➤ **Data Model.** The data model to associate with the virtual service. ➤ **Performance Model.** The performance model to associate with the virtual service. ➤ **Emulation Server.** The machine used for emulating the virtual service. If the value was configured on the server machine as localhost, be sure to change it to the actual server name. ➤ **Deployed.** An indicator showing the deployment status: ➤ ● **Unknown**. Click the **Check Deployment** button to check the status. ➤ ✓ **Deployed.** Successfully deployed. ➤ ✗ **Not Deployed.** The service is not deployed on the specified emulation server.
Add Project	Opens the Add Project dialog box, allowing you to specify or browse for a **HP Service Virtualization** project. Project files have a **.vproj** extension.

UI Element (A-Z)	Description
Check Deployment	Checks if the virtual service was deployed on the virtualization server.
Delete Project	Removes the selected project(s) from the list of virtualized services.
Use Pass Through for all simulated services and ignore the Performance and Data model settings.	Operate in pass through mode. This mode ignores all of the Performance model and Data model settings saved with the project and lets you set them manually in this dialog box. If you select None for both the Performance and Data models, it is equivalent to working in pass through mode.

🔍 Troubleshooting and Limitations - Load Testing

This section describes troubleshooting and limitations for working with load testing.

Running Tests

- The Output tab may be unable to display the run results for very large tests, exceeding a thousand steps.
- When you manually add a reference to an external DLL, Service Test prompts you to save it locally. To change your preference about a specific referenced file, remove the reference and add it again manually.
- Running tests on remote machines using shared folders, may require adjusting the .NET 2.0 security settings.
  Suggestion: Open the **Control Panel** and locate the **Administrative Tools**, either by browsing or through a search. In the list of **Administrative Tools**, look for the following entry: Microsoft .NET Framework 2.0 Configuration. If it is not present, you must install the .NET Framework 2.0 SDK.
- The Validate Structure checkpoint fails if the expected value is a SOAP Fault and the Web Service call returns an **UnsupportedMediaType** status.

- When running tests using HP Service Virtualization, if the HP Service Virtualization component throws an exception, the test will end and no report will be generated. Common causes for exceptions are when the emulation server is down or if the simulated service is already locked by another user. Refer to the Log window for details about the failure.
- To open and execute a test stored on a remote computer, you must configure the .NET security settings in the following way:

  a Open the .NET Framework Configuration Console.

  b In the left pane, expand the **Runtime Security Policy** node and select the **LocalIntranet_Zone** subnode.

  c Right-click the **LocalIntranet_Zone** subnode and select **Properties**.

  d Select the **Permission Set** tab and select FullTrust as a **Permission set**.

Load Testing

- Related data mapping in a load-enabled test is not supported for the LoadRunner parameter advance policy of **Each Occurrence**.
- Load Enabled tests that were compiled or run within VuGen, cannot be run in the LoadRunner Controller. Run the tests in Service Test only—do not replay them in VuGen.
- Tests created as Business Process Testing (BPT) components, cannot be used in load testing.
- If your tests use IBM's MQ client, make sure to install the MQ client on all machines running these tests.
- When running a test in Load Testing mode, the structural checkpoints, **Validate Structure** and **Validate WS-I**, are validated even when the options are disabled in the user interface.
- For tests with custom user handlers, all code must be compatible with the .NET 2 Framework, in order to run on a load generator.

10

Run Results Viewer

This chapter includes:

Concepts

Tasks

Reference

Concepts

Run Results Viewer Overview

After running a test, the Run Results Viewer opens automatically at the end of a test run. You can also open it manually at any time.

The Run Results Viewer contains a description of the steps performed during the run session. It displays details for each iteration of the test run. The results are grouped by the steps in the test.

For an overview of the various panes, see "Run Results Viewer User Interface" on page 454.

Standalone Installation

The Service Test installation includes the Run Results Viewer application to view run results. You can also install the Run Results viewer independently of Service Test on any machine.

To install the Run Results Viewer, run the HP_Run_Results_Viewer.msi file in the DVD's STSetup\MSI\ThirdPartyInstallations folder on any machine.

QuickTest Professional Integration

Service Test lets you perform (UFT) Unified Functional Testing with Quick Test Professional tests. If you run a Service Test test that contains a call to a QuickTest Professional test, or vice versa, you can view the results for all steps performed in the main test and in the called test.

Run Results XML File

The results of each Service Test run session are saved in a single XML file (called **results.xml**). This XML file stores information on each of the run result nodes in the display. The information in these nodes is used to dynamically create **.htm** files that are shown in the top-right pane in the Run Results Viewer.

Each node in the run results tree is an element in the **results.xml** file. In addition, there are different elements that represent different types of information displayed in the run results. You can take run result information from the XML file and use XSL to display the information you require in a customized format (either when printing from within the Service Test Run Results Viewer, when displaying run results in your own customized results viewer, or when exporting the run results to an HTML file).

XSL provides you with the tools to describe exactly which run result information to display and exactly where and how to display, print or export it. You can also modify the **.css** file referenced by the **.xsl** file, to change the appearance of the report (for example, fonts, colors, and so forth).

For example, in the **results.xml** file, one element tag contains the name of a step, and another element tag contains information on the time at which the run session is performed. Using XSL, you could tell your customized run results viewer that the step name should be displayed in a specific place on the page and in a bold green font, and that the time information should not be displayed at all.

You may find it easier to modify the existing **.xsl** and **.css** files provided with Service Test, instead of creating your own customized files from scratch. The files are located in **C:\Program Files\HP\UFT Result Viewer\dat**, and are named as follows:

- **PShort.xsl.** Specifies the content of the run results report printed, or exported to an HTML file, when you select the **Short** option in the Print or Export to HTML File dialog boxes.
- **PDetails.xsl.** Specifies the content of the run results report printed, or exported to an HTML file, when you select the **Detailed** option in the Print or Export to HTML File dialog boxes.
- **PResults.css.** Specifies the appearance of the run results print preview. This file is referenced by all three **.xsl** files.

For more information on printing run results using a customized **.xsl** file, see "Print Dialog Box (Run Results Viewer)" on page 478.

For more information on exporting the run results to a file using a customized **.xsl** file, see "Export Run Results Dialog Box" on page 473.

Run Results File Location

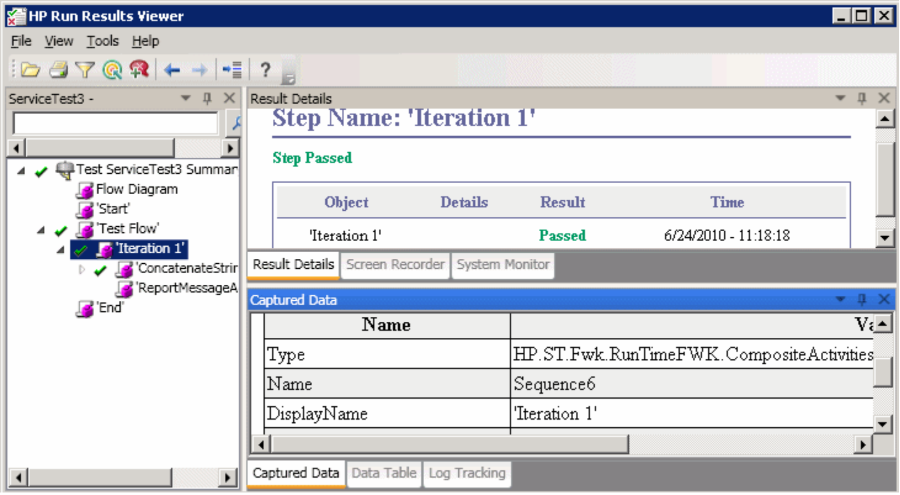
When you run a test, Service Test opens the Run dialog box. You can select a path for the results or use the default location—the test's folder. Alternatively, you can specify a temporary folder, that gets overwritten by each subsequent test run. This is ideal if you are developing a test and have no need for the results.

If your test is stored in ALM/QC (Application Management Lifecycle/ALM/QC), the Run dialog box prompts you to store the results in your ALM/QC project. You cannot modify the project, but you can specify a run name, a test folder, and an instance.

For details, see "How to Run a Test" on page 417.

Captured Data

The captured data tab in the bottom pane shows the data generated during a test run. The contents of the tab differs depending on the level you select in the Results tree in the left pane.



Step Name: 'Iteration 1'

Step Passed

Object	Details	Result	Time
'Iteration 1'		Passed	6/24/2010 - 11:18:18

Name	Va
Type	HP.ST.Fwk.RunTimeFWK.CompositeActivities
Name	Sequence6
DisplayName	'Iteration 1'

These user interface elements are described below:

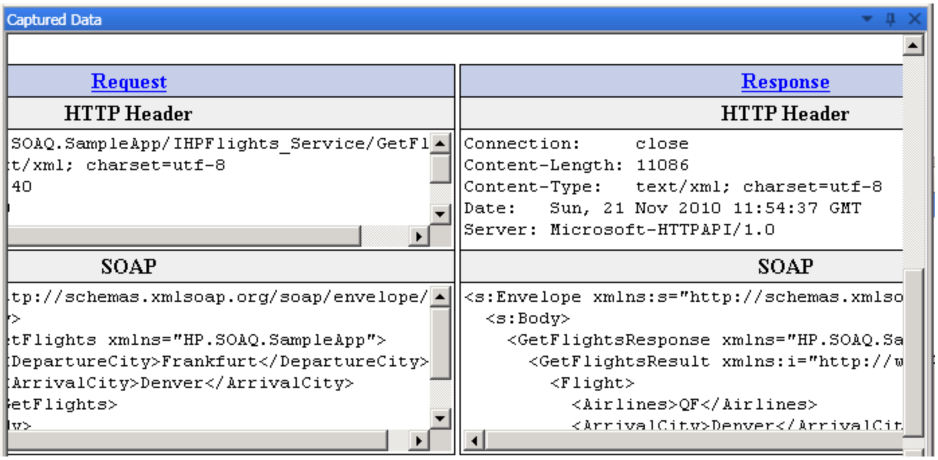
UI Elements	Description
Flow Diagram	A snapshot of the test's canvas.
Start, End	General information about the Start and End activities.
Test Flow / Loop	Information about the loop such as loop name, loop type, display name and so forth.
Iteration	Information about the iteration to which the activities belong.

UI Elements	Description
Activity	Captured data from the activity: ➤ For Service type activities, this level shows the Request and Response data for the operation or method. ➤ For the **Report Message** activity, this level displays the custom message defined in the activity's properties. For details, see "Sending Messages to the Output and Results Viewer" on page 24.
Checkpoint	Data about the checkpoints such as the Expected and Actual values, the method of evaluation (Equals, Does Not Equal, and so forth) and status.

Request and Response

The Activity level captured data contains a table showing the request and response messages.

The following example shows the Request and Response data for the **GetFlights** operation from the sample Web Service.



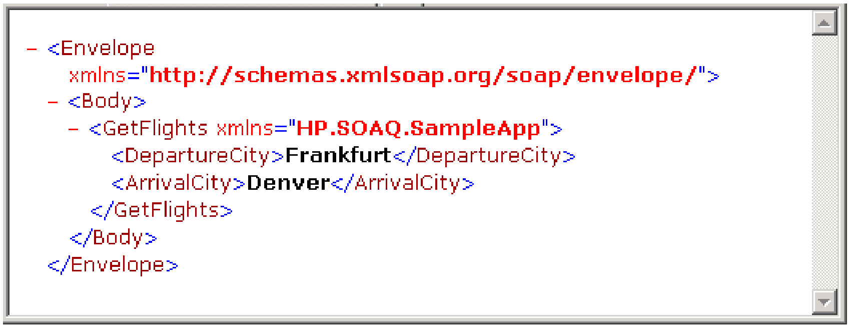
```
SOAQ.SampleApp/IHPFlights_Service/GetFl
t/xml; charset=utf-8
40
```

```
Connection:     close
Content-Length: 11086
Content-Type:   text/xml; charset=utf-8
Date:    Sun, 21 Nov 2010 11:54:37 GMT
Server:  Microsoft-HTTPAPI/1.0
```

```
tp://schemas.xmlsoap.org/soap/envelope/
>
tFlights xmlns="HP.SOAQ.SampleApp">
DepartureCity>Frankfurt</DepartureCity>
ArrivalCity>Denver</ArrivalCity>
etFlights>
v>
```

```
<s:Envelope xmlns:s="http://schemas.xmlso
  <s:Body>
    <GetFlightsResponse xmlns="HP.SOAQ.Sa
      <GetFlightsResult xmlns:i="http://w
        <Flight>
          <Airlines>QF</Airlines>
          <ArrivalCity>Denver</ArrivalCit
```

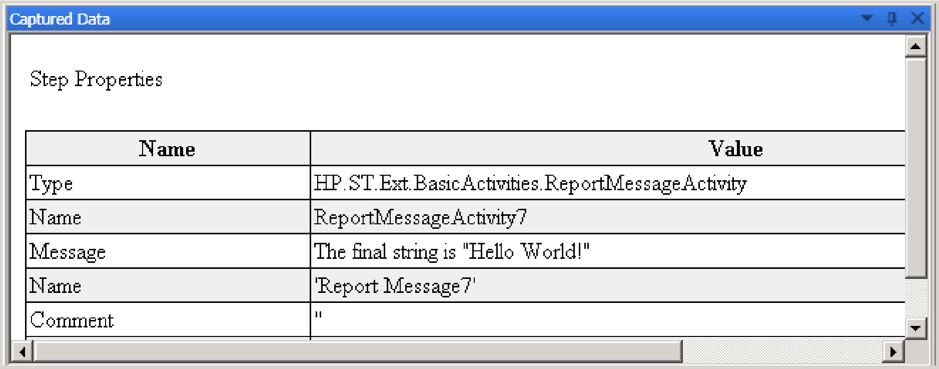
To view the request or response in greater detail, click the **Request** or **Response** link to open the XML in a separate browser.



```
- <Envelope
    xmlns="http://schemas.xmlsoap.org/soap/envelope/">
  - <Body>
    - <GetFlights xmlns="HP.SOAQ.SampleApp">
        <DepartureCity>Frankfurt</DepartureCity>
        <ArrivalCity>Denver</ArrivalCity>
      </GetFlights>
    </Body>
  </Envelope>
```

Messages

For the **Report Message** activity, the Activity level displays a custom message defined in the activity's properties.



Step Properties

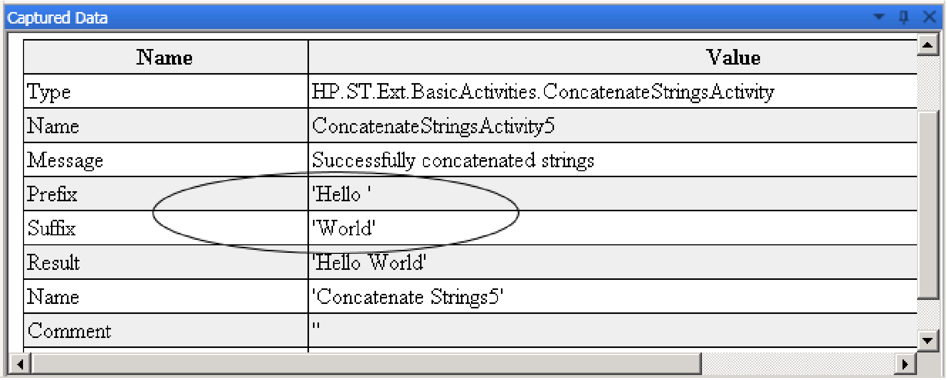
Name	Value
Type	HP.ST.Ext.BasicActivities.ReportMessageActivity
Name	ReportMessageActivity7
Message	The final string is "Hello World!"
Name	'Report Message7'
Comment	''

For details, see "Sending Messages to the Output and Results Viewer" on page 24.

Data Driven and Parameterized Properties

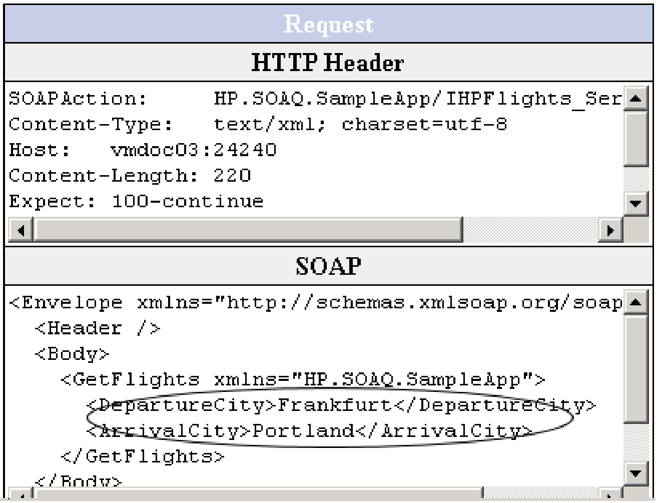
If you parameterized or applied data driving to an activity's properties, the viewer lists the actual values used during the test run, per iteration.

For built-in activities, the **Step Properties** table shows the values used during the test run.



Name	Value
Type	HP.ST.Ext.BasicActivities.ConcatenateStringsActivity
Name	ConcatenateStringsActivity5
Message	Successfully concatenated strings
Prefix	'Hello '
Suffix	'World'
Result	'Hello World'
Name	'Concatenate Strings5'
Comment	''

For service requests, you can observe the actual values in the **Request/ Response** table.



```
SOAPAction:      HP.SOAQ.SampleApp/IHPFlights_Ser
Content-Type:    text/xml; charset=utf-8
Host:    vmdoc03:24240
Content-Length: 220
Expect: 100-continue
```

```
<Envelope xmlns="http://schemas.xmlsoap.org/soap
  <Header />
  <Body>
    <GetFlights xmlns="HP.SOAQ.SampleApp">
      <DepartureCity>Frankfurt</DepartureCity>
      <ArrivalCity>Portland</ArrivalCity>
    </GetFlights>
  </Body>
```

HTTP Checkpoint Response

To view the actual result for HTTP activity checkpoints, select the checkpoint's parent node in the **Captured Data** tab, and scroll to the Response body. Locate the actual result string in the Response body table. The child node of the checkpoint does not provide this information.

Custom Fields

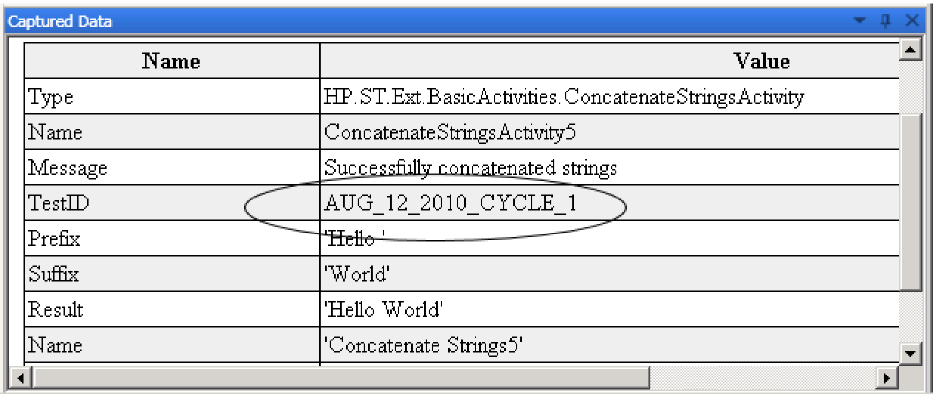
You can use the **Report** function to show custom information in the Results report. You can specify strings or existing arguments and display them in the report.

