HP Unified Functional Testing

Software Version: 12.52

Windows ® operating systems

Add-ins Guide

Document Release Date: January 2016

Software Release Date: January 2016

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Contents

Welcome to the Add-ins Guide

The HP Unified Functional Testing Add-ins Guide explains how to set up support for, and work with, the UFT add-ins and standard Windows testing support, enabling you to test any supported environment using GUI tests and business components. This guide begins with an introductory section that describes working with GUI testing add-ins, and specific aspects of working with Windows-based and Web-based add-ins. After this overview section, the add-ins are presented alphabetically.

The information, examples, and screen captures in this guide often focus specifically on working with GUI tests. However, much of the information applies equally to keyword components and scripted components. Information that is unique to using a specific add-in with BPT is indicated as such.

Note: Keyword components and scripted components are part of HP BPT, which utilizes a keyword-driven methodology for testing applications. For more information, see the section on working with BPT in the *HP Unified Functional Testing User Guide*.

For users that work with UFT add-in extensibility, UFT also provides developer guides that describe how to extend UFT support for third-party and custom controls for supported environments, such as Delphi, Java, .NET, or Web. For more information, see the relevant Add-in Extensibility Guide, available from the UFT Extensibility Documentation program group (**Start > All Programs > HP Software > HP Unified Functional Testing > Extensibility > Documentation** or the `<UFT installation folder>\help\Extensibility` folder.

Note: For details on accessing UFT and UFT tools and files in Windows 8.X or higher and Windows Server 2012, see "Accessing UFT in Windows 8.X or Higher Operating Systems" on page 387.

Prerequisite Background

This guide is intended for UFT users at all levels. You should already have some understanding of functional testing concepts and processes, and know which aspects of their application you want to test.

In addition, because each UFT add-in takes advantage of commonly used UFT features such as the object repository, Keyword View, and checkpoints and output value steps, you should also have at least a basic understanding of these concepts before you begin working with a UFT add-in.

This guide assumes that you are familiar with UFT features and options. It describes the functionality that is added or changed in UFT when you work with specific GUI testing add-ins, as well as other add-in-specific considerations and best practices.

This guide should be used in conjunction with the *HP Unified Functional Testing User Guide* and the *HP UFT Object Model Reference for GUI Testing*.

Part 1: Working with UFT Add-ins

This section includes:

UFT Add-ins Overview

This chapter includes:

UFT Add-in Support - Overview

UFT add-ins help you to create and run tests and business components on applications in a variety of development environments. After you load an add-in, you can record and run tests or business components on applications in the corresponding development environment, similar to the way you do with any other application. When you work with UFT add-ins, you can use special methods, properties, and various special options to create the best possible test or business component for your application.

You can install UFT add-ins when you install UFT, or you can install the add-ins at a later time by running the installation again in **Modify** mode. For details about installing and loading add-ins, see "How to Manage UFT Add-ins" on page 22.

When UFT opens, you can choose which of the installed add-ins you want to load using the Unified Functional Testing Add-in Manager Dialog Box, but to maximize performance, you should load only the add-ins you need for that testing session.

UFT includes built-in support for testing standard Windows applications. Standard Windows testing support is automatically loaded when UFT opens.

Your UFT license enables all UFT features, including the use of all UFT add-ins. You can use the latest released version of all add-ins with UFT. If you upgrade from a version earlier than 9.5, only licensed add-ins are available. Additional non-licensed add-ins that you install are disabled in the Add-in Manager Dialog Box. For details on installing add-ins and licenses, see the *HP Unified Functional Testing Installation Guide*. For details, see "Add-in Licenses" on page 17.

Using Add-ins in Your Test or Component

- You can use the Keyword View, the Step Generator, and the Editor to activate environment-specific test object and native (run-time object) operations, retrieve and set the values of properties, and check that objects exist.
- You can enhance your tests and business components using environment-specific checkpoints and output values. See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*.
- You can customize the Active Screen capture settings for some of the UFT add-ins. When you apply custom Active Screen settings, you override your previous capture-level settings with all of the settings in the Custom Active Screen Capture Settings dialog box. If you want to customize only specific settings, use the **Reset to** option to ensure that all other settings are using the capture-level setting you prefer and then modify the specific settings you need. For details, see the section describing Active Screen capture setting options in the *HP Unified Functional Testing User Guide*.

Available Add-ins Environments

- Several UFT Add-ins are designed to support special objects that are generally available in Web applications, such as standard Web (HTML), Siebel, .NET Web Forms, and Web-based SAP objects.

These add-ins are known as Web-based Add-ins. The interface options, capabilities, and other functionality that is available for the Web-based add-ins are often identical or similar. These Web-specific features are described in "Web-Based Application Support" on page 25

- UFT provides a set of add-ins designed to support special objects that are generally part of Windows applications, such as .NET Windows Forms, Windows Presentation Foundation, PowerBuilder, SAP GUI for Windows, VisualAge Smalltalk, Stingray, and others. These add-ins are known as Windows-based Add-ins. The interface options, capabilities, and other functionality that is available for the Windows-based add-ins are often identical or similar. These Windows-specific features are described in "Windows-Based Application Support" on page 52

To learn more, see:

Loading UFT Add-ins

To test applications developed in various environments, you must ensure that the relevant UFT add-in is installed and loaded on the computer on which you create and run your tests and business components. Loading the relevant add-in enables UFT to work with the corresponding environment.

When you start UFT, the Add-in Manager Dialog Box opens. It displays a list of all installed add-ins.

If you have UFT add-ins installed, you can specify which add-ins to load at the beginning of each UFT session. You can also load UFT without add-in support if you want to test only standard Windows-based objects.

While UFT is open, you can check whether a specific add-in is installed by choosing **Help > About Unified Functional Testing**. Loaded add-ins are indicated by a check mark in the add-ins list.

> **Tip:** The Web Services Add-in is supported for backwards compatibility only and is not enabled by default. New tests and components can use UFT's API testing solution for web service testing purposes. To enable the Web Services Add-in for previously created tests, contact HP Software support.

When you load an add-in, UFT recognizes the objects you work with on the corresponding environment. In many cases, loading the add-in also adds new user interface options and capabilities to UFT, as well as adding support for the add-in's **object model**—the set of test objects, methods, and properties specially designed for working with the objects in your development environment. Details of these objects, methods, and properties can be found in the relevant section of the *HP UFT Object Model Reference for GUI Testing* (select **Help > HP Unified Functional Testing Help**).

Add-in Licenses

When you open UFT, if an add-in license has not yet been installed for a specific add-in, the add-in is displayed as **Not Licensed** in the **License** column of the Add-in Manager Dialog Box. An add-in may also be displayed as **Not Licensed** if no concurrent license server within your subnet has a registered license for the specific add-in, or if all concurrent licenses are in use (and are, therefore, unavailable). In this case, you can use the LSFORCEHOST or LSHOST variable to connect to a concurrent license server outside of the subnet that has the relevant add-in license installed on it, if one is available. For details on connecting to concurrent license servers, see the *HP Unified Functional Testing Installation Guide*.

You can also view license details for all currently loaded licensed add-ins in the About Unified Functional TestingDialog Box (**Help > About Unified Functional Testing**).

- For seat licenses, the category for each license is displayed. The license category may be **Demo**, **Permanent**, **Commuter**, or **Time-Limited**. For **Demo**, **Commuter** (used with concurrent licenses), and **Time-Limited** UFT seat licenses, the number of days and hours remaining until the license expires is also displayed.
- For concurrent licenses, the URL or host name of the concurrent license server used for each license is displayed.
- To switch between a seat and a concurrent license, click **Modify License**. Note that you can use only one license type per session for UFT and all loaded add-ins—either seat or concurrent. For more information on license types, installing licenses, and modifying licenses, see the *HP Unified Functional Testing Installation Guide*.

Considerations for Working with UFT Add-ins

Consider the following when loading and using UFT add-ins:

Installing and Loading Add-ins

- You must install and load an add-in to enable UFT to recognize objects from the corresponding environment. To load an add-in, select the add-in from the Add-in Manager Dialog Box that opens when you start UFT.
- For optimal performance when testing your applications, it is strongly recommended that you load *only* the required add-in or add-ins. For example, if you want to test a process that spans a Web application and a .NET application, load only the Web and .NET Add-ins. Do not load all add-ins unless you need to work with all of them. As a reminder, the tip at the bottom of the Add-in Manager changes to red text if more than three add-ins are selected.
- Some UFT add-ins require additional configuration after the installation is complete. Similarly, some environments may require configuration to enable UFT to interact with them. Configuration requirements, if any, are described in the introductory section of each relevant environment.
- Some applications must be opened prior to opening UFT, while some must be opened after UFT is

opened. These requirements are described in the introductory section for each relevant environment.

- When testing applications that do not contain .NET objects, it is strongly recommended that you do not load the .NET Add-in.
- When you open a test or business component, UFT compares the add-ins that are currently loaded with the add-ins associated with your test or with your business component's application area. If they do not match, UFT issues a warning message. For details on matching loaded add-ins with installed add-ins, see "Match loaded add-ins with associated add-ins" on page 22.

Running UFT from ALM with Add-ins

- When you run a UFT test from ALM, ALM instructs UFT to load the add-ins that are associated with the test.

  If you created the test in ALM (and not in UFT), the test contains the settings specified in the template test you chose when creating the test. If you need to modify the associated add-ins, you can do so by opening the test in UFT. For details, see the section on template tests in the *HP Unified Functional Testing User Guide*.
- Before you run a UFT test from ALM, make sure that the required UFT add-ins are installed on the computer on which you want to run the UFT test.

Record and Run Settings for Add-ins - Overview

Before you record or run a test on an application, you can use the Record and Run Settings Dialog Box to instruct UFT which applications to open when you begin to record or run your test.

For some Windows-based applications, you also use the dialog box to specify the specific applications you want UFT to recognize during record, run, and Object Spy sessions. For example, you can choose to have UFT open a specific application when you start a record or run session.

You can set your record and run options in the Record and Run Settings dialog box, or you can set the options using environment variables.

The Record and Run Settings dialog box opens automatically each time you begin recording a new test and saves your settings with that test. Subsequently, when you perform additional record or run sessions on existing tests, the Record and Run Settings dialog box does not open. This is because UFT automatically applies the saved record and run settings.

You can modify the record or run settings prior to any session using the Record and Run Settings dialog box (**Record > Record and Run Settings**).

The Record and Run Settings dialog box always contains the Windows Applications tab. It may contain other tabs corresponding to add-ins that are loaded. For details on which tab of the Record and Run Settings dialog box you should use with an add-in, see the relevant add-in chapter.

For details on defining record and run settings, see the relevant add-in environment section, for example, the Windows Applications tab of the Record and Run Settings dialog box if you are testing a standard Windows-based application.

To learn more, see:

Considerations for Defining Record and Run Settings

- The setting of the Active Screen capture level (**Tools > Options > GUI Testing** tab **> Active Screen** pane) can significantly affect the recording time for your test and the functionality of the Active Screen while editing your test. Confirm that the level selected answers your testing needs. For details, see the section on setting active screen options in the *HP Unified Functional Testing User Guide*.
- You can set the record and run settings for some add-in environments using the corresponding tab in the Record and Run Settings dialog box (displayed only when the add-in is installed and loaded).

  In addition to setting the appropriate settings in the specific application tabs, you should confirm that the other tabs in the dialog box have the appropriate settings.

  The following settings are recommended:

  - **Windows Applications tab.** When not running Windows-based applications, select **Record and run only on:** and confirm that all three check boxes are cleared.
  - **Other tabs.** (If displayed.) Select the option to record and run on any open application (upper radio button of each tab).

  While these settings do not directly affect your record or run sessions, they prevent you from inadvertently recording operations performed on Windows applications (such as e-mail) during your recording session. These settings also prevent UFT from opening unnecessary applications when you record or run tests on Windows-based applications.
- You can set record and run options such that no applications open at the beginning of record and run sessions. In this case, you may need to open the application after you open UFT to ensure that UFT recognizes the application. For details, see the relevant add-in chapter.
- After you set the record and run settings for a test, the Record and Run settings dialog box will not open the next time you record operations in that test. If needed, you open the Record and Run Settings dialog box by choosing **Record > Record and Run Settings**.

  If you change the record and run settings for additional recording sessions, confirm that you return the settings to match the needs of the first step in your test before you run it.

  You should set or modify your record and run preferences in the following scenarios:

  - You have already recorded one or more steps in the test and you want to modify the settings before you continue recording.

  - You want to run the test on a different application than the one you previously set in the Record and Run Settings dialog box.

- If you define environment variables to specify the record and run details, those values override the values in the Record and Run Settings dialog box. For details, see "Environment Variables in Record and Run Settings" below.
- After defining the connection information for HP Mobile Center in the Mobile pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Mobile** node), a remote access window opens every time a record or run session begins. To prevent this window from opening when you are not testing mobile applications, select **Do not record and run tests on mobile** in the **Mobile** pane of the Record and Run settings dialog box.

Environment Variables in Record and Run Settings

You can use special, predefined environment variables to specify the applications or browsers you want to use for your test. This can be useful if you want to test how your application works in different environments. For example, you may want to test that your Web application works properly on identical or similar Web sites with different Web addresses.

When you define an environment variable for one (or more) of the application details, the environment variable values override any values that were added using these areas of the Record and Run Settings dialog box.

> **Note:** If you select the option to Record and Run on any application (the upper radio button in each tab of the Record and Run Settings dialog box), UFT ignores any defined Record and Run environment variables.

You can define the environment variables as internal user-defined variables, or you can add them to an external environment variable file and set your test to load environment variables from that file.

You can set your Record and Run settings manually while recording your test and then define the environment variables or load the environment variable file only when you are ready to run the test (as described in the procedure below).

Alternatively, you can define environment variables before you record your test. In this case, UFT uses these values to determine which applications or browsers to open when you begin recording—assuming that the option to open an application when starting record and run sessions for the particular environment is selected. (This option corresponds to the lower radio button in each tab of the Record and Run Settings dialog box, and the third check box in the Windows Applications tab.)

For details on setting and modifying environment variables, see "How to Define Record and Run Settings for UFT Add-ins" on page 23.

UFT Add-in Extensibility

UFT add-in extensibility, available for some environments, enables you to extend the relevant UFT add-in to support third-party and custom controls that are not supported out-of-the-box.

When UFT learns an object in an application, it recognizes the object as belonging to a specific test object class. This type of test object might not have certain characteristics that are specific to the control you are testing. Therefore, when you try to create test steps with this test object, the available identification properties and test object operations might not be sufficient.

By developing support for a control using Add-in Extensibility, you can direct UFT to recognize the control as belonging to a specific test object class, and you can specify the behavior of the test object.

You can also teach UFT to treat a control that contains a set of lower-level controls as a single functional control, instead of relating to each lower-level control separately. For example, a calendar control may consist of buttons and text boxes. If you teach UFT to recognize the control as a calendar, ignoring the individual buttons and text boxes, you can create more meaningful tests on the calendar control.

In most environments, you can also extend the list of available test object classes that UFT is able to recognize. This enables you to create tests that fully support the specific behavior of your controls.

UFT add-in extensibility is currently supported for the Delphi, Java, .NET, Silverlight, Web, and WPF add-ins.

If you cannot develop support for your controls using the extensibility options provided for these environments, you might be able to take advantage of the Testing Extensibility for UFT program. Testing Extensibility is intended for customers who want to extend UFT testing capabilities for technologies or applications not supported by existing UFT add-ins. Participation in the program requires a separate license agreement with HP.

For details on Testing Extensibility, contact HP Software support.

For details on UFT Add-in Extensibility, see:

- "Delphi Add-in Extensibility" on page 101
- "Java Add-in Extensibility" on page 128
- ".NET Add-in Extensibility" on page 78
- "Silverlight Add-in Extensibility " on page 64
- "Web Add-in Extensibility" on page 312
- "WPF Add-in Extensibility" on page 91

How to Manage UFT Add-ins

This task contains the following steps:

- "Load or remove add-ins from UFT" below
- "Match loaded add-ins with associated add-ins" below

Load or remove add-ins from UFT

1. Start UFT.

   The Unified Functional Testing Add-in Manager Dialog Box opens.
2. In the add-in list, select or clear the check box for the relevant add-in and click **OK**.

Match loaded add-ins with associated add-ins

If there are add-ins associated with your test or with your business component's application area that are not currently loaded, you can:

- Close and reopen UFT, and select the required add-ins in the Add-in Manager Dialog Box.
- Remove the add-ins from the list of associated add-ins for your test or business component. To change the list of add-ins associated with your test or business component, select **File > Settings** and click **Modify** in the Properties pane.

If add-ins are loaded but are not associated with your test or with your business component's application area, you can:

- Close and reopen UFT, and clear the check boxes for the add-ins in the Add-in Manager Dialog Box, if they are not required.
- Add the add-ins to the list of associated add-ins for your test or for your business component's application area.
  - To change the list of add-ins associated with your test, select **File > Settings** and click **Modify** in the Properties pane.
  - To change the list of add-ins associated with your business component, open the application area associated with your business component, and modify the list in the Properties pane.

For details on associating add-ins with your test or business component, see the *HP Unified Functional Testing User Guide*.

How to Define Record and Run Settings for UFT Add-ins

This task contains the following steps:

- "Define record and run settings for specific add-ins" below
- "Set record and run environment variables for add-ins" below

Define record and run settings for specific add-ins

1. Review "Considerations for Defining Record and Run Settings" on page 19.
2. Use one of the following to open the Record and Run Settings dialog box:
   - Select **Record > Record and Run Settings**.
   - Click the **Record** button or select **Record > Record**. If you are recording for the first time in a test and have not yet set your recording preferences (by opening the dialog box manually), the Record and Run Settings dialog box opens.

   The Record and Run Settings dialog box is divided by environment into several tabbed pages.
3. Select the relevant environment by clicking a tab.
4. Set the required options, as described in the relevant add-in chapter.
5. To apply your changes and keep the Record and Run Settings dialog box open, click **Apply**.
6. Close the Record and Run Settings dialog box to begin your record or run session, click **OK**.

Set record and run environment variables for add-ins

1. Review "Environment Variables in Record and Run Settings" on page 20.
2. Use one of the following to open the Record and Run Settings dialog box:
   - Select **Record > Record and Run Settings**.
   - Click the **Record** button or select **Record > Record**. If you are recording for the first time in a test and have not yet set your recording preferences (by opening the dialog box manually), the Record and Run Settings dialog box opens.

   The Record and Run Settings dialog box is divided by environment into several tabbed pages.
3. Set your record and run preferences normally before recording your test.

   > **Note:** If you already have environment variables set for one or more application details, and you select the option to open an application when the record session begins (the lower radio button in each tab of the Record and Run Settings dialog box), UFT ignores the record settings you enter in the dialog box.

4. Record and edit your test normally.
5. If you did not define environment variables prior to recording your test, define an environment variable for each application detail you want to set using the appropriate variable name. For details on the variable names required, see:
   - For Web browsers and URLs to open, see "Environment Variables for a Web-Based Environment" on page 46.
   - For Windows applications on which you want to record and run tests, see "Record and Run Settings for Windows-Based Applications" on page 54.
   - For other tabs in the Record and Run Settings dialog box, see the relevant add-in chapter in this guide.

   For details on how to define a user-defined environment variable and how to create environment variable files, see the section on using environment variable parameters in the *HP Unified Functional Testing User Guide*.
6. Run the test. UFT uses the environment values to determine which applications to open at the beginning of the run session, and on which processes to record.

Web-Based Application Support

This chapter includes:

Web-Based Application Support - Overview

UFT provides a number of add-ins for testing Web-based applications. The way you configure many of your UFT settings is the same or similar for most UFT Web-based add-ins. These common configuration options are described in the remainder of this chapter.

For additional details on how to work with Web-based add-ins, see the following sections:

- ".NET Web Forms Add-in - Quick Reference" on page 68
- "PeopleSoft Add-in - Quick Reference" on page 167
- "Siebel Add-in - Quick Reference" on page 236
- ".NET Silverlight Add-in - Quick Reference" on page 62
- "Web Add-in - Quick Reference" on page 305
- "Web 2.0 Add-ins" on page 365
- "Web-Based SAP Support - Quick Reference" on page 181

In addition to using the add-ins described above, you can also use the Extensibility Accelerator to develop your own Web-based add-in support for third-party and custom Web controls that are not supported by any of the above UFT Web-based add-ins. For details, see "Extensibility Accelerator for HP Functional Testing" on page 313.

Considerations - Web-Based Application Support

This section contains the following items to consider when testing Web-based applications:

- "Recording and Running Steps on Web Controls" below
- "Working with Web Browsers" on the next page
- "Testing Applications with Embedded Web Browser Controls" on the next page

Recording and Running Steps on Web Controls

- If UFT does not record Web events in a way that matches your needs, you can also configure the events you want to record for each type of Web object. For example, if you want to record events, such as moving the pointer over an object to open a sub-menu, you may need to modify the Web event configuration to recognize such events. For details, see "Event Recording Configuration for Web-Based Applications" on page 30.
- If you are recording on a list in an application, you must highlight the list, scroll to an entry that was not originally showing, and select it. If you want to select the item in the list that is already displayed, you must first select another item in the list (click it), then return to the originally displayed item and select it (click it). This is because UFT records a step only if the value in the list changes.
- If a Web element in an HTML page is set to be disabled or invisible, for example if a `<DIV>` element above it controls its appearance, but the elements on the page are available in the DOM, then UFT

can perform operations on those objects even though a human user of the application could not.

Working with Web Browsers

- You select your browser in the Web Tab of the Run and Record Settings dialog box.
- UFT does not support the option to zoom in and out of a Web page. If you use this option, some UFT functionality may not work as expected. For example, the Object Spy may be unable to correctly highlight objects or display object details. (These problems do not occur if the **Zoom Text Only** Firefox menu item is selected.)

  Additionally, bitmap checkpoints will fail if a different zoom level is used when capturing the expected bitmap than the zoom level used when running the checkpoint step.
- By default, the name assigned to the `Browser` test object in the object repository is always the name assigned to the first `Page` object that is learned or recorded for the `Browser` object. The same `Browser` test object is used each time you learn an object or record in a browser with the same ordinal ID. Therefore, the name used for the `Browser` test object in the steps you record may not reflect the actual browser name.
- UFT Web support behaves as a browser extension in Microsoft Internet Explorer. Therefore, you cannot use the Web Add-in on Microsoft Internet Explorer without selecting the **Enable third-party browser extensions** option. To set the option, in Microsoft Internet Explorer select **Tools > Internet Options > Advanced** and select the **Enable third-party browser extensions** option.
- For UFT to run JavaScript methods, the security settings in your browser must be set to allow active scripting. (In Internet Explorer, for example, you can find these security settings under: **Tools > Internet Options > Security > Custom Level > Scripting > Active scripting**.)

  This is relevant if your test steps include **RunScript** or **EmbedScript** methods, or if you are working with test objects supported using Web Add-in Extensibility, such as Web 2.0 test objects.
- Creating and running steps that start an InPrivate Browsing session is supported only by using **Tools > InPrivate Browsing**. Using toolbars or extensions for this operation may cause Microsoft Internet Explorer to behave unexpectedly.
- Creating and running steps that are related to tabs, such as selecting a tab or creating a new tab is not supported when Microsoft Internet Explorer is in Full Screen mode.

  Workaround: Add a `<Browser>.FullScreen` step before and after the desired step to toggle Full Screen mode.

Testing Applications with Embedded Web Browser Controls

Working with applications that contain embedded Web browser controls is similar to working with Web objects in a Web browser.

> **Note:** Embedded browser controls are supported only for Microsoft Internet Explorer.

To test objects in embedded browser controls, ensure that:

- The Web Add-in is loaded.

- The application opens only after UFT is open.
- (For tests) In the Web Tab of the Record and Run Settings dialog box, the **Record and run test on any open browser** option is selected. (This option is not relevant for business components.)

After these conditions are met, you can start adding steps or running your test or business component.

Registering Browser Controls

A browser control adds navigation, document viewing, data download, and other browser functionality to a non-Web application. This enables the user to browse the Internet as well as local and network folders from within the application.

UFT cannot automatically recognize the objects that provide browser functionality in your non-Web application as Web objects. For UFT to record or run on these objects, the application hosting the browser control must be registered.

> **Note:** You can register applications developed in different environments, such as those written in Java, .NET, and so on.

Accessing Password-Protected Resources in the Active Screen

When UFT creates an Active Screen page for a Web-based application, it stores the path to images and other resources on the page, rather than downloading and storing the images with your test.

> **Note:** The Active Screen pane is not available when working with keyword components (although it is available for scripted components).

Storing the path to images and other resources ensures that the disk space used by the Active Screen pages captured with your test is not affected by the file size of the resources displayed on the page.

For this reason, a page in the Active Screen (or in your run results) may require a user name and password to access certain images or other resources within the page. If this is the case, a pop-up login window may open when you select a step corresponding to the page (see Active Screen Dialog Box), or you may note that images or other resources are missing from the page.

For example, the formatting of your page may look very different from the actual page on your Web site if the cascading style sheet (CSS) referenced in the page is password-protected, and therefore could not be downloaded to the Active Screen.

You may need to use one or both of the following methods to access your password-protected resources, depending on the password-protection mechanism used by your Web server:

- **Standard Authentication.** If your server uses a standard authentication mechanism, you can enter the login information in the Web Pane of the Settings dialog box. UFT saves this information with your test and automatically enters the login information each time you select to display an Active Screen page that requires the information.

  If you do not enter this information in the Web pane of the Test Settings dialog box and attempt to access the password-protected resources, the Active Screen Dialog Box opens.
- **Advanced Authentication.** If your server uses a more complex authentication mechanism, you may need to log in to the Web site manually using the Advanced Authentication Dialog Box. This gives the Active Screen access to password-protected resources in your Active Screen pages for the duration of your UFT session. When using this method, you must log in to your Web site in the Advanced Authentication dialog box each time you open the test in a new UFT session.

In most cases, the automatic login is sufficient. In some cases, you must use the manual login method. In rare cases, you may need to use both login mechanisms to enable access to all resources in your Active Screen pages.

Note: If your Web site is not password-protected, but you are still unable to view images or other resources on your Active Screen, you may not be connected to the Internet, the Web server may be down, or the source path that was captured with the Active Screen page may no longer be accurate.

Checkpoints for Web Pages

This section describes the checkpoint types that are supported only for Web-based add-ins. For a list of all supported checkpoints per add-in, see "Supported Checkpoints " on page 383

Accessibility Checkpoints

Accessibility checkpoints are designed to help you easily locate the areas of your Web site that require special attention according to the W3C Web Content Accessibility Guidelines. They do not necessarily indicate whether or not your Web site conforms to the guidelines.

Accessibility checkpoints are not supported for keyword components.

For details, see the section on accessibility checkpoints in the *HP Unified Functional Testing User Guide*.

Page Checkpoints

When working with tests, you can check statistical information about your Web pages by adding page checkpoints to your test. These checkpoints check the links and the sources of the images on a Web page. You can also instruct page checkpoints to include a check for broken links.

Page checkpoints are not supported for keyword components.

For details, see the section on page checkpoints in the *HP Unified Functional Testing User Guide*.

Tip: You can instruct UFT to create automatic page checkpoints for every page in all tests by selecting the **Create a checkpoint for each Web page while recording** check box in the **Web > Advanced** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Web > Advanced** node).

Event Recording Configuration for Web-Based Applications

When you record on a Web application, UFT generates steps by recording the events you perform on the Web objects in your application. An **event** is a notification that occurs in response to an operation, such as a change in state, or as a result of the user clicking the mouse or pressing a key while viewing the document.

UFT includes event recording configurations that have been optimized for each Web-based add-in, so that in most cases UFT records steps for relevant events on each object and avoids recording steps for events that usually do not impact the application. For example, by default, UFT records a step when a click event occurs on a link object, but does not record a step when a mouseover event occurs on a link.

Each Web-based add-in has its own `.xml` file that defines the Web-event recording configuration for objects in that environment.

When you perform an operation on a Web-based object during a recording session (and the appropriate add-in is installed and loaded), UFT uses the recording configuration defined for that environment.

If your application contains several types of Web-based controls, the appropriate Web event recording configuration is used for each object and the configuration for one environment does not override another.

Customizing Event Recording Configurations for Web-Based Applications

You can view and customize the configuration settings for the Web Add-in in the Web Event Recording Configuration Dialog box. The settings in that dialog box affect the recording behavior only for objects that UFT recognizes as Web test objects.

Note: For the purposes of Web event recording, UFT treats Web test objects that are child objects of a PSFrame test object as PeopleSoft objects and thus applies the settings in the PeopleSoft event configuration XML file when recording those objects.

In most cases, it is not necessary to customize the Web event recording configuration of other add-ins. If you do need to customize these settings, you can do so either by editing the XML for the relevant add-in manually, or you can import the XML into the Web Event Recording Configuration dialog box to make the necessary changes and then export the modified file.

Web Event Recording Configuration XML File Structure

The Web event recording configuration XML file is structured in a specific format when you export it from the Custom Web Event Recording Configuration Dialog Box. If you are modifying the file, or creating your own file, you must ensure that you adhere to this format for your settings to take effect.

For task details, see "How to Modify Event Recording Configuration for Web-Based Applications" on page 43.

Sample XML File

```
<XML>
    <Object Name="Any Web Object">
        <Event Name="onclick" Listen="2" Record="2"/>
        <Event Name="onmouseup" Listen="2" Record="1">
            <Property Name="button" Value="2" Listen="2" Record="2"/>
        </Event>
    </Object>
        . . .
        . . .
        . . .
    <Object Name="WebList">
        <Event Name="onblur" Listen="1" Record="2"/>
        <Event Name="onchange" Listen="1" Record="2"/>
        <Event Name="onfocus" Listen="1" Record="2"/>
    </Object>
</XML>
```

The following attributes enable you to define the listening criteria and recording status options in the XML file:

Attribute	Possible Values
Listen	**1.** Always **2.** If Handler **4.** If Behavior **6.** If Handler or Behavior **0.** Never
Record	**1.** Disabled **2.** Enabled **6.** Enabled on Next Event

Advanced Operations on Web-Based Applications

This section describes various advanced operations you can perform on Web-based objects, and includes the following:

Activating methods associated with a Web-based object using the Object property

In the Editor, you can use the `Object` property to activate the method for a Web object. Activating the method for a Web object has the following syntax:

```
WebObjectName.Object.Method_to_activate( )
```

For example, suppose you have the following statement in your script:

```
document.MyForm.MyHiddenField.value = "My New Text"
```

The following example achieves the same thing by using the `Object` property, where `MyDoc` is the DOM's document:

```
Dim MyDoc
Set MyDoc = Browser(browser_name).page(page_name).Object
MyDoc.MyForm.MyHiddenField.value = "My New Text"
```

In the following example, `LinksCollecton` is assigned to the link collection of the page through the `Object` property. Then, a message box opens for each of the links, with its innerHTML text.

```
Dim LinksCollection, link
Set LinksCollection = Browser(browser_name).Page(page_name).Object.links
For Each link in LinksCollection
       MsgBox link.innerHTML
Next
```

For details on the **Object** property (`.Object`), see the section on retrieving and setting identification property values in the *HP Unified Functional Testing User Guide*.

For a list of a Web object's internal properties and methods, see: http://msdn2.microsoft.com/en-us/library/ms531073.aspx

Using programmatic descriptions for the WebElement object

When UFT recognizes an object as a Web-based object that does not fit into any other UFT test object class, it learns the object as a WebElement object. You can also use a programmatic description with a WebElement test object to perform methods on any Web object in your Web site.

For example, when you run either of the examples below, UFT clicks the first Web object in the Mercury Tours page with the name `UserName`.

```
Browser("Mercury Tours").Page("Mercury Tours").WebElement("Name:=UserName",
"Index:=0").Click
```

or

```
set WebObjDesc = Description.Create()
WebObjDesc("Name").Value = "UserName"
WebObjDesc("Index").Value = "0"
Browser("Mercury Tours").Page("Mercury Tours").WebElement(WebObjDesc).Click
```

For details on the **WebElement** object, see the *HP UFT Object Model Reference for GUI Testing*. For details on programmatic descriptions, see the section on programmatic descriptions in the *HP Unified Functional Testing User Guide*.