You add the **Report** function to the test's events. For details, see the section on Custom Code and Events.

The following example prints **AUG-12-2010_CYCLE_1** in the **TestID** property's **Value** column.

```
args.Activity.Report("TestID","AUG-12-2010_CYCLE_1");
```

The report displays the keyword and its value at the Activity level of the results. For details, see the "Captured Data" on page 443.



Captured Data

Name	Value
Type	HP.ST.Ext.BasicActivities.ConcatenateStringsActivity
Name	ConcatenateStringsActivity5
Message	Successfully concatenated strings
TestID	AUG_12_2010_CYCLE_1
Prefix	'Hello '
Suffix	'World'
Result	'Hello World'
Name	'Concatenate Strings5'

Tasks

How to Open Run Results

After a test run, Service Test automatically opens the Run Results Window with the results of the current run. This task describes how to open specific run results in the Run Results Viewer.

This task includes the following steps:

- "Open the Run Results Viewer" on page 449
- "Connect to your ALM/QC project - optional" on page 449
- "View saved results" on page 449

Open the Run Results Viewer

If the Run Results Viewer is not open, select **Test** > **View Test Results** in the Service Test window.

Connect to your ALM/QC project - optional

If your run results are saved in ALM/QC, connect to your ALM/QC project before opening the results file. For details, see "HP ALM Connection - Server Connection Dialog Box" on page 482.

View saved results

Click the **Open** button or select **File** > **Open**. The Open Run Results dialog box opens. Browse to the relevant results folder or file. For details, see "Open Run Results Dialog Box" on page 477.

How to Navigate the Run Results Tree

This task describes how to collapse or expand a branch in the run results tree to select the level of detail that the tree displays.

When you open the Run Results Viewer for the first time, the tree expands one level at a time. If the child branches under a parent branch were previously expanded, that state is maintained when you expand or collapse the parent branch.

To expand a specific branch:

Do any of the following:

- Select the branch and click the expand (+) sign to the left of the branch icon.
- Press the plus key (+) on your keyboard number pad.

The tree displays the details for the branch, and the expand sign changes to collapse.

To expand a branch and all branches below it:

- Select the branch and press the asterisk (*) key on your keyboard number pad.

To expand all of the branches in the run results tree:

Do any of the following:

- Right-click a branch and select **Expand All**.
- Select the top level of the tree and press the asterisk (*) key on your keyboard number pad.

To collapse a specific node:

Do any of the following:

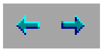
- Select it and click the collapse (–) sign to the left of the node icon.
- Press the minus key (–) on your keyboard number pad.

The node’s child nodes disappear from the tree, and the collapse sign changes to expand (+).

To collapse all of the nodes in the tree:

Right-click a node and select **Collapse All**.

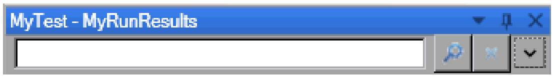
To move between previously selected nodes within the run results tree:



Click the **Go to Previous Node** or **Go to Next Node** buttons.

To find specific steps within the Run Results:

Use the **Search** box (shown in the example below).



You can search for text and/or types of nodes. For details, see "Run Results Tree Pane and Search Box" on page 459.

To filter the tree to display only nodes that match certain criteria:

Use the **Filter dialog box (View > Filters).** For details, see "Filter Dialog Box" on page 475.

How to Manually Submit Defects to ALM/QC

This task describes how to manually add defects to an ALM/QC project.

This task includes the following steps:

- "Prerequisites" on page 451
- "Connect to an ALM/QC project" on page 451
- "Open the New Defect dialog box" on page 452
- "Modify the defect information if needed and submit it" on page 452
- "Results" on page 452

1 Prerequisites

Ensure that the ALM/QC client is installed on your computer. (Enter the ALM/QC Server URL in a browser and ensure that the Login screen is displayed.)

2 Connect to an ALM/QC project

Select **Tools** > **ALM/QC Connection** or click the **ALM/QC Connection** button and connect to an ALM/QC project. "HP ALM Connection - Server Connection Dialog Box" on page 482.

Note: If you do not connect to an ALM/QC project before proceeding to the next step, Service Test prompts you to connect before continuing.

3 Open the New Defect dialog box

Select **Tools** > **Add Defect** or click the **Add Defect** button to open the New Defect dialog box in the specified ALM/QC project. The New Defect dialog box opens.

4 Modify the defect information if needed and submit it

Basic information is included in the description, but you can modify the defect if needed.

5 Results

The defect is added to the ALM/QC project's defect database.

How to Export Run Results

This task describes how to export run results to a file. For details on what is included when you export run results, see "Export Run Results Dialog Box" on page 473.

This task includes the following steps:

- "Open the results in the Run Results Viewer" on page 453
- "Specify the export settings" on page 453
- "Save the file" on page 453
- "Results" on page 453

1 Open the results in the Run Results Viewer

For details, see "Open Run Results Dialog Box" on page 477.

2 Specify the export settings

Select **File** > **Export To File**. The Export Run Results dialog box opens. For details on the various settings, see "Export Run Results Dialog Box" on page 473.

3 Save the file

Click **Export**. The Save As dialog box opens. Specify the file name and path, and select the required file type.

Report type	Save as type
Step details	➤ HTML (*.htm, *.htm) (default) ➤ PDF (*.pdf) ➤ DOC (*.doc)
Data Table	Excel (.xls)
Log Tracking	XML (.xml)
Screen Recorder	FlashBack (*.fbr)
System Monitor	➤ Text (*.csv, *.txt) (default) ➤ Excel (.xls) ➤ XML (.xml) ➤ HTML (*.htm, *.htm)

4 Results

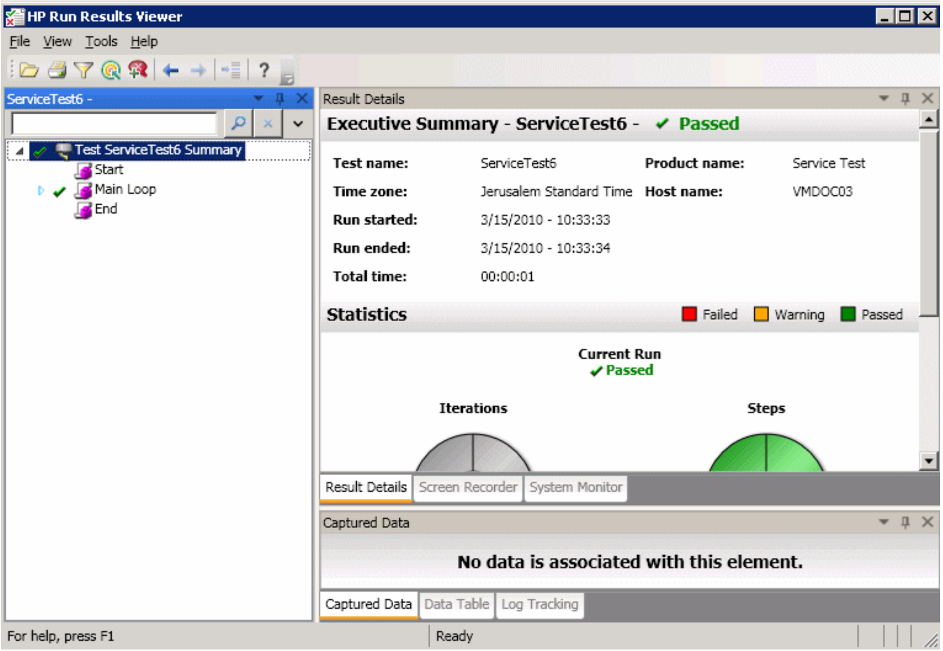
When you click **Save**, the file is exported in the specified format to the designated location.

Reference

Run Results Viewer User Interface

This window enables you to view the results of a test run.

The following example shows an Executive Summary for a Service Test run:



Executive Summary - ServiceTest6 - ✓ Passed

Test name:	ServiceTest6	**Product name:**	Service Test
Time zone:	Jerusalem Standard Time	**Host name:**	VMDOC03
Run started:	3/15/2010 - 10:33:33		
Run ended:	3/15/2010 - 10:33:34		
Total time:	00:00:01		

No data is associated with this element.

To access	Do one of the following: ➤ Enable it to open automatically after a test run. To enable or disable, select **Edit** > **Settings** > **Show Results After Run.** ➤ Choose **Test** > **View Test Results.**
Relevant tasks	"How to Run a Test" on page 417

By default, the left pane contains the Run Results tree. The right side of the window contains additional panes. These user interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements (A-Z)	Description
<Run Results Viewer menu bar and toolbar>	See "Run Results Viewer Commands" on page 456.
<status bar>	Displays the status of the currently selected command.
Captured Data pane	A still image of the state of your application at a particular step. For details, see "Captured Data Pane" on page 467.
Executive Summary pane	➤ A high-level results overview report (pass/fail status) ➤ ALM/QC information for your test (if the test was run from ALM/QC
Result Details pane	Detailed explanations of each step and checkpoint pass or failure, at each stage of the test
Run Results Tree pane	➤ A graphical representation of the results in an expandable tree ➤ Displays the test steps, specifying exactly where application failures occurred

Note: Certain panes are available only if the results include QuickTest Professional steps.

Run Results Viewer Commands

The Run Results Viewer menu bar and toolbar contain commands to help you view run session results.

Button	Command	Shortcut Key	Description
📂	**File > Open**	CTRL+O	Opens the Open Run Results dialog box, enabling you to open saved run results from the file system or from ALM/QC. For details, see "How to Open Run Results" on page 448.
🖨	**File > Print**	CTRL+P	Opens the Print dialog box, enabling you to print the results of the run session. For details, see "Print Dialog Box (Run Results Viewer)" on page 478.
--	**File > Print Preview**	CTRL+F2	Opens the Print Preview dialog box, enabling you to preview the results of the run session prior to printing. For details, see "Print Preview Dialog Box (Run Results Viewer)" on page 480.
--	**File > Export To File**	--	Opens the Export Run Results dialog box, enabling you to save various parts of the results as external files. For details, see "Export Run Results Dialog Box" on page 473.
--	**File > Recent Files**	--	Lists the recently viewed files.
--	**File > Exit**	--	Closes the Run Results Viewer session.
--	**View > Run Results Viewer Toolbar**	--	Shows or hides the Run Results Viewer toolbar.

Button	Command	Shortcut Key	Description
--	**View > Status Bar**	--	Shows or hides the status bar, which indicates: ➤ a hint about the currently selected command ➤ the status of the Run Results Viewer ➤ the ALM/QC server name and project to which the Run Results Viewer is connected
--	**View > Result Details**	--	Shows or hides the Results Details pane. For details, see "Result Details Pane" on page 463.
--	**View > Captured Data**	--	Shows or hides the Captured Data pane. For details, see "Captured Data Pane" on page 467.
--	**View > Restore Layout**	--	Restores the default layout of the Run Results Viewer.
▽	**View > Filters**	CTRL+T	Opens the Filters dialog box, enabling you to filter the information displayed. For details, see the "Filter Dialog Box" on page 475.
--	**View > Expand All**	--	Expands all of the branches in the run results tree. Also available as a context-menu option.
--	**View > Collapse All**	--	Collapses all of the branches in the run results tree. Also available from the shortcut menu.

Button	Command	Shortcut Key	Description
	Tools > Add Defect	--	Enables you to add a defect to your ALM/QC project. If you are not currently connected to ALM/QC, opens the ALM/QC Connection - Server Connection dialog box. For more information, see "How to Manually Submit Defects to ALM/QC" on page 451.
	Tools > ALM/QC Connection	--	Opens the ALM/QC Connection - Server Connection dialog box, enabling you to connect to a ALM/QC project. For more information, see the "HP ALM Connection - Server Connection Dialog Box" on page 482.
⇦	**Go to Previous Node**	BACKSPACE	Moves the cursor to the previously selected node in the run results tree. For more information, see "How to Navigate the Run Results Tree" on page 449.
⇨	**Go to Next Node**	ALT+RIGHT ARROW	Moves the cursor to the node you selected in the run results tree prior to clicking the **Go to Previous Node** button. For more information, see "How to Navigate the Run Results Tree" on page 449.
?	**Help > Help Topics**	--	Opens the online help for the Run Results Viewer.
--	**Help > About Run Results Viewer**	--	Displays version information about the Run Results Viewer.

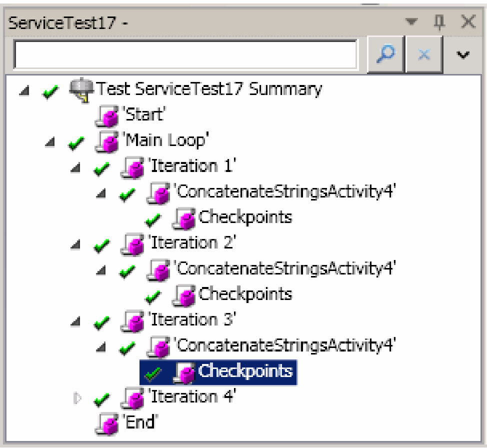
Run Results Viewer Panes

This section includes:

- "Run Results Tree Pane and Search Box" on page 459
- "Result Details Pane" on page 463

Run Results Tree Pane and Search Box

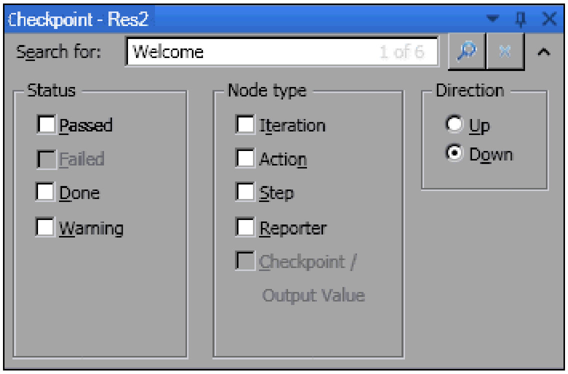
This pane displays the **run results tree**—a hierarchical representation of the test run results.



ServiceTest17 -

```
◢ ✓ Test ServiceTest17 Summary
      'Start'
  ◢ ✓ 'Main Loop'
    ◢ ✓ 'Iteration 1'
      ◢ ✓ 'ConcatenateStringsActivity4'
          ✓ Checkpoints
    ◢ ✓ 'Iteration 2'
      ◢ ✓ 'ConcatenateStringsActivity4'
          ✓ Checkpoints
    ◢ ✓ 'Iteration 3'
      ◢ ✓ 'ConcatenateStringsActivity4'
          ✓ Checkpoints
    ▷ ✓ 'Iteration 4'
      'End'
```

The following image shows an example of an expanded **Search** box. Six instances of the searched for text, Welcome, were found.



Search for: Welcome 1 of 6

Status
- □ Passed
- □ Failed
- □ Done
- □ Warning

Node type
- □ Iteration
- □ Action
- □ Step
- □ Reporter
- □ Checkpoint / Output Value

Direction
- ○ Up
- ● Down

To access	This pane is displayed by default on the left side of the Run Results Viewer. It cannot be hidden.
Important information	You can collapse or expand a node in the run results tree to change the level of detail that the tree displays. You can also use the Search and Filter commands to control what is displayed in the run results tree. For details, see "Run Results Tree Pane and Search Box" on page 459 and "Filter Dialog Box" on page 475.

User interface elements are described below:

UI Elements (A-Z)	Description
✓	A step that succeeded. **Note**: If a test does not contain checkpoints, no icon is displayed.
✗	A step that failed. Note that this causes all parent steps (up to the root action test) to fail as well.
!	A warning, meaning that the step did not succeed, but it did not cause the action test to fail.

UI Elements (A-Z)	Description
! ✖	A step that failed unexpectedly.
✋	The run session was stopped before it ended.

Search box user interface elements are described below:

UI Elements (A-Z)	Description
🔍	**Search**. Finds the next instance that matches the criteria you specified in the **Search** box. Click this button to jump to each node that matches your search criteria.
✖	**Cancel**. Clears the **Search for** text box.
⌄ ⌃	**Expand** or **Collapse**. Shows or hides the lower part of the **Search** box.
Direction	The direction to search in the tree. Possible values: ➤ **Up** ➤ **Down**
Node type	The type of node for which you want to search (together with your other search criteria). (Optional) Possible values for Service Test: ➤ **Step.** Searches for steps that match your other selection criteria.

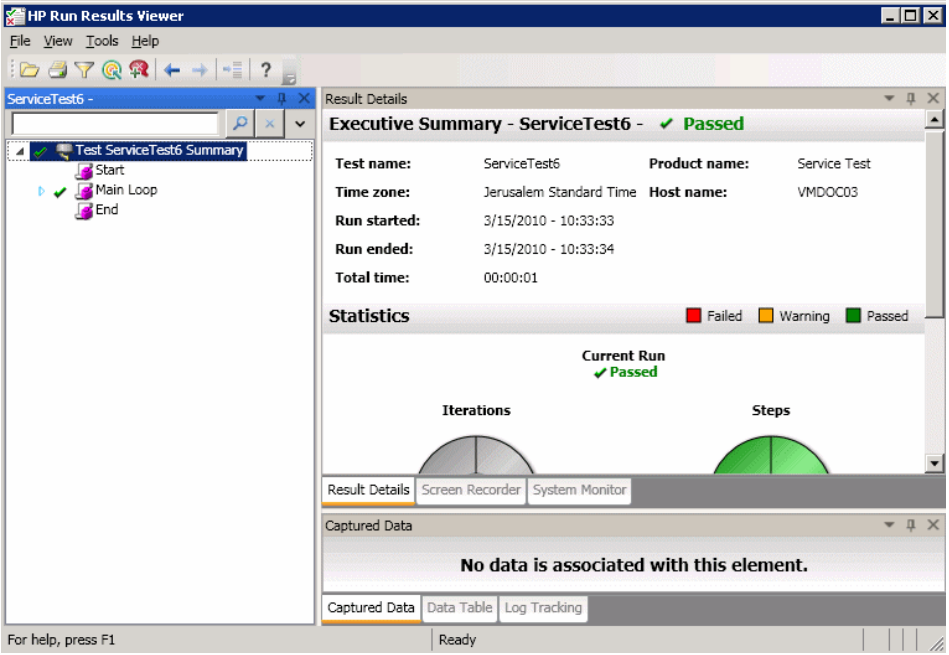
UI Elements (A-Z)	Description
Search for	Text box in which you can optionally enter text for which to search. If the specified text is found in one or more tree nodes, the text area indicates this, as shown below: Welcome 1 of 6 In this example, 1 of 6 indicates that there are six nodes displaying the text, Welcome, and the first matching node is highlighted in the tree.
Status	The status for which you want to search. (Optional) Possible values: ➤ **Passed.** Searches for steps that passed and match your other selection criteria. ➤ **Failed.** Searches for steps that failed and match your other selection criteria. ➤ **Done.** Searches for steps with the status **Done** (steps that were performed successfully but did not receive a pass, fail, or warning status) that match your other selection criteria. ➤ **Warning.** Searches for steps with the status **Warning** (steps that did not pass, but did not cause the test to fail) that match your other selection criteria. **Note:** If the tree does not contain any steps that match a particular status, that option is grayed out in the **Search** box.

Result Details Pane (Run Results Viewer)

This pane displays the details for an individual iteration, an action, or a step that is currently selected in the run results tree.