Web Object Identifiers

During a run session, UFT attempts to identify each object in your application by matching the description properties stored for the corresponding test object with the properties of the DOM element in the application. For complex Web applications that contain many objects, using only the standard identification methods may have unreliable results. For details on the standard methods UFT uses to identify objects, see the section on how UFT identifies objects in the *HP Unified Functional Testing User Guide*.

You can instruct UFT to use Web object identifiers before the regular object identification process to help limit the number of candidate objects to identify. UFT accesses the application's DOM and returns objects that match the object identifier property values. UFT then continues to identify this smaller set of returned objects using the normal object identification process. Therefore, using Web object identifiers can lead to a more reliable and accurate object identification, and a quicker object identification process.

To follow an exercise describing the identification process using Web object identifiers, see " How to Use Web Object Identifiers - Exercise" on page 39.

For details about the general workflow of the object identification process, see the section on object identification in the *HP Unified Functional Testing User Guide*.

To learn more, see:

Web Object Identifier Types

The following Web object identifiers are available:

For general considerations on working with Web object identifiers, see "Considerations - Web Object Identifiers" on page 39.

CSS Web Object Identification

CSS (Cascading Style Sheet) is a language used to define formatting of elements in HTML pages. You can define a CSS identification property value for a test object to help identify a Web object in your application based on its CSS definition.

UFT uses CSS identifiers only when identifying objects and not when learning objects. Therefore, they are not available from the Object Spy dialog box or the Object Identification dialog box.

For usage examples, see " How to Use Web Object Identifiers - Exercise" on page 39.

For more details on the Object Identification dialog box and on programmatic descriptions, see the sections on the Object Identification dialog box and Programmatic Descriptions in the *HP Unified Functional Testing User Guide*.

User-Defined XPath Web Object Identification

XPath (XML Path) is a language used to define the structure of elements in XML documents. You can define an XPath identification property to help identify a Web object in your application based on its location in the hierarchy of elements in the Web page. Because of the flexible nature of the language, you can define the XPath according to the unique way your Web page is structured.

UFT uses XPath identifiers only when identifying objects and not when learning objects. Therefore, they are not available from the Object Spy dialog box or the Object Identification dialog box.

For usage examples, see " How to Use Web Object Identifiers - Exercise" on page 39.

Automatic X-Path Web Object Identification

You can instruct UFT to automatically generate and store an XPath value when learning Web test objects. During the run session, if the automatically learned XPath for a particular object results in multiple matches or no matches, the learned XPath is ignored. Additionally, if you have added a user-defined XPath or CSS identification property to a test object description, then the automatically learned XPath is ignored.

Automatic XPath is a UFT-generated property, and therefore it is not available from the Object Spy dialog box , the Add/Remove Properties dialog box, or the Object Identification dialog box.

You enable this option in the **Web > Advanced** pane of the Options dialog box.

Attribute/* Notation Web Object Identification

You can use the `attribute/*` notation to access custom native properties of Web-based objects or events associated with Web-based objects. You can then use these properties or events to identify such objects by adding the notation to the object's description properties using the Object Identification dialog box, or by using programmatic descriptions.

The following examples describe how you can use the `attribute/*` notation to identify Web objects:

- "Example of using attribute/<property> to identify a Web object" below
- "Example of using attribute/<event> to identify a Web object" on the next page

Example of using attribute/<property> to identify a Web object

Suppose a Web page has the same company logo image in two places on the page:

```
<IMG src="logo.gif" LogoID="122">

<IMG src="logo.gif" LogoID="123">
```

You could identify the image that you want to click by adding the `attribute/LogoID` notation to the object's description properties and using a programmatic description to identify the object:

```
Browser("Mercury Tours").Page("Find Flights").Image
("src:=logo.gif","attribute/LogoID:=123").Click 68, 12
```

Example of using attribute/<event> to identify a Web object

Suppose a Web page has an object with an `onclick` event attached to it:

```
"alert('OnClick event for edit.');"
```

You can identify the object by adding the attribute/onclick notation to the object’s description properties and using a programmatic description to identify the object:

```
Browser("Simple controls").Page("Simple controls").WebEdit("attribute/onclick:=
alert\('OnClick event for edit\.'\);").Set "EditText"
```

Style/* Notation Web Object Identification

You can use the `style/*` notation to access the values of CSS properties for a Web-based object. You can then use these property values to identify such objects by adding the notation to the object's description properties using programmatic descriptions.

The following examples describe how you can use the `style/*` notation to identify Web objects:

- "Example of using style/<property> to identify a Web object using the background-color property" below
- "Example of using style/<property> to identify a Web object using the background-position property" on the next page
- "Example of using style/<property> to identify a Web object and update invalid input controls" on the next page

For more details, see "Considerations for using the Style/* notation" on page 38

Example of using style/<property> to identify a Web object using the background-color property

Suppose a web page has different colored button objects on the same page:

```
<input  type="button" style="background-color:rgb(255, 255, 0)">
<input  type="button" style="background-color:rgb(255, 0, 0)">
```

You can identify the button that you want to click by adding the `style/background-color` notation to the object's description properties or using a programmatic description to identify the object:

```
Browser("Simple controls").Page("Simple controls").WebButton("style/background-
color:=rgb\(255, 255, 0\)").Click
```

Example of using style/<property> to identify a Web object using the background-position property

Suppose a web page has different image objects on the same page:

```
<head>
<style>
img.home {
width:46px;
height:44px;
background:url(img_navsprites.gif) 0px 1px;
}
img.next {
width:43px;
height:44px;
background:url(img_navsprites.gif) -91px 1px;
}
</style>
</head>
<body>
<img class="home" src="img_trans.gif" onclick="var info =
document.getElementById('info'); info.value = 'HOME';"  id="home"/>
<br /><br />
<img class="next" src="img_trans.gif" onclick="var info =
document.getElementById('info'); info.value = 'NEXT';" id="next"/>
<br /><br /><br /><br /><br />
<input type="text" id="info" />
</body>
```

You can identify the image that you want to click by adding the `style/background-position` notation to the object's description properties and using a programmatic description to identify the object:

```
Browser("Browser").Page("Page").WebElement("html tag:=img", "style/background-
position:=-91px 1px").Click
```

Example of using style/<property> to identify a Web object and update invalid input controls

Suppose a web page has different edit objects on the same page, each defined to use a red background color if the input is invalid:

```
<head>
<STYLE TYPE="text/css">
input:required:invalid, input:focus:invalid {
```

```
background-color: rgb(255, 0, 0);
}
input:required:valid {
background-color: rgb(0, 255, 0);
}
</STYLE>
</head>
<body>
<form>
<p>email:</p>
<input  id="emailTxt" type="email" placeholder="test@.com" required><br />
<p>url:</p>
<input  id="urlTxt" type="url" pattern="https?://.+" placeholder="https?://.+"
required><br />
</form>
```

You can identify the invalid values that need to be corrected by adding the `style/background-color` notation to the object's description properties and using a programmatic description to identify the object. You can then enter valid input into the edit object based on the object's `type` property:

```
Set oDesc = Description.Create()
oDesc("micclass").Value = "WebEdit"
oDesc("style/background-color").Value = "rgb\(255, 0, 0\)"

Set invalidEdit = Browser("Browser").Page("Page").ChildObjects(oDesc)
numberOfEdits = invalidEdit.Count
For i = 0 To numberOfEdits - 1
If invalidEdit(i).GetROProperty("type") = "email" Then
invalidEdit(i).Set "test@.com"
End If
 invalidEdit(i).GetROProperty("type") = "url" Then
invalidEdit(i).Set "http://www.test."
End If
```

Considerations for using the Style/* notation

- The CSS property values are returned using the browser's functions, and values may differ depending on the browser you are using.
- UFT retrieves the CSS property values from the browser. When designing tests or components that will run on different browsers, keep in mind that different browsers may have different CSS functionality and return different property values for the same object.
- CSS shorthand properties, such as **animation**, **font**, **background**, and **outline** are not supported. Instead, use a concrete CSS property in your descriptions, such as **background-image**, **font-family**, **border-width**, and so on.

Considerations - Web Object Identifiers

Consider the following when using Web object identifiers:

General

- Defining **xpath** and **css** properties using Frame HTML tags is not supported. This may cause incorrect identification when identifying **Frame** objects or retrieving **Frame** objects using the **ChildObjects** method.
- **xpath** and **css** properties are not supported for .NET Web Forms test objects or for other Web-based test objects that have .NET Web Forms parent test objects.
- When running in Maintenance Mode, UFT may replace test objects with `XPath` or `css` identifier property values with new objects from your application.

  Workaround: Use the **Update from Application** option in the Object Repository Manager to update specific test objects with **XPath** or **css** identifier property values.

Differences Between User-Defined XPath and Automatic XPath Behavior During Run Sessions

Behavior in case of...	User-defined XPath	Automatic XPath
Multiple objects match the XPath value	UFT continues to identify the matching objects.	UFT ignores the learned XPath and continues with the regular object identification process.
No objects match the XPath value	Object identification fails, and UFT continues to identify the object using Smart Identification	UFT ignores the learned XPath and continues with the regular object identification process.

How to Use Web Object Identifiers - Exercise

In this exercise, you use XPath and CSS identifiers in a test object description to help locate the correct button in an HTML table.

This exercise includes the following steps:

1. "Prerequisites" on the next page
2. "Create a sample Web application" on the next page
3. "Learn the button objects in the Web application" on the next page
4. "Remove the ordinal identifiers from the button objects" on the next page
5. "Add a CSS identifier based on the object's parent container" on page 41
6. "Add an XPath identifier based on the object's parent container" on page 41
7. "Add an XPath identifier based on the object's sibling element" on page 41
8. "Results" on page 41

1. **Prerequisites**

   a. Open UFT and create a new test.

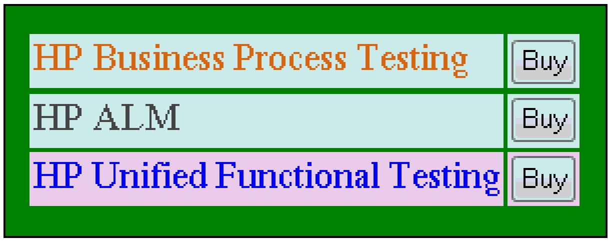
   b. Disable Smart Identification for the Button test object class by selecting **Tools > Object Identification**, selecting the Web environment in the Object Identification dialog box, and then selecting the **Button** test object class from the **Test Object classes** list.

   c. Disable automatic XPath in the **Web > Advanced** node (**Tools > Options > GUI Testing** tab > **Web > Advanced** node) by clearing the **Learn and run using automatic XPath identifiers** check box.

2. **Create a sample Web application**

   a. Open the Help version of this exercise, copy the syntax content into a text document, and save the document with an `.html` extension. The document is saved as an HTML page.

   b. Review the appearance and content of your newly created HTML page in any browser. Make sure that it matches the following image.



HP Business Process Testing	Buy
HP ALM	Buy
HP Unified Functional Testing	Buy

3. **Learn the button objects in the Web application**

   a. In UFT, open the Object Repository Manager, and select **Object > Navigate and Learn**. UFT is hidden, and the cursor changes to a pointing hand.

   b. To verify that UFT learned the objects correctly, in the object repository, select each **Button** object and select **View > Highlight in Application**. UFT highlights each button object in the HTML page.

   c. Rename the **Button** objects to make them more clear:

      - Rename **Buy** to **Buy_BPT**.
      - Rename **Buy_2** to **Buy_ALM**.
      - Rename **Buy_3** to **Buy_UFT**.

4. **Remove the ordinal identifiers from the button objects**

   Because all of the Button objects have identical property values, when UFT learned the objects it assigned an ordinal identifier to each test object based on the location of each object in the application. This may cause UFT to identify the objects incorrectly if the sorting order of the buttons in the application changes.

   a. In the Object Repository Window, select the first button object to display its object properties on the right side of the object repository window.

b. In the **Ordinal Identifier** section, select the **Browse** button. The Ordinal Identifier Dialog Box opens.

c. In the **Identifier type** drop-down list, select **None** and close the dialog box. The ordinal identifier is removed from the test object's identification properties.

d. Repeat the previous steps for each of the buttons.

e. Verify that the test object descriptions are no longer unique by selecting each test object and selecting **View > Highlight in Application**. UFT cannot identify the objects.

5. Add a CSS identifier based on the object's parent container

a. Select the **Buy_BPT** button. The test object details are displayed on the right side of the object repository window.

b. In the **Object Description** section, click the **Add** button, and add the **css** property to the test object description.

c. Copy and paste the following syntax into the Value edit box:

```
tr.BPTRow input
```

6. Add an XPath identifier based on the object's parent container

a. Select the **Buy_UFT** button. The test object details are displayed on the right side of the object repository window.

b. In the **Object Description** section, click the **Add** button, and add the **xpath** property to the test object description.

c. Copy and paste the following syntax into the Value edit box:

```
//TR[@id='UFT']/*/INPUT
```

7. Add an XPath identifier based on the object's sibling element

a. Select the **Buy_ALM** button. The test object details are displayed on the right side of the object repository window.

b. In the **Object Description** section, click the **Add** button, and add the **xpath** property to the test object description.

c. Copy and paste the following syntax into the **Value** edit box:

```
//td[contains(text(),'ALM')]/../*/INPUT
```

8. Results

Select each object and select **View > Highlight in Application**. UFT can now identify each button based on the Web object identifiers you added.

Web Object Recognition Using the Web Accessibility Toolkit

By default, when loading UFT's Web support, the Web Accessibility toolkit is loaded. This toolkit enables you to work with Web objects that have defined the role property in the HTML code of the object. For details on this property and its implementation in Web pages and applications, see http://www.w3.org/TR/wai-aria/roles.

This toolkit enables UFT to correctly map objects in your application by identifying the value of the role property and then creating a test object accordingly. For example, if you have an object that with this structure:

```
<ul role="menubar">

 <!-- Rule 2A: "File" label via aria-labelledby -->
  <li role="menuitem" aria-haspopup="true" aria-labelledby="fileLabel"><span
id="fileLabel">File</span>
    <ul role="menu">

      <!-- Rule 2C: "New" label via Namefrom:contents -->
      <li role="menuitem">New</li>
      <li role="menuitem">Open…</li>
      …
    </ul>
  </li>
  …
</ul>
```

UFT reads the `role=` attribute and creates (in this case) a WebMenu object, according to the role:

Rp;e	**UFT Test Object**
button	WebButton
link	Link
listbox	WebList
tablist	WebTabStrip
menubar menu	WebMenu
tree	WebTree

This toolkit is enabled by default when starting UFT, unless you have one or more of the Web 2.0 toolkits (ASP .NET AJAX, Dojo, Ext-JS, GWT, jQueryUI, SiebelOpenUI, or YahooUI), the Add-in for SAP Solutions, or the PeopleSoft Add-in loaded.

If you want to manually activate or turn off this toolkit's support, you can use the **Setting** object in your test or component steps:

To activate the toolkit:	`Setting,Packages.WebPackage.Settings("EnableWebRoleBasedKit") = 1`
To turn off the toolkit support:	`Setting,Packages.WebPackage.Settings("EnableWebRoleBasedKit") = 0`

How to Modify Event Recording Configuration for Web-Based Applications

This task includes the following steps:

- "Modify the event recording configuration XML file manually" below
- "Modify the event recording configuration in the Web Event Recording Configuration dialog box" below

Modify the event recording configuration XML file manually

1. In a text or XML editor, open the appropriate **MyEnvEventConfiguration.xml** file from the **<UFT installation folder>\dat** folder, according to the following table:

Object Type:	XML File Name
.NET Web Forms	`WebFormsEventConfiguration.xml`
Siebel 7.5 or earlier	`SiebelEventConfiguration.xml`
Siebel 7.7 or later	`CASEventConfiguration.xml`
PeopleSoft Frame objects and all Web objects that are children of a PeopleSoft frame object	`PSEventConfiguration.xml`

2. Edit the file as necessary.
3. Save the file.

Modify the event recording configuration in the Web Event Recording Configuration dialog box

1. Back up the event recording configuration for the Web environment:
   a. Select **Record > Web Event Recording Configuration**. The Web Event Recording Configuration dialog box opens.

   b. Click **Custom Settings**.

   c. Select **File > Save Configuration As** and specify an XML filename for the backup file.

2. Back up the event recording configuration for the environment you want to modify:

   Create a copy of the relevant **<MyEnv>EventConfiguration.xml** file from the **<UFT installation folder>\dat** folder.

3. Modify the **<MyEnv>EventConfiguration.xml** file in the Web Event Recording Configuration dialog box:

   a. In the Web Event Recording Configuration dialog box, select **File > Load Configuration** and browse to the relevant **<UFT installation folder>\dat\<MyEnv>EventConfiguration.xml** file. The event configuration for the selected environment is displayed in the dialog box.

   b. Modify the configuration using the Web Event Recording Configuration dialog box options, as described in "Event Recording Configuration for Web Objects - Overview" on page 309.

   c. Select **File > Save Configuration As** and overwrite the previous **<UFT installation folder>\dat\<MyEnv>EventConfiguration.xml** file.

4. Restore the configuration file for the Web environment:

   Select **File > Load Configuration** and browse to the backup copy of the Web configuration XML file that you saved earlier.

   Caution: UFT always applies the configuration that is loaded in the Web Event Recording Configuration Dialog Box to all Web objects. If you do not restore the Web configuration file, then UFT will apply the configuration for the **<MyEnv>EventConfiguration.xml** file you last loaded, and as a result, UFT may not record Web events properly.

How to Configure UFT to Record Mouse Clicks

This task describes how to instruct UFT to record right mouse clicks by modifying the configuration file manually.

1. (Web Add-in only) Prerequisite - Export the configuration file from the Custom Web Event Recording Configuration dialog box

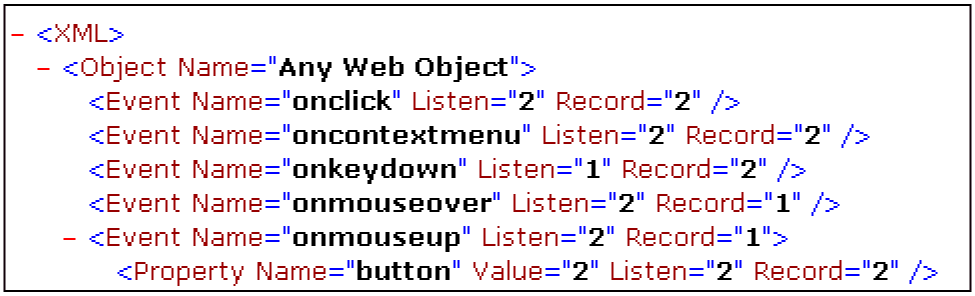
   a. Select **Record > Web Event Recording Configuration**, and then click **Custom Settings**.

   b. Export your custom configuration to an `.xml` file by selecting **File > Save Configuration As**. Then, navigate to the folder in which you want to save the Web event recording configuration file, and enter a configuration file name. The extension for configuration files is `.xml`.

2. Open the XML file in a text editor

Open the configuration file for editing in any text editor. The configuration file uses a predefined XML structure.

The following example illustrates the beginning of an exported configuration file:



```
- <XML>
  - <Object Name="Any Web Object">
      <Event Name="onclick" Listen="2" Record="2" />
      <Event Name="oncontextmenu" Listen="2" Record="2" />
      <Event Name="onkeydown" Listen="1" Record="2" />
      <Event Name="onmouseover" Listen="2" Record="1" />
    - <Event Name="onmouseup" Listen="2" Record="1">
        <Property Name="button" Value="2" Listen="2" Record="2" />
```

The **Property Name** element controls the recording of the mouse buttons. The values of the mouse buttons are defined as follows:

- **1.** Left
- **2.** Right
- **4.** Middle

3. Modify the XML file to enable mouse click recording

a. Edit the `.xml` file as follows:

   - To record a left mouse click for the **onmouseup** event, add the following line:

     ```
     <Property Name="button" Value="1" Listen="2" Record="2"/>
     ```

   - To record right and left mouse clicks for the **onmousedown** event, add the following lines:

     ```
     <Event Name="onmousedown" Listen="2" Record="1">
         <Property Name="button" Value="2" Listen="2" Record="2"/>
         <Property Name="button" Value="1" Listen="2" Record="2"/>
         </Event>
     ```

   Note: Only one event, either **onmouseup** or **onmousedown**, should be used to handle mouse clicks. If both events are used, UFT records two clicks instead of one. By default, UFT listens for the **onmouseup** event.

b. Save the `.xml` file.

4. (Web Add-in only) Load the XML file into the Custom Web Even Recording Configuration dialog box

a. In the Custom Web Event Recording Configuration Dialog Box, select **File > Load Configuration**. The Open dialog box opens.

b. Navigate to the folder in which you saved the edited configuration file, select the file, and click **Open**. The Custom Web Recording Configuration dialog box reopens.

c. Click **OK**. The new configuration is loaded, with all preferences corresponding to those you defined in the `.xml` configuration file. Any Web objects you now record will be recorded according to these new settings.

Environment Variables for a Web-Based Environment

You can use predefined environment variables to specify the applications or browsers you want to use for your test. This can be useful if you want to test how your application works in different environments.

> **Note:** For details on environment variables and how to use them in tests, see "Environment Variables in Record and Run Settings" on page 20.

To use environment variables to define the Web browser and URL to open, set the appropriate variable names as specified below:

Option	Variable Name	Description
Type	BROWSER_ENV	The browser program to open. For example, Microsoft Internet Explorer, Google Chrome, or Mozilla Firefox. Possible values: **IE.** Opens Internet Explorer. **IE64.** Opens a 64-bit version of Internet Explorer. **CHROME.** Opens Google Chrome. **FIREFOX.** Opens the latest version of Mozilla Firefox that is both installed on the computer and supported by UFT. **FIREFOX64.** Opens the latest version of 64-bit Mozilla Firefox that is both installed on the computer and supported by UFT. **FF<VersionNumber>.** Opens the specified version of Mozilla Firefox. For example: `FF36` (version 3.6), `FF40` (version 4.0), `FF140` (version 14.0). **SAFARI.** Opens Safari on the remote Mac computer connected to UFT (defined in the Web tab of the Record and Run Settings dialog box or in the `REMOTE_HOST` environment variable). **EDGE.** Opens the locally installed version of Microsoft Edge loaded with the Edge Agent for Functional Testing. **Note:** • If the specified browser program is not installed, the default browser is used. • Mozilla Firefox is supported only for the Web Add-in. • When specifying a Firefox version number, make sure to specify a supported version. For a list of all supported browser versions, see the *HP Unified Functional Testing Product Availability Matrix*.

Option	Variable Name	Description
Address	URL_ENV	The Web address to display in the browser.
Remote Host	REMOTE_HOST	The host name or IP address of the Mac computer to which UFT connects. By default, UFT connects to the Mac using port **8822**. To use a different port, append the port number to the host name: *<hostname>***:***<port number>*. Make sure to configure the same port number on the Mac, in the **UFT port** option in the UFT Connection Agent preferences. For more details, see "How to Connect to a Remote Mac Computer" on page 347. **Note:** Relevant only for running tests and components on the Apple Safari browser.
use SSL flag	USE_SSL	Specifies whether to secure the connection to the Mac computer by using SSL for the connection. Possible values: • **TRUE** • **FALSE** (Default) **Note:** Relevant only for running tests and components on the Apple Safari browser.

Troubleshooting and Limitations - Web-Based Application Support

This section contains general troubleshooting and limitation information about the Web add-in, and includes the following sections:

Test Objects, Methods, and Properties

- Web test objects do not support the `Class Name` identification property. If you try to run a `ChildObjects(<Descr>)` step on a Web object, and the `Descr` argument includes the `Class Name` property, a **General Run Error** message is displayed.

  Workaround: Use the `micclass` property in the `Descr` argument.

- If you record drag and drop steps on a Web element within the same frame, the test steps may fail during the run session if the screen resolution is not identical to the screen resolution during the recording session. This is because the target location coordinates may be different for different screen resolutions.

  Workaround: If this problem occurs, adjust the **Drop** coordinates according to the new location.

- UFT records changes in the edit field only on `<input type="file">` tags. Browsing operations are not recorded.

- Clicks on form tags of type POST may not run correctly.

  Workaround: If this problem occurs, change the replay type before the click to **Run by mouse operations** using: `Setting.WebPackage("ReplayType") = 2.` It is recommended to return the replay type to the default (**Run by Events**) setting after the click step: `Setting.WebPackage ("ReplayType") = 1.`

Creating and Running Testing Documents

- If you use the Tab key when recording password fields in the AutoComplete dialog box, UFT may record incorrectly.

  Workaround: Press **ENTER** after entering the user name or click the button for logging in.

- When UFT opens a browser, it may not correctly recognize multiple tabs that were opened and saved from a previous browser session.

  Workaround: If multiple tabs are required, open them during the run session by adding the relevant steps to your test or business component.

Recognition of WebTable Test Objects

By default, when using the UFT Web Add-in, UFT recognizes any HTML table as a **WebTable** test object.

However, in QuickTest 9.5 or 10.00, the default behavior was to ignore HTML tables with one row and one column during Object Spy, learn, and record sessions.

In specific situations, this changed default behavior may result in differences when learning new test objects or when running steps containing Web test objects that were learned in QuickTest 9.5 or 10.00. For example, the **ChildObjects** method may return a different value for parent objects that contain Web tables.

If necessary, you can revert to the previous behavior by enabling (and optionally modifying) **abstract table** support.

Abstract tables are defined in a built-in Web Add-in Extensibility toolkit support set called **HPInternal.** By default, this toolkit support set is not loaded.

To activate the abstract table support:

1. Open `<UFT installation folder>\dat\Extensibility\Web\Toolkits\HPInternal\loadalways.ind`
2. Change the single line in the file to: `load=true`

To modify which types of tables UFT treats as an abstract table:

Edit the **IsHPAbstractTable** JavaScript located in: `<UFT installation folder>\dat\Extensibility\Web\Toolkits\HPInternal\HPAbstractTable.js`.

The sample **IsHPAbstractTable** JavaScript function below causes UFT to treat Web table elements containing one row and one column as abstract tables:

```
function IsHPAbstractTable()
{
        // Treat all tables with only one cell as abstract tables
        if ( _elem.rows.length == 1 && _elem.rows[0].cells.length == 1 )
        {
                return true;
        }
        return false;
```

To instruct UFT to ignore additional types of Web table elements, modify the **IsHPAbstractTable** JavaScript function to return **true** for those types based on their HTML properties or other information. (Use the token **_elem** to represent the Web element UFT is currently handling.)

> **Caution:** `HPAbstractTable.js` affects the way UFT identifies Web objects and can cause problems if modified incorrectly. Edit this file only if you are an experienced JavaScript programmer and are familiar with the implementation of your Web controls. Make sure to create a backup copy of the file before making changes.

Registering Browsers

UFT supports applications with embedded browsers only for applications that embed Internet Explorer.

Checkpoints, Output Values, and the Active Screen

- Checkpoints on page source/HTML tags cannot be inserted from the Active Screen and must be inserted while recording. These checkpoints may fail during the first run session.

  Workaround: Perform an update run (**Run > Update Run Mode**) of your test or business component before you run a test or business component that includes a page source/HTML tag checkpoint.

- If you insert checkpoints from the Active Screen when you are working with an application containing a browser control instead of a Web browser, your checkpoints may fail.

  Workaround: Insert checkpoints while recording.

Working with Multiple Web Browsers

UFT retrieves the CSS property values from the browser. When designing tests or components that will run on different browsers, keep in mind that different browsers may have different CSS functionality and return different property values for the same object.

Problem

When running steps that are intended to be performed on different browsers, and UFT tries to perform the step intended for the second browser before the second browser has finished loading, UFT will perform the step on the first browser, and the step may fail.

Solution

Insert a `Wait()` statement before the first step on the second browser to enable the second browser to finish loading.

Reason

By default, a Browser test object does not have any identification properties in its description. When only one browser is open, the open browser matches the (empty) description for any Browser test objects. When multiple browsers are open, UFT uses smart identification or the ordinal identifier property value stored with the relevant Browser test object to distinguish between the browsers and to select the correct browser.

However, if a second browser has not fully loaded when UFT tries to perform a step intended for that browser, UFT will assume that only one browser is open and it will try to perform the step on the first browser without reverting to smart identification or ordinal identifiers.

Windows-Based Application Support

This chapter includes:

Windows-Based Application Support - Overview

UFT provides a number of add-ins for testing Windows-based applications.

The way you configure many of your UFT options is the same or similar for most UFT Windows-based add-ins (as well as for the built-in standard Windows testing support). For details, see "UFT Configuration for Windows-Based Applications" below.

Many UFT add-ins rely on the settings in the Windows Applications Tab (Record and Run Settings Dialog Box) to determine on which applications UFT records and runs. For some add-ins, these settings may also affect the applications that UFT recognizes for certain operations while in edit mode, such as using the Object Spy or other pointing hand operations.

You can also use predefined environment variables to specify the applications or browsers you want to use for your test. This can be useful if you want to test how your application works in different environments.

There may also be additional issues that you need to address to ensure that UFT recognizes your objects properly during record, run, and/or pointing hand operations. For details, see "Record and Run Setting Guidelines for Windows-Based Add-ins" on page 57.

For details about standard Windows testing support, see "Standard Windows Support -Quick Reference" on page 256

For details on how to work with Windows-based add-ins, see the specific sections describing these add-ins in the guide:

- "ActiveX Add-in - Quick Reference" on page 94
- "Delphi Add-in - Quick Reference" on page 100
- ".NET Windows Forms Support - Quick Reference" on page 74
- "PowerBuilder Add-in" on page 170
- "Qt Add-in" on page 174
- "Windows-based SAP Support - Quick Reference" on page 190
- "Stingray Add-in" on page 259
- "Terminal Emulator Add-in" on page 270
- "VisualAge Smalltalk Add-in" on page 296
- "Visual Basic Add-in" on page 300
- "Windows Runtime Add-in" on page 374

UFT Configuration for Windows-Based Applications

Use the **Windows Applications** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Windows Applications** node) to configure general and advanced Windows-based application options, as follows:

- **General options.** Configure how UFT records and runs tests and business components for Windows-based applications, such as Standard Windows, ActiveX, .NET Windows Forms, WPF, SAP GUI for Windows, Visual Basic applications, and Windows Runtime.

  > **Tip:** When recording tests or scripted components on Windows-based applications, you can choose to save all Active Screen information in every step, save information only in certain steps, or disable Active Screen captures entirely. You set this preference in the **Active Screen** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Active Screen** node). The less information saved, the faster your recording times will be.
  >
  > This option is not relevant for keyword components.
  >
  > For details, see the section describing the Active Screen pane in the *HP Unified Functional Testing User Guide*.

- **Advanced options.** Modify how UFT records and runs tests or business components on Windows-based applications, such as ActiveX or Visual Basic.

Record and Run Settings for Windows-Based Applications

You can set options that affect how you start creating and running tests for Windows-based applications in the Windows Applications tab of the Record and Run Settings dialog box. These options instruct UFT which applications to open when you begin to record or run your test.

Additionally, you can specify the applications on which you want to record in the Application Details Dialog Box. You can use environment variables to define the details for the Windows-based applications on which you want to record and run tests. If you do this, use the appropriate variable names as specified in "Environment Variables for Windows-based Applications" on the next page.

> **Note:** The Record and Run Settings dialog box applies only to tests. Record settings for business components are specified in the Applications pane or Applications dialog box of the relevant application area. However, specific record and run settings do not need to be defined for business components. For details on the Applications pane in the Additional Settings pane of an application area, see the *HP Unified Functional Testing User Guide*.