Example of Executive Summary:

The Executive Summary is displayed when the topmost node in the run results tree is selected.



Executive Summary - ServiceTest6 - ✓ Passed

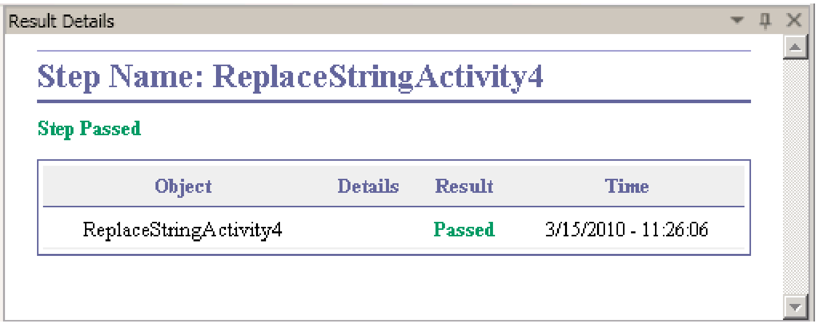
Test name:	ServiceTest6	**Product name:**	Service Test
Time zone:	Jerusalem Standard Time	**Host name:**	VMDOC03
Run started:	3/15/2010 - 10:33:33		
Run ended:	3/15/2010 - 10:33:34		
Total time:	00:00:01		

Statistics 🟥 Failed 🟧 Warning 🟩 Passed

No data is associated with this element.

Example of Result Details:

Result details are displayed when any node (other than the topmost node) is selected in the run results tree.



Step Name: ReplaceStringActivity4

Step Passed

Object	Details	Result	Time
ReplaceStringActivity4		Passed	3/15/2010 - 11:26:06

To access	Open the Run Results Viewer, as described in "How to Open Run Results" on page 446. Do the following: **1** Select a node in the run results tree: ➤ To open the **Executive Summary** page, select the topmost node in the tree. ➤ To open the **Result Details** for a step, select the relevant node in the tree. **2** Select the **Result Details** tab. (This assumes that the default layout is displayed.) **Tip:** If the Result Details pane is hidden, select **View** > **Result Details** to show it.
Important information	By default, when the Run Results Viewer opens after a run session, an **Executive Summary** is displayed in the Result Details pane. For any other node, the details in the Result Details pane are specific for the step selected in the run results tree. For details, see "Captured Data" on page 443.

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

Executive Summary Page

UI Elements (A-Z)	Description
Executive Summary	Includes: ➤ the test name and result details ➤ time-related information for the run ➤ the product from which the test was run ➤ HP ALM/QC server and project, if Service Test was connected to a ALM/QC project during the run **Note:** If a test that is stored in ALM/QC is run from QuickTest, but you choose to store the results in a temporary location, the **Test set** and **Test instance** fields are not displayed in the results.
Statistics	Graphical, status-related statistics for the current run and the previous run (if any). If the test was run previously, you can click **Open** to open a previous run results.

Result Details for Step

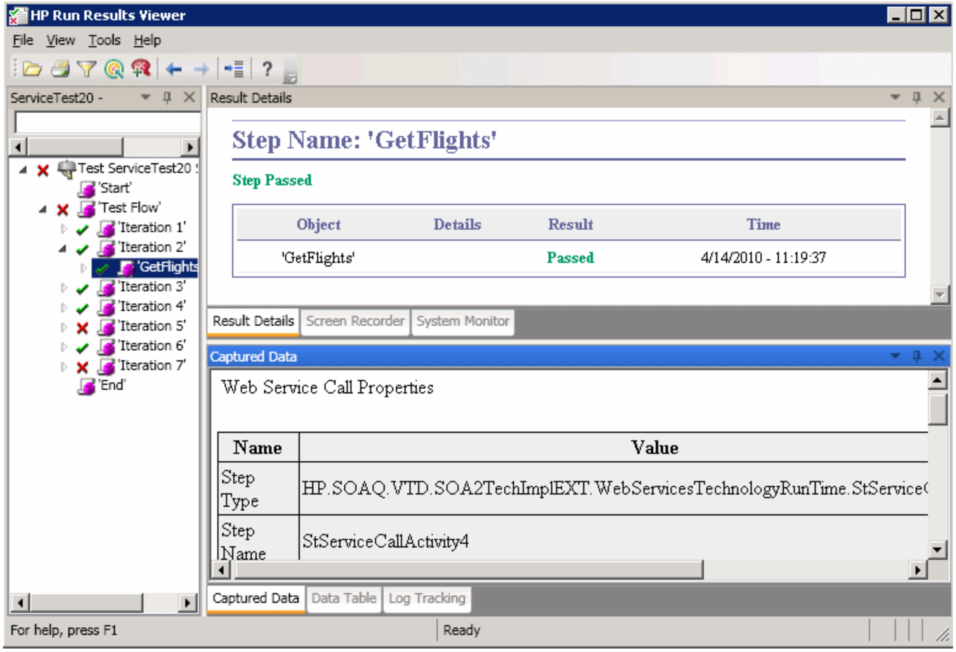
UI Elements (A-Z)	Description
<step details>	Details about the step, such as the object on which the step was performed, the timestamp, the step results, and so on. The information in this area changes according to the type of step. For more details, see "Captured Data" on page 443.
<step name>	The name of the step.

UI Elements (A-Z)	Description
<step status>	The status of the step. Possible values: ➤ **Done.** Relevant for iterations, actions, and steps that ran successfully, but do not contain checkpoints. ➤ **Failed.** Relevant for iterations, actions, and steps that contain checkpoints. ➤ **Passed.** Relevant for iterations, actions, and steps that contain checkpoints. ➤ **Warning.** Relevant for steps that were not successful, but did not cause the test to stop running. **Note:** A test, iteration, or action containing a step marked **Warning** may still be labeled **Passed** or **Done**.

Captured Data Pane

The captured data tab in the bottom pane shows the data generated during a test run. The contents of the tab differs depending on the level you select in the step pane tree in the left pane.

The following image shows the Captured Data pane showing the Web Service Call properties.



Step Name: 'GetFlights'

Step Passed

Object	Details	Result	Time
'GetFlights'		Passed	4/14/2010 - 11:19:37

Web Service Call Properties

Name	Value
Step Type	HP.SOAQ.VTD.SOA2TechImplEXT.WebServicesTechnologyRunTime.StService(
Step Name	StServiceCallActivity4

To access	Select **View** > **Captured Data** or click the **Captured Data** tab.
Important information	**Programmatically adding information to the results:** You can programmatically add items to the report. For details, see "Custom Fields" on page 447.
Relevant tasks	"How to Navigate the Run Results Tree" on page 449

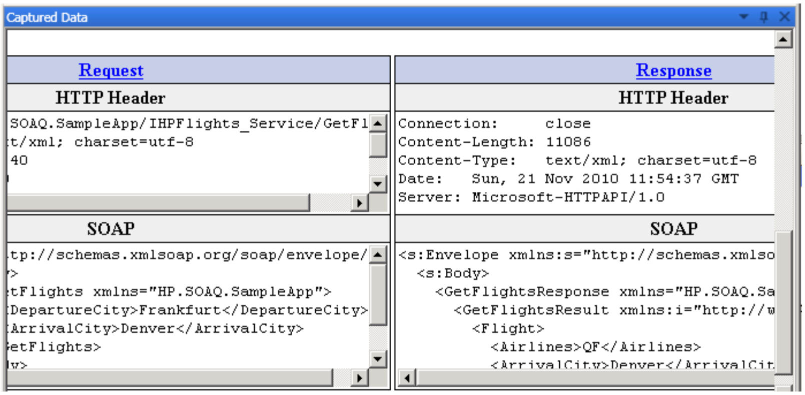
The contents of the Captured Data in Service Test pane differs depending on the level you select in the run results tree.

- **Start, End.** General information about the Start and End activities.
- **Parent step.** Information about the loop to which the test steps belong, such as **Test Flow**.
- **Iteration**. Information about the iteration to which the activities belongs such as the status of the iteration and its display name.
- **Activity.** Captured data from the activity, or operation in the case of Web Services. For Service type activities, this level shows the Request and Response data.
- **Checkpoints.** Data about the checkpoints such as the Expected and Actual values, the method of evaluation (Equals, Does Not Equal, and so forth) and status.

Samples of Captured Data

Request and Response

The following example shows the Request and Response data for the **GetFlights** operation from the sample Web Service, on the Step level.



```
SOAQ.SampleApp/IHPFlights_Service/GetFl
t/xml; charset=utf-8
40
```

```
Connection:      close
Content-Length:  11086
Content-Type:    text/xml; charset=utf-8
Date:    Sun, 21 Nov 2010 11:54:37 GMT
Server:  Microsoft-HTTPAPI/1.0
```

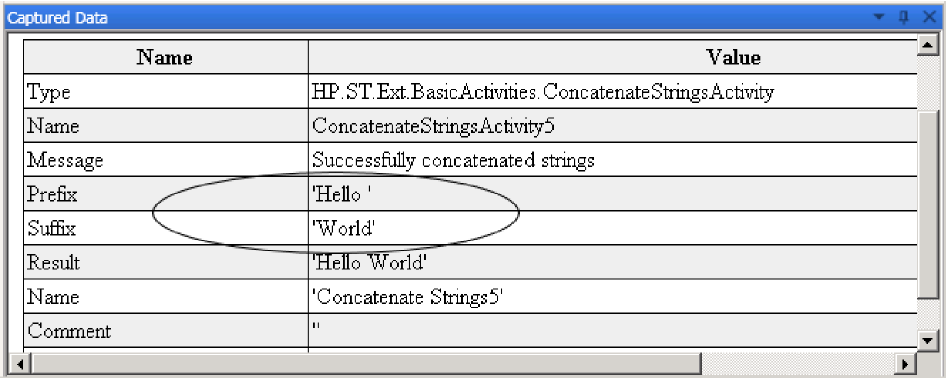
```
tp://schemas.xmlsoap.org/soap/envelope/
>
tFlights xmlns="HP.SOAQ.SampleApp">
DepartureCity>Frankfurt</DepartureCity>
ArrivalCity>Denver</ArrivalCity>
etFlights>
y>
```

```
<s:Envelope xmlns:s="http://schemas.xmlso
  <s:Body>
    <GetFlightsResponse xmlns="HP.SOAQ.Sa
      <GetFlightsResult xmlns:i="http://w
        <Flight>
          <Airlines>QF</Airlines>
          <ArrivalCity>Denver</ArrivalCit
```

Data Driven and Parameterized Properties

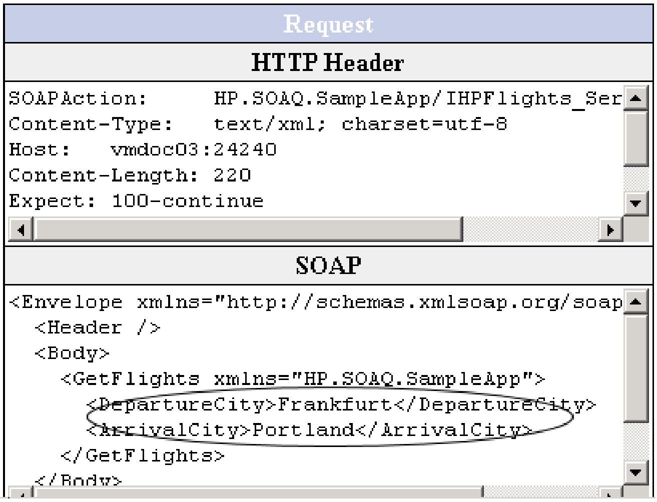
If you parameterized or applied data driving to an activity's properties, the viewer lists the actual values used during the test run, per iteration.

For built-in activities, the **Step Properties** table shows the values used during the test run.



Name	Value
Type	HP.ST.Ext.BasicActivities.ConcatenateStringsActivity
Name	ConcatenateStringsActivity5
Message	Successfully concatenated strings
Prefix	'Hello '
Suffix	'World'
Result	'Hello World'
Name	'Concatenate Strings5'
Comment	''

For service requests, you can observe the actual values in the **Request/ Response** table.



HTTP Header

```
SOAPAction:     HP.SOAQ.SampleApp/IHPFlights_Ser
Content-Type:   text/xml; charset=utf-8
Host:   vmdoc03:24240
Content-Length: 220
Expect: 100-continue
```

SOAP

```
<Envelope xmlns="http://schemas.xmlsoap.org/soap
  <Header />
  <Body>
    <GetFlights xmlns="HP.SOAQ.SampleApp">
      <DepartureCity>Frankfurt</DepartureCity>
      <ArrivalCity>Portland</ArrivalCity>
    </GetFlights>
  </Body>
```

Web Service Activity

The following tables shows the results of a Web Service operation from the Sample application, **GetFlights**:

In the results tree:	In the Result Details pane:
Step Type	The type of step as it is defined in the source code. This field is not editable by the user. For example HP.ST.Ext.WebServicesTechnologyRT.StServiceCallActivity.
Step Name	The step name as it appears in the test's source code, visible when you create an event handler for a step. For example StServiceCallActivity1. This field is read-only.
Service Name	The service name as defined in the WSDL.
Port Name	The name of the operation's port.
Operation Name	The name of the operation.
Endpoint Address	The endpoint for the service to which the requests are sent.
SOAP Action	The full path of the SOAP action, such as HP.SOAQ.SampleApp/IHPFlights_Service/CreateFlightOrder.
Content Type	The content type of the request message, for example, text/ xml, charset=utf
Message Exchange Pattern	The pattern of the messages, for example Request {followed by) Response.
HTTP Status Code	The HTTP Status code returned by the server.

Concatenate String Activity

The following tables shows the results of a String Manipulation Activity, Concatenate String.

In the results tree:	In the Result Details pane:
Type	The internal type name of the step. HP.ST.Ext.BasicActivities.ConcatenateStringsActivity

In the results tree:	**In the Result Details pane:**
Name	The step name as it appears in the test's source code, ConcatenateStringsActivity. This is visible when you create an event handler for a step.
Message	A message indicating the status and purpose of the step. For example, "Successfully concatenated strings."
Prefix	The built-in property, **Prefix**.
Suffix	The built-in property, **Suffix**.
Result	The resulting text after the step was executed.
Name	The name of the step as it appears in the canvas, **ConcatenateStringsActivity**, or a custom name.
Comment	The comment entered in the step's **General** tab.
Status	The run status, such as **Done**, **Failed**, and so forth.

Checkpoint Captured Data

The Checkpoint level captured data is only presented if you enable Checkpoints for the test run. A grid provides the following information for each checkpoint:

In the results tree:	**In the Result Details pane:**
Name	The checkpoint index. For example, Checkpoint(), Checkpoint1, and so forth.
Result	Passed or Failed, indicated graphically with a check or X mark.
Property	The path of the checkpoint in the SOAP envelope. For example, Envelope[1]\Body[1]\CreateFlightOrderResponse[1]\CreateFlightOrderResult[1]\OrderNumber[1].
Actual Result	The actual output value received in the response.

In the results tree:	In the Result Details pane:
Evaluation Style	The type of comparison operator, such as **EqualTo**, and so forth.
Expected Values	The response you expected to receive, from the Checkpoint grid's **Expected Value** field.
Details	Checkpoint details, when relevant. For example, if you add an **Assert** function to the step's event handler, the text will appear in this field. For details, see the "How to Write Checkpoint Events" on page 517.

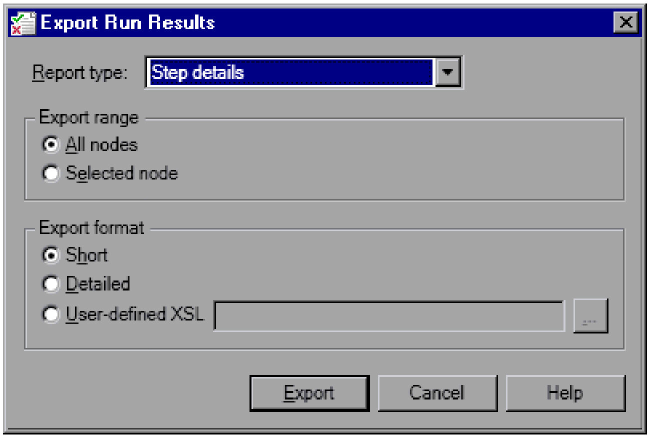
Run Results Viewer Dialog Boxes

This section includes (in alphabetical order):

- Export Run Results Dialog Box on page 473
- Filter Dialog Box on page 475
- Open Run Results Dialog Box on page 477
- Print Dialog Box (Run Results Viewer) on page 478
- Print Preview Dialog Box (Run Results Viewer) on page 480
- HP ALM Connection - Server Connection Dialog Box on page 482

Export Run Results Dialog Box (Run Results Viewer)

This dialog box enables you to export run results to a file so that you can view them even if the Run Results Viewer is unavailable. For example, you can send the file containing the run results in an e-mail to a third-party who does not have the Run Results Viewer installed.



Export Run Results

Report type: Step details

Export range
- ● All nodes
- ○ Selected node

Export format
- ● Short
- ○ Detailed
- ○ User-defined XSL

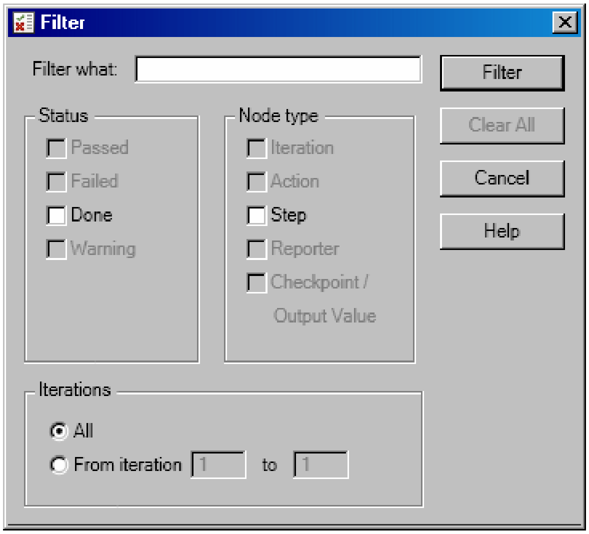
To access	Open the Run Results Viewer, as described in "How to Open Run Results" on page 446. Select **File** > **Export to File**.
Important information	**The export time varies according to the size of the results file and the file type you select.** When selecting the file type, consider the length of time it will take to generate different document types, especially for a report with many images. HTML files generate the fastest, followed by PDF and DOC. When exporting a report with 100 or more images to a DOC file, a dialog box is displayed reminding you that it may take a long time to generate the file. The dialog box gives you the option to continue exporting with images, continue exporting without images, or to export to PDF.
Relevant tasks	"How to Export Run Results" on page 452

User interface elements are described below:

UI Elements (A-Z)	Description
Export format	Relevant only for **Step Details** report type. ➤ **Short.** Exports a summary line (when available) for each item in the run results tree. This option is only available if you selected **All nodes** in **Export range**. ➤ **Detailed.** Exports all available information for each item in the run results tree, or for the selected branch, according to your **Export range** selection. (In the Run Results Viewer, these images are displayed in the Captured Data pane.) ➤ **User-defined XSL.** Enables you to browse to and select a customized **.xsl** file. You can create a customized **.xsl** file that specifies the information to be included in the exported report, and the way it should appear. For more information, see the "Run Results XML File" on page 441.
Export range	Relevant only for **Step Details** report type. ➤ **All nodes.** Exports the results for the entire test. ➤ **Selected node.** Exports run result information for the selected branch in the run results tree.
Report type	The type of report you want to export, for example, Step Details.