Environment Variables for Windows-based Applications

You can use environment variables to define the details for the Windows-based applications on which you want to record and run tests. If you do this, use the appropriate variable names as specified below.

Note:

- For details on environment variables and how to use them in tests, see "Environment Variables in Record and Run Settings" on page 20.
- The environment variables described in this section correspond with the settings you define in the Application Details Dialog Box.

Option	Variable Names	Description
Application	EXE_ENV_1 EXE_ENV_10	The executable files on which UFT records operations when record and run sessions begin. You can specify up to ten executable files.
Working folder	DIR_ENV_1 DIR_ENV_10	The folder to which the corresponding executable file refers (for each corresponding application).
Program arguments	ARGS_ENV_1 ... ARGS_ENV_10	The command line arguments to be used for the specified application (for each corresponding application).
Launch application	LNCH_ENV_1 ... LNCH_ENV_10	Whether to open the application when starting the record and run session (for each corresponding application). Possible values: • **0** (do not launch the application) • **1** (launch the application)
Include descendant processes	CHLD_ENV_1 ... CHLD_ENV_10	Whether to record and run on processes created by the application during the record and run session (for each corresponding application). Possible values: • **0** (do not record on descendant processes) • **1** (record descendant processes)

Considerations for Advanced Windows-based Application Testing

The following information is intended for users with expertise in the Win32 API and the Windows messages model. It expands on the information provided for some of the options described in Windows Applications pane of the Options dialog box..

Always enumerate child windows

If UFT does not correctly record an object in your application, you can select this option to force UFT to enumerate all windows in the system. This means that even when UFT looks for a window without WS_CHILD style, it enumerates all windows in the system and not only the top-level windows.

You should select this option if there is a window in your application that does not have a WS_CHILD style but does have a parent (not an owner) window.

Record only the object's basic operation

In general, UFT records operations on Windows objects based on Windows messages sent by the application. UFT recognizes the sequence of Windows messages sent to a specific application window by the system, and uses a smart algorithm to determine which operation to record.

In rare cases (where a non-standard message sequence is used), the smart algorithm may record unwanted operations. Select this option if you want to record only the object's basic operation when the selected event occurs. When you select this option, you can also select when to record the operation. If you select **On mouse button down**, UFT records the operation performed when a WM_LBUTTONDOWN message is detected; if you select **On mouse button up**, UFT records the operation performed when a WM_LBUTTONUP message is detected.

Keyboard state detection

If UFT does not correctly record keyboard key combinations (for example, **CTRL+Y**, or **ALT+CTRL+HOME**), you can try changing the default setting for this option. Following is a brief explanation of each of the options:

- **Standard.** Uses the **GetKeyboardState** API to detect the keyboard state. For details, see http://msdn2.microsoft.com/en-us/library/ms646299.aspx.
- **Alternate synchronous.** Uses the **GetKeyState** API to detect the keyboard state. For details, see http://msdn2.microsoft.com/en-us/library/ms646301.aspx.
- **Alternate asynchronous.** Uses the **GetAsyncKeyState** API to detect the keyboard state. For details, see http://msdn2.microsoft.com/en-us/library/ms646293.aspx.

Menu recording mode

In most applications, Windows sends a WM_CONTEXTMENU message, WM_ENTERMENULOOP message, WM_INITMENU message, WM_INITMENUPOPUP message, or other initialization message when a user opens a menu. Windows then sends a WM_MENUSELECT message when a user selects a menu item.

The **Verify menu initialization** event option instructs UFT to record menu operations only after detecting a menu initialization message. If UFT does not correctly record menu operations, or if your application does not send initialization messages before sending WM_MENUSELECT messages, try using the **Ignore menu initialization** event option. This instructs UFT to always record menu operations.

Record and Run Setting Guidelines for Windows-Based Add-ins

Special considerations are detailed below for each UFT add-in that is affected by the settings in the Windows Applications tab of the Record and Run Settings dialog box.

Add-in Environment	Guidelines
ActiveX	• If you select the **Record and Run only on** radio button, the settings also define and limit which applications are recognized by the Object Spy and other pointing hand operations. • UFT recognizes ActiveX objects only in applications that are opened after changing the settings in the Windows Applications tab of the Record and Run Settings dialog box.
Delphi	• UFT recognizes only Delphi applications that have been precompiled with the Delphi agent module (`MicDelphiAgent.pas`). For details, see "How to Enable Communications Between UFT and Your Delphi Application" on page 102. • In some cases, if you select the **Record and Run only on** radio button, the settings may also define and limit which applications are recognized by the Object Spy and other pointing hand operations.
.NET Windows Forms	If you select the **Record and Run only on** radio button, the settings also define and limit the applications that are recognized by the .NET Windows Forms Spy, the Object Spy, and other pointing hand operations.
.NET Windows Presentation Foundation Environment	If you select the **Record and Run** only on radio button, the settings also define and limit the applications that are recognized by the .NET Spy, the Object Spy, and other pointing hand operations.
PowerBuilder	If you select the **Record and Run only on** radio button, the settings also define and limit the applications that are recognized by the Object Spy and other pointing hand operations.
Standard Windows	• The **Record and Run only on** radio button applies only to record and run sessions. UFT recognizes all standard Windows objects for Object Spy and pointing hand operations, regardless of the settings in the Record and Run Settings dialog box. • It is recommended that applications are opened after changing the settings in the Windows Applications tab of the Record and Run Settings dialog box.
Stingray	• In addition to the settings in the Record and Run Settings dialog box, you must also configure UFT to recognize your Stingray applications in the **Stingray** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Stingray** node). • If you select the **Record and Run only on** radio button, the settings also define and limit the applications that are recognized by the Object Spy and other pointing hand operations.
Terminal Emulators	• UFT recognizes only the terminal emulator set in the **Terminal Emulator** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Terminal Emulator** node). • The **Record and Run only on** radio button does not affect the applications on which UFT records, recognizes, and runs.

Add-in Environment	Guidelines
Visual Basic	• If you select the **Record and Run only on** radio button, the settings may also define and limit the applications that are recognized by the Object Spy and other pointing hand operations. • UFT recognizes Visual Basic objects only in applications that are opened after changing the settings in the Windows Applications tab of the Record and Run Settings dialog box.
VisualAge	• UFT can recognize only VisualAge Smalltalk applications that have been precompiled with the **VisualAge Smalltalk agent (qt-adapter)**. For details, see "How to Configure the VisualAge Smalltalk Add-in" on page 299. • The **Record and Run only on** radio button applies only to record and run sessions. UFT recognizes all VisualAge Smalltalk objects for Object Spy and pointing hand operations, regardless of the settings in the Record and Run Settings dialog box.
Windows Runtime	• UFT cannot open Windows Runtime applications as part of recording or running. Therefore, the **Applications opened by UFT** and **Applications opened via the Desktop** are not supported. • If you specify a specific application for recording or running using the **Applications specified below** option, enter the following information: • **For WPF or XAML-based applications:** the name of the `.exe` process for the application • **For HTML or JavaScript-based applications:** `WWAHOST.exe`

Part 2: .NET Add-in

This section includes:

.NET Add-in - Overview

You can use the UFT .NET Add-in to test user interface objects (controls) in Silverlight, .NET Web Forms, .NET Windows Forms, and Windows Presentation Foundation applications. You can create and run tests and business components on these objects, and check their properties.

This section contains:

.NET Silverlight Add-in

This chapter includes:

.NET Silverlight Add-in - Quick Reference

You can use the UFT Silverlight Add-in to test user-interface objects (controls) in Silverlight applications.

The following tables summarize basic information about the Silverlight Add-in and how it relates to some commonly-used aspects of UFT.

General	
Add-in Type	This is a Web-based add-in. Much of its functionality is the same as other Web-based add-ins. This add-in is installed as a sub add-in of the .NET Add-in. See "Web-Based Application Support" on page 25.
Supported Environments	For details on supported Silverlight environments, see the **.NET Add-in**section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	• To work with the Silverlight Add-in, your Silverlight application must be initialized with the **EnableHtmlAccess** property value set to `'True'`. For details, see http://msdn.microsoft.com/en-us/library/cc838264.aspx • **Registering Microsoft sllauncher.exe.** You can use the UFT Silverlight Add-in to test Silverlight out-of-browser applications. To do this you must register the Microsoft `sllauncher.exe` as a browser control. This executable is located in the Silverlight installation folder, for example, `%ProgramFiles%\Microsoft Silverlight`. You can do this using the UFT Register Browser Control Utility, which is available from **Start > All Programs > HP Software > HP Unified Functional Testing > Tools > Register New Browser Control.** or `<UFT installation folder>\bin\SettingNewBrowserControlApplication.exe`. For details, see "Registering Browser Controls" on page 28. **Note:** For details on accessing UFT and UFT tools and files in Windows 8.X or higher and Windows Server 2012, see "Accessing UFT in Windows 8.X or Higher Operating Systems" on page 387.
Test Object Methods and Properties	The Silverlight Add-in provides test objects, methods, and properties that can be used when testing objects in Silverlight applications. For details, see the **Silverlight** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Extending the Silverlight Add-in	"Silverlight Add-in Extensibility " (described on page 64 enables you to develop support for testing third-party and custom Silverlight controls that are not supported out-of-the-box by the UFT Silverlight Add-in.
Troubleshooting and Limitations	"Known Issues - Silverlight Add-in" on page 65.

Prerequisites

Opening Your Application	You must open UFT before opening your Silverlight application.
Add-in Dependencies	The Web Add-in must be loaded.
Other	• To work with the Silverlight Add-in, .NET FrameWork 3.0 or later must be installed on your computer. • To test your Web application in Mozilla Firefox version 33 and later, you must enable the Functional Testing Extension in one of the following ways: • If the **Select Your Add-ons** screen is displayed when you open Firefox, select to enable the Functional Testing Extension. • If the **Install Add-on** tab opens and displays Functional Testing Extension when opening Firefox, select the **Allow this installation check box** and click **Continue**. Otherwise: i. In Firefox, open the browser menu. ii. In the menu, click **Add-ons**. iii. In the Add-ons Manager tab, select the **Extensions** node. iv. In the Functional Testing Extension row, click the **Enable** button. To test your Web application in Mozilla Firefox versions earlier than 33, you must enable the legacy Firefox agent: a. Open the **<UFT installation folder>\Installations\Firefox** folder. b. From the Firefox folder, drag the **Legacy.xpi** file into Firefox. c. In Firefox, open the browser menu. d. In the menu, click Add-ons. e. In the Add-ons Manager tab, select the Extensions node. f. In the Functional Testing Extension row, disable the Functional Testing 12.50 extension and enable the extension you added to Firefox.

Configuration	
Options Dialog Box	Use the **Web** pane. (Make sure that a GUI test is open and select **Tools > Options > GUI Testing** tab **> Web > General** node.)
Record and Run Settings Dialog Box (tests only)	Use the **Web** tab. (**Record > Record and Run Settings**.)
Test Settings Dialog Box (tests only)	Use the **Web** pane. (File > Settings > Web node)
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Web** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node **> Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.

Application Area Additional Settings pane (business components only)	Use the **Web** pane. In the application area, select **Additional Settings > Web** in the sidebar.

Silverlight Add-in Extensibility

UFT Silverlight Add-in Extensibility enables you to develop support for testing third-party and custom Silverlight controls that are not supported out-of-the-box by the UFT Silverlight Add-in.

If the test object class that UFT uses to represent a control does not provide the operations and properties necessary to operate on your control, you can use Silverlight Add-in Extensibility to create a new test object class.

You can then map the control to the new test object class, and design the test object class behavior using .NET programming. You can program how operations are performed on the control, how properties are retrieved, and more.

You can also teach UFT to treat a control that contains a set of lower-level controls as a single functional control, instead of relating to each lower-level control separately.

To implement Silverlight Add-in Extensibility, you need to be familiar with:

- UFT and its Object Model Reference
- The behavior of the custom control (operations, properties, events)
- .NET programming in C#
- XML (basic knowledge)

You can install the WPF and Silverlight Add-in Extensibility SDK from the **Add-in Extensibility and Web 2.0 Toolkits** option in the UFT setup program.

The SDK also includes project templates and a wizard for Microsoft Visual Studio, that simplify setting up of your Silverlight Add-in Extensibility project.

For details on implementing Silverlight Add-in Extensibility, see the WPF and Silverlight Add-in Extensibility Help, available from the UFT Extensibility Documentation program group (**Start > All Programs > HP Software > HP Unified Functional Testing > Extensibility > Documentation** or the `<UFT installation folder>\help\Extensibility` folder).

Note: For details on accessing UFT and UFT tools and files in Windows 8.X or higher and Windows Server 2012, see "Accessing UFT in Windows 8.X or Higher Operating Systems" on page 387.

A printer-friendly (PDF) version of the *HP Unified Functional Testing WPF and Silverlight Add-in Extensibility Developer Guide* is available in the `<Unified Functional Testing installation folder>\help\Extensibility` folder.

Known Issues - Silverlight Add-in

This section describes troubleshooting and limitations for the Silverlight Add-in, and contains the following sections:

- "General" below
- "Checkpoints" below
- "Creating and editing testing documents" below
- "Running steps on Silverlight applications" on the next page

General

- UFT retrieves incorrect values for the **all items** and **selection** properties for **ListBox** and **ComboBox** controls that are bound to data via a template.
- If a recovery scenario uses the **Object State** trigger, the following may occur:
  - The recovery scenario may detect redundant test objects when checking a **SlvWindow** state.
  - The run results may not include all nodes related to the recovery scenario.
- The Silverlight Add-in is not supported on Internet Explorer 11 when the Enhanced Protected Mode is turned on.
- You cannot create a virtual object for an area in a Silverlight application.
- The Silverlight Add-in does not support 64-bit Firefox browsers.

Checkpoints

- If you insert a text area checkpoint or a text area output value using the Windows API text recognition mechanism (as opposed to the OCR mechanism), all of the text on the Silverlight control is captured (instead of only the text from the selected area).
- For some test objects, if you try to insert a text checkpoint from the Active Screen, the text checkpoint cannot be inserted and an error message is displayed.

Creating and editing testing documents

- Recording on windowless Silverlight applications is not supported on Mozilla Firefox.
- If you open a Silverlight context menu when creating or editing a test, you must close the context menu control (for example, by pressing **ESC**) before you close the browser. Otherwise, during a run session, the browser window will remain open.

  Workaround: Add the following line to the test before the line that closes the browser:

  ```
  Browser("SilverLightAUT").Page("SilverLightAUT").SlvWindow("Page").SlvButton
  ```

```
("Login").Type micEsc
```

Example:

```
Browser("SilverLightAUT").Page("SilverLightAUT").SlvWindow("Page").SlvButton
("Login").ShowContextMenu
Browser("SilverLightAUT").Page("SilverLightAUT").SlvWindow("Page").SlvButton
("Login").Type micEsc
Browser("SilverLightAUT").Close
```

Running steps on Silverlight applications

- If a Web page contains a Silverlight application that is windowless and is scrolled out of view when the page opens the first time, UFT will not be able to make this application visible. (For example, in this scenario, UFT will not be able to perform an `SlvWindow.MakeVisible` step).
- In some versions of Internet Explorer, the Silverlight application becomes active only after a **Click** operation is performed. In these cases, UFT may fail to run test steps unless an initial **Click** operation is performed.

  Workaround: Insert a step containing a **Click** operation on the Silverlight application before performing other operations on the application.
- To improve performance when running legacy tests in UFT, update your Silverlight test object descriptions to include the **devnamepath** property.

.NET Web Forms Add-in

This chapter includes:

.NET Web Forms Add-in - Quick Reference

You can use the .NET Add-in to test .NET Web Forms user-interface objects (controls).

The following tables summarize basic information about the **.NET Web Forms** application support and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	The .NET Add-in functions like a Web-based add-in when testing .NET Web Forms controls. Much of its functionality is the same as other Web-based add-ins. See "Web-Based Application Support" on page 25.
Supported Environments	For details on supported .NET Web Forms environments, see the **.NET** Add-in section of the *HP Unified Functional Testing Product Availability Matrix*.
Test Object Methods and Properties	The .NET Add-in provides test objects, methods, and properties that can be used when testing objects in .NET Web Forms applications. For details, see the **.NET Web Forms** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382 • See "Accessing Internal Properties and Methods of Run-Time .NET Web Forms Objects" on the next page.
Troubleshooting and Limitations	See "Known Issues- .NET Web Forms" on the next page.

Prerequisites	
Opening Your Application	You must open UFT and set the Record and Run options before opening your .NET Web Forms application. Open your application only after you begin the recording session.
Add-in Dependencies	The Web Add-in must be loaded.

Configuration	
Options Dialog Box	Use the **Web** pane. (Make sure that a GUI test is open and select **Tools> Options > GUI Testing** tab **> Web > General** node.)
Record and Run Settings Dialog Box (tests only)	Use the **Web** tab. (**Record > Record and Run Settings**)
Test Settings Dialog Box (tests only)	Use the **Web** pane. (File > Settings > Web node)
Custom Active Screen Capture	Use the **Web** section.

Settings Dialog Box (tests only)	(**Tools > Options > GUI Testing** tab **> Active Screen** node > **Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Web** pane. In the application area, select **Additional Settings > Web** in the sidebar.

Considerations for Testing .NET Web Forms

When testing .NET Web Forms Applications applications, consider the following:

- When UFT learns .NET Web Forms objects, it does not learn the HTML elements that comprise the test objects. For example, when UFT learns the `WbfGrid` test object, the `WbfGrid` object is the bottommost object in the hierarchy, and the HTML elements used to create the grid's cells are not learned.
- When you load the .NET Add-in, the Web event recording configurations designed for this add-in are loaded and are used whenever you record on a .NET Web Forms object. The.NET Web Forms Web event recording configurations do not affect the way UFT behaves when you record on other non-.NET Web Forms Web objects. For details, see "Event Recording Configuration for Web-Based Applications" on page 30.

Accessing Internal Properties and Methods of Run-Time .NET Web Forms Objects

You can use the **Object** property to retrieve internal (native) properties and activate internal methods of any .NET Web Forms object in your application.

In the example below, the **orientation** property of the **WbfTabStrip** control is returned and displayed in a message box.

```
MsgBox Browser("WebControls:").Page("Page").WbfTabStrip
    ("WbfTabStrip").Object.Orientation
```

The **Object** property is also useful for verifying the value of properties that are not available using a standard checkpoint.

For details on the **Object** property and for details on .NET Web Forms test objects, methods, and properties see the **.NET Web Forms** section of the *HP UFT Object Model Reference for GUI Testing*.

Known Issues- .NET Web Forms

This section describes troubleshooting and limitations for the .NET Web Forms Add-in.

General

- **xpath** and **css** properties are not supported for .NET Web Forms test objects or for other Web-based test objects that have .NET Web Forms parent test objects.
- Tests on **WbfTreeView** test objects that contain special characters may not run as expected.

  Workaround: To run a test on a **WbfTreeView** item that contains special characters, use the `#index` format. See the *.NET Web Forms Object Model Reference Help* for details.
- WbfTreeView, WbfToolbar, and WbfTabStrip test objects are not supported for browser control applications.
- Active Screen operations are not supported for WbfTreeView, WbfToolbar, and WbfTabStrip objects.
- Performing a **Select** or **Expand** operation on a WbfTreeView object that causes page navigation may fail due to a synchronization problem.

  Workaround: Try running the test on the WbfTreeView object step-by-step. For example, change:

  ```
  WbfTreeView.Select "item1;item2;item3;"
  ```

  to:

  ```
  WbfTreeView.Expand "item1
  WbfTreeView.Expand "item1;item2"
  WbfTreeView.Select "item1;item2;item3;"
  ```
- Working on a .NET Web Forms application that has calendars with more than one unified style is not fully supported.
- The value of the **Selected Date** and **Selected Range** identification properties is always **none** for WbfCalendar objects in selection mode **none**.
- To retrieve correct values for WbfCalendar **Selected Date** and **Selected Range** identification properties, the selected date or range must be currently visible in your Web Forms application.
- All operations on grouping areas in WbfUltraGrid objects (**InfragisticsUltraWebGrid**) are not recorded.
- Operations performed in a rapid sequence on `WbfUltraGrid` objects may not be recorded.

  Workaround: Try to limit the recording to 1-2 operations per second.

  WbfUltraGrid column names are comprised of the inner HTML of the column header, and therefore may include extraneous information.
- WbfUltraGrid may fail to sort columns in a descending order when the column is not already sorted.

  Workaround: Split the Sort call into two calls—first sort in ascending order, then sort in descending order. For example, change:

  ```
  WbfUltraGrid("UltraWebGrid1").Sort "Model","Descending"
  ```

to:

```
WbfUltraGrid("UltraWebGrid1").Sort "Model","Ascending"
WbfUltraGrid("UltraWebGrid1").Sort "Model","Descending"
```

- Note that Visual Basic .NET applications are supported by the UFT .NET Add-in.

Creating, Editing, and Running Testing Documents

- UFT may recognize some Web Forms grids as WebTables instead of WbfGrid test objects.

  Workaround: Do one of the following:

  - Modify the Web forms control so that it meets one of the following conditions:
    - The **class** attribute contains the string `DataGrid`.
    - The **id** attribute contains at least one of the strings `DataGrid` or `GridView`.
  - Modify the rules that UFT uses to determine when to identify a Web Forms table control as a DataGrid or GridView (and learn it as a WbfGrid test object).

    These rules are defined in:`<UFT installation folder>\dat\WebFormsConfiguration.xml`.

    The file contains comments that describe its format and explain how to use it.
- .NET Web Forms objects are supported only on Microsoft Internet Explorer.
- When recording, you must open UFT and define record options before opening your .NET Web Forms application.

Checkpoint and Output Values

- WbfTreeView, WbfToolbar, and WbfTabStrip objects are not properly recognized in the Active Screen. Therefore:

  - You cannot insert checkpoint or output value steps for these objects from the Active Screen.
  - If you select to insert checkpoints for these objects from the Keyword View or Editor while in edit mode, the expected values of these objects may be incorrect.

  Workaround: Insert checkpoint or output value steps on these objects during a recording session or remove the Active Screen for the relevant step and then insert a checkpoint from the Keyword View or Editor with your application open to the proper location, so that the values will be retrieved from the application.
- Text checkpoints are not supported for WbfTreeView, WbfToolbar, and WbfTabStrip objects.
- The Active Screen image for a WbfCalendar object is always saved before navigation. For example, if you click a **NextMonth** link, the Active Screen displays the current month. Therefore, if you create a checkpoint from the Active Screen and insert it after the `Calendar.ShowNextMonth` line, the checkpoint will fail.

Workaround: Do one of the following:

  - Insert checkpoints on calendar objects while recording.
  - While editing your test, edit the expected value for the checkpoint or insert the checkpoint before the current step.

- Table checkpoints are supported for WbfUltraGrid objects only while recording.
- When using the **WbfUltraGrid.RowCount** and **WbfUltraGrid.ColumnCount** methods or performing a table checkpoint on a grid that also contains additional grid controls inside it, UFT retrieves the rows or columns only for the outermost table. Note that the **rows** property and **RowCount** method count only the non-grouping rows.

.NET Windows Forms Add-in

This section includes:

.NET Windows Forms Support - Quick Reference

You can use the UFT .NET Add-in to test .NET Windows Forms user-interface objects (controls).

The following tables summarize basic information about .NET Windows Forms application support and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	The .NET Windows Forms testing support functions like a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. See "Windows-Based Application Support" on page 52.
Supported Environments	For details on supported .NET Windows Forms environments, see the **.NET Add-in** section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	• You can also test most custom .NET controls inherited from the System.Windows.Forms.Control regardless of which language was used to create the application (for example, Visual Basic .NET, C#, and so on) • See " Considerations for Testing .NET Windows Forms Applications"
Test Object Methods and Properties	The .NET Add-in provides test objects, methods, and properties that can be used when testing objects in .NET Windows Forms applications. For details, see the **.NET Windows Forms** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See " Considerations for Testing .NET Windows Forms Applications" on page 77. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Extending the .NET Add-in	".NET Add-in Extensibility" (described on page 78 enables you to develop support for testing third-party and custom .NET Windows Forms controls that are not supported out-of-the-box by the UFT .NET Add-in.
Troubleshooting and Limitations	See "Known Issues - .NET Windows Forms" on page 83.

Prerequisites	
Opening Your Application	You must open UFT before opening your .NET Windows Forms application
Add-in Dependencies	The .NET Add-in must be installed.

Configuration	
Options Dialog Box	Use the **Windows Applications** pane. (Select **Tools> Options > GUI Testing** tab **> Windows Applications** node).
Record and Run Settings Dialog Box (tests only)	Use the **Windows Applications** tab. (**Record > Record and Run Settings**)

	Note: If you select the **Record and Run only on** radio button in the Record and Run Settings dialog box, the settings also apply to (limit) the applications that are recognized for the .NET Windows Spy, the Object Spy, and other pointing hand operations.
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Windows applications** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node **> Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, select **Additional Settings** > **Applications** in the sidebar. See the section on the Applications pane in the *HP Unified Functional Testing User Guide*.

.NET Windows Forms Support - Testing and Configuration

This section includes

Considerations for Testing .NET Windows Forms Applications

- You can use the Keyword View and Editor to activate .NET Windows Forms test object operations and native (run-time object) operations, retrieve and set the values of properties, and check that objects in your application exist and function as expected.
- When you create a checkpoint on a .NET Windows Forms object, UFT stores the selected property values of the object. If your application changes, you can modify the captured values to match the new expected values.

.NET Windows Forms Objects - Checkpoints and Output Values

You can check or output values from supported .NET Windows Forms grid controls and use the **Object** property to retrieve internal properties.

For details, see:

- "Checking .NET Windows Forms Tables and Outputting Their Values" below
- "Accessing Internal Properties and Methods of Run-Time .NET Windows Forms Objects" on the next page

Checking .NET Windows Forms Tables and Outputting Their Values

You check or output values from supported .NET Windows Forms grid controls using the Table Checkpoint Properties dialog box.

For tables with more than 100 rows, you can specify the rows you want to include in the checkpoint or output value in the Define/Modify Row Range Dialog Box. If you do not specify the rows to include, the table checkpoint or output value captures all data in the current level or view as follows:

When working with:	The table checkpoint or output value captures:
`ComponentOne C1FlexGrid` and `C1TrueDBGrid`	The entire grid.
`Microsoft Data Grid` and `DataGrid View`	The currently displayed table (parent or child).
`Infragistics UltraWinGrid`	The band in which a cell, column, or row is selected.
`DevExpress XtraGrid`	The view that was most recently set. **Tip:** Insert a **SetView** method before your table checkpoint to ensure that the view you want is displayed when the table checkpoint runs.

Apart from the difference in captured information as listed above, you define a table checkpoint or output value for .NET Windows Forms in the same way as you do for any other table. For details, see the sections on checkpoints and output values in the *HP Unified Functional Testing User Guide*.

Accessing Internal Properties and Methods of Run-Time .NET Windows Forms Objects

You can use the **Object** property to retrieve internal (native) properties and activate internal methods of any .NET Windows Forms object in your application.

For example, you can set the focus to a particular button and change its caption using statements similar to the following:

```
Set theButton = SwfWindow("frmWin").SwfButton("OK").Object
theButton.SetFocus
theButton.Caption = "Yes"
```

The **Object** property is also useful for verifying the value of properties that are not available using a standard checkpoint.

When you use the **Object** property to retrieve arrays of structures, the **Object** property returns the COM wrapper of the **system.array** object. In your VBScript test or business component steps, you can then use the **system.array** object to access the array members.

For example, suppose a button object in your application has a **PointArray** property, which is an array of Point structures. To access the first item in the **PointArray** property, you would use the following expression:

```
SwfWindow("Form1").SwfButton("button1").Object.PointArray.GetValue1(0)
```

If the same object had an **IntArray** property, which was an array of integers, you would use the following expression to access the first item in the **IntArray** property:

```
SwfWindow("Form1").SwfButton("button1").Object.IntArray(0)
```

For details on the **Object** property and for details on .NET Windows Forms test objects, methods, and properties see the **.NET Windows Forms** section of the *HP UFT Object Model Reference for GUI Testing*.

.NET Add-in Extensibility

UFT .NET Add-in Extensibility enables you to develop support for testing third-party and custom .NET Windows Forms controls that are not supported out-of-the-box by the UFT .NET Add-in.

If the test object class that UFT uses to represent a control does not provide the operations and properties necessary to operate on your control, you can use .NET Add-in Extensibility to customize this behavior.

- You can instruct UFT to use a different test object class to represent the control.
- You can add operations or override existing ones, using .NET programming, to operate as necessary on the control.
- You can also teach UFT to treat a control that contains a set of lower-level controls as a single functional control, instead of relating to each lower-level control separately.

To implement .NET Add-in Extensibility, you need to be familiar with:

- UFT and its Object Model Reference
- The behavior of the custom control (operations, properties, events)
- .NET programming in C# or Visual Basic
- XML (basic knowledge)

You can install the .NET Add-in Extensibility SDK from the **Add-in Extensibility and Web 2.0 Toolkits** option in the UFT setup program.

The SDK also includes:

- Project templates and a wizard for Microsoft Visual Studio, that simplify setting up of your .NET Add-in Extensibility project.
- Samples of support developed using .NET Add-in Extensibility, which you can use to gain a better understanding of how to create your own support.

For installation and implementation details, see the .NET Add-in Windows Forms Extensibility Help, available from the UFT Extensibility Documentation program group (**Start > All Programs > HP Software > HP Unified Functional Testing > Extensibility > Documentation** or the `<UFT installation folder>\help\Extensibility` folder).

> **Note:** For details on accessing UFT and UFT tools and files in Windows 8.X or higher and Windows Server 2012, see "Accessing UFT in Windows 8.X or Higher Operating Systems" on page 387.

A printer-friendly (PDF) version of the *HP UFT .NET Add-in Extensibility Developer Guide* is available in the `<Unified Functional Testing installation folder>\help\Extensibility` folder.

.NET Windows Forms Spy

The .NET Windows Forms Spy (described in .NET Windows Forms Spy Dialog Box) enables you to select a specific control in your .NET application, view its run-time object properties and values, change property values in the application in run-time, listen to events on a specific control, view the event arguments, and fire events back at the application.

You can use the .NET Windows Forms Spy to help you develop extensibility for .NET Windows Forms controls.

To spy on a .NET Windows Forms application, make sure that the application is specified in the Windows Applications tab of the Record and Run Setings dialog box and that the application is running with Full Trust. If the application is not defined to run with Full Trust, you cannot spy on the .NET application's Windows Forms controls with the .NET Windows Forms Spy. For details on defining trust levels for .NET applications, see Microsoft documentation.

The .NET Windows Forms Spy is intended for advanced UFT users, especially those who are using .NET Add-in Extensibility to create support for custom .NET Windows Forms controls. The .NET Windows Forms Spy can assist you in examining .NET Windows Forms controls within your application and seeing which events cause it to change (to facilitate recording and running) and how the changes manifest themselves in the control's state.

> **Note:** The .NET Windows Forms Spy runs in the context of your .NET application, not in the UFT context. The objects and run-time object properties on which you are spying are the raw .NET objects in your application, and not the .NET test objects used in UFT. Since the .NET Windows Forms Spy runs in the context of your .NET application, you can close UFT while you use the .NET Windows Forms Spy. However, UFT must be open if you want to use the pointing hand mechanism to spy on additional objects. If you close the .NET application on which you are spying, the UFT .NET Windows Forms Spy window is closed automatically.

How to Use the .NET Windows Forms Spy

This task describes elements of the .NET Windows Forms Spy including how to:

Spy on an object

1. Make sure that the application on which you want to spy is specified in the Windows Applications tab of the Record and Run Settings dialog box, and that the application is running with Full Trust.
2. Open the .NET Windows Forms application to the window containing the object on which you want to spy.
3. Select **Tools > .NET Windows Forms Spy**. The UFT.NET Windows Forms Spy Dialog Box opens.
4. In the UFT .NET Windows Forms Spy window, click the pointing hand . Both UFT and the .NET Windows Forms Spy are minimized so that you can point to, and click on, any object in the open application.

   For details on using the pointing hand, see the section describing the pointing hand in the *HP Unified Functional Testing User Guide*.
5. Click the object whose properties you want to view. If the location you clicked in your application is associated with more than one object, the Object Selection dialog box opens. The objects associated with the location you clicked are displayed in hierarchical order.
6. Select the .NET Windows Forms object on which you want to spy and click **OK**. The UFT .NET Windows Forms Spy window opens showing the properties and values for the selected object.
7. You can repeat these steps to spy on additional objects and add them to the Objects pane in the

UFT .NET Windows Forms Spy window.

Remove objects from the Objects pane

1. Select the object that you want to remove.
2. Perform one of the following:
   - Right-click the object and select **Remove Object**.
   - Press **DELETE**.

View values of run-time object properties

In the Objects pane, select the object whose run-time object properties you want to view. The properties for the selected object are displayed in the Properties tab, with the property names on the left, and the property values on the right. A description of the selected property is displayed below the properties grid.

> **Note:** Any changes you make to the values of run-time object properties in the .NET application remain in effect only for the current instance of the .NET application. The next time you run the .NET application, the properties will return to their original run-time values.

View properties of embedded objects

1. In the Properties tab, select the property whose embedded object properties you want to view. For details on locating a property by value, see "Locate a property by its value" below.
2. Click the **Add selected property to the Objects tree** button . The property is added to the Objects pane, and its run-time object properties and property values (if any) are shown in the Properties tab. Each time you add an embedded object to the Objects pane, it is added below its parent object, in a hierarchical format.

   > **Note:** The **Add selected property to the Objects tree** button is disabled if the property's value is null, or the property is an object with no properties of its own.

Locate a property by its value

1. Click the **Search a property by value** button . The Find Property by Value dialog box opens.
2. In the **Find what** box, specify the value for which you want to search.
3. To find only those occurrences in which the capitalization matches the text you entered, select **Match case**.
4. Specify the direction from the current cursor location in which you want to search: **Up** or **Down**.
5. Click **Find Next**. The .NET Windows Forms Spy locates the property whose value you specified.

Sort the properties grid

Click one of the following buttons to sort the properties grid in the Properties tab:

- **Categorized.** Lists all properties and property values for the selected object, by category. Categories are listed alphabetically. You can collapse a category to reduce the number of visible properties. When you expand or collapse a category, a plus (+) or minus (-) is displayed to the left of the category name.
- **Alphabetical.** Alphabetically sorts all run-time object properties for the selected object.

> **Note:** The **Property Pages** button is not currently supported.

Modify values of run-time object properties

1. In the Properties tab, click the property value you want to modify. Properties shown in gray are defined as read-only in the .NET application and cannot be modified.
2. Edit the property value as required. The property value displays different types of edit fields, depending on the needs of a particular property. These edit fields include edit boxes, drop-down lists, and links to custom editor dialog boxes.

   After you modify a property value, the new value is applied to the run-time instance of the .NET application. For example, you can change the text of an edit box label, change the background color of a dialog box from gray to red, and so on.

View event arguments on an object

1. In the Objects pane, select the object whose event arguments you want to view.
2. Select the event in the Fired Events list whose arguments you want to view. The selected events arguments and argument values are shown directly below the event, in the Event Arguments list.

Listen to specified events of an object

1. In the Objects pane, select the object to whose events you want to listen.
2. In the Events list, select the check boxes for the event types to which you want to listen.

   > **Note:** The events that you select affect only the events that are listened to and logged by UFT. If you select or clear a check box for an event type after listening to events for an object, the events in the Fired Events list are not changed.

   > **Tip:** You can click the **Select All Events** or **Clear All Events** buttons to select or clear all the event check boxes. You can also right-click the Events list and select **Select All** or **Clear All**.

3. Click the **Listen to Selected Events** button . UFT starts listening to the specified events on the selected object, and **Listening** is displayed in the status bar.
4. In your .NET application, perform the operations on the object to whose events you want to listen. The specified events are logged as they occur and are shown in the Fired Events list.
5. When you want to stop listening to events, click the **Stop Listening to Events** button ■. UFT stops listening to and logging the specified events.

Fire selected events on an object

1. In the Objects pane, select the object whose events you want to fire.
2. In the Fired Events list, select one or more events that you want to fire on your .NET application. You can select multiple events using standard Windows selection techniques (**CTRL** and **SHIFT** keys).

   > **Tip:** The selected events are fired in the order in which they appear in the Fired Events list. If the events do not appear in the Fired Events list in the order in which you want to fire them, listen to more events on the object until the events you want are added to the Fired Events list in the required order.

3. If the events you selected have editable arguments, you can change their argument values in the Event Arguments list if needed before firing the events. When the events are fired, they will be fired with the modified argument values.
4. Click the **Fire Selected Events** button ⚡. The selected events are fired in the order in which they appear in the Fired Events list. You can view the effect that firing these events has on the relevant object in your .NET application. The status bar displays that the event firing is in progress, and when it ends.

Remove specific events from the Fired Events list

1. In the Objects pane, select the object whose events you want to remove from the Fired Events list.
2. Select the events in the Fired Events list that you want to remove. You can select multiple events using standard Windows selection techniques (**CTRL** and **SHIFT** keys).
3. Click the **Clear Selected Events** button ✕. The selected events are removed from the Fired Events list.

Clear all events from the Fired Events list

1. In the Objects pane, select the object whose events you want to remove from the Fired Events list.
2. Click the **Clear Event List** button . All the logged events are removed from the Fired Events list.

Known Issues - .NET Windows Forms

This section describes troubleshooting and limitations for the .NET Windows Forms Add-in.

- Navigating in grid controls using keyboard keys (for example, to select cells, rows, and so on) may not be recorded correctly.

  Workaround: Use the mouse to navigate in the grid control.
- If you call the **Back** method for a Microsoft DataGrid control on a table that does not have a parent row, no operation is performed when the statement runs, and no error message is displayed.
- Grid controls in the Card View mode are not supported.
- Changing the format of a DateTimePicker control during a test run or between record and run sessions (for example, from "`Long Date`" to "`Time`") will cause the test run to fail.
- Combo box objects of style Simple ComboBox are not supported.
- If a window in the tested application has an opacity property value not equal to 100% (that is, the form is completely or partially transparent), the Active Screen captures the image displayed below the form, and not the transparent window.
- .NET Windows Forms table checkpoints and output value steps can be created only for objects that UFT recognizes as SwfTable objects. UFT does not treat SwfPropertyGrid test objects as table objects.
- Operations on a grid cell that was selected before you started recording on the grid control may be recorded incorrectly. For example, a child cell element operation may be recorded instead of the parent grid operation (for example, **SetCellData**).

  Workaround: Before performing operations on a cell that is already selected, begin recording, move the focus to another cell, select the required cell, and then perform the required operation.
- When recording steps using low-level recording, default description properties for WinObject and Window objects do not have constant values. This may lead to different description property values during a run session, which causes steps on these objects to fail.

  Workaround:

  - **Window test objects.** Before recording, remove the `regexpwndclass` property from the list of mandatory, assistive, and Smart Identification properties using the Object identification dialog box.
  - **WinObject test objects.** Do the following:
    - Before recording, remove the **window id** property from the list of mandatory, assistive, and Smart Identification properties using the Object identification dialog box.
    - After recording, change the **regexpwndclass** property value to a regular expression for each WinObject test object in the object repository, and edit the property value to remove everything except for the control type,

      For example, change `WindowsForms10.BUTTON.app3` to `.*BUTTON.*`
- Note that Visual Basic .NET applications are supported by the UFT .NET Add-in.

.NET Windows Presentation Foundation (WPF) Add-in

This section includes:

.NET Windows Presentation Foundation (WPF) Add-in - Quick Reference

You can use the UFT Windows Presentation Foundation (WPF) Add-in to test WPF (Windows Presentation Foundation) user-interface objects (controls).

The following tables summarize basic information about the Windows Presentation Foundation Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	This is a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. This add-in is installed as a sub add-in of the .NET Add-in. See "Windows-Based Application Support" on page 52.
Supported Environments	For details on supported Windows Presentation Foundation environments, see the WPF Add-in section of the *HP Unified Functional Testing Product Availability Matrix*. **Note:** See also Child Add-ins, below.
Test Object Methods and Properties	The WPF Add-in provides test objects, methods, and properties that can be used when testing objects in WPF applications. For details, see the **.NET Windows Presentation Foundation** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • To check properties that are not included in the Checkpoint Properties dialog box you can use the `Object`, `AutomationElement`, or `AutomationPattern` property. For details, see "Accessing Internal Properties and Methods of WPF Objects" on page 89. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Extending the WPF Add-in	"WPF Add-in Extensibility" (described on page 91 enables you to develop support for testing third-party and custom WPF controls that are not supported out-of-the-box by the UFT WPF Add-in. For details, see "WPF Add-in Extensibility" on page 91
Troubleshooting and Limitations	See "Known Issues - .NET WPF" on page 91.

Prerequisites	
Opening Your Application	You can open your WPF application before or after opening UFT.
Add-in Dependencies	The Web and .NET Add-ins must be installed.

Configuration	
Options Dialog Box	Use the **Windows Applications** pane. (**Tools> Options > GUI Testing** tab **> Windows Applications** node)

Record and Run Settings Dialog Box (tests only)	Use the **Windows Applications** tab. (**Record > Record and Run Settings**)
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Windows applications** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node **> Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, select **Additional Settings > Applications** in the sidebar. See the section on the Applications pane in the *HP Unified Functional Testing User Guide*.

.NET Windows Presentation Foundation (WPF) Add-in - Testing and Configuration

This section includes

Considerations for Working with the WPF Add-in

- You can test most custom WPF controls inherited directly or indirectly from the **System.Windows.Controls.Control** class regardless of which language was used to create the application (for example, Visual Basic, .NET, C#, and so on), as well as third-party WPF controls that are inherited from the **System.Windows.Controls.Control** class and implement automation interfaces.
- You can use the Keyword View and Editor to activate WPF test objects, Automation objects and run-time object methods, retrieve and set the values of properties, and check that objects exist.

WPF Objects, Methods, and Properties to Enhance Your Test or Component

A test or business component consists of statements coded in Microsoft VBScript. These statements are composed of objects, methods, and/or properties that instruct UFT to perform operations or retrieve information. You add these statements using objects from your object repositories, and methods and properties that are available for each object type. In addition, when you record, these statements are generated automatically in response to input to the application. You can also program statements manually, or mix recorded and programmed statements in the same test or business component. You create, view, and edit these statements in the Keyword View and/or Editor.

Accessing Internal Properties and Methods of WPF Objects

When accessing the internal properties and methods of WPF objects, it is important to know which property to use to access the object that contains the information you want to set or retrieve.

- **AutomationElement property.** Returns the object that gives access to the set of standard properties that expose information about the **Automation Element**.
- **AutomationPattern property.** Returns the object that gives access to the specific instance of a **Control Pattern**. For details on the methods and properties that are accessible through the **AutomationPattern** property, see the .NET Framework Developer Center of the Microsoft Developer Network library at http://msdn2.microsoft.com/en-us/library/system.windows.automation.aspx.
- **Object property.** Returns the object that gives access to properties specific to the actual run-time UI object, as defined by the developer.

Many of the properties and methods accessible through the **AutomationElement** and **AutomationPattern** properties contain the same information as the properties and methods accessible through the **Object** property. However, information available through UI Automation that is accessed through the **Object** property lacks the standardization provided by UI Automation.

Custom properties designed by the developer are accessible only through the **Object** property.

About WPF User Interface Automation

UI Automation provides a single, consistent, reference object for UI elements in multiple frameworks (For example, Win32, WPF, and Trident). With UI Automation, the functionality of objects in the UI is defined by a set of standard control patterns and properties that are common to all objects of that type.

WPF uses UI (User Interface) Automation to define UI objects. UI Automation provides standardization of controls and properties for the functionality of objects. The .NET Add-in supports UI Automation through the AutomationElement and AutomationPattern properties.

To learn more about UI Automation, see the UI Automation Fundamentals page of the Microsoft Developer Network library at http://msdn2.microsoft.com/en-us/library/ms753107.aspx.

To learn more, see:

Automation Elements

UI Automation exposes every element in the UI as an **Automation Element**. Automation Elements expose common properties of the UI elements they represent.

For example, a button control has the **Automation Element** property **NameProperty**, which references the name or text associated with a button control. That same property is called **caption** or **alt** in Win32 and HTML, respectively. With UI Automation, all button controls have a **NameProperty**, which is mapped to the corresponding property in each framework.

The **Automation Element** also exposes **control patterns** that provide properties and expose methods specific to their control types.

Control Patterns

Control patterns represent discrete pieces of functionality that a control in the UI can perform. The total set of control patterns for a control type define the functionality of that control type.

Control patterns expose **methods** that provide the ability to programmatically manipulate the control.

Control patterns expose **properties** that provide information on the control's functionality and current state.

The set of supported control patterns for a particular control can be dynamically defined. Therefore, a particular control type may not always support the same set of control patterns. For example, a multiline edit box supports scrolling (**scrollpattern** pattern) only if its text exceeds the viewable area.

Some controls types, such as Image controls do not support any control patterns.

UFT enables you to access the methods and properties of automation elements and control patterns using special properties in the UFT object model for WPF.

For details on how to work with UI Automation in your test or business component, see "Accessing Internal Properties and Methods of WPF Objects" on page 89.

WPF Add-in Extensibility

UFT WPF Add-in Extensibility enables you to develop support for testing third-party and custom WPF controls that are not supported out-of-the-box by the UFT WPF Add-in.

If the test object class that UFT uses to represent a control does not provide the operations and properties necessary to operate on your control, you can use WPF Add-in Extensibility to create a new test object class.

You can then map the control to the new test object class, and design the test object class behavior using .NET programming. You can program how operations are performed on the control, how properties are retrieved, and more.

You can also teach UFT to treat a control that contains a set of lower-level controls as a single functional control, instead of relating to each lower-level control separately.

To implement WPF Add-in Extensibility, you need to be familiar with:

- UFT and its Object Model Reference
- The behavior of the custom control (operations, properties, events)
- .NET programming in C#
- XML (basic knowledge)

You can install the WPF Add-in Extensibility SDK from the **Add-in Extensibility and Web 2.0 Toolkits** option in the UFT setup program.

Known Issues - .NET WPF

- The UFT .NET Add-in supports:
  - Testing standard .NET Windows Forms controls from the **System.Windows.Forms** library.
  - Testing third-party .NET Windows Forms controls that are inherited from **System.Windows.Forms.Control** class.
- The UFT .NET Add-in supports testing WPF controls inherited directly or indirectly from the **System.Windows.Controls.Control** class regardless of which language was used to create the application (for example, VisualBasic, .NET, C#, and so forth), as well as third-party WPF controls that are inherited from the **System.Windows.Controls.Control** class and implement automation interfaces when the WPF Add-in is loaded.
- In addition to the controls listed in the *HP Unified Functional Testing Product Availability Matrix*, custom-built UFT support for a variety of Infragistics .NET Windows Forms controls is provided out-

of-the-box by Infragistics TestAdvantage. For more information, refer to: http://www.infragistics.com/dotnet/testadvantageoverview.aspx#Overview

- UFT does not treat text block elements as children of WPF objects, such as lists, treeviews, and tables. Therefore, they will not be returned in a **ChildObjects** statement, nor will they be learned as test objects when you select to learn a WPF object and its children.

  If you want to work with the text block elements of a WPF object, use a **GetItem()** or **GetItemProperty()** statement.

- When you spy on a WPF object using the Object Spy (or the .NET Windows Forms Spy when the .NET Add-in is loaded), and the Record and Run Settings dialog box is not configured to record on the WPF application on which you are spying, UFT recognizes the object as a standard Windows object.

  Workaround: Close your WPF application. In UFT, open the Record and Run Settings dialog box (**Record > Record and Run Settings**) and in the Windows Application tab, select the **Record and run test on any Windows application** option. Reopen your WPF application and then spy on it again.

- When you spy on a WpfComboBox control on a Microsoft Windows 7 operating system, to enable displaying the correct **all items** property value, you must first manually expand and collapse the combo box.

- To view the full type name of a .NET Windows Forms object in your application, view the **SwfTypeName** identification property in the Object Spy.

  You can also view a list of the base types of a selected object by running a statement using the following syntax:

  ```
  MsgBox <SwfTestObj>(<descr>).GetROProperty("SwfTypeNames")
  ```

  where `SwfTestObj(<descr>)` is the test object you want to check. Running this statement causes a message box to open displaying the actual class at the top of the list and the base classes below it.

- When recording steps using low-level recording, default description properties for Windows Presentation Foundation test objects do not have constant values. This may lead to different description property values during a run session, which causes steps on these objects to fail.

- When recording dynamically changing objects in your application, UFT records the object properties of the object after the change instead of on the original object before the change. This causes run sessions using this object to fail.

  Workaround: Manually change the object description in the editor.

- UFT does not treat text block elements as child objects of WPF objects, such as lists, treeviews, and tables. Therefore, they will not be returned in a **ChildObjects** statement, nor will they be learned as test objects when you select to learn a WPF object and its children.

  If you want to work with the text block elements of a WPF object, use a **GetItem()** or **GetItemProperty()** statement.

  > **Note:** The above behavior was implemented after QTP 11.00. Therefore, if you have **ChildObject** steps in existing tests that previously returned these text block elements, those tests may fail or produce unexpected results. In this case, update such steps as recommended above.

Part 3: ActiveX Add-in

This section includes:

ActiveX Add-in - Quick Reference

You can use the UFT ActiveX Add-in to test ActiveX user-interface objects (controls).

The following tables summarize basic information about the ActiveX Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	This is a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. See "Windows-Based Application Support" on page 52.
Supported Environments	For details on supported ActiveX environments, see the **ActiveX Add-in** section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	See "Considerations for Working with the ActiveX Add-in" on the next page.
Test Object Methods and Properties	The ActiveX Add-in provides test objects, methods, and properties that can be used when testing ActiveX objects in applications. For details, see the **ActiveX** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	See "Known Issues - ActiveX Add-in" on page 96.

Prerequisites	
Opening Your Application	The application containing the ActiveX controls on which you want to record must be closed before you begin a UFT recording session and set the Record and Run options. Open the application only after you begin the recording session.
Add-in Dependencies	Loading the ActiveX and Siebel add-ins together may cause problems when recording on some ActiveX methods.

Configuration	
Options Dialog Box	Use the **Windows Applications** pane. (**Tools > Options > GUI Testing** tab **> Windows Applications** node)
Record and Run Settings Dialog Box (tests only)	Use the **Windows Applications** tab. (**Run > Run Settings** or **Record > Record Settings**) **Note:** • If you select the **Record and Run only on** radio button in the Record and Run Settings dialog box, the settings also apply to (limit) the applications that are recognized for Object Spy and other pointing hand operations.

	- UFT recognizes ActiveX objects only in applications that are opened after changing the record and replay settings in the Windows Applications tab of the Record and Run Settings dialog box.
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Windows applications** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node **> Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, select **Additional Settings > Applications** in the sidebar. See the section on the Applications pane in the *HP Unified Functional Testing User Guide*.

Considerations for Working with the ActiveX Add-in

- When you create a checkpoint on an ActiveX control, UFT captures all the properties for an ActiveX control, but it does not select any properties to check.
- When testing ActiveX objects in a browser, the top-level ActiveX object is inserted within the standard Web object hierarchy, for example, `Browser.Page.ActiveX`.
- UFT can record on standard controls within an ActiveX control and if an ActiveX control contains another ActiveX control, then UFT can record and run on this internal control as well. For example, suppose your ActiveX control is a calendar that contains a drop-down list from which you can choose the month. If you record a click in the list to select the month of May, UFT records this step in the Editor as:

  ```
  Dialog("ActiveX Calendars").ActiveX("SMonth Control").WinComboBox
  ("ComboBox").Select "May"
  ```

- Loading the ActiveX and Siebel add-ins together may cause problems when recording on some ActiveX methods.
- When creating a programmatic description for an ActiveX test object and the relevant run-time object is windowless (has no window handle associated with it), you must add the **windowless** property to the description and set its value to `True`.

  For example:

  ```
  Set ButDesc = Description.Create
  ButDesc("ProgId").Value = "Forms.CommandButton.1"
  ```

```
ButDesc("Caption").Value = "OK"
ButDesc("Windowless").Value = True
Window("Form1").AcxButton(ButDesc).Click
```

For details, see the section on using programmatic descriptions in the *HP Unified Functional Testing User Guide*.

- If a "windowless" ActiveX radio button object is not first activated by clicking on it (**AcxRadioButton.Click**) or by using the **Set** method, a step containing the **AcxRadioButton.GetVisibleText** method will return an error stating that the object is not visible.

  Workaround: Insert a step using the **Click** or **Set** methods prior to any step that uses the **GetVisibleText** method on a "windowless" ActiveX radio button object.

Known Issues - ActiveX Add-in

This section describes troubleshooting and limitations for the ActiveX Add-in.

Creating, Editing, and Running Testing Documents

- The ActiveX Add-in is not supported on Internet Explorer 11 when the Enhanced Protected Mode is turned on.
- In the following ActiveX test object methods, if you specify the column by name, an error occurs when you run the test: **ActivateCell**, **ActivateColumn**, **SelectCell**, **SetCellData**, **SelectColumn.**

  Workaround: When calling these methods, specify the column by number.
- When inserting steps in the Editor for a Web application that has a mixed hierarchy of Java objects inside an ActiveX control, then it may take a long time for UFT to retrieve the possible argument values (dynamic list of values) for ActiveX arguments.

  Workaround: Insert these steps using the Keyword View (where the dynamic list of values functionality is not used).
- If UFT does not recognize an ActiveX control inside a Web page, reduce the security level within your Microsoft Internet Explorer browser.
- If an ActiveX control's internal properties have the same name as the ActiveX properties created by UFT, retrieval and verification of such properties may be problematic.

  Workaround: You can access the internal properties of an ActiveX control using the **Object** property.
- Methods performed on row and column positions for Apex, DataBound, and Sheridan grids return the values of the visible positions and not the absolute positions within the tables.

  Workaround: Use the scroll bar while recording in order to display the required cells.
- If an ActiveX control is registered after UFT was started, UFT may not recognize the controls correctly. For example, UFT may recognize an **AcxCalendar** as a **ActiveX** object.

Workaround: Install the application running the ActiveX controls and register all ActiveX objects before starting UFT.

Checkpoints and Output Values

- ActiveX table checkpoints capture only visible rows in data bound grids.
- When you insert a checkpoint on an ActiveX table from the Active Screen, the browser (or application) must be open to the same page (or screen). Otherwise, some data from the ActiveX table will be missing.

  Workaround: Create ActiveX table checkpoints while recording.
- Checkpoints and output values for ActiveX properties of type `VT_DISPATCH` are not supported.
- Checkpoints and output values for write-only ActiveX properties are not supported.
- If you perform an update run (**Run > Update Run Mode**) on a test that contains checkpoints or output values for windowless ActiveX controls, and then you rerun the test, the run session may fail. This is because a hidden property called "windowless" is missing from the test object description.

  Workaround: You can either relearn the problematic ActiveX controls, or you can add the "windowless" property with a value of 1 to all problematic, windowless ActiveX controls.

Unsupported Controls

UFT does not support certain ActiveX controls or controls with certain prefixes. These controls are listed in the table below.

Unsupported Control Prefixes	Unsupported Controls
Msawt	AMOVIE.ActiveMovieControl.2
SpectrumHR.GrabBag	MediaPlayer.MediaPlayer.1
SpectrumHR.EDataControl	Trident.HTMLEditor.1
SpectrumHR.SSDBGridEventHandler	htmlfile
ShockwaveFlash	xmlfile
Spider90	htmlfile_FullWindowEmbed
XGO	xmlfile_FullWindowEmbed
	lnkfile
	JScript
	VBScript
	MSJava
	PDF.PdfCtrl.1
	ScriptBridge.ScriptBridge.1

Unsupported Control Prefixes	Unsupported Controls
	`JavaSoft.JavaBeansBridge.1`
	`Oracle.JavaBeansBridge.1`
	`Spider.Loader.1`
	`COMCTL.ImageListCtrl.1`
	`ActiveTabs.SSTabPanel.4`
	`ActiveTabs.SSTabPanel.2`
	`ActiveTabs.SSTabPanel.3`
	`{3050f67D-98b5-11cf-bb82-00aa00bdce0b}`
	`{3050F5C8-98B5-11CF-BB82-00AA00BDCE0B}`
	`TriEditDocument.TriEditDocument.1`
	`Miner3D.Miner3DObj.1`
	`ActiveBar2Library.ActiveBar2.2`
	`{275C23E2-3747-11D0-9FEA-00AA003F8646}`
	`SpectrumHR.GrabBag.1`
	`SpectrumHR.EDataControl.1`
	`SpectrumHR.SSDBGridEventHandler.1`

Part 4: Delphi Add-in

This section includes:

Delphi Add-in - Quick Reference

You can use the UFT Delphi Add-in to test Delphi user-interface objects (controls).

The following tables summarize basic information about the Delphi Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	This is a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. See "Windows-Based Application Support" on page 52.
Supported Environments	The Delphi Add-in supports testing on Delphi controls created in the Delphi IDE and based on the Win32 VCL library. For details on supported Delphi environments, see the Delphi Add-in section of the *HP Unified Functional Testing Product Availability Matrix*.
Test Object Methods and Properties	The Delphi Add-in provides test objects, methods, and properties that can be used when testing objects in Delphi applications. For details, see the **Delphi** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Extending the Delphi Add-in	"Delphi Add-in Extensibility" (described on page 101 enables you to develop support for testing third-party and custom Delphi controls that are not supported out-of-the-box by the UFT Delphi Add-in.

Prerequisites	
Opening Your Application	You can open your Delphi application before or after opening UFT.
Add-in Dependencies	None
Other	Before running a test on a Delphi application, the application being tested must be compiled with the UFT agent **MicDelphiAgent**. See "How to Enable Communications Between UFT and Your Delphi Application" on page 102.

Configuration	
Options Dialog Box	Use the **Windows Applications** pane. (**Tools > Options > GUI Testing** tab **> Windows Applications** node)
Record and Run Settings Dialog Box (tests only)	Use the **Windows Applications** tab. (**Record > Record and Run Settings**) **Note:** • UFT recognizes only Delphi applications that have been precompiled with the **MicDelphiAgent.pas** module. For details, see "How to Enable Communications

	Between UFT and Your Delphi Application" on page 102. • In some cases, if you select the **Record and Run only on** radio button, the settings may also apply to (limit) the applications that are recognized for Object Spy and other pointing hand operations.
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Windows** section. (**Tools > Options > GUI Testing** tab **> Active Screen** pane **> Custom Level** button) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, select **Additional Settings > Applications** in the sidebar. See the section on the Applications pane in the *HP Unified Functional Testing User Guide*.

Delphi Add-in Extensibility

UFT Delphi Add-in Extensibility enables you to develop support for testing third-party and custom Delphi controls that are not supported out-of-the-box by the UFT Delphi Add-in.

If the test object class that UFT uses to represent your control does not provide the operations and properties necessary to operate on your control, you can use Delphi Add-in Extensibility to customize this behavior.

- You can map the control to an existing test object class.
- You can map the control to a new test object class that you create, and design the test object class behavior in Delphi code. You can program how operations are performed on the control, how properties are retrieved, and more.
- You can also teach UFT to treat a control that contains a set of lower-level controls as a single functional control, instead of relating to each lower-level control separately.

To implement Delphi Add-in Extensibility, you need to be familiar with:

- UFT and its Object Model Reference
- The behavior of the custom control (operations, properties, events)
- XML (basic knowledge)
- Delphi programming

Delphi Add-in Extensibility is available as part of the Delphi Add-in and does not require an additional installation.

UFT also provides samples of support developed using Delphi Add-in Extensibility, which you can use to gain a better understanding of how to create your own support.

For details on implementing Delphi Add-in Extensibility, see the Delphi Add-in Extensibility Help, available from the UFT Extensibility Documentation program group (**Start > All Programs > HP Software >**

HP Unified Functional Testing > Extensibility > Documentation or the `<UFT installation folder>\help\Extensibility` folder).

> **Note:** For details on accessing UFT and UFT tools and files in Windows 8.X or higher and Windows Server 2012, see "Accessing UFT in Windows 8.X or Higher Operating Systems" on page 387.

A printer-friendly (PDF) version of the *HP UFT Delphi Add-in Extensibility Developer Guide* is available in the `<UFT installation folder>\help\Extensibility` folder.

How to Enable Communications Between UFT and Your Delphi Application

This task describes how to:

Link to the MicDelphiAgent.pas Module to Enable Communications

You must perform the following steps for each application that you want to test.

1. Add the `<UFT Installation folder>\dat\Extensibility\Delphi` folder to your Delphi project search path, or copy the contents of the `<UFT Installation folder>\dat\Extensibility\Delphi` folder to your project folder.
2. Add **MicDelphiAgent** to the **Uses** section of your application's project file (`project.dpr`) as shown in the example below:

```
program flight;
uses
       MicDelphiAgent,
       Forms,
       Windows;
($R*.RES)
begin
       Application.Initialize
       Application.Title :='Flight Reservation';
       Application.Run;
end.
```

3. Compile your Delphi project.

> **Note:** If your application includes the **TwwDBGrid** from InfoPower, you must add support for this grid as described below..

Configure Support for TwwDBGrid

If your application includes the **TwwDBGrid** from InfoPower, do the following to enable support for this grid:

1. Add **MicWWSupport** to the **Uses** section of your application's project file (`project.dpr`) after **MicDelphiAgent**, as shown in the example below:

   ```
   program flight;
   uses
          MicDelphiAgent,
          MicWWSupport,
          Forms,
          Windows;
   ($R*.RES)
   begin
          Application.Initialize
          Application.Title :='Flight Reservation';
          Application.Run;
   end.
   ```

2. Recompile your application.

   You are now ready to create and run tests on Delphi applications.

Known Issues - Delphi Add-in

- Button controls in message boxes are identified as **WinButton** objects instead of **DelphiButton** objects.

  Workaround: Replace the button control test objects in the object repository with **DelphiButton** objects.

- By default, UFT recognizes objects in your application as Delphi objects only if the application was built with a supported version of Delphi. You can compile your application with an unsupported Delphi compiler version but UFT may experience unexpected results.

  For details on supported versions of Delphi, see the *HP Unified Functional Testing Product Availability Matrix*.

Part 5: Flex Add-in

This section includes:

Flex Add-in - Quick Reference

You can use the UFT Flex Add-in to test Flex user-interface objects (controls).

The following tables summarize basic information about the Flex Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Supported Environments	Tested applications must be built with Flex SDK versions that are supported by the UFT Flex Add-in. For details on supported Flex SDK versions, see the **Flex** section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	• You can use UFT with Flex applications that satisfy one of the following conditions: • Applications opened with Adobe Flash Player Debugger • Application s opened using the UFT Runtime Loader • Applications prepared manually for testing. Preparing the application consists of embedding the application in a Web page together with the Runtime Loader, or recompiling the application with the relevant Adobe or Apache Flex automation libraries and a UFT Flex pre-compiled agent. For details, see: • "Considerations for Working with the Flex Add-in" on page 109 • "How to Set Up the Adobe Flash Player Debugger to Enable UFT GUI Testing" on page 110 • "How to Open Flex Applications Using the Runtime Loader" on page 112 • "How to Compile Flex Applications for UFT Testing" on page 116
Test Object Methods and Properties	The Flex Add-in provides Flex test objects, methods, and properties that can be used when testing Flex objects in Flex applications. For details, see the **Flex** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide* • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	"Known Issues - Flex Add-in " on page 120

Prerequisites	
Opening Your Application	You can open your Flex application before or after opening UFT.
Add-in	• Different versions of the Flex SDK require different versions of Adobe Flash Player, Adobe Flash Player

Dependencies	Debugger, or Adobe Air. The Flex Add-in requires the versions of Adobe Flash Player / Debugger or Adobe Air that are required by the version of the Flex SDK used to build the application being tested. For more details, see the Adobe Flex SDK or Apache Flex SDK documentation. • For Flex applications that you recompile with UFT's pre-compiled agent: If the Flex applications were compiled using Adobe Flex SDK versions 4.5.x or 4.6.x, verify that you have licensed versions of the relevant Adobe Automation libraries before running full UFT GUI tests and components. If you do not have licensed versions of the libraries, consider upgrading to Apache Flex SDK version 4.9.x or 4.12.x. • UFT interacts with the Flex application it is testing via a local TCP socket object, selecting an available communication port in the range 24654 - 24663. Make sure that at least one of these ports is available on the UFT computer. If no ports in this range are available, the add-in fails to load properly. On a Windows server, multiple users can run multiple instances of UFT. To test Flex applications, you must have one port in this range available for each UFT instance.