Filter Dialog Box (Run Results Viewer)

This dialog box enables you to filter the results tree of the Run Results Viewer to display only those nodes that match the conditions that you specify.



To access	Open the Run Results Viewer, as described in "How to Open Run Results" on page 446. Select **View** > **Filters.**

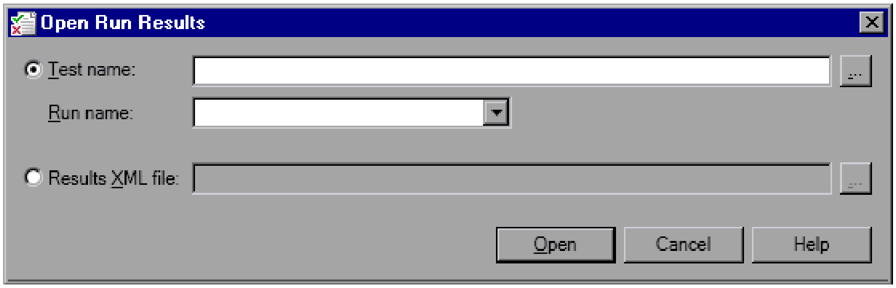
User interface elements are described below (unlabeled elements are shown in angle brackets):

UI Elements (A-Z)	Description
<Filter box>	The text by which you want to filter.
Iterations	➤ **All.** Displays run results from all iterations. ➤ **From iteration X to Y.** Displays the run results from the specified range of test iterations.

UI Elements (A-Z)	Description
Node type list	Displays all results that match your selection criteria based on: (Optional) ➤ **Iteration.** Displays the run results for the iterations specified in the **Iterations** area. ➤ **Action.** Displays the run results for all actions in the run results tree that match your other selection criteria. ➤ **Step.** Displays the run results for all steps in the run results tree that match your other selection criteria. ➤ **Reporter.** Displays the run results for all Reporter steps in the run results tree that match your other selection criteria. (QuickTest Professional only) ➤ **Checkpoint/Output Value.** Displays the run results for all checkpoint and output value steps in the run results tree that match your other selection criteria.
Status	➤ **Passed.** Displays the run results for the steps that passed. ➤ **Failed.** Displays the run results for the steps that failed. ➤ **Done.** Displays the run results for the steps with the status **Done** (steps that were performed successfully but did not receive a pass, fail, or warning status). ➤ **Warning.** Displays the run results for the steps with the status **Warning** (steps that did not pass, but did not cause the test to fail).

Open Run Results Dialog Box

This dialog box enables you to select the results to display in the Run Results Viewer.



To access	Select **File** > **Open** or click the **Open** button .
Important information	➤ To view results stored in ALM/QC, you must first connect to your ALM/QC project. For details, see "HP ALM Connection - Server Connection Dialog Box" on page 482. ➤ By default, results files for Service Test tests are stored in the Reports folder under the user's My Documents folder.
Relevant tasks	"How to Open Run Results" on page 448

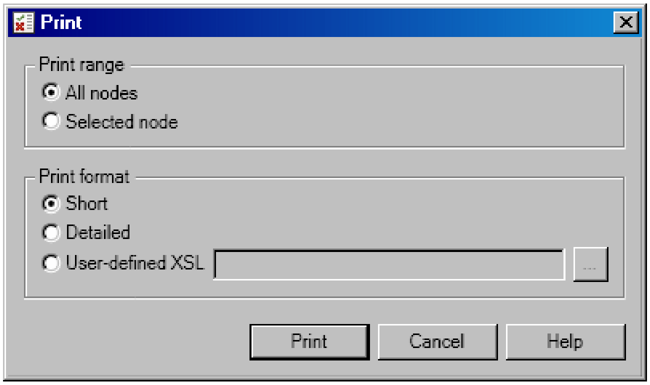
User interface elements are described below.

UI Elements (A-Z)	Description
Results folder	The results for a particular run.

UI Elements (A-Z)	Description
Results XML file	An XML file in which the results are stored. The file must be located in the file system.
Test name	The name of the test for which you want to view results. The test can be located in the file system or in a ALM/QC project. If you select the **Test name** option, you must also specify the **Results folder name**. The Browse button enables you to navigate to the location of the test.

Print Dialog Box (Run Results Viewer) (Run Results Viewer)

This dialog box enables you to print run results from the Run Results Viewer. You can select the type of report you want to print, and you can also create and print a customized report.



Print

Print range

- ● All nodes
- ○ Selected node

Print format

- ● Short
- ○ Detailed
- ○ User-defined XSL

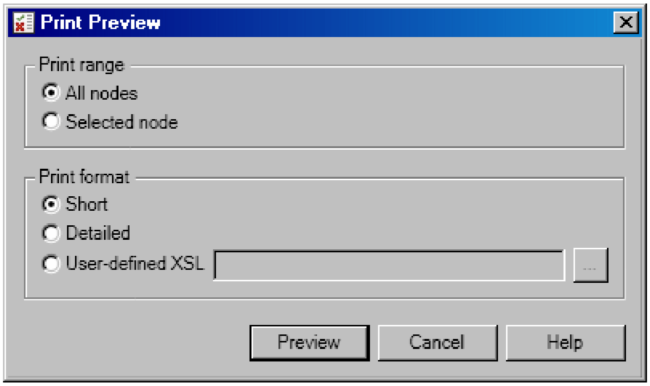
To access	Use one of the following: ➤ Select **File** > **Print.** ➤ Click the **Print** button 🖨.

User interface elements are described below:

UI Elements (A-Z)	Description
Print format	➤ **Short.** Prints a summary line (when available) for each item in the run results tree. This option is only available if you selected **All** in **Print range**. ➤ **Detailed.** Prints all available information for each item in the run results tree, or for the selected branch, according to your selection in **Print range**. The printed report includes still images associated with the steps in your run results. If a bitmap checkpoint step displays expected, actual, and difference bitmaps, these are also included. ➤ **User-defined XSL.** Enables you to browse to and select a customized **.xsl** file. You can create a customized **.xsl** file that specifies the information to be included in the printed report, and the way it should appear.
Print range	➤ **All nodes.** Prints the run results for the entire test. ➤ **Selected nodes.** Prints the run results information for the selected branch in the run results tree.

Print Preview Dialog Box (Run Results Viewer)

This dialog box enables you to preview run results on screen before you print them. You can select the type and quantity of information you want to view, and you can also display the information in a customized format.



Print range

● All nodes

○ Selected node

Print format

● Short

○ Detailed

○ User-defined XSL

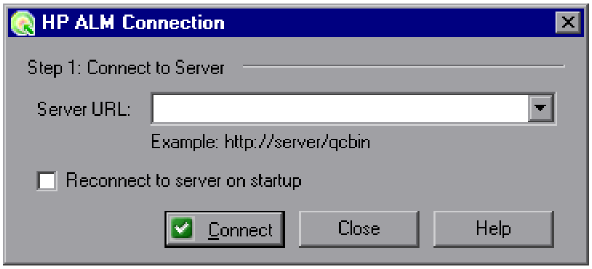
To access	Select **File** > **Print Preview.**

User interface elements are described below:

UI Elements (A-Z)	**Description**
Preview	Displays the run results on screen as they will appear when printed. **Tip:** If some of the information is cut off in the preview, for example, if checkpoint names are too long to fit in the display, click the **Page Setup** button in the Print Preview window and change the page orientation from **Portrait** to **Landscape**.
Print format	➤ **Short.** Previews a summary line (when available) for each item in the run results tree. This option is only available if you selected **All** in **Print range**. ➤ **Detailed.** Previews all available information for each item in the run results tree, or for the selected branch, according to your selection in **Print range**. The preview includes still images associated with the steps in your run results. If a bitmap checkpoint step displays expected, actual, and difference bitmaps, these are also included. ➤ **User-defined XSL.** Enables you to browse to and select a customized **.xsl** file. You can create a customized **.xsl** file that specifies the information to be included in the preview, and the way it should appear. For more information, see "Run Results XML File" on page 441.
Print range	➤ **All nodes.** Previews the run results for the entire test. ➤ **Selected nodes.** Previews run results information for the selected branch in the run results tree.

HP ALM Connection - Server Connection Dialog Box

This dialog box enables you to connect or disconnect to or from an ALM/ QC project.



HP ALM Connection

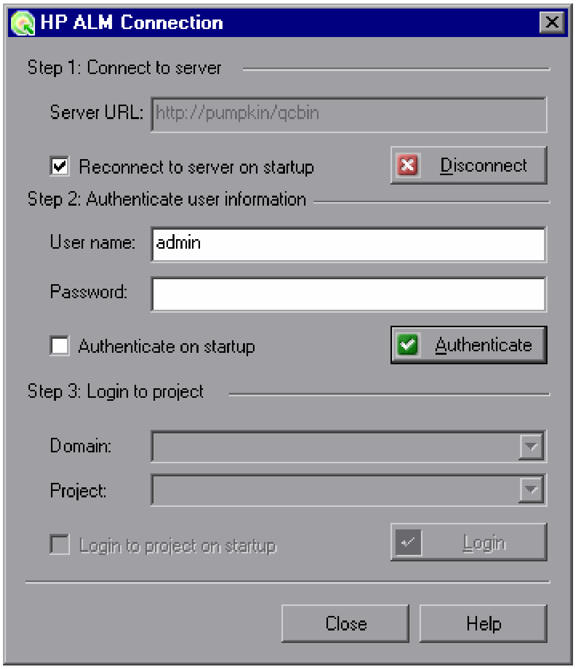
Step 1: Connect to Server

Server URL:

Example: http://server/qcbin

□ Reconnect to server on startup

After you connect to the server, the dialog box expands to include the remaining connection fields.



HP ALM Connection

Step 1: Connect to server

Server URL: http://pumpkin/qcbin

☑ Reconnect to server on startup

Step 2: Authenticate user information

User name: admin

Password:

□ Authenticate on startup

Step 3: Login to project

Domain:

Project:

□ Login to project on startup

To access	Select **Tools** > **ALM/QC Connection.**
Important information	**Connect.** The connection process has two stages. First, you connect to a local or remote ALM/QC server. This server handles the connections between Service Test and the ALM/QC project. Next, you log in and select the project you want the Run Results to access.
Relevant tasks	"How to Open Run Results" on page 448
See also	"Run Results Viewer Overview" on page 440

User interface elements are described below:

UI Elements (A-Z)	Description
Authenticate / Change User	Authenticates your user information against the ALM/QC server. **Note:** After your user information has been authenticated, the edit boxes in the **Authenticate** user information area are displayed in read-only format. The **Authenticate** button changes to a **Change User** button. **Tip:** You can log in to the same ALM/QC server using a different user name by clicking **Change User**, and then entering a new user name and password and clicking **Authenticate** again.
Authenticate on Startup	Automatically authenticates your user information against the ALM/QC server every time you open Service Test.
Close	Closes the ALM/QC Connection dialog box.
Connect / Disconnect	Connects or disconnects Service Test to or from the selected ALM/QC server. (After you successfully connect to a ALM/QC server, the button changes to **Disconnect**.)
Domain	The domain that contains the ALM/QC project. **Note:** Only those domains to which you have permission to connect are displayed.

UI Elements (A-Z)	Description
Login / Logout	➤ **Login.** Logs into the selected domain and project using the current user information. (After you successfully log into a project, the button changes to **Logout**.) ➤ **Logout.** Logs out of the selected domain and project.
Login to project on startup	Automatically logs into the selected project every time the Run Results Viewer opens.
Password	Your ALM/QC password.
Project	The ALM/QC project with which you want to work. **Note:** Only those projects for which you are a defined user are displayed.
Reconnect to Server on startup	Automatically reconnects to the ALM/QC server every time you open the Run Results Viewer.
Server URL	The URL address of the Web server where ALM/QC is installed. You can select a ALM/QC server accessible via a Local Area Network (LAN) or a Wide Area Network (WAN).
User name	Your ALM/QC user name.

Guidelines for Windows Vista, Windows 7, Server 2008, and Server 2008 R2 Users

The security settings in the following operating systems may prevent you from connecting to an HP ALM or ALM/QC project:

- Windows Vista
- Windows 7
- Windows Server 2008
- Windows Server 2008 R2

This can occur when the UAC (User Account Control) option is set to ON, and you have never connected to an HP ALM or ALM/QC project.

To connect to HP ALM or ALM/QC for the first time, you must disable the UAC option. After you successfully connect to HP ALM or ALM/QC, you can turn the UAC option on again. Thereafter, you should be able to connect to HP ALM or ALM/QC, as needed.

To enable Service Test to connect to an HP ALM or ALM/QC project:

For Microsoft Windows Vista and Windows Server 2008:

1. Log in as an administrator.
2. From the Control Panel, select **User Accounts** > **Change Security Settings**, and clear the **Use User Account Control (UAC) to help protect your computer** check box. You may need to restart your computer for the changes to take effect.
3. Restart your computer.
4. Connect to HP ALM or ALM/QC, as described above.
5. Select the **Use User Account Control (UAC) to help protect your computer** check box and click **OK** to turn the UAC option on again.

For Microsoft Windows 7 and Windows Server 2008 R2:

1. Log in as an administrator.
2. From the Control Panel, select **User Accounts** > **User Accounts** > **Change User Account Settings**.
3. In the User Account Control Settings window, move the slider to **Never notify**. You may need to restart your computer for the changes to take effect.
4. Restart your computer.
5. Connect to HP ALM or ALM/QC, as described above.
6. Return to the User Account Control Settings window, and restore the slider to its previous position to turn the UAC option on again.

Troubleshooting and Limitations - Run Results

This section describes troubleshooting and limitations for working with the Run Results Viewer.

- For UFT (Unified Functional Testing) activities, the Run Results Viewer may not display the results and test status properly.
- Test names with a hyphen character '-' stored in ALM/QC, cannot be opened in reports.
  Workaround: Save the test with another name.

11

ALM/QC Integration

This chapter includes:

Concepts

Tasks

Reference

Concepts

Managing Tests Through HP ALM/QC Overview

Service Test integrates with supported versions of HP ALM/QC (Application Lifecycle Management /Quality Center). ALM/QC integration enables you maintain projects with different kinds of tests (such as Service Test and QuickTest tests, Business Process tests, manual tests, tests created using other HP products, and so forth) that cover all aspects of your application's functionality. Each test in your project is designed to fulfill a specific testing requirement of your application. To meet the goals of a project, you organize the tests in your project into unique groups.

ALM/QC provides an intuitive and efficient method for scheduling and running tests, collecting results, analyzing the results, and managing test versions. It also features a system for tracking defects, enabling you to monitor defects closely from initial detection until resolution.

Service Test integrates with Service Test Management, the ALM/QC tool for storing and managing application components, such as Web services. Service Test Management is an extension of ALM/QC and it provides an efficient method for storing and retrieving application components.

In order for Service Test to work with ALM/QC, you must connect to the Web server on which ALM/QC is installed. You can connect to either a local or remote server.

For more information on working with ALM/QC, see the *HP Application Lifecycle Management User Guide*.

Data Awareness in ALM/QC

Note: ALM/QC's data awareness feature is available when integrating Service Test with ALM/QC. It requires the QuickTest Professional Add-in for ALM/QC, available from the **More HP Application Lifecycle Management Add-ins** page.

In ALM/QC, you can upload and store your Microsoft Excel (**.xls** or **.xlsx**) test data resource files in the **Test Resources** module, enabling you to use the same data for multiple tests, or different data for each test run.

In ALM/QC, you run **configurations** instead of standard tests. When working with data-driven tests in ALM/QC, each **configuration** is a Service Test test that is set to run with a selected data resource file and optional data filter settings. The filter settings enable you to filter data by specified row numbers, by parameter text values, or both.

Note: You define and manage configurations in ALM/QC.

Example

Suppose you define three configurations in a single test to test an application that provides different solutions for Gold Card, Silver Card, and Bronze Card users. You could use the same data resource for each configuration by filtering the rows or text of the data resource to match the relevant user type. Similarly, if your data is stored in several Excel files, you can run the same test multiple times using different data resources. You would do this by associating a different data resource with each configuration.

By managing your data as a resource in ALM/QC, you can see at a glance which data resource files are associated with a particular test or configuration, and which tests or configurations are using a specific data resource.

For more details, see the section about data awareness in the *HP Application Lifecycle Management User Guide*.

This section also includes:

- "Benefits of Data Awareness in ALM/QC" on page 490
- "How Does Data Awareness in ALM/QC Work?" on page 491
- "Considerations for Data Awareness in ALM/QC" on page 492

Benefits of Data Awareness in ALM/QC

Data Reuse. You can associate the same data resource with multiple tests or configurations.

Test Reuse. You can use the same test to test various scenarios, each time with a different set of data. You can do this associating a different data resource with each configuration, by associating a single data resource with different configurations and then filtering each configuration, or by using a combination of both.

Ease of Management. All of your resources are stored in one central location.

Visibility. You can see which tests are using a particular data table, and you can see which data table each test is using.

Requirements Coverage. You can cover all of your testing requirements by linking them to specific configurations. This enables you, for example, to use a single test to cover multiple requirements by associating different configurations in the same test with each requirement.

Resources and Dependencies Model. By storing your data in the **Test Resources** module, you can take advantage of additional ALM/QC integration features, such as:

- Version Control and Baselines
- Asset Comparison Tool and Asset Viewer
- Sharing data resources across ALM/QC projects

How Does Data Awareness in ALM/QC Work?

When you create a test in ALM/QC (or save a test to an ALM/QC project from Service Test for the first time), ALM creates a default **configuration** with the same name as the test. You can view this configuration in the Test Plan module's **Configuration** tab.

In the ALM/QC Test Resources module, you create one or more data resources and upload one Microsoft Excel file for each.

After you upload a data resource file to your ALM/QC project, you can define the test-level configuration settings for a particular test. You do this in the Test Plan module's **Parameters** tab, by selecting the data resource file and mapping its column names to the data table parameters in your test. You can associate one data resource with the test-level configuration. By mapping the column names to data table parameters, you enable Service Test to identify and use the correct parameter value when running the test.

Note: When running a test, Service Test's Data Navigation looks at the data resulting from the specific configuration. For example, if your ALM configuration filters the data to use only rows 3 through 5, and the Service Test navigation says to iterate rows 2 through 3, the actual data used will be rows 4 and 5 from the test resource.

Next, in the Test Lab module, you can run any or all of the configurations defined for a test (or associated with a requirement) by adding them to a test set.

For a task describing how to work with the data awareness feature, see "How to Work with Data Awareness" on page 496.

Considerations for Data Awareness in ALM/QC

Consider the following when managing your data resources in ALM/QC:

- Only Microsoft Excel files are supported as data resources.
- If you modify a data table parameter or a column name in the associated data resource after they are mapped to each other, you must update the mappings accordingly.

ALM/QC Tests and Version Control

If your test is saved in an ALM/QC project that uses version control, the process of opening and saving a test is different.

Tests with version control are either in a state of checked-in or checked-out. When you are working with a test in a checked-out state, any changes you make will not be saved on the ALM/QC server until you check in the test. If you save the test from within Service Test, a temporary file is saved onto your machine that protects the test in case your computer crashes.

If you are working with a test in a checked-in state, the test is read-only and you cannot save your changes until you check out the test.