Configuration	
Record and Run Settings Dialog Box (tests only)	Use the **Flex** tab. (**Record > Record and Run Settings**)

Flex Add-in - Testing and Configuration

This chapter includes:

Enabling UFT to Identify Objects in your Flex Application

Some preparation is required to enable UFT to communicate with and identify objects in your Flex application. Specifically, you must do one of the following:

- Install and pre-configure the relevant Flash Player Debugger
- Set up the UFT Runtime Loader on the computer or server where the application runs.
- Recompile your Flex application with the UFT Flex Agent

Depending on the type of Flex application you are testing, you may be able to choose from any of the above, or you may be limited to one or two of the above options.

The table below summarizes these possibilities, and the basic process to follow for each option:

Open Flex application using → **Application path ↓**	**Preconfigured Flash Player Debugger** (Configure once per testing computer; Flex application not modified)	**Runtime Loader** (Configure once per host computer/server; Flex application not modified)	**Precompiled Application** (Configure once per application; Must recompile Flex application)
***.html/.htm**	1. Install and preconfigure the relevant debugger. 2. **Open with:** Internet Explorer	* Relevant only for Web pages that embed an .swf application and the UFT Runtime loader 1. Make sure the RTL exists on the application host computer/server. 2. Embed the Swf application and RTL in the Web page. 3. **Open with:** Internet Explorer	1. Precompile your application with the UFT agent. 2. **Open with:** Internet Explorer
***.swf**	1. Install and preconfigure the relevant debugger. 2. **Open with**: • Internet Explorer • Flash Player Projector debugger	1. Make sure the RTL exists on the application host computer/server. 2. **Open with**: • Internet Explorer using the relevant command. • Flash Player Projector	1. Precompile your application with the UFT agent. 2. **Open with**: • Internet Explorer • Flash Player Projector
***.exe**	Not Supported	Not Supported	1. Precompile your application with the UFT agent. 2. Open the

Open Flex application using → **Application path ↓**	**Preconfigured Flash Player Debugger** (Configure once per testing computer; Flex application not modified)	**Runtime Loader** (Configure once per host computer/server; Flex application not modified)	**Precompiled Application** (Configure once per application; Must recompile Flex application)
	🟥	🟥	application directly.

Considerations for Working with the Flex Add-in

Consider the following when working with the Flex Add-in :

- "Working with or without the Web Add-in" below
- "Register local Web-based Flex applications as trusted applications" below

Working with or without the Web Add-in

You can use the Flex Add-in with or without the Web Add-in enabled. The test object hierarchy differs as follows:

- **With the Web Add-in enabled.** Flex test objects have a Web parent hierarchy.

  For example:

  ```
  Browser.Page.FlexWindow.FlexButton
  ```

- **Without the Web Add-in enabled.** Flex objects have a Windows parent hierarchy.

  For example:

  ```
  Window.WinObject.FlexWindow.FlexButton
  ```

> **Tip:** It is recommended to enable the Web Add-in when you are testing Flex applications so that you can test Flex applications in browser windows.

Register local Web-based Flex applications as trusted applications

Local Web-based Flex applications are Flex applications that are stored locally and run in a browser window. UFT does not recognize local Web-based Flex applications as Flex test objects unless all relevant elements are registered as trusted applications:

- In all cases, your local Flex application and its HTML wrapper must be registered.
- If you are opening your local Web applications using a (local) runtime loader file you also need to register the (local) Flex Runtime Loader file.
- If you use the **Open the following applications when a record or run session begins** option in the Flex tab of the Record and Run Settings dialog box and you set a local Web-based Flex application to be opened using a runtime loader, then UFT automatically creates an HTML wrapper for your application and stores the wrapper in your user profile **%temp%** folder (For example, `C:\Users\myname\AppData\Local\Temp`). In this case, you must additionally register the **%temp%** folder.

To register your local Web-based Flex applications, the HTML-wrappers, the and Runtime Loader file, add the paths of the folders that contain them (along with the **%temp%** folder if relevant) to one of the following:

- If you have an Internet connection, you can use the **Trusted Locations** list in the Flash Player Global Settings:

  Use this link to access the Settings pane: http://www.macromedia.com/support/documentation/en/flashplayer/help/settings_manager04.html and select **Edit locations** > **Add location** to edit the list).

- Otherwise, add or edit a text file located in the `FlashPlayerTrust` folder in the following location: `%appdata%\Macromedia\Flash Player\#Security\FlashPlayerTrust`

  Each line in the text file must contain the name of a folder to trust. For each specified folder, all files in that folder or any sub-folders are trusted. For example:

  ```
  # Trust all files in the Employee online calendar application folder
  %ProgramFiles%\Personnel\Employees\OnlineCalendar
  ```

  Note:

  - The `%appdata%` folder is hidden in Windows by default. To show hidden folders, open the Windows Explorer **Folder Options** dialog box and select **Show hidden files and folders**.

  - Create the `#Security\FlashPlayerTrust` folder, if it does not exist.

  - The UFT Flex Runtime Loader files are installed with UFT, in the **<UFT installation folder>\dat\Flash\Flex\Runtime Loader** folder.

How to Set Up the Adobe Flash Player Debugger to Enable UFT GUI Testing

This task describes how to set up the Adobe Flash Player Debugger on your UFT computer, and configure it for UFT testing.

After you do this, you can run Flex applications using the Adobe Flash Player Debugger (or the Adobe Flash Player Projector Debugger) and test them using UFT like you would any other type of application. You do not need to prepare the application for testing or load it in any special way.

This method can be used for SWF and HTML Flex applications.

Note: If you do not want to use the debugger to run your Flex applications, you can choose an alternative method of enabling UFT to communicate with your Flex application. For details, see "Enabling UFT to Identify Objects in your Flex Application" on page 106.

Make sure that you have the Adobe Flash Player Debugger installed

If you do not have the Adobe Flash Player Debugger, download and install the program file that is relevant for your operating system and browser from this site: **https://www.adobe.com/support/flashplayer/downloads.html**.

Tip: Some tips on locating and installing the Flash Player Debugger:

- The names **Flash Player Debugger** and **Flash Player ActiveX control content debugger** are interchangeable.
- To successfully complete the Flash Player Debugger installation on Windows 2012 or 2012 R2, add the **Desktop Experience** feature in the Windows Server Manager before installing the Flash Player Debugger from Adobe's site.

Set up the Adobe Flash Player Debugger to integrate with UFT

In this step you edit the Adobe Flash Player Debugger configuration file and add UFT's Flex Agent to the trusted locations in the Flash Player's global security settings.

- Configure the Flash Player to load the UFT Flex Agent every time it runs an application and to refrain from opening message boxes during the run session (direct the messages to the player's log file instead):

   a. Create or open the **%USERPROFILE%\MM.CFG** file

   b. Add the following lines to the file (replace `<UFT installation folder>` with the relevant path):

   ```
   PreloadSWF=<UFT installation
   folder>\dat\Flash\Flex\UFTFlexAgentInjector.swf
   SuppressDebuggerExceptionDialogs=1
   ErrorReportingEnable=1
   TraceOutputFileEnable=1
   ```

   You can use this default file as an example: **<UFT Installation folder>\dat\Flash\Flex\MM.CFG**

- (Optional) Add UFT's Flex Agent folder to the trusted locations in the Flash Player's global security settings.
(You need to perform this step only if you find that UFT does not properly interact with your Flex applications.)

   If you have an Internet connection:

   a. Open http://www.macromedia.com/support/documentation/en/flashplayer/help/settings_manager04.html

      This opens the Flash Player Help, which opens the actual Global Security Settings panel.

   b. Open the **Edit locations** drop-down list and select **Add location**.

   c. In the dialog box that opens, enter `<UFT installation folder>\dat\Flash\Flex\` in the text box (replace `<UFT installation folder>` with the relevant path), and click **Confirm**.

Otherwise:

a. Create or open a text file located in the `FlashPlayerTrust` folder in the following location:
`%appdata%\Macromedia\Flash Player\#Security\FlashPlayerTrust`

> **Note:**
>
> - The `%appdata%` folder is hidden in Windows by default. You may need to show hidden folders to see it.
> - Create the `#Security\FlashPlayerTrust` folder, if it does not exist.

b. Each line in the text file contains the name of a file or folder to trust.

Add the following line (replace `<UFT installation folder>` with the relevant path):

```
<UFT installation folder>\dat\Flash\Flex\
```

How to Open Flex Applications Using the Runtime Loader

This task describes how to open Flex applications for UFT testing in Internet Explorer, using the UFT Flex Runtime Loader.

The UFT Flex Runtime Loader enables you to test Flex applications (**.swf** files) directly without having to prepare the application manually for testing.

This method is supported only when testing **.swf** files directly.

> **Note:**
>
> - If you are testing an **.swf** application that must remain embedded in an HTML file, or other types of Flex applications, you can choose an alternative method of enabling UFT to communicate with your Flex application. For details, see "Enabling UFT to Identify Objects in your Flex Application" on page 106.
> - Do not use the Runtime Loader to load applications that you already compiled with the UFT Flex pre-compiled agent.

Prerequisites

The UFT Flex Runtime Loader files are installed with UFT, in the **<UFT installation folder>\dat\Flash\Flex\Runtime Loader** folder.

- Use one of the following Flex Runtime Loaders:
  - **UFTFlexAUTLoader_4_9_1.swf** - for testing Flex applications developed using the Flex SDK 4.9.1 or earlier
  - **UFTFlexAUTLoader_4_12_1.swf** - for testing Flex applications developed using the Flex SDK 4.12.x

- Make sure that the UFT Flex Runtime Loader is located in the same application and security domain as the Flex application you are testing.

  If the application you are testing resides on a Web server, you must place a copy of the Runtime Loader on the same Web server and use that copy to open the application.

  > **Note:**
  >
  > If you use tests that were recorded on pre-compiled Flex applications to test Flex applications opened with the Runtime Loader (or vice versa), you may need to modify the object repositories associated with the test and any test scripts that use programmatic descriptions to identify Flex test objects.
  >
  > The **uid** property value in all Flex test objects and the **id** property value in FlexWindow test objects will differ between applications opened with the Runtime Loader and pre-compiled Flex applications. Before running your test, make sure that test objects whose descriptions includes these properties match the objects found in the application you are testing.

  If the application is on the file system, use the Runtime Loader stored in the file system.

- If you use a copy of the Runtime Loader, and not one of the ones stored in the **<UFT installation folder>\dat\Flash\Flex\Runtime Loader** folder, make sure to recopy the file after any UFT upgrade to ensure that you use the most recent file version provided with UFT.

Open the Flex Web application using the Runtime Loader

Open the application in a 32-bit Internet Explorer, using the following syntax in the URL box:

```
<UFTFlexAUTLoaderPath.swf>?swf_url=<ApplicationName.swf>&<param_name1>=<param_value1>&<param_name2>=<param_value2>
```

UFTFlexAUTLoaderPath	The URL or file system path to the UFT Flex Runtime Loader file. If using file system paths, prefix the path with **file://**. For example: **file://C:\...\UFTFlexAUTLoader.swf?swf_url=C:\...\ApplicationName.swf** Make sure to use the Runtime Loader file suitable for your application: • **UFTFlexAUTLoader_4_9_1**.swf - for testing Flex applications developed using the Flex SDK 4.9.1 or earlier • **UFTFlexAUTLoader_4_12_1**.swf - for testing Flex applications developed using the Flex SDK 4.12.x
ApplicationName	The file name of the Flex application that you want to open. If the application is stored in a different folder than the Runtime Loader, include the URL or file system path to the application. **Tip:** A file system path can be a full path or the path relative to the location of the Runtime Loader.

param_names=param_values	(Optional) A list of parameters and their values to pass to the application being opened. Parameters are separated by the ampersand (&) character.

How to Embed a Flex Application in a Web Page with the Runtime Loader

This task describes how to embed a Flex application in a Web page together with the UFT Flex Runtime Loader. UFT can then test the application when this Web page is opened in Internet Explorer.

This method is useful if you are testing a Flex Web (**.swf**) application that is not already embedded in an HTML file.

> **Note:** If this method does not fit your needs, you can choose an alternative method of enabling UFT to communicate with your Flex application. For details, see "Enabling UFT to Identify Objects in your Flex Application" on page 106.

1. **Prerequisites**

   The UFT Flex Runtime Loader files are installed with UFT, in the **<UFT installation folder>\dat\Flash\Flex\Runtime Loader** folder.

   - Use one of the following Flex Runtime Loaders:
     - **UFTFlexAUTLoader_4_9_1.swf** - for testing Flex applications developed using the Flex SDK 4.9.1 or earlier
     - **UFTFlexAUTLoader_4_12_1.swf** - for testing Flex applications developed using the Flex SDK 4.12.x

   - Make sure that the UFT Flex Runtime Loader is located in the same application and security domain as the Flex application you are testing.

     If the application you are testing resides on a Web server, you must place a copy of the Runtime Loader on the same Web server and use that copy to open the application.

     > **Note:**
     >
     > If you use tests that were recorded on pre-compiled Flex applications to test Flex applications opened with the Runtime Loader (or vice versa), you may need to modify the object repositories associated with the test and any test scripts that use programmatic descriptions to identify Flex test objects.
     >
     > The **uid** property value in all Flex test objects and the **id** property value in FlexWindow test objects will differ between applications opened with the Runtime Loader and pre-compiled Flex applications. Before running your test, make sure that test objects whose descriptions includes these properties match the objects found in the application you are testing.

     If the application is on the file system, use the Runtime Loader stored in the file system.

- If you use a copy of the Runtime Loader, and not one of the ones stored in the **<UFT installation folder>\dat\Flash\Flex\Runtime Loader** folder, make sure to recopy the file after any UFT upgrade to ensure that you use the most recent file version provided with UFT.

2. Create the Web page

Make a copy of the UFT sample Web page located in **<UFT installation folder>\dat\Flash\Flex\Runtime Loader\UFTFlexAUTLoader_Sample.html**. Store this file in the same application and security domain as the UFT Flex Runtime Loader and the Flex application you are testing.

When you test your application using UFT, run the application by opening this file in Internet Explorer.

3. Update the Runtime Loader location specified in the Web page

a. (Optional) If the Runtime Loader is located in a different folder than the **html** file you created, modify the Runtime Loader file name to include a path.

The path can be a URL (if the Runtime Loader is located on a Web server), a full file system path, or a path relative to the location of the **html** file.

Locate this line to make the change:

```
<param name="movie" value="UFTFlexAUTLoader.swf" />
```

For example:

```
<param name="movie" value="C:\MyApps\FlexRT\UFTFlexAUTLoader.swf" />
```

b. In both places that the Runtime Loader file name appears in the file as **UFTFlexAUTLoader.swf**, change it to **UFTFlexAUTLoader_4_9_1.swf** or **UFTFlexAUTLoader_4_12_1.swf** according to the version of the Flex SDK used to develop the application you are testing.

4. Embed the Flex application in the Web page

Enter your application file name and, optionally, parameters, in the **swf_url** parameter, in the following lines (2 places):

```
<param name="FlashVars" value="swf_url=YourApplication.swf" />
<embed id="loader"
       width="100%" height="100%" align="middle"
       src="UFTFlexAUTLoader<version number>.swf"
       flashvars="swf_url=YourApplication.swf"/>
```

Use the following syntax:

```
swf_url=<ApplicationName.swf>&<param_name1>=<param_value1>&<param_
name2>=<param_value2>
```

ApplicationName	The file name of the Flex application that you want to open.
	If the application is stored in a different folder than the Runtime Loader, provide the URL or file system path to the application.
	For example:
	`swf_url=http://some_server/MyApp.swf`
	`swf_url=C:\\Flex\\AUTs\\MyApp45.swf`
	Tip: A file system path can be a full path or the path relative to the location of the Runtime Loader.

param_names=param_values	(Optional) A list of parameters and their values to pass to the application being opened. Parameters are separated by the ampersand (**&**) character. For example: `swf_url=MyApplication.swf&param_name=param_value&param2_name=param2_value`

How to Compile Flex Applications for UFT Testing

This task describes how to compile your Flex applications for UFT testing.

This method can be used for all supported Flex application types.

Note:

- **For all Flex applications except Adobe Air:** When you compile your Flex application with a UFT Flex pre-compiled agent, you must set the Flash Player target version to 10.0 or later.
- If you do not want to recompile your Flex application, and you are testing an HTML or SWF application, you can choose an alternative method of enabling UFT to communicate with your Flex application. For details, see "Enabling UFT to Identify Objects in your Flex Application" on page 106.

This section includes:

- "Prepare a Flex application for Web, when the Flex application is embedded in an HTML file" on the next page
- "Prepare a Flex application for Adobe AIR for testing" on the next page

- "Prepare a Flex application hosted by the Adobe Flash Player ActiveX control or Adobe Flash Player Projector (including the content debuggers)" below
- "Prepare a Flex application that uses the Flex charting or AdvancedDataGrid classes" on the next page

Prepare a Flex application for Web, when the Flex application is embedded in an HTML file

1. Link the Flex application to Adobe or Apache Flex automation libraries and a UFT Flex pre-compiled agent. To do this, add the following compiler arguments in the Flex project, and then recompile the application:

   For all Flex versions except Flex SDK 3.6:

   ```
   -include-libraries "<PATH_TO_UFT_ROOT>\dat\Flash\Flex\HpQTPAgent.swc"
   -include-libraries "${flexlib}\libs\automation\automation_agent.swc"
   -include-libraries "${flexlib}\libs\automation\automation.swc"
   -include-libraries "${flexlib}\libs\automation\automation_spark.swc"
   ```

   For Flex SDK 3.6:

   ```
   -include-libraries "<PATH_TO_UFT_ROOT>\dat\Flash\Flex\HpQTPAgent_3_6.swc"
   -include-libraries "${flexlib}\libs\automation\automation_agent.swc"
   -include-libraries "${flexlib}\libs\automation\automation.swc"
   ```

2. Embed the Flex application in a host **.html** document.
3. When testing, run your application by opening the host document in a Web browser.

Prepare a Flex application for Adobe AIR for testing

Link the Flex AIR application to Adobe or Apache Flex automation libraries and a UFT Flex pre-compiled agent. To do this, add the following compiler argument in the Flex AIR project, and then recompile the application:

```
-include-libraries "<PATH_TO_UFT_ROOT>\dat\Flash\Flex\HpQTPAgent.swc"
-include-libraries "${flexlib}\libs\automation\automation_agent.swc"
-include-libraries "${flexlib}\libs\automation\automation.swc"
-include-libraries "${flexlib}\libs\automation\automation_spark.swc"
-include-libraries "${flexlib}\libs\automation\automation_air.swc"
-include-libraries "${flexlib}\libs\automation\automation_airspark.swc"
```

Prepare a Flex application hosted by the Adobe Flash Player ActiveX control or Adobe Flash Player Projector (including the content debuggers)

1. Link the Flex application to Adobe or Apache Flex automation libraries and a UFT Flex pre-compiled

agent. To do this, add the following compiler argument in the Flex project, and then recompile the application:

```
-include-libraries "<PATH_TO_UFT_ROOT>\dat\Flash\Flex\HpQTPAgent.swc"
-include-libraries "${flexlib}\libs\automation\automation_agent.swc"
-include-libraries "${flexlib}\libs\automation\automation.swc"
-include-libraries "${flexlib}\libs\automation\automation_spark.swc"
```

2. When testing, run your application by opening it in one of the following:
   - an Adobe Flash Player ActiveX control
   - the Adobe Flash Player Projector

Prepare a Flex application that uses the Flex charting or AdvancedDataGrid classes

Link the Flex application to the `automation_dmv.swc` library. To do this, add the following compiler argument in the Flex project and then recompile your application:

```
-include-libraries "${flexlib}\libs\automation\automation_dmv.swc"
```

How to Work With Embedded Objects in Flex Lists, Tables, or Tree-Views

Sometimes, Flex objects are embedded inside of other non-container Flex objects. For example, a Flex table cell or a Flex list item might contain edit boxes, text boxes, check boxes, and so on.

UFT does not identify these objects when using the Object Spy, recording on Flex applications, or learning Flex objects.

However, for Flex objects embedded or contained inside FlexList, FlexTable, or FlexTreeView objects, you can manually add steps to your test or component that retrieve the embedded objects. Once you retrieve these child objects, you can use them as you would other test objects, though they are not stored in the object repository.

This task describes the steps you can use to access and test Flex objects embedded in FlexList, FlexTable, or FlexTreeView objects.

1. Record or learn the containing FlexTable, FlexList, or FlexTreeView objects.
2. (Optional) Activate the containing table cell, list item, or tree-view node, using the **FlexTable.SelectCell**, **FlexList.Select**, or **FlexTreeView.Select** methods.

   In some situations, this changes the embedded objects. In others, it is required in order to bring the containing object into view.
3. Retrieve the embedded Flex objects using the **FlexTable.GetCellChildObjects,**

FlexTreeView.GetItemChildObjects, or **FlexList.GetItemChildObjects** methods**.**

In these methods, you can provide a *Description* parameter that limits the returned child objects to the ones that match the description.

4. (Optional) Iterate through the collection of returned test objects to check what objects are contained inside the FlexTable cell, FlexList item, or FlexTreeView node to perform operations on the different objects.
5. Add steps to your test or component that perform operations on the embedded objects. For example, add **Set** steps on FlexSpin, FlexEdit,or FlexCheckBox objects.

   You can also perform steps on embedded objects without retrieving them, by clicking the relevant location inside the containing object. To do this, for example, use the **FlexTable.SelectRow**, **FlexTreeView.Select** or **FlexTable.SelectCell** method, providing the relevant coordinates within the row, node, or cell.
6. Check the properties of embedded objects. You can do this using the **CheckProperty** or **GetROProperty** methods, or checkpoints.

   To create a checkpoint to use for an embedded object, create the checkpoint on an object of the same type that is not embedded. The checkpoint is stored in the object repository and you can then use it for the embedded object, as demonstrated in the following example:

   ```
   'Retrieve child objects from Options column in the table's first row
   Set child_buttons = grid.GetCellChildObjects(0, "Options")
   'iterate through all retrieved options and run a checkpoint on each
   For n=0 to (child_buttons.count-1)
       child_buttons(n).Check CheckPoint("Option_radiobutton")
   Next
   ```

For details and examples on using the FlexTable and FlexList methods in your tests, see the **Flex** section of the *HP UFT Object Model Reference for GUI Testing* (**Help > HP Unified Functional Testing Help > Object Model Reference for GUI Testing > Flex**).

Known Issues - Flex Add-in

This section describes troubleshooting and limitations for the Flex Add-in.

General Functionality

- The Flex Add-in does not provide backward compatibility with the Adobe Flex Add-in for QuickTest, and uses a different set of test objects, methods, and properties. Legacy QuickTest tests recorded using the Adobe Flex Add-in cannot be used, and they cannot be upgraded to be used with the UFT Flex Add-in.
- The Flex Add-in does not support cross-domain or cross-host Flex applications. These types of applications are Flex applications where the HTML and SWF files are served from different domains, or from different hostnames within the same domain. For example, if an HTML page on **www.mysite.com** references an SWF file located on **www.anothersite.com**, or in **content.mysite.com**.
- The Flex Add-in is not supported on Internet Explorer 11 when the Enhanced Protected Mode is turned on.
- Testing Flex applications in UFT is only supported in Internet Explorer 32-bit browser versions.
- The UFT Flex Runtime Loader does not support applications that contain **mx::AreaChart** controls.
- To communicate with the Flex application, UFT selects an available port within the range 24654 - 24663. Make sure that at least one of these ports is available on the UFT computer.
  - On a Windows server, multiple users can run multiple instances of UFT. To test Flex applications, you must have one port in this range available for each UFT instance.

  - If you are testing a Flex application, you may experience a delay (up to one minute) from the moment you open UFT and your Flex application, until UFT can recognize objects in the application. This is due to the time it may take for UFT to locate an available port, as it cycles through the ports in this range, waiting for the socket connection timeout for each.

- If you are using Flex SDK version 3.6.0, you must set the Flash Player target version to 10.2 or higher when compiling your Flex application.

Active Screen

- The Active Screen pane is not fully supported for Flex test objects, and may not display the recorded steps correctly.

Object Identification and Functionality

- When identifying objects in a Flex application opened in a Web browser, the FlexWindow top-level test object is contained in a Page object.
- The UFT Flex add-in recognizes Advanced Data Grid controls as FlexTable test objects, and supports

basic table functionality for these controls. In addition, UFT supports **ExpandRow**, **CollapseRow**, and **SortByColumn** operations for tables of this type. Other abilities of Advanced Data Grid controls are not supported.

- The Flex Add-in does not support the **mx.controls::OLAPDataGrid** Flex control.
- The Navigate and Learn option is not supported in the following cases:
  - Windowless Flex applications.
  - Flex applications opened on Windows 8 or Windows 2012 (or later). (Such applications are opened as windowless Flex applications)
  - Flex applications opened in Internet Explorer using a URL with an **.swf** file extension.

  Workaround: To simultaneously add all or specific child objects from a windowless Flex application to an object repository, do the following:

  a. Start by adding one of the Flex child objects to the repository. In the **Object Selection - Add to Repository** dialog box, select the parent FlexWindow object instead of the original object you had selected.
  b. In the **Define Object Filter** dialog box, select either **All object types** to learn all child objects, or click **Select** to select the specific types of child objects you want to add.

  For more details about adding objects to object repositories, see the chapter on test objects in the *HP Unified Functional Testing User Guide*.

Part 6: Java Add-in

This section includes:

Java Add-in - Quick Reference

You can use the UFT Java Add-in to test Java user-interface objects (controls).

The following tables summarize basic information about the Java Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Supported Environments	- You can run steps on Java objects in environments such as Internet Explorer, Mozilla Firefox, Java Web Start, Applet Viewer, and in standalone Java applications. - For details on supported Java toolkits and versions, see the **Java Add-in** section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	"Considerations - Java Add-in" on page 127
Test Object Methods and Properties	The Java Add-in provides customized Java test objects, methods, and properties that can be used when testing objects in Java applications. For details, see the **Java** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	- See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. - See "Text Checkpoint and Text Output Value Steps for Java Objects" on page 142. - See "GUI Checkpoints and Output Values Per Add-in" on page 382
Extending the Java Add-in	"Java Add-in Extensibility" (described on page 128) enables you to develop support for testing third-party and custom Java controls that are not supported out-of-the-box by the UFT Java Add-in.
Troubleshooting and Limitations	"Known Issues - Java Add-in" on page 132

Prerequisites	
Opening Your Application	You can open your Java application before or after opening UFT. **Note:** If you cannot open your Java application after starting UFT, you may have a memory fragmentation issue. Check your memory settings, and see "Opening Java Applications After Opening UFT" on page 135.
Add-in Dependencies	The UFT Java Add-in can be installed and run together with any other UFT add-in. When testing Java applets in a Web browser, if your tests include operations on Web test objects, you must load the Web Add-in as well as the Java Add-in and use the Web tab of the Record and Run Settings dialog box to specify your record and run preferences.

Configuration	
Options Dialog Box	Use the **Java** pane. (Make sure that a GUI test is open and select **Tools > Options > GUI Testing** tab **> Java** node.)

Record and Run Settings Dialog Box (tests only)	Use the **Java** tab. (**Record > Record and Run Settings**
Test Settings Dialog Box (tests only)	Use the **Java** pane. (**File > Settings > Java** node)
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Java** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node **> Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	• Use the **Java** pane. In the application area, select **Additional Settings > Java** in the sidebar. • For business components, the settings displayed in this pane are read-only. To change the Java pane settings for a business component, open its associated application area and use the application area's **Additional Settings > Java** pane.

Java Add-in - Testing and Configuration

This chapter includes:

Java Add-in - Overview

This chapter explains how to use UFT to set testing preferences and to record and run steps on Java applets and applications. The chapter assumes basic knowledge of UFT features and capabilities. For details on working with UFT, see the *HP Unified Functional Testing User Guide*.

> **Note:** Some of the features described in this chapter are relevant only for tests and scripted components. For details on the features that are available when working with keyword components, see the *HP Unified Functional Testing User Guide*.

Java Testing Options

You can use the **Java** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Java** node) to set UFT record and run options on Java applets or applications. You can also open the Advanced Java Options dialog box that enables you to set table record mode preferences, enable text retrieval for checkpoints and output values, and specify lists of controls.

Java Settings - Tests and Components

You define and view Java test or business component settings using one of the following:

- The Java pane of the Test Settings dialog box.
- The Java pane of the Business Component Settings dialog box (view only).
- The Java pane of the application area's Additional Settings pane.

Java Add-in Environments

The Java Add-in uses a mechanism that supports multiple Java environments (such as IBM JRE, Oracle JRE, and Oracle JInitiator) and multiple Java versions (such as, JDK 1.5.x, 1.6.x and so on) without requiring any configuration changes. (For a list of supported environments and versions, see the *HP Unified Functional Testing Product Availability Matrix*.

This mechanism, known as the **dynamic transformation support** mechanism, adjusts the Java Add-in support classes according to the Java environment and version used. The dynamic transformation support mechanism uses the Tool Interface of the Java Virtual Machine (JVMTI) (or the Profiler Interface (JVMPI) when working with JDK 1.5 and earlier).

The dynamic transformation support mechanism is invoked by the **-Xrunjvmhook** option, which is supplied to the JVM. If the **-Xrunjvmhook** option is specified, the JVM hook profiler (part of the Java Add-in support) is loaded with every Java application or applet that loads. The JVM hook profiler dynamically transforms the necessary classes to enable context-sensitive Java support.

When you run the Java Add-in on Java 6 or Java 7 environments, the dynamic transformation support mechanism is invoked by the **-agentlib:jvmhook**, which is defined in the `JAVA_TOOL_OPTIONS` environment variable.

> **Note:** When working with Oracle Java 6 or Java 7 there is no conflict between **-agentlib:jvmhook** (defined in the `JAVA_TOOL_OPTIONS` environment variable) and **-Xrunjvmhook** (defined in the `_JAVA_OPTIONS` environment variable) because Java 6 and Java 7 ignore **-Xrunjvmhook**.
>
> When working with IBM Java 6 or Java 7, these environment variables may conflict. For workaround details, see "Running Java applications on the IBM Java Runtime Environment (JRE) 1.6 " on page 139.

The Java agent searches for the `jvmhook.dll` according to the `java.library.path` system property. You can identify any override of this system property using the Java command line: -**`djava.library.path = <path>`** However, although you can override the **java.library.path** system property, it is recommended to extend the **java.library.path** and not to overwrite it.

By default, the value of the **java.library.path** system property is the system path. If your application is loaded with a different library path, you must either add the `jvmhook.dll` to a location within the **java.library.path**, or change the **java.library.path** to contain `<Windows installation folder>/system32`.

The `<JRE root folder>/bin` folder is always located in the **java.library.path**. If needed, you can manually copy the `jvmhook.dll` to this folder. However, if you need to modify more than one computer, it is recommended to modify the batch file that alters the **java.library.path**.

For task details, see "How to Disable Dynamic Transformation Support (Advanced)" on page 129.

Considerations - Java Add-in

When learning objects and running steps on Java applications, consider the following:

- After installing the Java Add-in, Java applets and applications will always open with Java support active. You can confirm that your Java environment has opened properly by checking the Java console for a message similar to the following confirmation message: "`Loading Unified Functional Testing Java Support (version x.x.x.x) (<App> version x.x.x.x).`" (where <App> is IE, IBM, or Oracle).
- The **Object** property can access only **public** methods and properties. A recommended alternative to using the **Object** property is to extend UFT support for the required Java object using UFT Java Add-in Extensibility. For details, see the *HP UFT Java Add-in Extensibility Developer Guide*.
- You cannot add SWT-based JavaMenu objects directly to an object repository using the **Add Objects to Local** button in the Object Repository window or the **Add Objects** button in the Object Repository Manager. If you want to add an SWT-based JavaMenu objects to the object repository, you can use the **Add Objects** or **Add Objects to Local** button to add its parent object and then select to add the parent object together with its descendants. Alternatively, you can add a JavaMenu object using the **Navigate and Learn** option in the Object Repository Manager. For details, see the section on adding

test objects using the Navigate and Learn toolbar in the *HP Unified Functional Testing User Guide*.

- If you want to use a control's native property for object identification, you can add the property to a Java test object as an identification property in the Add/Remove Properties Dialog Box dialog box. If you do this, consider the following:
  - You can add only native properties for which the control has a public **get** or **is** method that returns the property value.
  - If the native property name includes upper-case letters, then in the corresponding identification property name that you create, you must replace each of the upper-case letters except the first one with `_<lower-case letter>`. For example, to use the native property `OneSmallProp`, add an identification property named `One_small_prop`.

    For more details on adding identification properties, see the section on the Object Identification dialog box in the *HP Unified Functional Testing User Guide*.
- In early releases of QuickTest, Java identification properties were not case-sensitive. If you learned a test object in a QuickTest version earlier than 11.00, you need to re-learn the object with properties that are case-sensitive by performing an **Update Run** (using the **Update test object descriptions** option). For details, see the section on Updating Test Object Descriptions in the *HP Unified Functional Testing User Guide*.
- In UFT, table data is always loaded from the application itself, even if the Active Screen contains an image of the table. For this reason, you must first open the table in the application before creating a table checkpoint in a test.
  - In some cases you may have to scroll to the last row of the table to make sure that all the data is loaded.
  - It is not necessary to open the table in your application to edit an existing table checkpoint.
- If you load or unload an add-in that is displayed as a child of the Java add-in in the Add-in Manager, only applications that are opened after loading or unloading the add-in are affected.
- When working with tests, if you create a checkpoint on an SWT-based Java tree with columns, a table checkpoint is created.
- For details on UFT functionality, see the *HP Unified Functional Testing User Guide*.

Java Add-in Extensibility

UFT Java Add-in Extensibility enables you to develop support for testing third-party and custom Java controls that are not supported out-of-the-box by the UFT Java Add-in.

If the test object class that UFT uses to represent a control does not provide the operations and properties necessary to operate on your control, you can use Java Add-in Extensibility to customize this behavior.

- You can map a custom control to an existing test object class, or to a new test object class that you define
- You can design and customize the behavior of the test object classes by developing custom Java support classes. You can program how operations are performed on the control, how properties are retrieved, and more.
- You can also teach UFT to treat a control that contains a set of lower-level controls as a single functional control, instead of relating to each lower-level control separately.

To implement Java Add-in Extensibility, you need to be familiar with:

- UFT and its Object Model Reference
- The behavior of the custom control (operations, properties, events)
- XML (basic knowledge)
- Java programming

You can install the Java Add-in Extensibility SDK from the **Add-in Extensibility and Web 2.0 Toolkits** option in the UFT setup program.

The SDK also includes:

- A plug-in for the Eclipse Java development environment, which provides wizards and commands that help you create and edit the support that you develop.
- Samples of support developed using Java Add-in Extensibility, which you can use to gain a better understanding of how to create your own support.

For details on installing and implementing Java Add-in Extensibility, see the Java Add-in Extensibility Help, available from the UFT Extensibility Documentation program group (**Start > All Programs > HP Software > HP Unified Functional Testing > Extensibility > Documentation** or the `<UFT installation folder>\help\Extensibility` folder).

Note: For details on accessing UFT and UFT tools and files in Windows 8.X or higher and Windows Server 2012, see "Accessing UFT in Windows 8.X or Higher Operating Systems" on page 387.

A printer-friendly (PDF) version of the *HP UFT Java Add-in Extensibility Developer Guide* is available in the `<UFT installation folder>\help\Extensibility` folder.

How to Disable Dynamic Transformation Support (Advanced)

This task describes how to disable the dynamic transformation support mechanism if it does not work properly, and how to manually configure the Java environment to use the Java Add-in without dynamic transformation support. For general details about using the Java Add-in with multiple environments, see "Java Add-in Environments" on page 126.

> **Note:** The dynamic transformation support mechanism is not supported when using the incremental garbage collector (**`-Xincgc`** option). Therefore, if you absolutely must use the **`-Xincgc`** option, you need to disable dynamic transformation support.

This task includes the following steps:

- "Save the dynamically transformed classes" below
- "Disable dynamic transformation support" below
- "Results" on the next page

1. Save the dynamically transformed classes

a. Specify the folder in which to save the dynamically transformed classes that will be generated during the preliminary launching of your java applet or application.

   To do this, open the registry editor (select **Start > Run**, type `regedit` in the **Open** box and click **OK**) and navigate to the **JavaAgent** main key, located in: `HKEY_LOCAL_MACHINE\SOFTWARE\Mercury Interactive\JavaAgent`. Define a new string value named **ClassesDumpFolder**, and set its value data to an existing folder (preferably empty) on your computer, for example, `C:\JavaSupportClasses`.

   > **Note:** If the `ClassesDumpFolder` string value already exists, you can modify its value data to an existing folder on your computer.

b. If you are using the **`-Xincgc`** option, temporarily remove it from the command line to enable the JVM hook profiler to transform and save the necessary classes.

c. Launch your applet or application and perform some basic operations on it. This ensures that all of the necessary classes are transformed and saved. Close your applet or application. All of the dynamically transformed classes are now saved in the folder you specified in the previous step (for example, `C:\JavaSupportClasses`).

d. If you temporarily removed the **`-Xincgc`** option from the command line, you can restore it now.

   Now that you saved the transformed classes, you are ready to disable dynamic transformation support.

2. Disable dynamic transformation support

a. Remove the **`-Xrunjvmhook`** option from the `_JAVA_OPTIONS` (or `IBM_JAVA_OPTIONS` for IBM VM-based applications, and `JAVA_TOOL_OPTIONS` if you are working with Java 6) environment variable.

b. Add the following option instead: **-Xbootclasspath/p:<ClassesDumpfolder>\Final** where **<ClassesDumpfolder>** is the value of the folder in which the dynamically transformed classes were saved, such as C:\JavaSupportClasses. For example, after your modification the _JAVA_OPTIONS environment variable might look like this:

```
-Xbootclasspath/p:C:\JavaSupportClasses\Final -
Xbootclasspath/a:C:\PROGRA~1\HP\
UNIFIE~1\bin\JAVA_S~1\classes;C:\PROGRA~1\HP\UNIFIE~1\bin\JAVA_
S~1\classes\jasmine.jar
```

3. **Results**

The saved transformed classes are now used instead of dynamic transformation.

Java Environment Variables Settings

This section describes the environment variables that need to be set when you load your Java application with UFT Java Add-in support. You need to set one or more environment variables to the path name of the Java Add-in support classes folder.

Set the _JAVA_OPTIONS environment variable (Oracle) or the IBM_JAVA_OPTIONS environment variable (IBM) as follows:

```
-Xrunjvmhook
-Xbootclasspath/a:"<UFT installation folder>\bin\java_shared\classes";
"<UFT installation folder>\bin\java_shared\classes\jasmine.jar"
```

The above settings should appear on one line (no newline separators).

Note: If you are updating to Java 8, you must temporarily rename this variable before performing the Java 8 update. After the update is finished, you can restore the variable name.

If you are working with Oracle Java 6 or 7 (versions 1.6 or 1.7), you must set an additional environment variable, JAVA_TOOL_OPTIONS, with the value **-agentlib:jvmhook**

Tip: If needed, you can temporarily remove Java support by renaming the _JAVA_OPTIONS or IBM_JAVA_OPTIONS environment variable. (If you are working with Java 5 or 6, you need to rename the JAVA_TOOL_OPTIONS environment variable as well.) For example, you must remove Java support if you want to test ActiveX controls that are embedded in SWT- or Eclipse-based applications.

Note:

You can also use short paths in these commands. For example:

```
-Xrunjvmhook -Xbootclasspath/a:C:\PROGRA~2\
HP\UNIFIE~1\bin\ JAVA_S~1\classes;C:\PROGRA~2\
HP\UNIFIE~1\bin\JAVA_S~1\classes\jasmine.jar
```

In this example, UFT is installed in the default installation folder (C drive, Program Files) on a Windows 7 computer. `PROGRA~2` denotes the `Program Files (x86)` folder, which is the Program Files folder on 64-bit operating systems.

Record and Run Environment Variables for Java Objects

You can override the values in the **Executable file**, **Command line**, and **Working directory** boxes in the Java tab of the Record and Run Settings dialog box by defining the Java application details using the following variables:

Option	Variable Name	Description
Executable file	`EXEPATH_ENV`	The executable file or a batch file to open.
Command line	`CMDLINE_ENV`	The command line to use to open the file.
Working directory	`WORKDIR_ENV`	The folder to which the specified command line or executable file refers.

For details on defining and working with environment variables, see the *HP Unified Functional Testing User Guide*.

Known Issues - Java Add-in

This section is intended to help pinpoint and resolve some common problems that may occur when testing Java applets and applications.

In some cases, running another Java application or applet with the same settings helps determine whether you are encountering a general problem with the Java Add-in or an application-specific problem. For details, see

This section includes:

- "Running Another Java Application or Applet with the Same Settings" on the next page
- "Identifying and Solving Common Problems" on the next page
- "General Notes and Limitations" on page 135

Running Another Java Application or Applet with the Same Settings

You can run another Java application or applet with the same settings as the one you are currently running to help determine whether you are encountering a general problem with the Java Add-in or an application-specific problem.

When running another Java application or applet, do the following:

- Determine whether the application is a standalone application or an applet.
- If the application is an applet, check the browser type.
- If the applet is executed from a shortcut, execute another applet with the same command.
- If the applet is executed from a batch file, copy the batch file and change only the class file that invokes the applet.

  Note: If the classpath must also be changed, add only the new items needed. Do not remove any of the items from the original application or applet classpath.

Identifying and Solving Common Problems

The UFT Java Add-in provides a number of indicators that help you identify whether your add-in is properly installed and functioning. The following table describes the indicators you may see when your add-in is not functioning properly and suggests possible solutions:

Indicator	Solution
You cannot record or run tests on Java applets or applications, or the Object Spy identifies Java objects as Standard Windows objects.	Make sure that the Java Add-in is loaded with UFT. To check this, select **Help > About Unified Functional Testing** and verify that the **Java Add-in** check box is selected. You load the Java Add-in using the Add-in Manager. For details, see "How to Manage UFT Add-ins" on page 22.
You cannot record or run tests on Java applets running on Microsoft Internet Explorer, and the Object Spy identifies Java objects in these applets as Standard Windows objects.	If you are using Oracle Java JRE 5 or 6 on Microsoft Internet Explore, the JVM might not use the Java settings added to your system's environment variables. Use the Java Add-in JRE Support Tool to adjust your computer's configuration to overcome this problem. The tool is available in the **Start > All Programs > HP Software > HP Unified Functional Testing > Tools** program group or the `UFT installation folder\bin\java\classes\QTPJavaEnabler.jar` file **Note:** For details on accessing UFT and UFT tools and files in Windows 8.X or higher and Windows Server 2012, see "Accessing UFT in Windows 8.X or Higher Operating Systems" on page 387. For details, see:

Indicator	Solution
	- "Java Environment Variables Settings" on page 131 - "Using the Java Add-in on Applets Running on Internet Explorer" on page 139
The Java console does not display a line containing text similar to "Loading Java Support".	Check that the settings in your environment correspond to the environment settings defined in this chapter, or check for a batch file that may override the settings. For details, see: - "Java Environment Variables Settings" on page 131 **Note:** For details on accessing UFT and UFT tools and files in Windows 8.X or higher and Windows Server 2012, see "Accessing UFT in Windows 8.X or Higher Operating Systems" on page 387.
A different applet or application works with the Java Add-in, but the application you want to test does not work.	First check whether you can record and run tests if you invoke the other Java applet or application using exactly the same settings. Check that the settings in your environment correspond to the environment settings defined in this chapter, or check for a batch file that may override the settings. For details, see: - "Java Environment Variables Settings" on page 131
After installing the Java Add-in, you cannot run Java applications using the IBM Java 6 JVM.	Check that the settings in your environment correspond to the environment settings defined in "Java Environment Variables Settings" on page 131, or check for a batch file that may override the settings. In addition, you may need to do the following: 1. Remove `-Xrunjvmhook` from the `_JAVA_OPTIONS` and `IBM_JAVA_OPTIONS` environment variables. Remove **-Xrunjvmhook** from the `_JAVA_OPTIONS` and `IBM_JAVA_OPTIONS` environment variables. 2. Add `-agentlib:jvmhook` at the beginning of the `_JAVA_OPTIONS` and `IBM_JAVA_OPTIONS` environment variables. Add **-agentlib:jvmhook** at the beginning of the `_JAVA_OPTIONS` and `IBM_JAVA_OPTIONS` environment variables. 3. Delete the JAVA_TOOL_OPTIONS environment variable.
The add-in does not function properly with applications that run with the `-Xincgc` option.	Either remove the `-Xincgc` option, or run without dynamic transformation support. For details, see: "How to Disable Dynamic Transformation Support (Advanced)" on page 129.
Your Java console contains the line: `Could not find -Xrun library: jvmhook.dll.`	Check that the **jvmhook.dll** is located within your **java.library.path**. Check that the `jvmhook.dll` is located within your **java.library.path**.
None of the indicators above describe my problem.	See "General Notes and Limitations" on the next page

General Notes and Limitations

This section contains general information and limitations about the Java Add-in, and includes the following sections:

Opening Java Applications After Opening UFT

- If you are not able to open your Java application after you've opened UFT, you may have a memory space fragmentation issue, caused by loading a Windows `.dll` file. If Eclipse fails to start with higher memory settings, do one of the following:

  - Use a 64-bit Windows operating system and 64-bit JVM, with 64-bit Eclipse. Have a 64-bit virtual memory space can prevent you from encountering memory fragmentation issues.

  - Force Eclipse to start using the `java.exe` or `javaw.exe` file instead of the default `jvm.dll` startup file. To do this edit the `eclipse.ini` file by adding the following text, on two separate lines:

    ```
    -vm
    <full path to the java.exe or javaw.exe file>
    ```

  - Modify the Eclipse memory setting in the `eclipse.ini` file. For example, if the application fails to start with a parameter setting of **-Xmx512m**, use a parameter setting of **-Xmx256m** or **-Xmx384m** instead.

- In some cases, Java applications that run successfully when UFT is closed, fail to run if you open them while UFT is open. An error message is displayed: **Could not create the Java Virtual Machine**.

  Workaround: Activate UFT's memory defragmenting by adding a line to the **mercury.ini** file:

  Locate the **mercury.ini** file in your Windows folder (**%windir%**) and add a line to the **Memory_Defrag** section, as follows:

```
[Memory_Defrag]
<process_name>.exe=1
```

`process_name`: The name of the Java engine or application that you are using.
`1`: Turns on defragmenting (use 0 to turn off, if necessary).

Loading a Child Add-in of the Java Add-in

When you select a child add-in under Java in the Add-in Manager, you load Java Add-in extensibility support for the selected environment.

If you load support that was developed using a Java Add-in Extensibility SDK version earlier than version 10.00, then when you open one of the UFT dialog boxes that display test object classes for a selected environment (such as the Object Identification dialog box), the extensibility test object classes are displayed in the wrong list. If you select the child add-in in the **Environment** list, the list of test object classes is empty. Instead, the extensibility test object classes are displayed directly under the Java environment instead of being displayed under the child add-in in the **Environment** list.

Additionally, in some cases, the **Generate Script** button in the Object Identification Dialog Box does not function properly.

Workaround:

1. Locate the test object configuration file associated with the child add-in. This file is located in the following locations:
   - `<UFT Installation Folder>\dat\Extensibility\Java\<add-in name>TestObjects.xml`.
   - If working with ALM: `<UFT Add-in for ALM Installation Folder>\dat\Extensibility\Java\<add-in name>TestObjects.xml`.
2. In the XML file, locate the **PackageName** attribute in the **TypeInformation** element, and change its value from `JavaPackage` to the name of the child add-in.
3. Save the file and reopen UFT.
4. If this extensibility support (child add-in) was developed by a third party, you may want to contact them for assistance.

Creating and Running Testing Documents

- If, while recording keyboard operations in a JFC single-line edit box in an IME composition window, you press the **ENTER** key to select the composition string, the key press may be recorded as the **Activate** method, thereby generating an extra step. For example:

```
JavaWindow("Application").JavaEdit("User Name").Activate
```

This extra step generally does not affect the run session adversely.

Workaround: Before running your test or business component, remove the extra step that was recorded.

- The **ALT+F4** keyboard shortcut (used for closing a Java applet or Java application) is not supported for recording or running.

  Workaround: Use a **Close** menu command or button to close a Java applet or Java application during a recording session. Alternatively, manually add a `JavaWindow(...).Close` step.

Java Environmental Variables

If you are updating to Java 8, you must temporarily rename the **_JAVA_OPTIONS** variables before performing the Java 8 update. After the update is finished, you can restore the variable name.

Record and Run Options

- Adding a **`-Xincgc`** flag to the `java.exe` command line (in the Record and Run Settings dialog box or in a batch file) prevents the Java support from working properly.

  Workaround: When testing with UFT Java support, do not use **`-Xincgc`** in your command line, or, alternatively, do not use the dynamic transformation support mechanism. For details, see the *HP Unified Functional Testing Add-ins Guide*.

- When selecting a `JAR` file from the command line in the Record and Run Settings dialog box, you should manually add **`-jar`** to the Command line box before you invoke the Java application.

- If you intend to launch your Java application using the Record and Run Settings dialog box without using a batch file (or another executable file), and without the **`-jar`** command line option (after selecting a JAR file), you should include the fully qualified name of the Java class in the Command line box.

Working with Java Controls

- By default, moving and resizing of Java windows are not recorded. This is because it may cause redundant recordings in some cases.

  Workaround: To instruct the Java Add-in record these actions, use the **Setting.Java** method to set the `record_win_ops` variable to 1. For example:

  ```
  Setting.Java("RECORD_WIN_OPS") = 1
  ```

- AWT popup menus are recorded by the Standard Window control support WinMenu test object (while other Java menus are recorded using the JavaMenu test object). You cannot perform checkpoints or Active Screen operations on such menus.

  Workaround: Use other verification methods (such as using **GetTOProperty**). For more details on verification methods, see the *HP Unified Functional Testing User Guide*.

- A call to **.Object.startModal** of a JavaInternalFrame or JavaDialog object may cause UFT to behave unexpectedly until the dialog box is closed.

- The use of multi-byte characters in a multiline edit field object is not supported.
- The Java Add-in does not record or run steps for hovering over identifiers in an Eclipse window.
- When you record a step that closes a Java dialog box, UFT records an additional **Close** statement.

  Workaround: Manually delete the extraneous **Close** statement.
- For button objects (either JavaButton or a button in a JavaToolbar) whose label is determined by the name of the image file they display, the process of naming the test object when running in JDK 1.6 is different than the one used when running in JDK 1.5.

  Therefore, if you have a test or business component containing button objects that were learned on JDK 1.5 and labeled according to their image file, when you run it on JDK 1.6, the test or business component may fail.

  Workaround:

  - For a JavaButton object—relearn the object on JDK 1.6. Then modify the test to use the new test object, or delete the old object from the object repository and rename the new test object to match the object name used in the step. Make sure the **Automatically update test and business components steps when you rename test objects** option is selected in the **General** pane of the GUI Testing tab in the Options dialog box (**Tools > Options > GUI Testing** tab **> General** node).
  - For a button in a JavaToolbar object—modify the **Item** argument in the **JavaToolbar** statement to refer to the relevant button. You can specify the button's index, or you can use the Object Spy to spy on the toolbar button, and then provide the label identification property as the **Item** argument.
- When the Active Screen displays a Java applet or ActiveX control within a Web page, the applet or control is for viewing purposes only and you cannot perform operations (for example, create checkpoints, add methods, and so forth) on the object.

  Workaround: Record an operation on the Java applet/ActiveX control to create a step on the object with the ActiveX Add-in and/or Java Add-in loaded. Then you can create a checkpoint, parameterize a step, or add a method from the individual Java applet/ActiveX control in the Active Screen.

Test Objects and Methods

The **PropertyValue** argument (second argument) of the **WaitProperty** method for any Java test object can be only of type **string**.

Workaround: Use a string instead of the original type. For example, instead of `1`, use `"1"`. For example:

```
y = JavaCheckBox("Active").WaitProperty ("enabled", "1", 1000)
```

Checkpoints and Output Values

- You can create text checkpoints and text output values only for Java objects that meet specific criteria. For details, see "Text Checkpoint and Text Output Value Steps for Java Objects" on page 142.

- To create a new table checkpoint on a Java table while editing a test or business component, you must first open the application containing the table you want to check and display the table in the application.
- If you add a checkpoints on a JavaList or JavaTree object while editing a test or business component, the **list_content** or **tree_content** property is not available in the checkpoint.

  Workaround: Create checkpoints on Java lists and Java trees while recording.
- Performing a checkpoint on an object that is not always visible (such as a list opening from a combo box selection or a menu item) is not fully supported.

  Workaround: If a checkpoint on a transient object is required, make sure the object is visible prior to executing the checkpoint. For example, in the case of combo box list, you should insert a statement that clicks the combo box button before executing the checkpoint.

Running Java applications on the IBM Java Runtime Environment (JRE) 1.6

In some cases, after installing the Java Add-in, Java applications running on the IBM Java 6 JVM cannot be started. The error message displayed may indicate that Mercury Interactive support could not be loaded and the Java Virtual Machine could not be created.

Workaround:

1. Remove **`-Xrunjvmhook`** from the `_JAVA_OPTIONS` and `IBM_JAVA_OPTIONS` environment variables.
2. Add **`-agentlib:jvmhook`** at the beginning of the `_JAVA_OPTIONS` and `IBM_JAVA_OPTIONS` environment variables.
3. Delete the `JAVA_TOOL_OPTIONS` environment variable.

Using the Java Add-in on Applets Running on Internet Explorer

In some cases, when running Java applets using Oracle Java JRE 5 or 6 on Microsoft Internet Explorer, the Java Add-in does not recognize the applet as belonging to the Java environment. It does not recognize objects in the applet as Java objects, and cannot record or run steps on them.

This happens when the JVM does not use the Java Add-in's settings from the environment variables. In this case, you need to set `-agentlib:jvmhook -Xbootclasspath/ a:"<UFT installation folder>\bin\java_shared\classes";"<UFT installation folder>\bin\java_shared\classes\jasmine.jar"` in the JVM Runtime Parameters.

Use the Java Add-in JRE Support Tool to set this string in the Runtime Parameters for the relevant JVM. The tool is available from: **Start > All Programs > HP Software > HP Unified Functional Testing > Tools > Java Add-in JRE Support Tool** or `UFT installation folder\bin\java\classes\QTPJavaEnabler.jar` file

> **Note:** For details on accessing UFT and UFT tools and files in Windows 8.X or higher and Windows Server 2012, see "Accessing UFT in Windows 8.X or Higher Operating Systems" on page 387.

Java Add-in - Test Objects

This chapter includes:

Recording Steps on Java Objects

When you record an operation on an applet, application, or Java object, UFT records the appropriate object icon next to the step in the Keyword View (for tests and business components) and adds the relevant statement in the Editor (for tests only).

If you try to record an operation on an unsupported or custom Java object, UFT records a generic Java `Object.Click` statement that includes the coordinates of the click and the mouse button (that is, left or right) that was clicked. You can create support for your custom object using the UFT Java Add-in Extensibility. For details, see the *HP UFT Java Add-in Extensibility Developer Guide*.

> **Note:** The way in which UFT records operations depends on the type of `JTable` cell editor in the table cell. For details, see "Recording Steps on Jtable Cell Editors" on the next page.

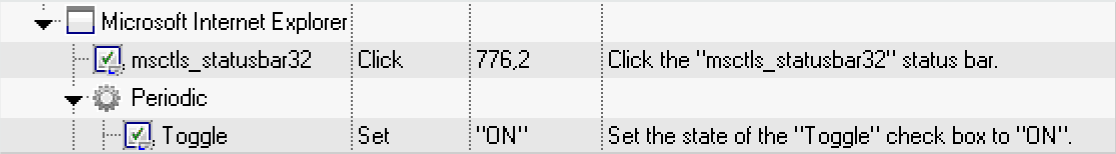
The UFT recorded hierarchy is composed of two or three levels of Java test objects. The top level is represented by the **JavaApplet**, **JavaDialog**, or **JavaWindow** object, as appropriate. The actual object on which you performed an operation may be recorded as a second or third level object. If the object is located directly in the top level object, it is recorded as a second level object (for example, **JavaApplet.JavaButton**). If a **JavaDialog** or **JavaInternalFrame** exists at the second level, then the object on which you performed the operation is recorded as a third level object (for example, **JavaWindow.JavaDialog.JavaButton**).

When testing applets in a browser, the two- or three-level hierarchy is recorded within the standard Web object hierarchy (for example, **Browser.Page.JavaApplet.JavaTestObject.SubJavaTestObject**).

Even though the object on which you record may be embedded in several levels of objects, the recorded hierarchy does not include these objects. For example, if the **JavaList** object on which you record is actually contained in several **JPanel** objects, which are all contained in a **JavaWindow**, the recorded hierarchy is only **JavaWindow.JavaList**.

Example

In a test, if you record a click on a Java check box, the Keyword View may be displayed as follows:

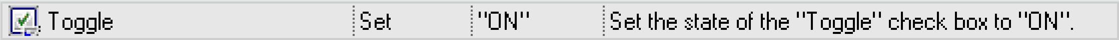


Microsoft Internet Explorer			
msctls_statusbar32	Click	776,2	Click the "msctls_statusbar32" status bar.
Periodic			
Toggle	Set	"ON"	Set the state of the "Toggle" check box to "ON".

UFT records this step in the Editor as:

```
Window("Microsoft Internet Explorer").JavaApplet("Periodic").JavaCheckBox
("Toggle").Set "ON"
```

In a keyword component, if you record a click on this same Java check box, the Keyword View would displayed as follows:



☑ Toggle	Set	"ON"	Set the state of the "Toggle" check box to "ON".

You can view the recorded hierarchy of a test object in the object repository. You can also access the full hierarchy of an object when using the pointing hand mechanism in the Step Generator (tests only), when inserting a checkpoint or output value step while recording, or when using the Object Spy.

For a related task, see "How to Modify Options for Recording on Java Tables" on page 146.

This section also includes:

Recording Steps on Jtable Cell Editors

UFT records operations differently, depending on the type of **JTable** cell editor in the table cell.

If you are recording on standard cell editors in Swing **Jtable** tables, UFT records operations by default in the same way it records other table objects, using **SetCellData** statements.

However, when a **JTable** contains a custom (non-standard) cell editor, the default **SetCellData** statement cannot be recorded. For example, if a cell contains both a check box and a button that opens a dialog box, then a **SetCellData** statement may not always provide an accurate description of the operations performed inside the cell.

If you record an operation on a custom cell editor, UFT records a statement that reflects the operation you performed on the object inside of the cell. For example, if the cell editor contains a custom check box, UFT might record the following statement:

```
Browser("Periodic").Page("Periodic").JavaWindow("CoolJava").JavaDialog
("SetOptions").JavaCheckBox("MyCheckBox").Set "ON"
```

instead of:

```
Browser("Periodic").Page("Periodic").JavaWindow("CoolJava").JavaDialog
("SetOptions").JavaTable("MyTable").SetCellData "ON"
```

Text Checkpoint and Text Output Value Steps for Java Objects

When working with tests, you can use checkpoints or output values to check that text in your Java application or applet displays correctly. Similar to many other supported environments, it is recommended to retrieve and check text from your Java applet or application by inserting a standard checkpoint or output value for the object containing the desired text, and selecting to check or output its **text** (or similar) identification property (for example, **text**, **attached text**, or **label**).

If the object you want to work with does not have an appropriate identification property, or, if for any other reason, the above recommendation does not answer your needs (for example, the text before or after the selected text is important), you can consider inserting a UFT text checkpoint or text output value step for a Java object if it meets the following criteria:

- The object must draw the text itself (and not delegate the drawing task to the underlying operating system, as is the case with most AWT business components).
- The object must draw text by overriding the **paint()** method and calling the **standard graphics.drawString()** method to draw text. For example, the object cannot use special drawing methods for writing text, such as using a method that can draw oval circles to draw the letter **O**.
- The object cannot use the **double (image) buffering** drawing technique.

> **Note:** Because many Java objects do not answer these criteria, the text checkpoint and text output mechanism for Java objects is disabled by default. You can enable it in the Advanced Java Options Dialog Box.

Full Object Hierarchy Views

The Java Add-in enables you to view the full object hierarchy of each of the objects in your application in the Object Spy and Object Selection dialog boxes. In contrast to the recorded object hierarchy, the full object hierarchy shows you all of the parent objects associated with the clicked locations and, in some cases, the child objects of the clicked object.

The full object hierarchy enables you to view associated operations and properties of non-recorded objects in the Object Spy. You can also access non-recorded objects from the Object Selection dialog box that opens when using the Step Generator dialog box (tests only) or when inserting a checkpoint or output value step during a recording session.

The Object Spy and Object Selection dialog boxes enable you to view details, insert statements, or perform operations even for elements of an object (class business components) that are not recorded, such as **java.awt.Component**. For example, you can access the edit box, drop-down list, and button elements of a combo box.

For details on the Object Spy and Object Selection dialog box, see the *HP Unified Functional Testing User Guide*.

Advanced Java Test Object Methods

Java test object classes include test object methods that you can use in your tests to enhance the interaction between UFT and the application being tested.

This section includes:

CreateObject Method

You can use the **CreateObject** method to create an instance of any Java object within your applet or application. The **CreateObject** method returns an object reference to the newly created Java object. For details on the syntax of this method, see the **Java** section of the *HP UFT Object Model Reference for GUI Testing*.

You can activate the methods of an object you create in the same way as you would activate the methods of any returned object from a prior call. Because the **CreateObject** method returns an object reference, there is no need to use the **Object** property when activating methods of the created object.

For example, you can use the **CreateObject** method to create a rectangle object. The return value is an object reference.

```
Set Rect = Browser("Periodic").Page("Periodic").JavaApplet
("Periodic").JavaObject("Panel").CreateObject ("java.awt.Rectangle", 10, 20)
```

Note: The **CreateObject** method can be performed on any Java test object. The class loader of the Java test object on which the **CreateObject** method is performed is used to load the class of the newly created Java object.

It is recommended to use the **CreateObject** method on a Java test object from the same toolkit as the object you want to create. For example, to create a **Swing/JFC** object, use the **CreateObject** method on an existing **Swing/JFC** Java test object.

GetStatics Method

You can invoke any static method, or you can set or retrieve the value of any static property of a Java class using the **GetStatics** method. For details on the syntax of this method, see the **Java** section of the *HP UFT Object Model Reference for GUI Testing*.

GetStatics returns a reference to an object that can access static members of the specified class. The class loader of the Java test object on which the **GetStatics** method is performed is used to load the class specified as a parameter of the **GetStatics** method.