If a particular test is being saved to ALM/QC for the first time, and the project uses version control, the test automatically starts in a checked-out state.

Tasks

How to Work with Tests in ALM/QC

The following steps describe the workflow of how to work with tests saved in an ALM/QC project.

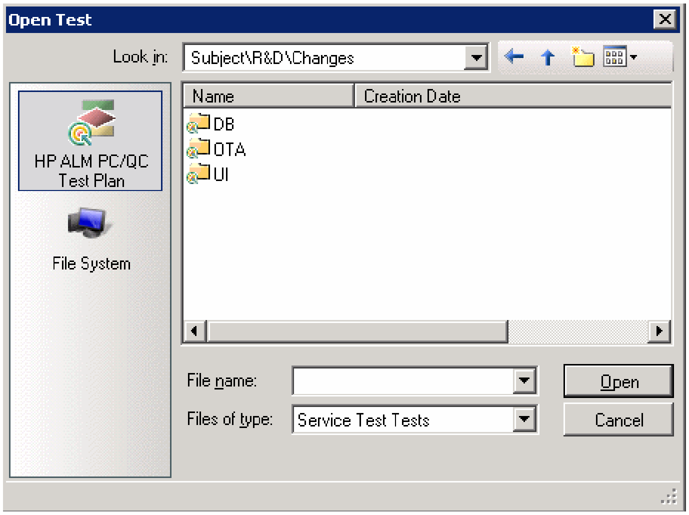
- "Connect to ALM/QC" on page 493
- "Open the test" on page 494
- "(Version control only) Check in/out the test" on page 494
- "(Version control only) Cancel a check out" on page 494
- "Save the test" on page 494

Connect to ALM/QC

Open a connection to the ALM/QC server. Log into the project that contains the test. For task details, see "How to Connect to ALM/QC" on page 495.

Open the test

Select **File** > **New** menu to create a new test, or select **Open** > **Test** to open a test already saved in ALM/QC. To find the test, select the **HP ALM/QC Test Plan** module, and drill down in the folder tree until you locate it.



Open Test

Look in: Subject\R&D\Changes

Name	Creation Date
DB	
OTA	
UI	

File name:

Files of type: Service Test Tests

(Version control only) Check in/out the test

If the ALM/QC project has version control, tests are defined as being either checked-in or checked-out. For more details, see "ALM/QC Tests and Version Control" on page 492. To check in and check out tests, select **File** > **ALM/QC Version Control** > **Check In/Out**.

(Version control only) Cancel a check out

If you checked out a test and do not want to save the changes, you can return the status of the test to checked-in without saving by selecting **File** > **ALM/QC Version Control** > **Undo Check Out**.

Save the test

Select **File** > **Save Test as**. Click the **HP ALM/QC Test Plan** button and navigate to the desired location. If you connected to a project that uses version control but is not checked out, the test is only saved as a temporary file on your local machine.

How to Connect to ALM/QC

To store and retrieve scripts from ALM/QC, you need to connect to a project.

1. Select **File** > **HP ALM/QC Connection**.
2. Enter a URL, user name and password and click **Connect**. Use the complete URL. For example, http://servername.mylab:8080/qcbin.

   Note: An **http/https** prefix and port number are mandatory.

   ---

3. Select a domain and project for your test and click **Login**.
4. To logout from the project, but remain connected to ALM/QC, click **Logout**. This is useful if you want to switch to a different project.
5. To disconnect from ALM/QC, click **Disconnect**.

For user interface details, see "HP ALM/QC Connection Dialog Box" on page 500.

How to Save Tests to ALM/QC Projects

The following steps describe how to save a Service Test project to the ALM/QC repository:

- "Open a test" on page 495
- "Connect to ALM/QC" on page 496
- "Save the test" on page 496
- "Save the test to ALM/QC" on page 496

Open a test

Create or open a test. Choose **File** > **Open** > **Test** or click the **Create New Test** link on Service Test's **Start Page** tab.

Connect to ALM/QC

Open a connection to the ALM/QC server and project that you want to store the test. For task details, see "How to Connect to ALM/QC" on page 495.

Save the test

Choose **File** > **Save** to save the test to a temporary folder.

Save the test to ALM/QC

Choose **File** > **Save Test as** and select the **HP ALM/QC Test Plan** button. Navigate to the desired location or use the New Folder button to create a new directory for the test. Specify a **File Name** and click **Save**.

How to Work with Data Awareness

Service Test lets you integrate with ALM/QC to use ALM's Data Awareness and Test Resource features. For details, see "Data Awareness in ALM/QC" on page 489.

➤ "Connect to ALM/QC" on page 497

➤ "Create a data driven test" on page 497

➤ "Save the test in ALM/QC" on page 497

➤ "Save test resources in ALM" on page 497

➤ "Map the data in ALM" on page 497

➤ "Create test configurations in ALM" on page 497

➤ "Run the test in ALM" on page 497

1 Connect to ALM/QC

Open a connection to an ALM 11.00 (or higher) server and project. For details, see "How to Connect to ALM/QC" on page 495.

2 Create a data driven test

Create a new test or open an existing test. Data drive the properties with an Excel data source. When you import the Excel data source, enable the **Data Awareness** option. For details, see "Linking to a Data Source" on page 344.

3 Save the test in ALM/QC

Select **File** > **Save Test as** and save the test to the ALM project.

4 Save test resources in ALM

In ALM, open the **Testing** > **Test Resources** module and select the **Resource Viewer** tab. Click the **Upload File** button to load the files into ALM. In order to view the data, you need to have the QuickTest Professional Add-in for ALM. For details, see the Application Lifecycle Management documentation and the add-in page.

5 Map the data in ALM

Map the tables and columns from the test's current data source to the columns in the ALM test resource. If the Excel's data table parameter names and the column names are identical, you do not need to perform any mappings.

6 Create test configurations in ALM

Create configurations of data with the test and map them to requirements.

7 Run the test in ALM

Run the configurations as a test set in ALM. View the results indicating the number of iterations, their status, and which data was associated with each iteration.

For more information, see the *Application Lifecycle Management User Guide*.

How to View a List of Previous Test Versions

If your test is saved in an ALM/QC project that uses version control, you can view a list of the versions of the test. The following steps describe how to do this.

➤ "Connect to ALM/QC" on page 498

➤ "Open a test" on page 498

➤ "View a list of the versions" on page 498

1 Connect to ALM/QC

Open a connection to the ALM/QC server and project that you want to store the test. Make sure the ALM/QC project supports versioning.

For task details, see "How to Connect to ALM/QC" on page 495.

2 Open a test

Create or open a test. Choose **File** > **Open** > **Test**.

3 View a list of the versions

Select **File** > **HP ALM/QC Version Control** > **Version History** and view the list.

Reference

ALM/QC Data Awareness - Task Breakdown

The following table lists where to perform specific data awareness tasks in ALM/QC.

Module	Tab	Task
Test Plan	**Parameters**	Define the test-level configuration for the current test: ➤ Specify a data resource file. ➤ Map the data table parameters used in your test steps to the column names in your data resource file.
	Configurations	Create additional configurations. (Optional) **Data tab:** ➤ Select a different data resource. (Optional) ➤ Specify the data resource settings: ➤ Specify the rows to be used during a run session. ➤ Specify any text parameters values filters. (Optional) ➤ If you select a different data resource (by overriding the data resource defined in the Parameters tab), map the data table parameters used in your test steps to the column names in your data resource file.
	Req Coverage	If you add requirement coverage to a test that contains multiple configurations, specify which configuration(s) to use for coverage. (Can also be done from the Requirements module)

Module	Tab	Task
Test Resources	**Resource Viewer**	➤ Create a data resource. ➤ Upload a Microsoft Excel (**.xls**) file to use as the data resource.
Test Lab	**Execution Grid**	➤ Add all of the configurations in a test to a test set. ➤ Add only specific configurations to a test set. ➤ Add all of the configurations contained in a tests that cover specific requirements to a test set. ➤ Add only the configurations associated with a specific requirement to a test set.

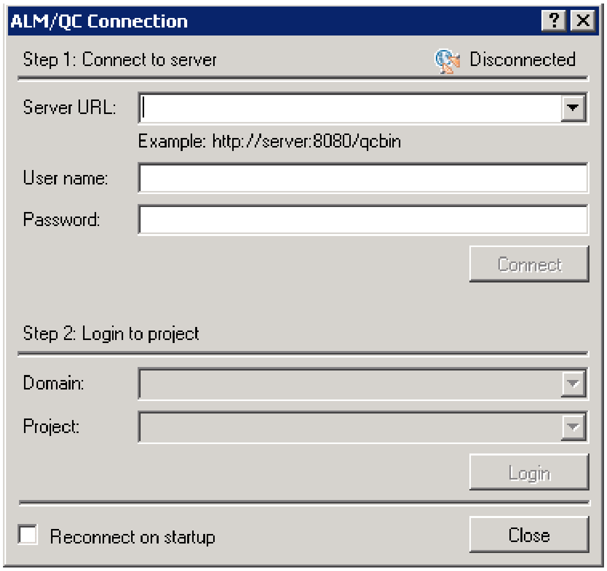
ALM/QC User Interface

This section includes:

- HP ALM/QC Connection Dialog Box on page 500

HP ALM/QC Connection Dialog Box

This dialog box enables you to connect to an ALM/QC project from within Service Test.



ALM/QC Connection

Step 1: Connect to server — Disconnected

Server URL:

Example: http://server:8080/qcbin

User name:

Password:

Step 2: Login to project

Domain:

Project:

☐ Reconnect on startup

To access	Select **File** > **HP ALM/QC Connection**
Important information	In order to import a WSDL from ALM/QC, you must connect to a project in which the Service Test Management extension is enabled.
Relevant tasks	➤ "Managing Tests Through HP ALM/QC Overview" on page 488 ➤ "How to Work with Tests in ALM/QC" on page 493

User interface elements are described below:

UI Elements (A-Z)	Description
Reconnect on startup	➤ Connects to ALM/QC the next time your open Service Test.
Step 1: Connect to Server	➤ **Server URL.** The URL of the server that hosts an ALM/QC project with the services. ➤ **User Name.** Your ALM/QC user name. ➤ **Password.** Your ALM/QC password. ➤ **Connect**. Connects to the ALM/QC server with your user information. ➤ **Disconnect**. Disconnects from the ALM/QC server.
Step 2: Login to Project	➤ **Domain.** The domain that contains the ALM/QC project. Only those domains containing projects to which you have permission to connect to are displayed. ➤ **Project.** Enter the ALM/QC project name or select a project from the list. Only those projects that you have permission to connect to are displayed. ➤ **Login**. Logs in to the selected project. ➤ **Logout**. Logs out from the current project.

Troubleshooting and Limitations - ALM/QC Integration

This section describes troubleshooting and limitations for ALM/QC integrations.

Forward Proxy

The following prerequisite applies if there is a forward proxy with Basic Authentication between the server and client machines. Before the first connection to an ALM platform, each ALM client must configure the proxy credentials by using the **Webgate Customization Tool**. If you do not run WebGate, you may be unable to connect, or you may need to enter your credentials multiple times.

To run the tool:

1. Go to the following location on the ALM client machine: http://<ALM Platform server name>[<:port number>]/qcbin/Apps/
2. In **WebGate Customization**, click in the **Proxy Credentials** area. Select the **Use these credentials** check box, and type values in the **Proxy Username** and **Proxy Password** boxes.
3. Click **Save** and then **Close**.

Running Service Test Locally on a Windows 2003 Server

To run Service Test *locally* on a Windows 2003 Server machine, you must perform the following steps in order run a test stored in ALM/QC.

1. Select **Start** > **Run**.
2. In the Run dialog type dcomcnfg. The **Component Service** Console opens.
3. In the left pane, expand the **Component Services** tree. Select the **Computers** -> **My Computer** -> **COM+ Applications** node.
4. In the right pane, select **Service Test Remote Agent** and select **Properties** from its shortcut menu.
5. Select the **Identity** tab. Select **This User** and enter the credentials of a user with administrator privileges.
6. Click **OK** and close all of the dialog boxes.

Note: This is only required if ALM/QC is not installed on the same server as Service Test.

Running Service Test Remotely on a Windows 2003 Server

To run Service Test *remotely* on a Windows 2003 server machine, you must enable network COM+ access. To enable this access, perform these steps on the remote server machine:

1 Select **Start** > **Settings** > **Control Panel**.

2 In the Control Panel, double-click **Add or Remove Programs**.

3 In the Add or Remove Programs dialog box, click **Add/Remove Windows Components** in the left pane.

4 Select **Application Server** and click the **Details** button.

5 In the **Subcomponents of Application Server** pane, select **Enable network COM+ access**. Click **OK**.

6 Click **Next** and **Finish** to close all of the dialog boxes. Restart the server machine.

7 Perform the steps described in the previous bullet for running Service Test locally on a Windows 2003 server machine.

Miscellaneous ALM/QC Integration Issues

- For Service Test Management version 10.50: Before importing a WSDL from Service Test Management, you must connect at least once to the Service Test Management- ALM/QC server, through Internet Explorer.
- If you rename a resource in ALM/QC, the Toolbox does not reflect the renaming.
- When create a new test in ALM/QC and add a new folder—if you attempt to rename the folder, ALM/QC creates a subfolder of New Folder and the renaming fails.
- When calling a Service Test test from a QuickTest test, and both tests are stored in ALM/QC, the results of the Service Test step may not appear in the Run Results.

- If you are connected to an ALM/QC server, and you want to connect to a different server, disconnect from the first ALM/QC server, restart Service Test, and connect to the second server.
- To enable test versioning in ALM/QC versions prior to 11.00, create a file in the <QC installation folder>\repository\sa\DomsInfo\Metadata\TEST folder called ServiceTest.xml with the following content:

```
<?xml version="1.0" encoding="UTF-8" ?>
<Test Type="SERVICE-TEST">
  <Repository>
    <Folders ID="1" Filter="." BlindCopy="true" />
  </Repository>
  <Versioning Enabled="true" />
  <Baselining Enabled="false" />
 </Test>
```

Unsupported ALM/QC Features

- The HP ALM/QC **Baseline** feature is not supported.
- The HP ALM/QC **ERI** feature is not supported. Due to this limitation, you cannot save tests with resources, such as QTP tests, external data tables, and so forth, to ALM/QC. Resources remain stored locally.
- Remote Execution is not supported when Web authentication is enabled.

Appendixes

A

Coding Service Test Events

This supplement includes:

Concepts

Tasks

Reference

Concepts

Writing Code for Events Overview

Service Test lets you write customized code for your test in two ways:

- Event Handlers for all activities
- Custom Code activity

For each activity, you can define event handlers for common events, such as: **CodeCheckPointEvent**, **BeforeExecuteStepEvent,** and **AfterExecuteStepEvent**. Certain activity types such as Web Services and HTTP have additional built-in events. For a list of the events, see the "Events View" on page 61.

The **Custom Code** activity enables you to define the behavior of your own activity and its properties. You define this behavior through an event handler that is triggered before, during, or after the execution of the activity.

Service Test's code editor enables you to use autocompletion to prepare the event handler. For task details, see "How to Open a Window for Writing Custom Code" on page 510.

Tip: To instruct Service Test to ignore an event handler, select the handler and press DELETE to remove the name of the handler from the grid. To remove the handler, you must delete the code manually in the **TestUserCode.cs** tab.

Casting

The Event Handler code in the **TestUserCode.cs** file uses the following objects:

- **sender.** The object that raises the activity's event.
- **args.** The event arguments passed to the activity.

You can set an activity's properties in the following way:

```
CodeActivity4.Input.a="My string";
```

To access an activity's property, use the **this** object. The following example retrieves an output property from an earlier **CodeActivity** step:

```
CodeActivity4.Output.secondOutput = " Previous Code Activity Output : " +
this.CodeActivity2.Output.FirstOutputParameter
```

Tasks

How to Open a Window for Writing Custom Code

For non-custom code activities, you can define default event handlers for checkpoints, before step execution, and after step execution.

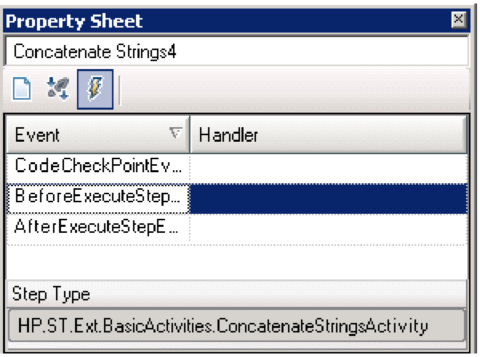
The checkpoint event handlers help you verify the output values in your test. You can use a Report, Assert, or Log function to gather information about your service.

This task includes the following steps:

- "Open the Events view" on page 510
- "Select an event" on page 511
- "Edit the code" on page 511
- "Enable access to the activity's properties" on page 511
- "Save the changes" on page 511

1 Open the Events view

Select an activity title in the canvas and open the **Events** view in the Property Sheet.



Property Sheet

Concatenate Strings4

Event	Handler
CodeCheckPointEv...	
BeforeExecuteStep...	
AfterExecuteStepE...	

Step Type

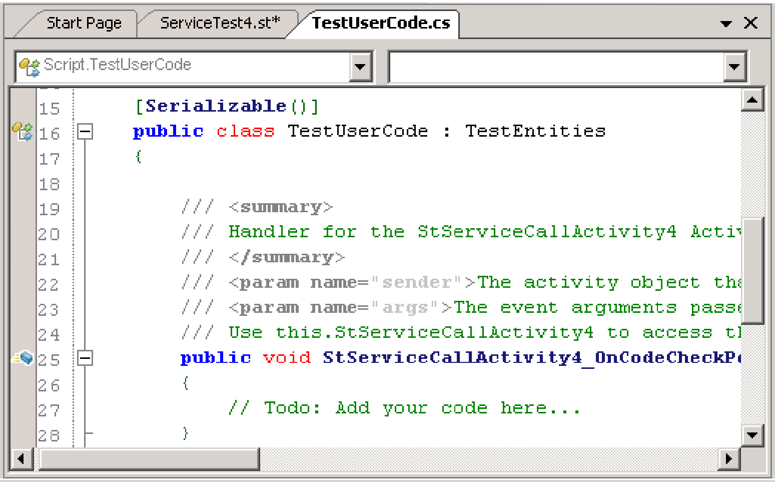
HP.ST.Ext.BasicActivities.ConcatenateStringsActivity

2 Select an event

Select the event for which you want to provide code. Double-click in the **Handler** column. A **TestUserCode.cs** tab opens.

3 Edit the code

Select the **TestUserCode.cs** tab. Locate the **Todo** section and add your custom code. You can use autocompletion to assist you in writing the code.



```
    [Serializable()]
    public class TestUserCode : TestEntities
    {

        /// <summary>
        /// Handler for the StServiceCallActivity4 Acti
        /// </summary>
        /// <param name="sender">The activity object tha
        /// <param name="args">The event arguments passe
        /// Use this.StServiceCallActivity4 to access t
        public void StServiceCallActivity4_OnCodeCheckP
        {
            // Todo: Add your code here...
        }
```

4 Enable access to the activity’s properties

Use the **this** object to access the activity's context, including input and output properties. For example:

```
this.StServiceCallActivity4.InputEnvelope
```

5 Save the changes

Click **File** > **Save All** to save all buffers of the test.

How to Access Input and Output Properties

You can set the values of input and output properties through event handlers.

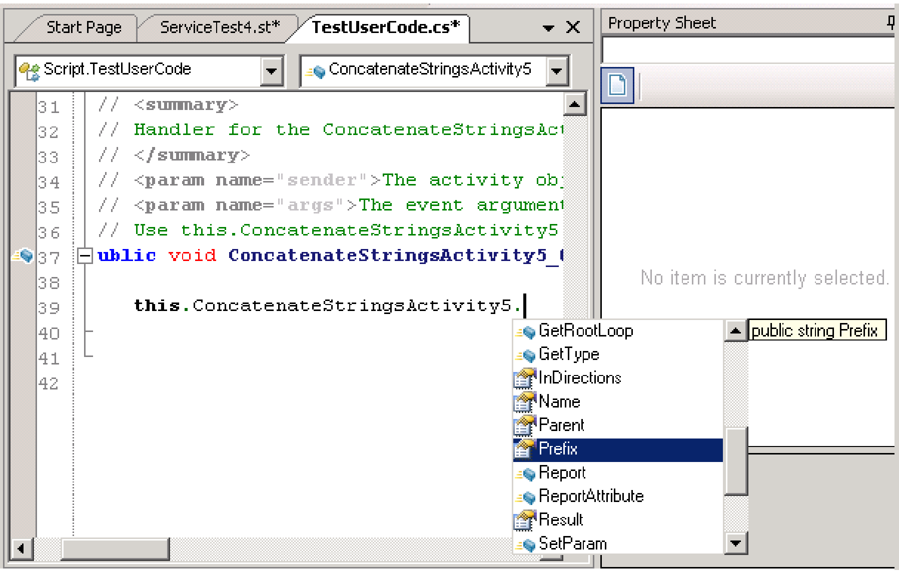
This task includes the following steps:

➤ "Select a property" on page 512

➤ "Access the activity's parent" on page 513

1 Select a property

Use autocompletion to locate and select a property from the drop-down list. The drop-down shows all the activity-specific properties. For example, for the **ConcatenateString** activity, the drop-down includes **Prefix** and **Suffix**.



```
// <summary>
// Handler for the ConcatenateStringsAct
// </summary>
// <param name="sender">The activity ob
// <param name="args">The event argument
// Use this.ConcatenateStringsActivity5
ublic void ConcatenateStringsActivity5_(

    this.ConcatenateStringsActivity5.
```

public string Prefix

No item is currently selected.

2 Access the activity's parent

To access the activity's parent, select the **Parent** property from the drop-down list. A parent refers to the step or condition that encloses the activity. For example, for a step in a conditional branch, the parent is the name of the condition step.

```
string ParentName = this.ConcatenateStringsActivity5.Parent.Name
```

To obtain the parent of an activity's loop, use a **this** object.

```
this.ConcatenateStringsActivity5.GetParentLoop();
```

How to Set Input and Output Properties

You can set the values of input and output properties using event handlers.

This task includes the following steps:

- "Access the activity's properties" on page 513
- "Select a property" on page 514
- "Access the activity's parent - optional" on page 514

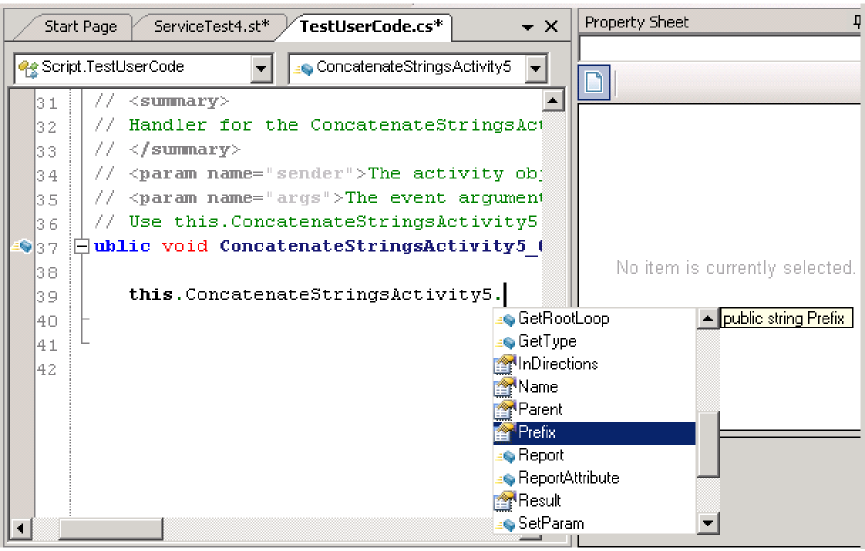
1 Access the activity's properties

Access the activity's properties using the this object. For example:

```
this.ConcatenateStringsActivity4
```

2 Select a property

Use autocompletion to locate and select a property from the drop-down list. The drop-down shows all the activity-specific properties. For example, for a **ConcatenateStrings** activity, the drop-down shows **Prefix** and **Suffix**.



```
// <summary>
// Handler for the ConcatenateStringsAct
// </summary>
// <param name="sender">The activity ob
// <param name="args">The event argument
// Use this.ConcatenateStringsActivity5
ublic void ConcatenateStringsActivity5_(

    this.ConcatenateStringsActivity5.
```

3 Set the activity's property values - optional

Set the property values using hard-coded values or variables that you defined earlier. For example:

```
this.ConcatenateStringsActivity5.Prefix = "hello";
this.ConcatenateStringsActivity5.Suffix = "world";
```

4 Access the activity's parent - optional

A parent property refers to the step or condition that encloses an activity. To access an activity's parent property, use the **Parent** property. For example, for a step in a conditional branch, the parent is the name of the condition step. To obtain the activity's parent loop, use GetParentLoop.

```
string ParentName = this.ConcatenateStringsActivity5.Parent.Name;
this.ConcatenateStringsActivity5.GetParentLoop();
```

How to Use the Logging Function

The **UserLogger** function generates messages during replay. You can view these messages in the **Output** tab or in the log file.

This task includes the following steps:

- "Select the UserLogger object" on page 515
- "Choose a log type" on page 515
- "Complete the function" on page 516
- "View the Output Log" on page 516

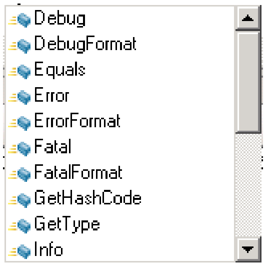
1 Select the UserLogger object

Use autocompletion from the activity's **Context** object, and select the **UserLogger** object.

```
this.StServiceCallActivity4.Context.UserLogger
```

2 Choose a log type

Use autocomplete to select a log type.



For a list of the log types, see "Logging Options" on page 531.

3 Complete the function

Provide to necessary arguments to complete the function as indicated by the tooltip.

The following example logs unformatted **Debug** information to the log from a variable called debug_information.

```
this.StServiceCallActivity4.Context.UserLogger.Debug(debug_information);
```

4 View the Output Log

View the debug information that you instructed Service Test's added, in the **Output** tab or in the log file.

To view the output tab:

a Run the test at least once (F5).

b Select **View** > **Output**. View the **Output** tab in the bottom section of the Service Test window.

To view the output log file:

a Run the test at least once (F5).

b Select **Test** > **Open Containing Folder** and open the **Log** directory.

c Open the **vtd_user.log** file.

How to Use the Report Function

Use the **Report** function to show the results of a test's execution in the Run Results Viewer. The report opens automatically after you run the test. You can also view it at any time by selecting **Test** > **View Test Results.**

This task includes the following steps:

- "Select the Report object" on page 517
- "Complete the function" on page 517
- "View the run results" on page 517

1 Select the Report object

Select the **Report** function using autocompletion.

```
this.ConcatenateStringsActivity5.Report
```

2 Complete the function

Provide a keyword and value, based on the function's prototype:
Report(string keyword, string value);

The following example sends an employee's last name to the report. You can also use a variable that was defined earlier in the code.

```
this.ConcatenateStringsActivity5.Report("Employee Name", Jones);
```

3 View the run results

Run the test and check the results in the Run Results Viewer. The report displays the keyword and its value in the Iterations node.

How to Write Checkpoint Events

You write checkpoint event handlers using the **checkpoint** object. The Assert library functions run a comparison between actual and expected values, and show the results in the step's **Checkpoint** node. You can also use the **checkpoint** object to control checkpoints in the user interface and customize your reports.

This task includes the following steps:

- "Create a checkpoint handler" on page 518
- "Select the Checkpoint object" on page 518
- "Validate a checkpoint - optional" on page 518
- "Ignore selected checkpoints - optional" on page 519
- "Customize the checkpoints reporting - optional" on page 519
- "View the results" on page 519

1 Create a checkpoint handler

Double-click the **Handler** column of the **CodeCheckPointEvent** row in the activity's **Events** view.

2 Select the Checkpoint object

Use the **args** object, and select the **Checkpoint** object using autocomplete.

```
args.Checkpoint
```

3 Validate a checkpoint - optional

To validate a value during run-time, follow these steps:

a Use the **args.Checkpoint** object, and select **Assert** using autocomplete.

b Use autocomplete to select a comparison operator such as **Equals**, and so forth. For details, see "Assert Options" on page 532.

c Complete the function as indicated by its tooltip. Provide the necessary arguments. For example, to check that the expected and actual values match, use the following expression:

```
args.Checkpoint.Assert.Equals(<Expected Value>, <Actual Value>)
```

The following example checks if the actual value (second argument) equals the expected value (first argument) for the **ConcatenateString** activity. Note that you access the property values using the this.<activity_instance>.<property> object.

```
args.Checkpoint.Assert.Equals(this.ConcatenateStringsActivity4.Prefix+this.Concate
nateStringsActivity4.Suffix, this.ConcatenateStringsActivity4.Result);
```

The second example checks if the text value (alphabetical order for a string) of the prefix is less than the suffix. To ensure that the checkpoint succeeds, enter a prefix value that is greater than the suffix, for example a prefix of **aa** and a suffix of **bb**.

```
args.Checkpoint.Assert.Less("Concatenate test",
this.ConcatenateStringsActivity4.Prefix, this.ConcatenateStringsActivity4.Suffix,
      "The prefix is less than the suffix");
```

4 Ignore selected checkpoints - optional

You can instruct Service Test to ignore the checkpoints selected in the Property Sheet's **Input/Checkpoints** view. This is useful if you need to ignore the checkpoints temporarily.

- **a** Use the **args.Checkpoint** object, and select the **RunUICheckpoints** object using autocomplete.
- **b** Set the value to **false**. You can enable the checkpoints for this step at any time by removing this line or by setting it to **true**.

```
args.Checkpoint.RunUICheckpoints = false;
```

5 Customize the checkpoints reporting - optional

You can instruct Service Test to send a specific message to the Checkpoints node in the report. The standard Report function sends a message to the step's node, but the Checkpoint's Report function enables you to send messages to the Checkpoint sub-node.

- **a** Use the **args.Checkpoint** object, and select the **Report** object using autocomplete.
- **b** Complete the function syntax, based on the function's tooltip, providing the actual and expected result and a logical operator.

6 View the results

Run the test and view the Run Results Viewer. Drill down to the checkpoints and check your results.

How to Retrieve and Set Test Variables

The **Context** object's **TestProfile** method enables you to set or get the value of a user test variable from the active Test Profile.

This task includes the following steps:

- ➤ "Select the TestProfile object" on page 520
- ➤ "Get or Set a variable" on page 520

1 Select the TestProfile object

Use the activity's **Context** object, and select **TestProfile** from the autocomplete menu.

2 Get or Set a variable

From the autocomplete menu, select **GetVariableValue** or **SetVariableValue** methods.

The following example retrieves the value of the *TestName* test variable.

```
string testName =
this.StServiceCallActivity4.Context.TestProfile.GetVariableValue("TestName");
```

How to Encrypt and Decrypt Passwords

Password fields expect an encrypted string—if you provide an unencrypted string, the authentication will fail.

The **EncryptionMngr** method lets you encrypt and decrypt strings within your events.

This task includes the following steps:

- "Encrypt the password" on page 521
- "Decrypt the password - optional" on page 521

1 Encrypt the password

Use the activity's context's **EncryptionMngr** method, and select **Encrypt** from the autocompletion drop-down. The following example encrypts a password.

```
string plainText = "myPassword";
string encryptedText =
this.StServiceCallActivity4.Context.EncryptionMngr.Encrypt(plainText);
```

2 Decrypt the password - optional

Use the **Decrypt** method from the autocompletion drop-down.

The following example decrypts a password and validates it against the original string.

```
string decryptedText =
this.StServiceCallActivity4.Context.EncryptionMngr.Decrypt(encryptedText);
bool equalText = decryptedText.Equals(plainText);
```

How to Use the OnReceiveResponse Web Service Event

Service Test provides several custom event handlers for Web Services. The following example shows how to send the inner SOAP envelope as a string to the execution report, when a response is received.

Note: To manipulate the Output Envelope (**activity.OutputEnvelope** property), use the **AfterExecuteStepEvent**—the **activity.OutputEnvelope** property is not available for the **OnReceiveResponse** event.

For a complete list of the Web Service events, open the Property Sheet's **Events** view for a Web Service's step.

This task includes the following steps:

- "Create an event handler" on page 522
- "Add the Using text" on page 523
- "Define an XmlDocument and load the XML" on page 523
- "Create a new message" on page 523

1 Create an event handler

Select a Web Service step and provide values for its properties. Open the Property Sheet's **Events** view and double-click the **Handler** column in the **OnReceiveResponse** row. A code editor containing the new event handler opens.

2 Add the Using text

In the namespace section, make sure that System.Text appears in the list of using statements.

```
namespace Script
{
    using System;
    using System.Xml;
    using System.Text;
    using System.Xml.Schema;
    using HP.ST.Ext.BasicActivities;
    …
```

3 Define an XmlDocument and load the XML

In the **Todo** section of the StServiceCallActivity1_OnOnReceiveResponse function, add variable definitions for the message argument and envelope. Use autocompletion to select the **XmlDocument** method. Define a name for the envelope and assign it the value of the XML envelope.

```
var tmp = args.Message;
var envelope = Encoding.UTF8.GetString(tmp);
XmlDocument tmpXdoc = new XmlDocument();
tmpXdoc.LoadXml(envelope);
```

4 Create a new message

Save the OuterXml content to a string, and apply UTF-8 encoding.

```
var newStrMessage = tmpXdoc.OuterXml;
args.Message = Encoding.UTF8.GetBytes(newStrMessage);
```

How to Set HTTP Headers for Web and REST Services

The following section describes how to set HTTP headers for Web service and REST service steps.

HTTP Headers for Web Service Calls

To dynamically add an HTTP header to a Web service call:

1. Open the **Events** view in the Property Sheet and implement the **OnBeforeApplyProtocolSettings** event.
2. Implement the method as follows:

```
((StServiceCallActivity)args.Activity).HttpRequestHeaders.Add("<key>", "<value>");
```

HTTP Headers for REST Service Calls

To dynamically add an HTTP header to a REST service's inner HTTP Request step:

1. Open the **Events** view in the Property Sheet and implement the **OnBeforeExecuteStepEvent** event.
2. Implement the method as follows:

```
new HP.ST.Shared.Utilities.Pair<string, string>[1] {new
HP.ST.Shared.Utilities.Pair<string, string>("<key>", "<name>")};
```

Note: You can also set the HTTP headers values by expanding the RequestHeader node in the Property Sheet's **Input/Checkpoints** view. You then link to a data source from the **Name** and **Value** rows. For details, see "Select Link Source Dialog Box" on page 395.

Reference

Search and Replace for Events User Interface

You can search for text within your event code or within any file type. You can use standard text, regular expressions, or wildcards.

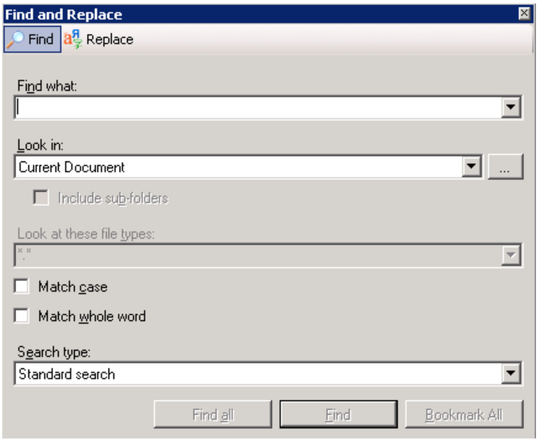
This section includes:

➤ Find and Replace Dialog Box on page 526

➤ Search Results Tab on page 528

Find and Replace Dialog Box

This dialog box enables you to find and replace strings in the event code.



Look in: Current Document

Search type: Standard search

To access	Do the following: **1** Select a code event tab (***.cs**). **2** Select **Edit** > **Find and Replace** **3** Select an option: ➤ **Find.** Find a string. ➤ **Replace.** Find a string and replace it with the specified text.

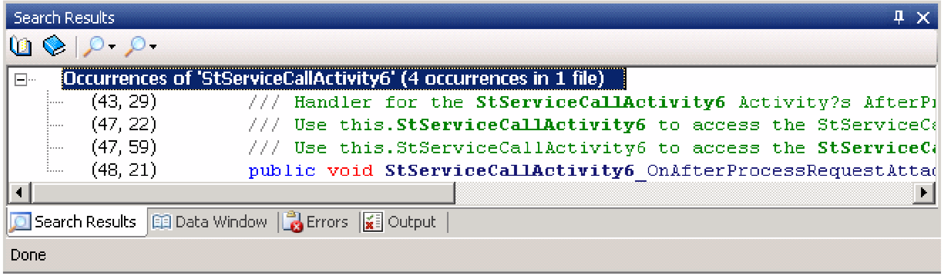
User interface elements are described below:

UI Elements (A-Z)	Description
Find	Displays the **Find** options for locating a string within the **TestUserCode.cs** file. The following buttons are available: ➤ **Find next.** Finds the next match of the string. ➤ **Find.** Finds the first match of the string and highlights it in the code. ➤ **Bookmark all.** Sets a bookmark for all matches. Service Test inserts the bookmarks notations in the left column of the event code in the **TestUserCode.cs** tab.
Find what	The string for which to search.
Look at these file types	The file types to search. To search in all file types, use the default, ***.***
Look in	The area in which to search: **Current Document, Current Selection, All Open Documents, Whole Project, Whole Solution,** or a folder. To specify a folder, click the **Browse** button and locate the folder. When specifying a folder, you can enable the **Include sub-folders** option.
Match case	Indicates whether to distinguish between uppercase and lowercase characters during the search.
Match whole word	Searches for occurrences that are whole words, and not part of a larger word.

UI Elements (A-Z)	Description
Replace	Displays the **Replace** options for replacing a string within the **TestUserCode.cs** file. The following buttons are available: ➤ **Find all.** Finds all matches of the string and lists them in the **Search Results** tab. ➤ **Replace.** Replaces the selected match with the replacement string. ➤ **Replace all.** Replaces all matches with the replacement string.
Replace with	The string to replace the matched string **Note:** Available only when selecting the **Replace** tab.
Search type	The search type: ➤ **Standard search** ➤ **Regular expression** ➤ **Wildcards**

Search Results Tab

This tab lets you select and view the search results. This tab opens when you select **Find all** in the Find and Replace dialog box.



```
Occurrences of 'StServiceCallActivity6' (4 occurrences in 1 file)
    (43, 29)        /// Handler for the StServiceCallActivity6 Activity?s AfterPı
    (47, 22)        /// Use this.StServiceCallActivity6 to access the StServiceCa
    (47, 59)        /// Use this.StServiceCallActivity6 to access the StServiceC
    (48, 21)        public void StServiceCallActivity6_OnAfterProcessRequestAttac
```

User interface elements are described below:

UI Elements (A-Z)	Description
📖	**Expand All.** Expands all nodes of the various searches.
📘	**Collapse All.** Collapses all nodes of the various searches.
🔍▾	**Show last search results.** Expanding the menu enables you to select a recent search or to clear the history.
🔍▾	Select Search mode. enables you to select the representation of the search results. ➤ **Flat.** Lists all results together. ➤ **Per file.** Creates a separate node for each file.