For example, to invoke the **gc** method of **class.java.lang.System**, which runs the garbage collector on the application, you can insert a statement similar to the following:

```
Browser("Browser").Page("Page").JavaApplet("mybuttonapplet.htm").JavaObject
```

```
("MyButton").GetStatics("java.lang.System").gc
```

To retrieve the value of the out property of the **java.lang.System class**, you can insert a statement similar to the following:

```
Set OutStream= Browser("Browser").Page("Page").JavaApplet("mybuttonapplet.htm").
JavaObject("MyButton").GetStatics("java.lang.System").out
```

To print a message to the Java console, you can insert a statement similar to the following:

```
Set OutStream= Browser("Browser").Page("Page").JavaApplet("mybuttonapplet.htm").
JavaObject("MyButton").GetStatics("java.lang.System").out
OutStream.println "Hello, World!"
```

FireEvent / FireEventEx Methods

You can simulate an event on a Java object during a run session with the **FireEvent** and **FireEventEx** methods. The **FireEvent** method simulates an event on a Java object using one of several pre-defined event constants. If the list of pre-defined constants does not cover the event you want to fire, you can use the **FireEventEx** method to fire any Java event. For details on the syntax of these methods and for the list of pre-defined event constants, see the **Java** section of the *HP UFT Object Model Reference for GUI Testing*.

For example, you can use the **FireEvent** method to fire a **MouseClick** event on the **JavaObject** called **MyButton_0**.

```
Browser("Browser").Page("Page").Applet("mybuttonapplet.htm").JavaObject
("MyButton_0").FireEvent micMouseClick, 0, "BUTTON1_MASK", 4, 4, 1, "OFF"
```

Alternatively, you can use the **FireEventEx** method to fire the same event as follows:

```
Browser("Browser").Page("Page").Applet("mybuttonapplet.htm").JavaObject
("MyButton_0").FireEventEx "java.awt.event.MouseEvent", "MOUSE_CLICKED", 0,
"BUTTON1_MASK", 4,4, 1, "False"
```

Note that you can pass any Java constant that is used as one of the event's constructor parameters using its string, rather than its value. In the example above, the **"java.awt.event.MouseEvent"** Java constant `MOUSE_CLICKED` is supplied as a string argument instead of its value (500 in this example).

How to Modify Options for Recording on Java Tables

This task describes how to modify some recording options for recording on Java table, as well as identify the toolkit class for an editor for use with the **table_external_editors_list**

This task includes the following steps:

- "Modify the default JTable recording behavior for SetCellData statements (advanced)" below
- "Modify table cell control options" below
- "Find the toolkit class of a JTable cell editor" on the next page

Modify the default JTable recording behavior for SetCellData statements (advanced)

If the default recording behavior for JTables does not provide the desired value for the `SetCellData` statement of a particular editor, set that editor to be recorded, like a custom cell editor, in terms of the operation performed on the object inside the cell.

Do one of the following:

- In the Advanced Java Options Dialog Box, select **Table cell controls > Controls to identify as separate test objects**, and then specify specific cell editor types that should always be treated as separate objects, and not as part of a JavaTable object.
- Create a `Setting.Java ("table_internal_editors_list")` statement. For details, see Advanced Java Options Dialog Box, and the *HP UFT Object Model Reference for GUI Testing*.

Modify table cell control options

You can specify a list of table cell controls that you want UFT to identify as separate test object, or for which you want UFT to record and run JavaTable operations.

> **Note:**
>
> - Any changes you make are not applied to the currently open test or business component.
> - You can restore the default settings in the Advanced Java Options Dialog Box by clicking the **Reset** button.

1. In the Advanced Java Options Dialog Box, click the relevant option once to highlight it.
2. Click the option again or press **F2** to open an edit box in which you can add or modify a list of controls.
3. Change the value as necessary.

   > **Note:** Specify editor class names separated by a space, tab, newline, or return character. Values are case sensitive.

4. When you finish editing the value, click another location in the dialog box to set the value.
5. To apply your changes to the currently open test or business component, close the document and then reopen it.

Find the toolkit class of a JTable cell editor

If you do not know the value of the toolkit class for an editor for use with the **table_external_editors_list** variable, you can find it by doing one of the following:

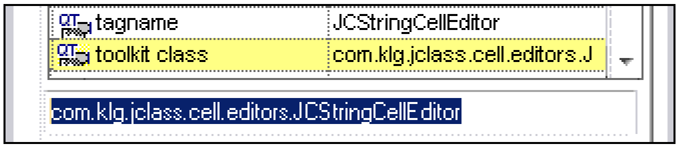
- **Use the Object Spy to retrieve the value.**
- **Run a short test in UFT to retrieve the value.** You may want to do this when working with a cell that does not stay activated for long enough to capture the cell with the Object Spy. For example, a cell that is no longer active after a check box is selected or cleared.
- **Create a user-defined function and insert it as a step in your test.** You may want to do this when working with business components.

  You can insert steps similar to the following example:

  ```
  ' Sample test to retrieve the toolkit class of a table cell editor
  ' that cannot be made continuously active
  Set table = JavaWindow("TableDemo").JavaTable("Left table").Object
  Set JTableCS = table.mic_get_supp_class()
  Set comp = JTableCS.getComponentAt(table, 0, 6) ‘row 0, col 6
  MsgBox comp.getClass().getName()
  ' Set the value of TABLE_EXTERNAL_EDITORS_LIST
  Setting.Java("TABLE_EXTERNAL_EDITORS_LIST") = comp.getClass().getName()
  ```

To find the toolkit class of a JTable cell editor using the Object Spy:

1. Open the table and activate a cell in the cell editor column. For example, make sure the cursor is blinking inside an edit field or display the drop-down list of a combo box.
2. With the appropriate cell activated, use the Object Spy to point to the active cell. For details on using the Object Spy dialog box , see the *HP Unified Functional Testing User Guide*.
3. Make sure the Properties tab of the Object Spy is displayed and select the **Identification** radio button.
4. In the **Properties** column, scroll to **toolkit class**.
5. In the **Values** column, select the value of the **toolkit class**. The value is displayed in the box below the Properties tab.

tagname	JCStringCellEditor
toolkit class	com.klg.jclass.cell.editors.J

   com.klg.jclass.cell.editors.JCStringCellEditor

6. Copy and paste the value from the Object Spy to the **Table cell controls > Controls to identify as**

separate test objects option or your `Setting.Java ("table_internal_editors_list")` statement.

Part 7: Mobile Add-in

This section includes:

Mobile Add-in - Quick Reference

Built on native HP technology, HP Mobile Center integrates mobile testing with many HP testing tools including Unified Functional Testing (UFT), Lean Functional Testing (LeanFT), Business Process Testing (BPT), Sprinter, LoadRunner, and Performance Center.

You can use UFT to record and run GUI tests and components on mobile applications that are running on real mobile devices hosted on HP Mobile Center. After you connect your devices to HP Mobile Center, you can immediately start testing them using the Mobile Add-in.

> **Note:** For details on using UFT with HP Mobile Center, see the UFT section in the Mobile Center Help.
>
> For details about known issues when testing mobile devices, see the Mobile Center Readme (Passport required).

The following tables summarize basic information about the Mobile Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Supported Environments	• For supported versions of HP Mobile Center, see: My product matrix in the Mobile Center Help. • For supported mobile devices, see: Connect devices to HP Mobile Center in the Mobile Center Help.
Test Object Methods and Properties	The Mobile Add-in provides test objects, methods, and properties that can be used when testing objects in mobile applications. For details, see the **Mobile** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See: "GUI Checkpoints and Output Values Per Add-in" on page 382
Considerations and Limitations	See limitations in the Mobile Center Readme (Passport required).

Configuration	
Options	Make sure that a GUI test is open and select **Tools > Options > GUI Testing** tab **> Mobile** node. For details, see Define connections and record and run settings in the Mobile Center Help.
Record and Run Settings	Make sure that a GUI test is open and select **Record > Record and Run Settings**. For details, see Define connections and record and run settings in the Mobile Center Help.
Test/Component Settings	Make sure that a GUI test is open and select **File > Settings > Mobile Hybrid** pane. Relevant only for a test that meets BOTH of the following conditions: • The test was created prior to UFT version 12.51. • The test includes steps on a hybrid application.

	For details, see: Testing hybrid applications in the Mobile Center Help.

Part 8: Oracle Add-in

This section includes:

Oracle Add-in - Quick Reference

You can use the UFT Oracle Add-in to test Oracle Applications and Oracle Forms objects (controls).

The following tables summarize basic information about the Oracle Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	This is a Web-based add-in. Much of its functionality is the same as other Web-based add-ins. See "Web-Based Application Support" on page 25.
Supported Environments	For details on supported Oracle environments, see the **Oracle Add-in** section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	When working with the Oracle Add-in, you must: • Verify that the Oracle `Name` attribute is unique. See "How to Verify or Enable the Oracle Server Unique Name Attributes" on page 159. • Enable the Oracle `Name` attribute. See "How to Enable the Oracle Name Attribute" on page 159.
Test Object Methods and Properties	The Oracle Add-in provides test objects, methods, and properties that can be used when testing objects in Oracle applications. For detail, see the **Oracle** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	See "Known Issues - Oracle Add-in" on page 164.

Prerequisites	
Opening Your Application	You can open your Oracle application before or after opening UFT.
Testing in Mozilla Firefox	To test your Web application in Mozilla Firefox version 33 and later, you must enable the Functional Testing Extension in one of the following ways: • If the **Select Your Add-ons** screen is displayed when you open Firefox, select to enable the Functional Testing Extension. • If the **Install Add-on** tab opens and displays Functional Testing Extension when opening Firefox, select the **Allow this installation check box** and click **Continue**. Otherwise: a. In Firefox, open the browser menu. b. In the menu, click **Add-ons**. c. In the Add-ons Manager tab, select the **Extensions** node.

	d. In the Functional Testing Extension row, click the **Enable** button. To test your Web application in Mozilla Firefox versions earlier than 33, you must enable the legacy Firefox agent: 1. Open the **<UFT installation folder>\Installations\Firefox** folder. 2. From the Firefox folder, drag the **Legacy.xpi** file into Firefox. 3. In Firefox, open the browser menu. 4. In the menu, click Add-ons. 5. In the Add-ons Manager tab, select the Extensions node. 6. In the Functional Testing Extension row, disable the Functional Testing 12.50 extension and enable the extension you added to Firefox.
Add-in Dependencies	• The Web Add-in must be loaded. The Web Add-in supports Web-based forms. • The Java Add-in must be loaded if your Oracle test or business component includes Java test objects.

Configuration	
Options Dialog Box	Use the Java pane if your Oracle test or business component includes Java test objects. (Make sure that a GUI test is open and select **Tools > Options > GUI Testing** tab **> Java** node).
Record and Run Settings Dialog Box (tests only)	Use the **Oracle** tab. (**Record > Record and Run Settings**)
Test Settings Dialog Box (tests only)	• Use the **Web** pane. (**File > Settings > Web** node) • Use the Java pane if your Oracle test or business component includes Java test objects. (**File > Settings > Java** node)
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the Oracle **applications** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node **> Custom Level**) For details, see the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	• Use the **Web** pane if your test includes Web test objects. In the application area, select **Additional Settings > Web** in the sidebar. • Use the **Java** pane if your Oracle test or business component includes Java test objects. In the application area, select **Additional Settings > Java** in the sidebar. (The options shown in the Java pane of the Test Settings dialog box are the same as the options that are available in the Additional Settings in the application area.)

Oracle Add-in - Testing and Configuration

This chapter includes:

Considerations for Working with the Oracle Add-in

- If you installed a version of JInitiator 1.1.x after installing the Oracle Add-in, a warning is displayed when you start recording your test or business component. Versions of JInitiator 1.1.x installed after you install the Oracle Add-in are not supported by UFT. In this case, you can repair the Oracle Add-in to enable full support of all currently installed versions of JInitiator 1.1.x. For details, see the section on repairing your UFT installation in the *HP Unified Functional Testing Installation Guide*.

  If you try to record an action on an Oracle object with an unsupported version of JInitiator 1.1.x, UFT records a generic `WinObject.Click` statement that includes the coordinates of the click and the mouse button that was clicked.

- After installing the Oracle Add-in, your applications will always open with Java support active. You can confirm that your Oracle environment has opened properly by checking the Java console for the confirmation message similar to:

  ```
  Loading Oracle Support (version x.x build xxx) (Oracle Corporation x.x.x.xx).
  ```

  For details, see " Dynamic Transformation Support " on page 158.

  > **Note:** The UFT Oracle Add-in supports only Oracle clients that are Java-based. Oracle Developer/2000 is not supported.

- Before using the Oracle Add-in to test Oracle Applications, you must first enable the Name attribute supplied by the Oracle Applications server. details, see "How to Enable the Oracle Name Attribute" on page 159.

- The Oracle Applications server supplies a unique **Name** attribute for many application objects. You can also find the Oracle Applications server **Name** attribute in the Oracle Add-in **developer name** identification property. The **developer name** identification property is used by UFT in most test object descriptions to identify Oracle objects. For details, see "How to Enable the Oracle Name Attribute" on page 159.

- In UFT, table data is always loaded from the application itself, even if the Active Screen contains an image of the table. For this reason, you must first open the table in the application before creating a table checkpoint in a test.

  - In some cases you may need to scroll to the last row of the table to make sure that all the data is loaded.

  - If the table object is not open in your application when you create the checkpoint, the Table Checkpoint Properties dialog box contains only the Properties tab, and the option to select which type of information to check (content or properties) is disabled.

  - It is not necessary to open the table in your application to edit an existing table checkpoint.

- For details on UFT functionality, see the *HP Unified Functional Testing User Guide*.

Recording Tests on Oracle Applications

As you record on an Oracle Applications session, UFT inserts statements into your test or business component that represent the operations you perform. The UFT Oracle Add-in recognizes specific Oracle objects such as button, form, navigator, list, and tree. It records these objects in relation to the data selected or entered and to the object within its parent object.

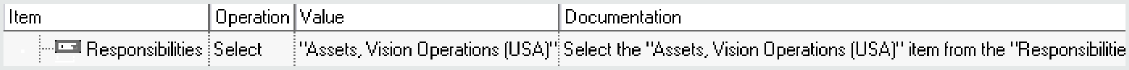
Note: UFT does not record the selection of Oracle tabs. Each object in an Oracle tab is included in the object repository within the tab hierarchy. UFT then uses this hierarchy when the test or business component is run, switching to the appropriate tab if needed.

The UFT learned object hierarchy is composed of one, two, or three levels of Oracle test objects. Depending on the actual object on which you performed an operation, that object may be recorded as a first level object (for example, **OracleLogon**), as a second level object (for example, **OracleFormWindow.OracleList**), or as a third level object (for example, **OracleFormWindow.OracleTabbedRegion.OracleTable**).

Even though the object on which you record may be embedded in several levels of objects, the recorded hierarchy does not include these objects. For example, even if the `OracleListOfValues` object in which you select an item is actually within an Oracle form, which is contained within an Oracle Applications session window, the recorded hierarchy is only `OracleListOfValues`.

Example of a Step on an Oracle Object

If you record the selection of an item in an Oracle List of Values window, the Keyword View may be displayed as follows:



Item	Operation	Value	Documentation
Responsibilities	Select	"Assets, Vision Operations (USA)"	Select the "Assets, Vision Operations (USA)" item from the "Responsibilitie

UFT records this step in the Editor as:

```
OracleListOfValues("Responsibilities").Select "Assets, Vision Operations (USA)"
```

Working with Tests

Each time you begin recording a test, you can use the Oracle Tab of the Record and Run Settings dialog box to instruct UFT to connect to a specified Oracle Applications server. Alternatively, you can instruct UFT to record on any open browser. For details, see "Recording Tests on Oracle Applications" above.

Working with Components

The Record and Run Settings dialog box is used for tests only. When you record a business component on an Oracle Applications session, you cannot instruct UFT to open or connect to a specified Oracle Applications server. You can open and connect to it manually or include statements in your business component (using the **OpenApp** operation or the SystemUtil utility object and the OracleLogon test object) that open and connect to the Oracle Applications server. For details on the Applications pane and Applications dialog box, see the *HP Unified Functional Testing User Guide*.

Working with Java Test Objects

You may have a combination of Oracle and Java test objects in your Oracle test or business component. This occurs when UFT encounters a Java applet within your Oracle Applications session and records it using the Java test object hierarchy.

You can edit steps that use Java test objects, methods, and properties in the same way as you edit other standard steps. You can add new steps to existing tests or business components using the new Oracle test object model. For details on Java objects, methods, and properties, see the **Java** section of the *HP UFT Object Model Reference for GUI Testing*, installed together with the Oracle Add-in. For details on Oracle objects, methods, and properties, see the **Oracle** section of the *HP UFT Object Model Reference for GUI Testing*.

There are specific options and settings you can use in your test or business component that apply only to steps that use Java test objects. These options and settings are located in the Java pane of the Test Settings dialog box (**File > Settings > Java** node) and the Java pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Java** node). For more information, click the **Help** button in the relevant Java pane. Note that the options in the Java panes do not have any effect on Oracle object steps in your test or business component.

Dynamic Transformation Support

The Oracle Add-in uses a mechanism for supporting multiple Java environments (Oracle Plug-in, JInitiator) and their versions (JInitiator 1.1.8, 1.3.1, and so on) without requiring any configuration changes. This mechanism is known as dynamic transformation support.

Dynamic transformation support uses the profiler interface of the Java Virtual Machine (JVM) to adjust the Oracle Add-in support classes according to the Java environment and version in use.

The dynamic transformation support mechanism is invoked by the **-Xrunjvmhook** option (for JInitiator 1.3.1.x and Sun Plug-in 1.4.1) or the **_classload_hook=jvmhook** option (for JInitiator 1.1.x) supplied to the JVM. If this option is specified, the JVM hook profiler, which is part of the Oracle Add-in support, is loaded with every application or applet and dynamically transforms the necessary classes to enable context-sensitive Oracle support.

- If the dynamic transformation support mechanism does not work properly, you can disable it and manually configure the Oracle environment to use the Oracle Add-in without dynamic transformation support. For details, see "How to Disable Dynamic Transformation Support" on page 161.
- The dynamic transformation support mechanism is not supported when using the incremental garbage collector (**-Xincgc** option). Therefore, if you absolutely must use the **-Xincgc** option, you need to disable dynamic transformation support. For details, see "How to Disable Dynamic Transformation Support" on page 161

How to Verify or Enable the Oracle Server Unique Name Attributes

This task includes the following steps:

- "Prerequisite" below
- "Enable the Oracle server to supply unique Name attributes" below

1. **Prerequisite**

   Use the Object Spy to point to a few edit boxes inside the Oracle application and view the **developer name** attribute. If the **developer name** is displayed in all capital letters in the format `FORM:BLOCK:FIELD` or `FORM_BLOCK_FIELD`, then the **developer name** attribute is supplied correctly.

   If the **developer name** value is empty, then the server does not supply unique **Name** attributes. To use the Oracle Add-in to test Oracle Applications, your Oracle server must supply unique **Name** attributes.

   Your Oracle server administrator can assist you in enabling unique **Name** attributes.

2. **Enable the Oracle server to supply unique Name attributes**

   a. Add the following line to the server configuration file (for example, `$OA_HTML/bin/appsweb_UKTRN_hwu00001.cfg`):

   ```
   otherparams=record=names
   ```

   b. Restart the Oracle server.

How to Enable the Oracle Name Attribute

This task describes the different ways in which you can enable the **Name** attribute supplied by the Oracle Applications server before using the Oracle Add-in to test Oracle Applications.

This task includes:

- "Enable the Name attribute when accessing the application directly" on the next page
- "Enable the Name attribute when using HTML to launch the Oracle application" on the next page
- "Enable the Name attribute when using the Personal Home Page to launch your Forms 6 application" on the next page

Enable the Name attribute when accessing the application directly

Add `record=names` to the URL parameters.

Example:

```
http://oracleapps.mydomain.com:8002/dev60cgi/f60cgi?record=names
```

Enable the Name attribute when using HTML to launch the Oracle application

1. In the startup HTML file that is used to launch the application, locate the line: `<PARAM name="serverArgs ........... fndnam= APPS">`
2. Add the Oracle key: `record=names`

   Example:

   ```
   <PARAM name="serverArgs"  value="module=f:\FNDSCSGN userid=XYZ fndnam=apps
   record=names">
   ```

Enable the Name attribute when using the Personal Home Page to launch your Forms 6 application

Set up the following system profile option at (your) user level to enable the **Name** attribute:

1. Sign on to your Oracle application and select System Administrator responsibility.
2. Select **Nav > Profile > System**.
3. In the Find System Profile Values form:
   - Confirm that **Display: Site and Users** contains your user logon.
   - Enter `%ICX%Launch%` in the **Profile** box.
   - Click the **Find** button.
4. Copy the value from the **Site** box of the **ICX: Forms Launcher** profile and paste it in the **User** box. Add `&play=&record=names` to the end of the URL in the **User** box.
5. Save your transaction.
6. Sign on again using your user name.

Note: If the **ICX: Forms Launcher** profile option is not updatable at the user level, access **Application Developer** and select the **Updatable** check box for the **ICX_FORMS_LAUNCHER** profile.

How to Set Oracle Environment Variables

This task describes how to set the environment variables you need for loading your Oracle application with UFT Oracle Add-in support. For all the environments, you need to set one or more environment variables with the path name of the Oracle Add-in support classes folder.

This task includes the following steps:

- "Sun Plug-in 1.4.1 and Oracle JInitiator 1.3.1.x" below
- "Oracle JInitiator 1.1.x" below

Sun Plug-in 1.4.1 and Oracle JInitiator 1.3.1.x

Set the `_JAVA_OPTIONS` environment variable as follows:

```
-Xrunjvmhook
-Xbootclasspath/a:"<UFT installation folder>\bin\java
shared\classes";"<UFT installation folder>\bin\java_sharedclasses\jasmine.jar"
```

The above variables should appear on one line (no newline separators).

Note:

You can also use short paths in this command. For example:

```
-Xrunjvmhook -Xbootclasspath/a:C:\PROGRA~2\HP\UNIFIE~1\bin\JAVA_
S~1\classes;C:\PROGRA~2\HP\UNIFIE~1\bin\JAVA_S~1\classes\jasmine.jar
```

In this example, UFT is installed in the default installation folder (C drive, Program Files) on a Windows 7 computer. `PROGRA~2` denotes the `Program Files (x86)` folder, which is the Program Files folder on 64-bit operating systems.

Oracle JInitiator 1.1.x

Set the `_classload_hook` environment variable to `jvmhook`.

How to Disable Dynamic Transformation Support

This task includes the following steps:

- "Save the dynamically transformed classes" on the next page
- "Disable dynamic transformation support " on the next page

This task describes how to disable dynamic transformation support if the dynamic transformation support mechanism does not work properly.

Save the dynamically transformed classes

1. Specify the folder in which to save the dynamically transformed classes that will be generated during the preliminary launching of your Oracle application.

   To do this:

   a. Open the registry editor (select **Start > Run**, type `regedit` in the **Open** box and click **OK**)

   b. Navigate to the `JavaAgent` main key, located in: `HKEY_LOCAL_MACHINE\SOFTWARE\Mercury Interactive\JavaAgent`.

   c. Define a new string value named `ClassesDumpFolder`, and set its value data to an existing folder (preferably empty) on your computer, for example, `C:\JavaSupportClasses`.

   d. If the `ClassesDumpFolder` string value already exists, you can modify its value data to an existing folder on your computer.

2. If you are using the **`-Xincgc`** option, temporarily remove it from the command line to enable the JVM hook profiler to transform and save the necessary classes. You can add it back to the command line after performing the following step.

3. Launch your applet or application and perform some basic operations on it. This ensures that all of the necessary classes are transformed and saved. Close your application. All of the dynamically transformed classes are now saved in the folder you specified in the previous step (for example, `C:\JavaSupportClasses`).

Disable dynamic transformation support

For Sun Plug-in 1.4.1 or JInitiator 1.3.1.x:

1. Remove the **`-Xrunjvmhook`** option from the `_JAVA_OPTIONS` environment variable.

2. Add the following option instead: **`-Xbootclasspath/p:<ClassesDumpFolder>\Final`**, where `<ClassesDumpFolder>` is the value of the folder in which the dynamically transformed classes were saved, such as `C:\JavaSupportClasses`, appended by the `Final` subfolder. For example, after your modification the `_JAVA_OPTIONS` environment variable might look like this:

```
-Xbootclasspath/p:C:\JavaSupportClasses\Final -
Xbootclasspath/a:"%ProgramFiles%\HP Software\Unified Functional
Testing\bin\java_shared\classes";
```

For Initiator 1.1.x:

1. Remove the **`_classload_hook`** option from the JDK settings by deleting the environment variable.

2. Manually copy the classes from the `<ClassesDumpFolder>`, where `<ClassesDumpFolder>` is the value of the folder in which the dynamically transformed classes were saved, such as `C:\JavaSupportClasses`, appended by the `Final` subfolder, to the JInitiator 1.1.x classes folder. You can find the JInitiator 1.1.x classes folder under `%ProgramFiles%\Oracle\JInitiator 1.1.x\classes`.

Oracle Record and Run Environment Variables

You can use record and run environment variables to specify the applications you want to use for recording and running your test. These variables can also be used in external library files for automation scripts.

If you define any of these record and run environment variables, they override the values in the corresponding boxes in the Oracle tab of the Record and Run Settings dialog box. For details, see "Recording Tests on Oracle Applications" on page 157.

Use the variable names listed in the table below to define Oracle record and run variables:

UI Elements	Variable Name	Description
Address	ORACLE_URL_ENV	The URL of the Oracle Applications server to which you want to connect.
Auto-login	ORACLE_AUTO_LOGIN_ENV	Instructs UFT to log on automatically to the Oracle Applications server. Possible values: • **True** • **False**
User name	ORACLE_USER_NAME_ENV	The user name used to log on to the specified server.
Password	ORACLE_PASSWORD_ENV	The password for the specified user name.
Log out of the application when the test closes	ORACLE_LOGOUT_ENV	Instructs UFT to log out of the Oracle Applications session specified in Oracle Tab of the Record and Run Settings dialog box when the test is closed. Possible values: **True** **False**
Close the browser when the test closes	ORACLE_CLOSE_BROWSER_ENV	Instructs UFT to close the browser on which the test is recorded when the test is closed. Possible values: **True** **False**

For details on defining and working with environment variables, see the *HP Unified Functional Testing User Guide.*

Known Issues - Oracle Add-in

This section contains general information and limitations about the Oracle add-in, and includes the following sections:

- "Installing the Oracle Add-in " below
- "Creating and Running Testing Documents" on the next page
- "Record and Run Options" on the next page
- "Checkpoints" on the next page

For limitations relevant to specific test objects and methods, see the **Oracle** section of the *HP UFT Object Model Reference for GUI Testing*.

Installing the Oracle Add-in

- If you install an Oracle JInitiator 1.1.x version after you install the UFT Oracle Add-in, you must repair UFT to test applications running in the newly installed JInitiator version. For details, see the *HP Unified Functional Testing Add-ins Guide*.

  Note: It is not necessary to re-install or otherwise configure the UFT Oracle Add-in if you installed a new Oracle environment other than JInitiator 1.1.x.

- The UFT Oracle Add-in provides a number of indicators that help you identify whether your add-in is properly installed and functioning. The following table describes the indicators you may see when your add-in is not functioning properly, and suggests possible solutions:

Indicator	Solution
You cannot record or run tests on Oracle Applications.	Ensure that the Oracle Add-in is loaded. For details, see "How to Manage UFT Add-ins" on page 22.
The Java console does not display a line containing the text similar to: **Loading Oracle Support**.	Check that the settings in your environment correspond to the environment settings defined in this chapter, or check for a batch file that may override the settings. For details, see: • "Recording Tests on Oracle Applications" on page 157. • " Dynamic Transformation Support " on page 158.
Your Java console contains the line `Could not find -Xrun library: jvmhook.dll`.	Check that you have `jvmhook.dll` in your system folder (`WINNT\system32`, `Windows\System32`, or `Windows\SysWOW64`, depending on your operating system).
You cannot use UFT to record on Oracle Applications running on Oracle JInitiator versions 1.1.X.	The version of Oracle JInitiator 1.1.X on which your Oracle Application runs must be installed before you install the UFT Oracle Add-in. If you installed Oracle JInitiator versions 1.1.X on your computer after you installed the

Indicator	Solution
	Oracle Add-in, you should repair the Oracle Add-in installation. For details, see the section on repairing your UFT installation in the *HP Unified Functional Testing Installation Guide*.

If, after reviewing the above indicators and solutions, you are still unable to record and run tests on your Oracle application, contact HP Software Support.

Creating and Running Testing Documents

- Test objects that require the index property for their description (for example, range flexfield objects) cannot be created from the Active Screen.

  Workaround: Use the **Add Objects** button in the Object Repository window to add these test objects directly from your Oracle Applications instead.
- Active Screen captures are not supported for OracleListOfValues and OracleNotification test objects.
- The recovery scenario pop-up window trigger event is not supported when testing Oracle Applications.
- Simultaneous testing of multiple Oracle Applications sessions is not supported.

Record and Run Options

The **Log out of the application when the test closes option** in the Record and Run Settings dialog box does not work if the Responsibilities List of Values window is displayed in the Oracle Applications session.

Checkpoints

- Performing a checkpoint on an object that is not always visible (such as a list opening from a combo box selection or a menu item) is not fully supported.

  Workaround: If a checkpoint on a transient object is required, make sure the object is visible prior to executing the checkpoint. For example, in the case of combo box list, you should insert a statement that clicks the combo box button before executing the checkpoint.
- When testing Oracle applications, a table checkpoint may not capture the values of columns that are not visible.

  Workaround: Before creating a table checkpoint, scroll in the table so that the last column is visible.

Part 9: PeopleSoft Add-in

This section includes:

PeopleSoft Add-in - Quick Reference

You can use the UFT PeopleSoft Add-in to test PeopleSoft user-interface objects (controls).

The following tables summarize basic information about the PeopleSoft Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	This is a Web-based add-in. Much of its functionality is the same as other Web-based add-ins. See "Web-Based Application Support" on page 25.
Supported Environments	For details on supported PeopleSoft environments, see the PeopleSoft Add-in section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	See "Considerations for Working with the PeopleSoft Add-in" on the next page.
Test Object Methods and Properties	The PeopleSoft Add-in provides test objects, methods, and properties that can be used when testing objects in PeopleSoft applications. For details, see the **PeopleSoft** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	See "Known Issues - PeopleSoft Add-in" on page 169.

Prerequisites	
Opening Your Application	You must open UFT before opening your PeopleSoft application.
Testing in Mozilla Firefox	To test your Web application in Mozilla Firefox version 33 and later, you must enable the Functional Testing Extension in one of the following ways: • If the **Select Your Add-ons** screen is displayed when you open Firefox, select to enable the Functional Testing Extension. • If the **Install Add-on** tab opens and displays Functional Testing Extension when opening Firefox, select the **Allow this installation check box** and click **Continue**. Otherwise: a. In Firefox, open the browser menu. b. In the menu, click **Add-ons**. c. In the Add-ons Manager tab, select the **Extensions** node. d. In the Functional Testing Extension row, click the **Enable** button. To test your Web application in Mozilla Firefox versions earlier than 33, you must enable the legacy Firefox

	agent: 1. Open the **<UFT installation folder>\Installations\Firefox** folder. 2. From the Firefox folder, drag the **Legacy.xpi** file into Firefox. 3. In Firefox, open the browser menu. 4. In the menu, click Add-ons. 5. In the Add-ons Manager tab, select the Extensions node. 6. In the Functional Testing Extension row, disable the Functional Testing 12.50 extension and enable the extension you added to Firefox.
Add-in Dependencies	The Web Add-in must be loaded.