Context Methods

This section describes some of the common **Context** methods.

UI Elements (A-Z)	Description
◆	Denotes a function.
▤	Denotes a string.
⚡	Denotes an event.
EncryptionMngr	Enables you to encrypt and decrypt password strings.
TestInputParameters	Enables you to retrieve the test's input parameters.
TestIteration	Provides information about the test iteration.
TestOutputParameters	Enables you to retrieve the test's output parameters.
TestProfile	Enables you to set and retrieve user variables. For details on how to define user variables, see "How to Define Test Properties or User/System Variables" on page 94.

For a complete list of the functions, use the autocompletion feature.

Logging Options

The Service Test API provides the following logging options, available from the **Context.UserLogger** object:

UI Elements (A-Z)	Description
Debug, DebugFormat	Logs debug information collected during the test run.
Error, ErrorFormat	Logs errors that occurred during the test run.
Fatal, FatalFormat	Logs fatal errors that occurred during the test run.
Info, InfoFormat	Logs informational data from the test run.
Warn, WarnFormat	Logs warnings that were issued during the test run.

The Format option enables you to provide values based on the list of items. The following example logs formatted informational messages, using the **FirstName** variable's value for the first item, and the **LastName** variable for the second item, and so forth.

```
this.<activity>.Context.UserLogger.InfoFormat("Hello: {0}{1}", FirstName, LastName);
```

For task details, see "How to Use the Logging Function" on page 515.

Assert Options

The Assert object provides the following comparison operators:

UI Elements (A-Z)
Equals
Greater
GreaterOrEqual
Less
LessOrEqual
NotEquals

For task details, see "How to Write Checkpoint Events" on page 517.

Troubleshooting and Limitations - Event Coding

This section describes troubleshooting and limitations for working with Service Test events.

- The **Loop.CurrentIterationObject** is deprecated and will always return null.

B

Extensibility in Service Test

The HP Service Test installation includes the capabilities to create custom activities for the Toolbox palette. After defining a custom activity, you can drag it into the HP Service Test canvas as you would with any other built-in activity.

This supplement includes:

Concepts

Tasks

Reference

Concepts

Creating New Activities - Overview

HP Service Test enables you to create custom activities to extend the capabilities of Service Test. After defining a custom activity, you can drag it into the canvas as you would with any other built-in activity.

For most custom activities, you can use the Activity Wizard. The wizard creates a Visual Studio project for the activity and lets you deploy it into Service Test. For details, see "Activity Wizard" on page 562.

Advanced users and users of earlier versions of Service Test, can build custom activities manually using the guideline described in the sections below.

Adding Activities Manually

This section describes the structure and content of the files required to manually define a new activity in Service Test.

Once you create a new activity through this mechanism, it will be available in the Toolbox for all future tests.

To create a custom activity, you need to define the following files on all machines upon which you intend to run the test.

- Runtime Files
- Signature Files
- Addin Files

The **Runtime** file is the DLL that Service Test invokes to run the activity. For details, see "Runtime Files" on page 535.

The **Signature** file is an XML file that defines the input and output properties, events, and the runtime class that executes the activity. For details, see "Signature Files" on page 536.

The **Addin** file is an XML file that references all of the activity component data. For details, see "Addin Files" on page 546.

In addition, you can also define resource files to store text strings used by your activity. For details, see "Resource Files" on page 549.

The Service Test installation includes a sample project in the product's **ExtensibilitySamples** folder. Use this sample as a basis for a new activity.

All of the custom files—Signature, Addin, and Runtime—should be stored in the <*Service Test installation*>**\addins\CustomerAddins**\<*addin_name*> folder. This enables Service Test to load them during startup.

For more details, see "How to Create a New Custom Activity" on page 556.

Disclaimer: This is a preliminary version of the SDK (Software Development Kit). It enables you to extend the capabilities of HP Service Test. However, this SDK is subject to change in a future release, and these changes might require you to update any code that uses this preliminary version. Although HP endeavors to keep these changes to a minimum, we cannot guarantee that extensions created using the preliminary version of the SDK will continue to work without modification when upgrading to a new version of HP Service Test.

Runtime Files

In addition to the signature and addin files, you must provide a DLL to run when executing the activity. You create a C sharp solution and customize the code as required. You can use the sample **ReportMessageActivitySample.sln** provided with Service Test as a basis for your project.

For task details and an example, see "How to Create a Runtime File" on page 550.

Signature Files

The signature file describes the activity to Service Test. It typically has a Resource element followed by the following sections: **GeneralProperties**, **InputProperties**, **OutputProperties**, **Tabs**, and **Events**. The signature file must have an **.xml** extension.

This following sections describe the:

- "Resource Element" on page 536
- "Section Element" on page 538
- "Property Definitions" on page 542

Resource Element

The **Resource** element has the following attributes:

Attribute	Description
type	The type of entity, in this case **Activity**.
id	A unique string that identifies the activity. You can reference this ID when writing event handler code. For details, see the section on API coding.
version	The version of the current addin mechanism. For example, 1.0.0
group	The parent group under which the activity will appear in the Toolbox palette, for example **String Manipulation**. To add it to an existing group, specify a group name as it appears in the Toolbox. If the group does not exist, Service Test adds a new group.
shortname	The short name of the activity as shown in the Toolbox hint area (above the description).
description	The description of the activity as shown in the Toolbox hint area.
assembly	The DLL file to call when running the activity, stored in the same folder as the signature and addin files.

Attribute	Description
className	The class implemented by the activity. **Note:** The class must inherit from the STActivityBase class.
image	An image file for the icon representing the activity. Store the image in the same folder as the signature file.
visible	A boolean value indicating whether to display the activity is displayed in the Toolbox palette.
xmlns	The namespace that defines the schema for the signature file, http://hp.vtd.schemas/signature/v1.0. Keep the default value.
xmlns:xsi	The schema instance used for the signature file. Keep the default value, http://www.w3.org/2001/XMLSchema-instance.
xmlns:Location	The URL of the signature file's schema, **Signature.xsd**, referenced by the namespace. This value has two parts: the namespace and the file path. ➤ **Namespace**. http://hp.vtd.schemas/signature/v1.0 ➤ **File path**. <*Installation_Folder*>/dat/schemas/Signature.xsd Keep the default value.

The following example shows the **Resource** section from the signature file of the sample activity, **ReportMessageActivitySample**. The location of the sample is:
<*Installation_Folder*>\ExtensibilitySamples\ReportMessageActivitySample

```
<Resource
  type="Activity"
  id="ReportMessageActivitySample"
  version="1.0.0"
  group="Miscellaneous"
  shortName="ReportMessageActivitySample"
  description="The ReportMessageActivitySample allows you to send a custom
message to the report and/or log. "
  assembly="ReportMessageActivitySample.dll"
  className="ReportMessageActivitySample.ReportMessageActivitySample"
  image="toolbox_ReportMessageActivitySample.png"
  visible="true"
  xmlns="http://hp.st.schemas/signature/v1.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://hp.st.schemas/signature/v1.0 ../../../dat/schemas/
Signature.xsd"
  >
```

Section Element

The Section definitions apply to all sections in the Signature file, such as **GeneralProperties**, **InputProperties**, and **OutputProperties**. The following table describes the **Section** element attributes.

Attribute	Description
name	The internal name of the section. To use a sub-element, it is recommended that you set the value to the name of the sub-element. For example name="Tab" or name="Alerts".
source	If set to **true**, it displays the source of the section.
dest	**destination**. If set to **true**, it displays the destination path of the section.
checkpoint	If set to **true**, displays the checkpoint check box in the **Validate** column.

Attribute	Description
isSharedMetadata	When **true**, enables the section to share its meta data with other sections.
propertiesType	The type of the properties in the section, for example, "XML".
showXmlControls	When **true**, displays the XML controls such as Text and XPath tabs in the section.
displayName	The name of the section as it will appear in the Property Sheet.

The following table describes the sub-elements of **Section**:

Element	Description
Tab	The tabs to appear in the Property Sheet using the following attributes. For details, see below. ➤ **name**. The internal name of the tab. Some of the built-in ones are General, InputOutput, Events, Attachments, and SOAPFault. ➤ **id.** The id of the tab referred to be the API. The id usually uses the name with an added suffix, "Tab". For example, GeneralTab, InputOutputTab, and EventsTab. ➤ **CanBeInToolbox.** If true, shows the tab on the Toolbox's toolbar. ➤ **CanBeInPropertySheet.** If true, shows the tab in the Property Sheet. ➤ **CanBeInDataLinkDialog.** If true, shows the tab in the Select Link Source dialog box. **Note:** To use the default tabs: **General**, **Input/Checkpoints**, and **Events**, you do not need to include this element. If you want to omit one of the tabs or add extra ones, then you need to include the Tabs sub-element and specify the desired tabs. For details about the tabs, see "The Property Sheet" on page 29.

Element	Description

Alert	Enables you to apply alerts to the properties in the section using the following attributes:
	➤ **constraint.** The reason to show the alert, for example, NullValueConstraint.
	➤ **target.** The Xpath of the property to which to apply the constraint.
	➤ **section.** The internal name of the section containing the properties.
	➤ **type.** The type of alert, such as error or warning
	The value of the element, is the alert message. For example:
	`<Section name="Alerts" isSharedMetaData="true">`
	`  <Alert constraint="NullValueConstraint" target="/Url[1]" section="InputProperties" type="error">The 'URL' must not be empty </Alert>`
	`</Section>`

Element	Description
Events	In the **Events** sub-element, you can customize the events that will be available for the activity. This sub-element uses the following attributes ➤ **name.** The internal name of the event. Use one of the built-in names or define a custom one. ➤ **CodeCheckpointEvent**. Enables you to create an event handler to run when the test is verifying checkpoints. ➤ **BeforeExecuteStepEvent.** Enables you to create an event handler to run before executing the activity. ➤ **AfterExecuteStepEvent.** Enables you to create an event to run after executing the activity. ➤ **<custom event>.** A custom event that you define. ➤ **description.** A textual description of the event. ➤ **eventArgs.** The source of the arguments for the event. The standard argument for **BeforeExecuteStepEvent** and **AfterExecuteStepEvent** event is STActivityBaseEventArgs. The built-in value for the **CodeCheckpointEvent** is CheckpointEventArgs. Web Service steps provide additional built-in events. For details, see "Updating Web Services" on page 246. **Note:** To access the default events: **CodeCheckpoint**, **BeforeExecute**, and **AfterExecute**, you need to include only the **Events** tab in the **Tab** sub-element, but you do not need to use the **Events** sub-element. If you want to omit one of the events or add custom events, then you need to include this sub-element and specify the desired events.

Property Definitions

The property definitions in the signature file, apply to all sections that use properties. The built-in sections that use properties are:

- **GeneralProperties.** Defines the properties in the **General** view of the Property Sheet, for example **Step ID** and **Name**.
- **InputProperties.** Defines the input properties located in the Input pane of the of the Property Sheet's **Input/Checkpoints** view.
- **OutputProperties**. Defines the output properties located in the **Checkpoints** pane of the of the Property Sheet's **Input/Checkpoints** view.

This section includes:

- "Elements and Sub-Elements" on page 543
- "Element Attributes" on page 544
- "Simple Elements with Enumeration" on page 545
- "Complex Array Elements" on page 545

Elements and Sub-Elements

The elements and attributes are defined in the standard XML schema file, http://www.w3.org/2001/XMLSchema, or Service Test's **types.xsd**, located in the <*Installation_Folder*>/dat/schema folder. The following table describes the elements and sub-elements that can be used in these sections. The level number indicates the level of the element or sub-element in the hierarchy.

Element	Description
xs:schema	The schema namespaces for the properties, as described by the **xml:ns** attribute. Keep the default values, http://hp.vtd.schemas/types/v1.0 and http://www.w3.org/2001/XMLSchema.
xs:import	The namespace to import using the **namespace** and **schemaLocation** attributes. Keep the default values, http://hp.vtd.schemas/types/v1.0 and ../../../dat/schemas/types.xsd.
xs:element	The element to define, using the attributes described in the table below.
xs:simpleType	A tag indicating the beginning of definitions of a simple type property. **Note:** You only need to enclose a simple type element with this tag, if you want to do enumeration with a drop-down list. For example, the following definition does not require an **xs:simpleType** tag. `<xs:element name="ClientCertificate" type="types:Certificate" types:displayName="Client certificate" />`

Element	Description
xs:complexType	A tag indicating the beginning of definitions for a node of multiple properties.
xs:sequence	A tag indicating the beginning of a list of properties in a complex type property.
xs:restriction	A tag restricting the value of the enumeration values of a property, using the **base** attribute. To restrict **String** type values, use base="xs:string".
xs:enumeration	A tag indicating the beginning of list of values in the drop-down menu for a property, using the **value** attribute.
xs:annotation	An annotation for the element Use an **xs:documentation** sub-element to compose text that will appear below the properties grid in the Property Sheet.

Element Attributes

The following table describes the primary attributes of the **xs:element**. For attributes in the standard XML schema, use an **xs:** prefix in the value, for example standard types use type=xs:string or type=xs:int.

For types defined in Service Test's **Types.xsd** schema, use a **types:** prefix in the attribute name. For example types:displayName.

Attribute	Description
name	The internal name of the property or grid in the Property Sheet. This is the name referenced by other calls and by the event handlers code. This is not the name displayed in the Property Sheet's **Name** column.
type	The type of property. Some common values are: xs:string, xs:int, xs:boolean, Multipart, Header, Part. For a value defined in the Types schema, use the **types**: prefix. For example type="types:filePath".
minOccurs	The minimum number of array elements for which the user must provide. For none, specify "**0**".

Attribute	Description
maxOccurs	The maximum number of array elements the user may provide. To allow an unlimited amount, specify "**unbounded**"
types:visible	When **true**, enables the parameter to be visible even before being expanded by the Add Array Element command.
types:argType	The type of the property: "XML" or "Object".
types:displayName	The property name as it will appear in the Property Sheet.

Simple Elements with Enumeration

The following **ReportMessageActivitySample** example defines an input parameter, **Status,** with an enumeration attribute. This code creates a drop-down list of values in the Property Sheet's input property grid.

```
<xs:element name="Status" default="Done" types:displayName="Status">
            <xs:simpleType>
              <xs:restriction base="xs:string">
                <xs:enumeration value="Done"/>
                <xs:enumeration value="Pass"/>
                <xs:enumeration value="Fail"/>
              </xs:restriction>
            </xs:simpleType>
</xs:element>
```

Complex Array Elements

The following sample defines a complex property, with a Key and Value pair of values.

```
<xs:complexType name="NameValueType">
  <xs:sequence>
    <xs:element name="Key" type="xs:string"/>
    <xs:element name="Value" type="xs:string"/>
  </xs:sequence>
</xs:complexType>
```

Addin Files

The **addin** file provides the references for the activity you are defining. The file is in XML format and contains information such as activity names, dependencies, and runtime DLLs.

The addin file should be located in the installation directory under the **addins\CustomerAddins\**<*addin_name*> folder, together with the signature file. The addin file must have an .addin extension.

Each addin file should contain the following sections:

- "Addin Section" on page 546
- "Manifest Section" on page 547
- "Runtime Section" on page 548

Addin Section

The Addin's attributes describe the activity to Service Test.

Element	Description	Attributes
<Addin>	Basic details about the addin.	➤ **name.** the name of the addin. ➤ **author.** the creator of the activity. ➤ **copyright.** the full path of a text file with the copyright information. ➤ **description.** a textual description of the activity. ➤ **version**. The addin file version, set to 1.0.

Element	Description	Attributes
Path	Details about the location of the activity.	➤ **name.** The logical path scanned by the framework, to identify addins. The physical location of this folder is addins\CustomerAddins\<addin_name>.
Activity (sub-element of Path)	See attribute descriptions	➤ **id.** An identifying string corresponding to the ID in the signature file. ➤ **displayName.** The activity's display name in the Toolbox. ➤ **signatureFile.** The name of the XML signature file.

Manifest Section

The Manifest section contains a unique logical name for the addin and provides a list of dependencies.

Element	Description	Attributes
Identity	Basic details about the addin.	➤ **name.** The activity name corresponding to the **ID** in the signature file. When referring to this addin as a dependency, use this name.
Dependency	The activity upon which the current activity is dependent	➤ **addin**. The identity name of the dependent activity, from the name attribute in the **Manifest** section of its addin file. ➤ **requirePreload**. A boolean value indicating whether to preload the dependent addin before loading the current one.

Runtime Section

The runtime section contains information about the addin's runtime file.

Element	Description	Attributes
Import	An assembly to import when running the activity.	➤ **assembly.** The name of an assembly. Use the DLL name without the DLL extension. **Note:** To import an addin from another activity, precede the addin name with a colon. For example, :HP.ST.Fwk.DesignerModel imports the DesignerModel addin.

The following example shows the **ReportMessageActivitySample.addin** file. For multiple activities, use unique **Addin** files.

```
<?xml version="1.0" encoding="utf-8"?>
<AddIn name        = "HP Report Message Activity Sample"
    author      = "John Doe"
    copyright   = "C:\Copyrights\copyright.txt"
    description = "Extensibility Sample - Report Message Activity"
    version="1.0">

  <Manifest>
    <!--<Must be unique -->
    <Identity name = "ReportMessageActivitySample"/>
  </Manifest>

  <Runtime>
    <Import assembly=":HP.ST.Fwk.DesignerModel"/>
  </Runtime>

<Path name = "/ST/Activities">
    <!--Misc Activities -->
    <Activity id     = "ReportMessageActivitySample"
            displayName   = "ReportMessageSample"
            signatureFile = "ReportMessageActivitySample.xml"
            assembly="ReportMessageActivitySample.dll"/>
  </Path>
</AddIn>
```

Resource Files

You can use resource files to retrieve values for elements and attributes. The **fromResource** function lets you name the resource containing the values.

In the following example, the signature file retrieves the **shortName** and **description** from a resource file.

```
<Resource
  type="Activity"
  id="ReportMessageActivitySample"
  version="1.0.0"
  group="Miscellaneous"
  shortName="fromResource(conc_str_short_name)"
  description="fromResource(conc_str_description)"
```

The resources are defined in a standard Microsoft ResX Schema version 2.0 Resource fie.

```
<data name="conc_str_description" xml:space="preserve">
    <value>Reports an activity's run status to the log</value>
  </data>
  <data name="conc_str_short_name" xml:space="preserve">
    <value>Report Message</value>
  </data>
```

The resource reference must be a compiled file with a **.resources** extension, compiled from the ResX source file and stored in the same folder as the signature file.

You can generate the compiled file as a post-build operation using the **resgen** utility. For example:

```
resgen STBasicActivity.resx STBasicActivity.resources.
```

For step-by-step instructions on how to create a custom activity, see "Prerequisite - create a runtime file" on page 557.

Tasks

How to Create a Runtime File

This section contains the following topics:

- Add Using statements
- Specify the namespace and class
- Set the internal logging
- Initialize the properties
- Retrieve the property values
- Define events
- Execute the step
- Set the status
- Compile the runtime file

1 Add Using statements

Provide the mandatory **using** statements. In your solution, you must also add a reference to the DLLs. The DLLs are located in the products installation's **bin** folder. You must always add a reference to **HP.ST.Fwk.RunTimeFWK.dll** and **HP.ST.Shared.Utilities.dll**. If you are using internal logging, you must also add a reference to **log4net.dll**.

The following example shows the **Using** statements in the sample **.cs** file.

```
using HP.ST.Fwk.RunTimeFWK;
using HP.ST.Fwk.RunTimeFWK.Utilities;
using HP.ST.Shared.Utilities;

// If you need to implement Internal Logging
using log4net;
```

2 Specify the namespace and class

Define the namespace and provide the activity's runtime code. The class you define for your custom activity must inherit from the **STActivityBase** class. For example:

```
namespace ReportMessageActivitySample
{
    [Serializable]
    public class ReportMessageActivitySample : STActivityBase
    {
```

3 Set the internal logging

Use Service Test's built-in logger manager to instruct the activity to create an internal log during runtime. This example gets the property values of the input properties and sends the output to either the Run Results Viewer only or to the Run Results Viewer and Output window. For example:

```
 /// <summary> /// Internal log
        /// </summary>
        private static readonly ILog log =
           LogManager.GetLogger(typeof(ReportMessageActivitySample));
        const string runResults = "Run Results";
       const string runResultsAndOutputWindow = "Run Results and Output Window";
```

For details about other logging options, see "How to Use the Logging Function" on page 515.

4 Initialize the properties

Initialize the custom Input and Output properties that you define in the signature file. The following example initializes the three input properties: **Status**, **Message**, and **Destination**. For example:

```
/// <summary>
        /// Initializes properties.
        /// </summary>
        /// <param name="ctx">The runtime context</param>
        public ReportMessageActivitySample(ISTRunTimeContext ctx, string name)
            : base(ctx, name)
        {
            this.Status = String.Empty;
            this.Message = String.Empty;
            this.Destination = String.Empty;
        }
```

5 Retrieve the property values

This section retrieves or sets the input property values.For example:

```
 /// <summary>
        /// Gets or sets the status of the message to report.
        /// </summary>
        public string Status { get; set; }

        /// <summary>
        /// Gets or sets the details of the message to report.
        /// </summary>
        public string Message { get; set; }

        /// <summary>
        /// Gets or sets the destination where the message should be reported to.
        /// </summary>
        public string Destination { get; set; }
```

If you have array type properties that are not described by a schema, for example, key/value pairs, you must initialize all the members of the array explicitly, and indicate the actual number of elements.

The following example initializes 40 elements for the MyArrayName property. It contains 40 key and value pairs.

```
 this. MyArrayName = new MyPair[40];
         for (int i=0; i<40; i++)
         {
            this. MyArrayName [i] = new MyPair();
         }

public MyPair[] MyArrayName;
      public class MyPair
      {
         string Key;
         string Value;
      }
```

For arrays defined by a schema or WSDL, you can use the standard Select Link Source dialog box and link directly to the array element.

6 Define events

Define one or more custom events, that you will invoke later. For example:

```
public event EventHandler CustomerEvent;
private void InvokeCustomerEvent(EventArgs MyArg)
      {
         EventHandler handler = this.CustomerEvent;
         if (handler != null)
         {
            handler(this, MyArg);
         }
      }
```

7 Execute the step

Execute the step and send the runtime information to the log. Use the **STExecutionResult** data type and its **ExecuteStep** function defined in the **STActivityBase** class. For example:

```
protected override STExecutionResult ExecuteStep()
        {
            string DetailsReport;

            if (this.Destination == runResultsAndOutputWindow)
            {
                LogInfo("\n" + this.Message.Replace("\\n", "\n"));
            }
/// <summary>
        /// Reports message to test results and output window.
        /// </summary>
// The line-breaks replacements allow the printing of multiple lines in the report
       DetailsReport = this.Message;
       DetailsReport = DetailsReport.Replace("\\n", "<BR>");
       DetailsReport = DetailsReport.Replace("\n", "<BR>");
       this.Report("Message", DetailsReport);
```

If you defined a custom event, invoke it after the call to **ExecuteStep**.

```
…
protected override STExecutionResult ExecuteStep()
{
InvokeCustomerEvent();
}
```

8 Set the status

Set the Status of the test run. The **ReportMessageActivitySample.cs** sample file uses enumeration to set the status, based on the **STExecutionResult** value. For example:

```
 switch (this.Status)
            {
case "Done":
                    this.Report(ReportKeywords.StatusKeywordTag,
ReportKeywords.DoneValueTag);
                    return new STExecutionResult(STExecutionStatus.Success);
case "Pass":
                    this.Report(ReportKeywords.StatusKeywordTag,
ReportKeywords.SuccessValueTag);
                    return new STExecutionResult(STExecutionStatus.Success);
case "Fail":
                    this.Report(ReportKeywords.StatusKeywordTag,
ReportKeywords.FailureValueTag);
                    return new STExecutionResult(STExecutionStatus.Success);
default:
                    return new STExecutionResult(STExecutionStatus.Success);
            }
```

9 Compile the runtime file

After you customize the code, you compile the DLL. The DLL name should be the same as the name of the addin file. For example, the runtime file, **ReportMessageActivitySample.dll** corresponds to the **ReportMessageActivitySample.addin** file.

After you create the runtime file in your development environment, you copy it into the activity's directory and reference the DLL from the addin file.

How to Create a New Custom Activity

This task describes how to create a new activity and implement into Service Test.

To run a test with the custom activity on another machine, you need to copy all of the custom files to its <*Service Test installation*>**addins****CustomerAddins**\<*addin_name*> folder.

This task includes the following steps:

➤ "Prerequisite - create a runtime file" on page 557

➤ "Create a signature file" on page 557

➤ "Create an addin file" on page 559

➤ "Provide a graphic for your activity - optional" on page 560

➤ "Check the implementation" on page 560

1 Prerequisite - create a runtime file

Create a C# project that implements your activity's actions in the **addins\CustomerAddins\<*addin_name*>** folder. For task details, see "How to Create a Runtime File" on page 550.

2 Create a signature file

a Create a new signature file with an **.xml** extension. in the **addins\CustomerAddins\<*addin_name*>** folder, together with the runtime file. Use the sample project in the *<installation folder>***ExtensibilitySamples** folder as a basis for your custom signature file.

b Customize the **Resource** section or copy the code provided below, modifying the bolded text for your needs. For information about each of the elements, see "Resource Element" on page 536.

```
<Resource
  type="Activity"
  id="ReportMessageActivitySample"
  version="1.0.0"
  group="Miscellaneous"
  shortName="ReportMessageActivitySample"
  description="ReportMessageActivitySample allows you to send a custom
message to the report and/or log. "
  assembly="ReportMessageActivitySample.dll"

className="ReportMessageActivitySample.ReportMessageActivitySample
"
  image="toolbox_ReportMessageActivitySample.png"
  visible="true"
  xmlns="http://hp.st.schemas/signature/v1.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://hp.st.schemas/signature/v1.0 ../../../dat/schemas/
Signature.xsd"
  >
```

c Add the required sections, such as GeneralProperties, InputProperties, Tabs, Events and so forth. For a list of the built-in sections and their attributes, see the "Section Element" on page 538.

d Add properties to the relevant sections. For details and examples, see "Property Definitions" on page 542.

- ➤ **GeneralProperties**. Properties displayed in the Property Sheet’s **General** tab. In most cases you can use the section as it appears in the sample file, without any modifications. By default, it will provide the **Step ID** and **Name** properties.
- ➤ **InputProperties**. Properties displayed in the Property Sheet’s **Input/ Checkpoints** tab, in the **Input** pane.
- ➤ **OutputProperties**. Properties displayed in the Property Sheet’s **Input/Checkpoints** tab, in the **Checkpoints** pane.

e Specify any external resource files as described in "Resource Files" on page 549.

f Close the file with the </Resource> tag.

```
</Resource>
```

For more details about the structure of the signature file, see "Signature Files" on page 536.

3 Create an addin file

a Create a new file with an **.addin** extension in the <*installation directory*>**addins****CustomerAddins**\<*addin_name*> folder, together with the signature file.

b Use the sample addin file in the <**installation folder**>**ExtensibilitySamples** folder as a basis, or copy the code provided below, modifying the bolded text for your needs. For details, see "Addin Files" on page 546.

```
<?xml version="1.0" encoding="utf-8"?>
<AddIn name       = "HP Report Message Activity Sample"
       author     = "John Doe"
       copyright   = "prj:///doc/copyright.txt"
       description = "Extensibility Sample - Report Message Activity"
          version="1.0">
<Manifest>
    <!--<Must be unique -->
    <Identity name = "ReportMessageActivitySample"/>
  </Manifest>

  <Runtime>
    <Import assembly=":HP.ST.Fwk.DesignerModel"/>
  </Runtime>

  <Path name = "/ST/Activities">
    <!--Misc Activities -->
    <Activity id    = "ReportMessageActivitySample"
     displayName   = "ReportMessageSample"
      signatureFile = "ReportMessageActivitySample.xml"
     assembly="ReportMessageActivitySample.dll"/>
  </Path>
</AddIn>
```

c Create a unique **Addin** file for each activity—do not define multiple activities in a single **Addin** file. For details, see "Addin Files" on page 546.

d Define post-build tasks such as **resgen**, as described in "Resource Files" on page 549.

e Compile the project and copy the DLL to the <*Service Test installation*>**addins****CustomerAddins**\<*addin_name*> folder.

For additional details, see "Runtime Files" on page 535.

4 Provide a graphic for your activity - optional

a Copy an icon image for your activity into the <*Service Test installation*>**\addins\CustomerAddins**\<*addin_name*> folder. This file should meet the following requirements:

- ➤ a **.png** extension
- ➤ sized at 16 x 16 pixels
- ➤ 8-bit color depth

b Specify the name of the image file in the signature file's Resource Element.

5 Check the implementation

a Reopen Service Test and drag the new activity into the Test Flow. Verify that the activity and its properties appear as expected.

b Provide property values.

c Run the test and observe the Output log and Run Results Viewer.

d Enable checkpoints to verify the results and rerun the test.

How to Debug a Custom Activity

This task describes how to debug a custom or built-in activity.

1 Open the source code and add a breakpoint

a In an existing test, select **File** > **Open** > **File**. Locate the source file of the solution, for example a **.cs** file. The file opens in Service Test.

b Use the F7 key to add a breakpoint in the **ExecuteStep()** function.

2 Run the test

a Run the test.

b Use Service Test's **Debug** menu commands such as **Step Into**, to execute the rest of the test.

Reference

Activity Wizard

This wizard enables you to create new custom activities for use within Service Test.

To access	**Start** > **HP Service Test 11.20** > **Activity Wizard**
Wizard map	This wizard contains: Welcome > General Properties Page > Project Properties Page > Set Properties Page > Confirm Page > Finish Page
See also	"Creating New Activities - Overview" on page 534

General Properties Page

This wizard page enables you to set the General type properties for the activity.

Important information	General information about this wizard is available here: "Activity Wizard" on page 562.
Wizard map	This wizard contains: Welcome > **General Properties Page** > Project Properties Page > Set Properties Page > Confirm Page > Progress Page > Finish Page

User interface elements are described below:

UI Elements (A-Z)	Description
	Reset Values. Resets all of the values to their original defaults and discards all changes that you made.
	Open Wizard Project. Opens a Visual Studio activity project that you created earlier.

UI Elements (A-Z)	Description
Category	The category under which to deploy the activity. A drop down list contains all of the built-in or previously created categories. **New**. Opens the Add New Category dialog box.
Description	A meaningful description that will appear in the Toolbox hint area when you select the activity.
Display Icon	The icon image used to represent the activity in the Toolbox and canvas. Click **Import** to upload a new image file for the icon. The recommended size is 16 x 16 pixels.
Display Name	The name of the activity as it will appear in the canvas and Toolbox.
Project Location	The location in which to save the project.
Unique Activity ID	A unique ID for the new activity. This ID can be used to reference the activity.

Project Properties Page

This wizard page enables you to set the properties for the activity project.

Important information	General information about this wizard is available here: "Activity Wizard" on page 562.
Wizard map	This wizard contains: Welcome > General Properties Page > **Project Properties Page** > Set Properties Page > Confirm Page > Progress Page > Finish Page

User interface elements are described below:

UI Elements (A-Z)	Description
Activity Class Name	A class name for the activity that will be generated.
Assembly Name	The name of the assembly file. This name will be associated with the **.dll** extension.
Class FIle Name	The name of the class file. By default, this is the **Project Name** with a **.cs** extension.
Class Partial FIle Name	The name of the class file. By default, this is the **Project Name** with a **.cs** extension.
Edit advanced properties	Enables the manual editing of additional project properties.
Output Directory	The path of the project relative to the test.
Project File Name	The name of the project file. By default, this is the **Project Name** with a **.csproj** extension.
Project Name	The name of the project.
Project Namespace	The namespace to create for the project.
Solution File Name	The name of the solution file. By default, this is the **Project Name** with an **.sln** extension.

Set Properties Page

This wizard page lets you to define Input and Output properties for the activity and add new General properties.

Important information	General information about this wizard is available here: "Activity Wizard" on page 562.
Wizard map	This wizard contains: Welcome > General Properties Page > Project Properties Page > **Set Properties Page** > Confirm Page > Progress Page > Finish Page

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

UI Elements (A-Z)	Description
	Open in Separate Window. Opens a list of the properties in a separate window.
+	**Add Property.** Opens the Add New Property dialog box. For details, see "Add New Property" on page 568.
✕	**Remove Property.** Deletes the selected property from the activity.
	Clone Property. Makes a copy of the selected property.
	Show Property Tree. Shows the properties in a tree hierarchy, by category—General, Input, and Output.
	Hide Property Tree. Hides the property tree hierarchy and shows all of the properties in a single grid.
	Add/Remove Columns. Enables you to indicate the columns that will be displayed in the Set Properties wizard page.
	Edit Properties. Opens the Properties pane in a dockable window. You can edit all of the property values— even ones that are not displayed in the wizard screen columns.
<property list>	A grid representation of the activities properties. **Tips:** ➤ To show more or different columns in the grid, click the **Add/Remove Columns** button and select the desired columns. ➤ To edit properties that are not displayed in the grid, click the **Edit Properties** button. ➤ To change the order of the columns in the display, drag to column title to the desired location.

Confirm Page

This wizard page shows you a summary of your settings before generating the activity.

Important information	General information about this wizard is available here: "Activity Wizard" on page 562.
Wizard map	This wizard contains: Welcome > General Properties Page > Project Properties Page > Set Properties Page > **Confirm Page** > Progress Page > Finish Page

User interface elements are described below:

UI Elements (A-Z)	Description
<summary text>	A message indicating that the wizard is ready to begin the generation.

Progress Page

This wizard page shows you the generation progress.

Important information	General information about this wizard is available here: "Activity Wizard" on page 562.
Wizard map	This wizard contains: Welcome > General Properties Page > Project Properties Page > Set Properties Page > Confirm Page > **Progress Page** > Finish Page

User interface elements are described below:

UI Elements (A-Z)	Description
<progress information>	A log indicating progress of the generation.

Finish Page

This wizard page enables you to view the generation log, open the solution and its folder, and deploy the activity.

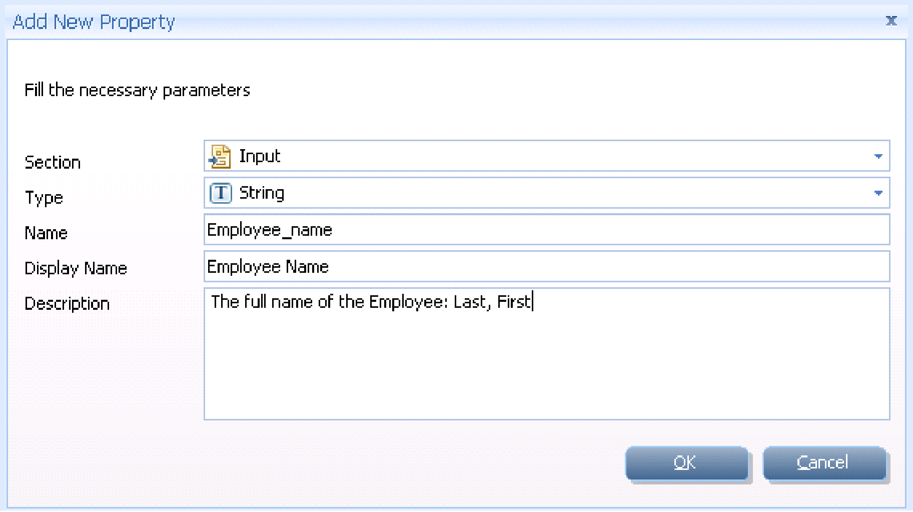
Important information	General information about this wizard is available here: "Activity Wizard" on page 562.
Wizard map	This wizard contains: Welcome > General Properties Page > Project Properties Page > Set Properties Page > Confirm Page > Progress Page > **Finish Page**

User interface elements are described below:

UI Elements (A-Z)	Description
Close the Activity Wizard after selecting one of the above options	Closes the wizard screen automatically after selecting the **View Report**, **Open Folder**, **Open Solution**, or **Deploy in Service Test** options.
Deploy in Service Test	Deploys the activity in Service Test by adding it to the Toolbox.
Open Folder	Opens the folder in which the activity files were generated. This folder is the Output directory you specified in the wizard.
Open Solution	Opens the activity's solution file in Visual Studio.
View Report	Opens a log of the generation process. The log file is located in the %temp%\ ActivityWizard\Reports folder. Its title contains the generation date, WizardLog_#datetime#.log

Add New Property

The Add New Property dialog box lets you create new properties for the activity.



Fill the necessary parameters

Section: Input

Type: String

Name: Employee_name

Display Name: Employee Name

Description: The full name of the Employee: Last, First

To access	Do the following: **1** Open the Activity Wizard. For details, see "Activity Wizard" on page 562. **2** Advance to the **Set Properties** page. **3** Click the Add Property button in the toolbar

User interface elements are described below:

Tree Elements (A-Z)	Description
Description	An optional description of the property, that will appear in the hint area when you select the property in the Property Sheet.
Display Name	The name of the property as it will be displayed in the property list.

Tree Elements (A-Z)	Description
Name	The name of the property as it will be called within the test and by event handlers.
Section	The section in which to add the property: **Input**, **Output** (Checkpoint), or **General**.
Type	The data type of the property, such as **String**, **Int**, and so forth.

Troubleshooting and Limitations

This section describes troubleshooting and limitations for creating and using custom activities.

- The following error may occur if you place the signature file beneath a sub folder of the **addin** folder.
  ServiceTest was unable to drag and drop the activity: Type 'http://hp.vtd.schemas/types/v1.0:GeneralPropertiesType' is not declared.
  Workaround: Modify the relative path of the Types schema. For example: schemaLocation="../../dat/schemas/Types.xsd".

- If you modify the activity structure in the signature file, you will be unable to open tests using that activity. To modify an activity structure, create a new activity with the new structure, replace all of the test steps using the old activity, and then remove the old activity implementation.

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