Configuration	
Options Dialog Box	Use the **Web** pane. (Make sure that a GUI test is open and select **Tools > Options > GUI Testing** tab **> Web > General** node.)
Record and Run Settings Dialog Box (tests only)	Use the **Web** tab. (**Record > Record and Run Settings**)
Test Settings Dialog Box (tests only)	Use the **Web** pane. (**File > Settings > Web** node)
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Web** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node **> Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Web** pane. In the application area, select **Additional Settings > Web** in the sidebar.

Considerations for Working with the PeopleSoft Add-in

- When learning PSFrame objects, or Web pages containing PSFrame objects, the following child objects are automatically filtered out and are not added to the object repository:

  - WebElement
  - WebTable
  - Images of type "Plain Image"
  - Images with type "Image Link"

  If you want to add an object that is automatically filtered out, you can manually add it by selecting it in the Object Selection Dialog Box .

- The PeopleSoft Add-in provides a customized PSFrame test object to identify PeopleSoft frames. The PSFrame object differs from the Web Frame object both in its test object description and its algorithm for generating object names. This customization helps make your PeopleSoft tests easy to read and maintain.
- The PeopleSoft Add-in identifies all other objects in your PeopleSoft application using Web test objects.

  For details on PeopleSoft and Web test objects, methods, and properties, see the **PeopleSoft** and **Web** sections of the *HP UFT Object Model Reference for GUI Testing*.
- For the purposes of Web event recording, UFT treats Web test objects that are child objects of a PSFrame test object as PeopleSoft objects and thus applies the settings in the PeopleSoft event configuration XML file when recording those objects.

  For details on Web event recording configurations, see "Event Recording Configuration for Web-Based Applications" on page 30.

Known Issues - PeopleSoft Add-in

- The Active Screen may not function correctly when working with non-English UI servers.
- If you use the **ENTER** key to activate a search operation while recording a test, UFT may not perform the operation as expected during the test run.

  Workaround: Activate the search by clicking the **Search** button with the mouse.
- The use of keyboard shortcut keys to perform operations while recording is not supported.

Part 10: PowerBuilder Add-in

This section includes:

PowerBuilder Add-in - Quick Reference

You can use the UFT PowerBuilder Add-in to test PowerBuilder user-interface objects (controls).

The following tables summarize basic information about PowerBuilder Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	This is a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. See "Windows-Based Application Support" on page 52.
Supported Environments	For details on supported PowerBuilder environments, see the PowerBuilder Add-in section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	See "Considerations for Working with the PowerBuilder Add-in " on the next page.
Test Object Methods and Properties	The PowerBuilder Add-in provides test objects, methods, and properties that can be used when testing objects in PowerBuilder applications. For details, see the **PowerBuilder** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "Considerations for Working with the PowerBuilder Add-in " on the next page. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	See "Known Issues - PowerBuilder Add-in" on page 173.

Prerequisites	
Opening Your Application	You can open your PowerBuilder application before or after opening UFT.

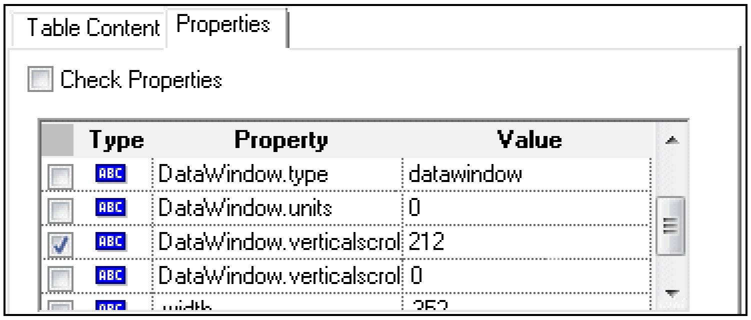
Configuration	
Options Dialog Box	Use the **Windows Applications** pane. (**Tools > Options > GUI Testing** tab **>Windows Applications** node)
Record and Run Settings Dialog Box (tests only)	Use the **Windows Applications** tab. (**Record > Record and Run Settings** **Note:** If you select the **Record and Run only on** radio button in the Record and Run Settings dialog box, the settings also apply to (limit) the applications that are recognized for Object Spy and other pointing hand operations.
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Windows applications** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node **> Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified*

	Functional Testing User Guide.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, select **Additional Settings > Applications** in the sidebar. See the section on the Applications pane in the *HP Unified Functional Testing User Guide*.

Considerations for Working with the PowerBuilder Add-in

The PowerBuilder Add-in provides the PbDataWindow test object with customized methods and properties to help you test PowerBuilder's DataWindow control.

- When you insert a checkpoint or output value step on a DataWindow control, UFT treats it as a table and opens the Table Checkpoint Properties or Table Output Value Properties dialog box (not supported for business components). It enables you to check or retrieve values for the table content and the object properties.
- When you insert a checkpoint or output value step on a DataWindow control during a recording session, the properties available to be checked or retrieved in the Properties tab include the DataWindow control's inner attributes (such as **DataWindow.color**) in addition to the identification properties (such as enabled and focused).

  □ Check Properties

	Type	Property	Value
□	ABC	DataWindow.type	datawindow
□	ABC	DataWindow.units	0
☑	ABC	DataWindow.verticalscrol	212
□	ABC	DataWindow.verticalscrol	0

  The set of DataWindow inner attributes available in the dialog box is the same as the list of properties that would be returned if you run a `DataWindow.Describe ("DataWindow.attributes")` statement. Properties of the inner objects of the table (objects that can be retrieved using a `DataWindow.Describe ("DataWindow.objects")` statement) are not available in this list.
- When you insert a checkpoint or output value step on a DataWindow control while editing (from the Active Screen, or on a step for which Active Screen data was captured), only the identification properties are available in the list.

For details on the `DataWindow` test object, see the **PowerBuilder** section of the *HP UFT Object Model Reference for GUI Testing*.

Known Issues - PowerBuilder Add-in

- When learning or recording on toolbars in PowerBuilder applications, UFT no longer records the PbToolbar test object. Instead, it records a `PbObject.Click` step. The PbToolbar test object is no longer available in UFT dialog boxes or in the documentation.
- If a PbToolbar test object exists in an old object repository, it will be recognized and supported, but toolbar-specific methods such as **CheckItem**, **GetContent**, **GetItem**, **GetItemProperty**, **GetItemCount**, **GetSelection**, **Press**, **ShowDropDown**, and **WaitItemProperty** are not supported for this object. To fix this, update object repositories and tests to use the PbObject test object for toolbar steps.
- By default, UFT recgonizes objects in your application as PowerBuilder objects only if the application was built with a supported version of PowerBuilder.

  If you want to try to use UFT with an unsupported PowerBuilder version, you can make the following change:

  a. Open **C:\Windows\wrun.ini** in a text editor. If this file does not exist, create it.

  b. Under the `[WrCfg]` section, add a line in the format: `PBRuntimeDllName=<YourPB_Dll>`. For example:

  ```
  [WrCfg]

  PBRuntimeDllName=pbvm126.dll
  ```

  Caution: This is an 'As-Is', unsupported option.

  For details on supported versions of PowerBuilder, see the *HP Unified Functional Testing Product Availability Matrix*.

Part 11: Qt Add-in

This section includes:

Qt Add-in - Quick Reference

You can use the Qt testing support provided by UFT to test user-interface objects (controls) developed using the Qt framework for mobile devices.

The following tables summarize basic information about Qt testing support and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	The Qt Add-in is a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. See "Windows-Based Application Support" on page 52
Important Information	"Considerations - Qt Add-in" on page 177
Test Object Methods and Properties	The Qt Add-in uses a sub-set of the standard Windows test objects, methods, and properties, which can be used when testing objects (controls) in Qt applications. For details, see the **Standard Windows** section of the *HP UFT Object Model Reference for GUI Testing*. For a list of supported Qt controls, see "Considerations - Qt Add-in" on page 177.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382

Prerequisites	
Opening Your Application	You must open UFT before opening your Qt application.
Add-in Dependencies	None
Low Level Recording	To enable low level recording on Qt controls, you must first modify the object identification properties list for the WinObject test object class, as follows: • Add the **regexpwndtitle** property to the **mandatory properties** list. • Move the **object class** property up the **assistive properties** list so that it is learned before the **text** property. For details, see the section describing the Object Identification Dialog Box in the *HP Unified Functional Testing User Guide*.

Configuration	
Options Dialog Box	Use the **Windows Applications** pane. (**Tools > Options > GUI Testing** tab **> Windows Applications** node)
Record and Run Settings Dialog Box	Use the **Windows Applications** tab. (**Run > Run Settings** or **Record > Record Settings**)

(tests only)	**Note:** UFT recognizes Qt objects only in applications that are opened after changing settings in the Windows Applications tab of the Record and Run Settings dialog box.
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Windows applications** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node **> Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings tab (business components only)	Use the **Applications** pane. In the application area, click **Additional Settings** in the sidebar and select the **Java** node See the section on the Applications Pane in the *HP Unified Functional Testing User Guide*.

Considerations - Qt Add-in

- Qt Add-in support is provided using standard Windows test objects. The following table lists each supported Qt control and its corresponding standard Windows test object.

Qt Control	Standard Windows Test Object
QCheckBox	WinCheckBox
QComboBox	WinComboBox
QComboBoxPrivateContainer	Window
QExpandingLineEdit	WinEdit
QLabel	Static
QLineEdit	WinEdit
QListWidget	WinList
QMenu	Window
QMenuBar	WinToolBar
QPlainTextEdit	WinEditor
QPushButton	WinButton
QRadioButton	WinRadioButton
QSpinBox	WinSpin
QTabWidget	WinTab
QToolButton	WinButton
QTreeWidget	WinTreeView

- UFT supports only Visual Studio as the compiler for QT applications.

Part 12: Add-in for SAP Solutions

This section includes:

Add-in for SAP Solutions - Overview

You can use the UFT Add-in for SAP Solutions to test user-interface objects (controls) in SAP GUI for Windows applications and in Web-based SAP applications. You can create and run tests and business components on these objects, and check their properties.

After you create your test or business component, you can enhance it by adding checkpoints, retrieving output values, and parameterizing values. Where relevant, you can also add SAP GUI for Windows or SAP Web objects, methods and properties to it.

This section contains:

Web-based SAP Support

This chapter includes:

Web-Based SAP Support - Quick Reference

You can use the SAP Web testing support provided with the UFT Add-in for SAP Solutions to test user-interface objects in Web-based SAP applications. These applications include SAP Enterprise Portal, Internet Transaction Server, SAP Customer Relationship Management (CRM), and the Interaction Centre Web Client.

The following tables summarize basic information about the Web-based SAP environment and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	Web-based SAP testing support is similar to other Web-based add-ins. For details, see "Web-Based Application Support" on page 25.
Supported Environments	For details on supported Web-based SAP environments, see the Add-in for SAP Solutions section of the *HP Unified Functional Testing Product Availability Matrix*. **Note:** Firefox is supported for testing SAPUI5 Desktop applications, but not other Web-based SAP environments.
Important Information	• Before you begin recording tests on Web-based SAP applications, you can define your required recording settings. This enables you to specify the browser on which you want UFT to record, specify any environment variables, and select the required Web options to optimize performance. • When the UFT Add-in for SAP Solutions is loaded, UFT can learn objects and run steps on both Web-based (requires the Web Add-in, too) and Windows-based SAP applications. • For details on recording and running tests and business components on SAP GUI for Windows applications, see "Low-Level or Analog Mode Recording on SAP GUI for Windows" on page 214 and "How to Record on Standard Windows Controls During an SAP GUI for Windows Recording Session" on page 215. • For details on working with SAP GUI from HTML, see "Considerations for Working with SAP GUI for HTML" on page 183. • The SAPUI5 Add-in and SAPWDJ Add-ins are installed when you install the Add-in for SAP Solutions. However, in order for full support for SAPUI5 and SAP WebDynpro (WDJ) applications, you must do the following: • Install the Add-in for SAP Solutions and the Web Add-in • When starting UFT, in the Add-ins Manager, select the SAPUI5 and/or the SAPWDJ add-in under the SAP add-in and the Web Add-in. • The SAPWDJ Add-in is supported only on Internet Explorer.
Test Object Methods and Properties	The Add-in for SAP Solutions provides test objects, methods, and properties that can be used when testing objects in Web-based SAP applications. For details, see the **SAP Web** section of the *HP UFT Object Model Reference for GUI Testing.*

	Note: If you working with SAPUI5 applications, see the **SAPUI5** section of the *HP UFT Object Model Reference for GUI Testing*, in the Web Child Add-ins section.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "Considerations for Working with SAP GUI for HTML" on the next page. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	See "Known Issues - Web-based SAP" on page 185.
Prerequisites	
Opening Your Application	• Open UFT before you open your Web-based SAP application. • If you are working in an SAP GUI application that contains HTML objects, you can log on to your application before opening UFT, but you must open UFT before navigating to the transaction containing any HTML objects. • For SAP GUI for HTML, Interaction Centre Web Client (ICWC) applications, and Customer Relationship Management (CRM) applications, confirm that your SAP server and client are configured properly. See "How to Enable Support for SAP GUI for Windows" on page 195.
Testing in Mozilla Firefox	To test your Web application in Mozilla Firefox version 33 and later, you must enable the Functional Testing Extension in one of the following ways: • If the **Select Your Add-ons** screen is displayed when you open Firefox, select to enable the Functional Testing Extension. • If the **Install Add-on** tab opens and displays Functional Testing Extension when opening Firefox, select the **Allow this installation check box** and click **Continue**. Otherwise: a. In Firefox, open the browser menu. b. In the menu, click **Add-ons**. c. In the Add-ons Manager tab, select the **Extensions** node. d. In the Functional Testing Extension row, click the **Enable** button. To test your Web application in Mozilla Firefox versions earlier than 33, you must enable the legacy Firefox agent: 1. Open the **<UFT installation folder>\Installations\Firefox** folder. 2. From the Firefox folder, drag the **Legacy.xpi** file into Firefox. 3. In Firefox, open the browser menu. 4. In the menu, click Add-ons. 5. In the Add-ons Manager tab, select the Extensions node. 6. In the Functional Testing Extension row, disable the Functional Testing 12.50 extension and enable the extension you added to Firefox.
Add-in Dependencies	The Web Add-in must be loaded.

Configuration	
Options Dialog Box	Use the **Web** pane. (Make sure that a GUI test is open and select **Tools > Options** > **GUI Testing** tab **> Web** > **General** node.)
Record and Run Settings Dialog Box (tests only)	• Use the **SAP** tab (**Record > Record and Run Settings**) to connect to the SAP GUI Client for SAP GUI for HTML or Interaction Centre Web Client (ICWC) applications. This is because ICWC opens from inside the SAP GUI Client. See "How to Enable Support for SAP GUI for Windows" on page 195. • Use the **Web** tab (**Record > Record Settings**) to instruct UFT to use a specific URL and browser to open a Web-based SAP application, or the SAP Enterprise Portal, at the beginning of each record and run session. Alternatively, you can instruct UFT to record and run on any open browser.
Test Settings Dialog Box (tests only)	Use the **Web** pane. (File > Settings > Web node)
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Web** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node **> Custom Level** button) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Web** pane. In the application area, select **Additional Settings > Web** in the sidebar.
Web Event Recording Configuration Dialog Box	When you load the Add-in for SAP Solutions, the settings in the Web Event Recording Configuration Dialog box (**Record > Web Event Recording Configuration**) are automatically customized. You do not need to make any Web event configuration changes.

Considerations for Working with SAP GUI for HTML

- You can add a table checkpoint while recording or editing your test.
- If a table has a column header row, it is counted as the first row in the table.
- If you have not recorded a step on the table object you want to check, but you have an Active Screen capture that displays the table object, you can add a table checkpoint if the Active Screen **Capture level** was set to **Complete** when the object was captured, and the **Active Screen** is currently selected (**View > Active Screen**).

  (You set the **Capture level** in the **Active Screen** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Active Screen** node). For details, see the section on Active Screen options in the *HP Unified Functional Testing User Guide*.)
- You can spool all of the available data from an SAP GUI for HTML application table into an external file

using the `GetCellData` method, which loops through each cell in the table. You can then save the information to an external file.

The following example uses the **GetCellData** method to list the data of each cell in a table of 10 rows and 10 columns:

```
For i=1 to 10
   For j=1 to 10
       Dat=Browser("ITS System Informati").Page("Table control").SAPTable
("MySAPTable").GetCellData (i, j)
       ‘Enter lines of code that use the value of the returned Dat variable
   Next
Next
```

For details on the **GetCellData** method, see the **SAP Web** section of the *HP UFT Object Model Reference for GUI Testing*.

Known Issues - Web-based SAP

This section contains general troubleshooting and limitation information about the Web-based SAP add-in, and includes the following sections:

- "General" below
- "SAPUI5 Objects" below
- "SAP WDJ Objects" on the next page
- "SAP Enterprise Portal" on page 187
- "SAP GUI for HTML—Internet Transaction Server (ITS) " on page 187
- "Using the Active Screen " on page 188
- "Web-based CRM Systems" on page 188

General

- It is not recommended to work with other Web-based add-ins when the UFT Add-in for SAP Solutions is loaded. The Add-in for SAP Solutions modifies certain Web configuration settings that may affect other add-ins or applications.
- When recording and running steps on a table control, only the table content that is visible on the client is actually available.
- During a run session, the SAP platform response time may be slower than the time it takes for UFT to run the corresponding step.

  Workaround: Add a **Wait** statement prior to the relevant step.
- In some cases, when running tests on SAPEdit, SAPNavigationBar, or SAPPortal, you may receive a **Cannot find object** error.

  Workaround: Do one of the following:

  - Ensure that the object properties are unique and correct.
  - Modify the registry as specified below:

    For 32 bit computers: In the **HKEY_LOCAL_MACHINE\Software\Mercury Interactive\QuickTestProfessional\MicTest\AbortIfHangInSendData** key, set the value of **DWORD** to **0**.

    For 64-bit computers: In the **HKEY_LOCAL_MACHINE\Software\Wow6432Node\Mercury Interactive\QuickTestProfessional\MicTest\AbortIfHangInSendData** key, set the value of **DWORD** to **0**.

SAPUI5 Objects

- Because the SAPUI5 add-in supports both desktop and mobile applications, not all methods for all objects are supported for both desktop and mobile applications.

- When running a test or component on SAPUI5 test objects, application Alert messages for some objects are not displayed.

  Workaround: Do one of the following:

  - Make sure your test does not contain steps that need to be performed on the Alert message.
  - Add an **If** statement to your test for the object that triggers the alert to check if the Alert exists.

- If your SAPUI5 application contains nested table objects, inserting a checkpoint on the nested table object shows only the parent SAPUITable object.

  Workaround: Select the nested WebTable objects and create checkpoints for the WebTable object instead of the parent SAPUITable object.

- When using the Object Spy to view an SAPUIMenu object or recording an SAPUIMenu object which is hidden in closed status, you may be unable to add the menu object to the repository with the **Add Object to the Repository** button or record the object.
- When working with mobile SAPUI5 applications, UFT cannot use the Object Spy on some disabled controls (like the SAPUIButton and SAPUITextEdit) due to the application object properties.

SAP WDJ Objects

- If you try to record objects in a SAP WDJ application without the SAPWDJ add-in loaded, UFT records only some of the objects correctly.

  Workaround: Restart UFT and load the SAP WDJ Add-in.

- During a run session, the response time of the SAP platform running a SAP Web Dynpro Java (WDJ) application may be slower than the time it takes for UFT to run the corresponding step.

  Workaround: Add a **Wait** statement prior to the relevant step or set the Delay each step execution option in the **Test Runs** pane of the Options dialog box (**Tools > Options > GUI Testing** tab > **Test Runs** node) to the necessary wait period (in milliseconds)

- The following functionalities are not supported for SAP WDJ applications:

  - Selection of non-visible table rows
  - Interaction with the application scroll bar
  - Menus inside table cells
  - Date navigator windows inside the application

- When recording steps on an SAPWDJTable object, the SelectCell method is not always recorded if you are selecting non-editable cells.
- If your table contains links that open a popup window, when using the **SAPWDJTable.SelectItemInCell** method to click thel link, UFT does not run the the **.SelectItemInCell** properly.

Workaround: Associate the linkFuncLibr function library with your test. This function library is found at **<UFT installation directory>\dat\Extensibility\Web\Toolkits\SAPWDJ\FunctionLibraries\linkFuncLibr.qfl**.

SAP Enterprise Portal

- Operations on the **iView** option menu and on objects within the page title bar of SAP Enterprise Portal are recorded as Web operations on the Frame object and not as SAP operations on the iView object.
- Minimized or collapsed iViews may not be recognized correctly.
- In some cases, when more than one browser is open during the test run, UFT is unable to correctly identify certain objects.

  Workaround: Clear the **Enable Smart Identification** check box for the Browser test objects in the Object Repository window. You may also want to disable the **Enable Smart Identification** option for Browser test objects in the Object Identification dialog box for future test recording.
- In some cases, a frame in SAP Enterprise Portal may be recognized as a Web Frame object instead of an iView object. In some of these, the frame name is generated dynamically. Because the Web Frame object uses the **name** property to identify the object, you must modify the recorded **name** value to use an appropriate regular expression so that UFT will be able to recognize it during the test run.

SAP GUI for HTML—Internet Transaction Server (ITS)

- When using the Object Spy or creating a checkpoint on an object inside an SAP Web table cell, UFT may recognize the object as a WebElement (and not as the appropriate SAP Web object), if a click has not yet been performed on the object.

  Workaround: Click on the object inside the SAP Web table cell before using the Object Spy or creating a checkpoint on it.
- Dragging the SAP GUI for HTML table scroll bar is not recorded.

  Workaround: You can record scrolling in SAP GUI for HTML tables by clicking the scroll button. Alternatively, use the Step Generator or Editor to insert a `SAPTable.Object.DoScroll("up")` or `SAPTable.Object.DoScroll("down")` statement in your test.
- The appearance of toolbar buttons may differ, and toolbar buttons may or may not be displayed, depending on the size of your browser window.

  Workaround: Try to maintain the same browser window size and the resulting menu appearance when recording and running your test.
- When running a test on an ITS frame in an SAP Enterprise Portal iView, the ITS menu sometimes fails to operate properly.

  Workaround: Enlarge the iView size and/or increase the **Object Synchronization Timeout** and then run the test again.
- When recording a SAPList object, you need to click the input part of the list, not its button part in order to enable UFT to recognize the object.

Using the Active Screen

- The Active Screen may not display the entire HTML page captured while recording your test.

  Workaround: Resize the Active Screen so that it best fits the HTML page size.
- When testing an SAP Enterprise Portal application, it is recommended to set advanced authentication for Active Screen access (**File > Settings > Web**).
- Avoid using an Active Screen that was captured when a pop-up dialog was open to add an object from the main window to the object repository. Doing this results in an incorrect object hierarchy in the object repository.

Web-based CRM Systems

- When using UFT to test Web-based CRM systems, make sure that the CRM system is in test mode. You can do this by adding "`?sap-testmode=X`" to the URL.

Windows-based SAP Support

This chapter includes:

Windows-based SAP Support - Quick Reference

You can use the Windows-based SAP testing support provided with the UFT Add-in for SAP Solutions to test user-interface objects in SAP GUI for Windows user-interface objects.

The following tables summarize basic information about the Windows-based SAP environment and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	When testing SAP GUI for Windows applications, much of the functionality is the same as other Windows-based add-ins. See "Windows-Based Application Support" on page 52.
Supported Environments	For details on supported Windows-based SAP environments, see the Add-in for SAP Solutions section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	• When the Add-in for SAP Solutions is loaded, UFT can learn objects and run steps on both Web-based and Windows-based SAP applications. For details on recording and running tests and business components on Web-based SAP applications, see "Web-based SAP Support" on page 180. • The SAPNWBC Desktop Add-in is installed with the Add-in for SAP solutions. However, in order for full support for NWBC Desktop applications, you must do the following: • Install both the Add-in for SAP Solutions and the WPF Add-in • When opening UFT, in the Add-in Manager, select the SAPNWBC Desktop Add-in under the SAP Add-in and the WPF Add-in.
Test Object Methods and Properties	The Add-in for SAP Solutions provides test objects, methods, and properties that can be used when testing objects in SAP GUI for Windows applications. For details, see the **SAP GUI for Windows** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "Checkpoints and Output Values in SAP GUI for Windows" on page 208. • See "Supported Checkpoints " on page 383and "Supported Output Values " on page 385Per Add-In. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	See "Known Issues - Windows-based SAP" on page 202

Prerequisites	
Before Using this Add-in	For details on the following prerequisites, see "How to Enable Support for SAP GUI for Windows" on page 195. • The SAP GUI Scripting option must be installed. • Your server and client must have the proper package and patch versions installed. For details, see "Package and Patch Versions Requirements - SAP Application Server and SAP GUI for Windows"

	on page 201. See also: SAP OSS note # 480149 • The Scripting API must be enabled on both the server and client. For details, see "Enable scripting on the SAP application (server-side)" on page 195. • Your client must be configured to use the **Dialog** display mode for **F4** Help screens. • Make sure that the server is not set to use a **Low speed connection**. • The **F1** and **F4** Help display setting must be configured correctly to support testing the use of the **F1** and **F4** Help screens in your SAP GUI for Windows application. • If you plan to use the UFT-Solution Manager integration features, you must also install the appropriate support package and configure the Solution Manager server to work with UFT. For details, see "How to Configure Solution Manager to Work with UFT" on page 221.
Add-in Dependencies	None

Configuration	
Options Dialog Box	Use the **SAP> General** pane. (**Tools > Options > GUI Testing** tab > **SAP > General** node)
Record and Run Settings Dialog Box (tests only)	Use the **SAP** tab. (**Record > Record and Run Settings**)
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the SAP GUI for Windows section. (**Tools > Options > GUI Testing** tab **> Active Screen** node **> Custom Level** button) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, select **Additional Settings > Applications** in the sidebar. See the section on the Applications pane in the *HP Unified Functional Testing User Guide*.

Windows-based SAP Support - Testing and Configuration

This section includes

SAP GUI Scripting API and UFT

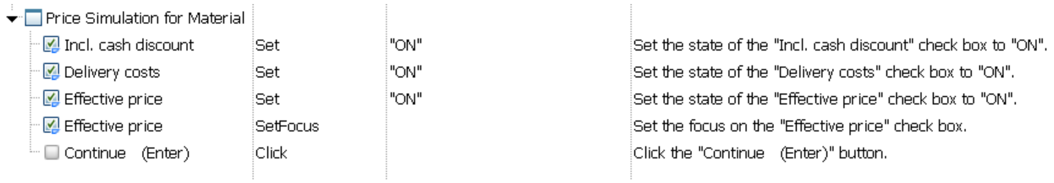
UFT works directly with the SAP GUI Scripting API to record your operations. Therefore, UFT adds steps to your test or business component only when API events are sent to the server. This means that while recording a test or business component, you may perform several operations on your application before the corresponding steps are added. When you perform a step that sends information to the server, UFT inserts steps with the relevant Windows-based SAP objects in the Keyword View (tests and business components) and adds corresponding statements in the Editor (tests only).

> **Note:** The UFT Add-in for SAP Solutions provides an alternative recording mechanism for specific SAP GUI for Windows objects that do not have built-in test object support. For details, see "Low-Level or Analog Mode Recording on SAP GUI for Windows" on page 214.

For details on the test object model, the object repository, and the Object Spy, see the *HP Unified Functional Testing User Guide*.

Example 1: Check Boxes

Suppose you record the steps of filling in a Price Simulation for Material form. You select the three check boxes in the form (**Incl. cash discount**, **Delivery costs**, and **Effective price**) and click **Continue**. When you click the **Continue** button, information is sent to the SAP server, and the steps in which you select the check boxes and click the **Continue** button are added to your test at once. In the Keyword View, the process described above is displayed as follows.



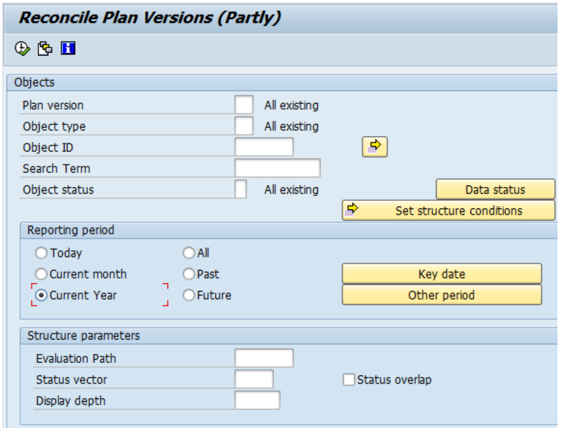
Price Simulation for Material			
Incl. cash discount	Set	"ON"	Set the state of the "Incl. cash discount" check box to "ON".
Delivery costs	Set	"ON"	Set the state of the "Delivery costs" check box to "ON".
Effective price	Set	"ON"	Set the state of the "Effective price" check box to "ON".
Effective price	SetFocus		Set the focus on the "Effective price" check box.
Continue (Enter)	Click		Click the "Continue (Enter)" button.

UFT records these steps in the Editor as follows:

```
SAPGuiSession("Session").SAPGuiWindow("Price Simulation for
Material").SAPGuiCheckBox("Incl. cash discount").Set "ON"
SAPGuiSession("Session").SAPGuiWindow("Price Simulation for
Material").SAPGuiCheckBox("Delivery costs").Set "ON"
SAPGuiSession("Session").SAPGuiWindow("Price Simulation for
Material").SAPGuiCheckBox("Effective price").Set "ON"
SAPGuiSession("Session").SAPGuiWindow("Price Simulation for
Material").SAPGuiCheckBox("Effective price").SetFocus
SAPGuiSession("Session").SAPGuiWindow("Price Simulation for
Material").SAPGuiButton("Continue   (Enter)").Click
```

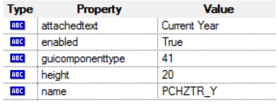
Example 2: Radio Buttons

Suppose you select a radio button to change the reporting period in the **Reconcile Plan Versions** transaction of your SAP GUI for Windows application. This radio button is labeled **Current Year**.



Reporting period: ○ Today ○ Current month ● Current Year ○ All ○ Past ○ Future

UFT uses the SAP GUI business component type (41) to identify the object as a SAPGuiRadioButton object. It creates a SAPGuiRadioButton test object with the name **Current Year** and records the following properties and values as the description for the radio button.

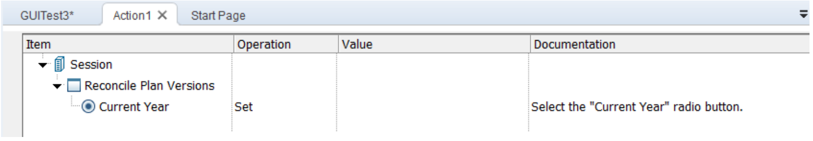


Type	Property	Value
ABC	attachedtext	Current Year
ABC	enabled	True
ABC	guicomponenttype	41
ABC	height	20
ABC	name	PCHZTR_Y

Note: The **guicomponenttype** and **name** property values are supplied by the SAP GUI Scripting API.

UFT also records that you performed a **Set** method to turn ON the radio button.

UFT displays your step in the Keyword View as follows:



Item	Operation	Value	Documentation
Session			
Reconcile Plan Versions			
Current Year	Set		Select the "Current Year" radio button.

UFT displays your step in the Editor like this:

```
SAPGuiSession("Session").SAPGuiWindow("Reconcile Plan
Versions").SAPGuiRadioButton("Current Year").Set
```

When you run a test or business component, UFT identifies each object in your application by its test object class and its *description*—the set of identification properties and values used to uniquely identify the object. In the above example, during the run session, UFT looks up the description for the SAPGuiRadioButton object with the name **Current Year**by searching the object repository. UFT finds the following description:

```
guicomponenttype:=41
name:=PCHZTR_Y
attachedtext:=Current Year
```

UFT then looks in the application for an SAPGuiRadioButton object that matches the above description. When it finds the object, it performs the **Set** method on it to change the value of the field to ON (selects the radio button).

How to Enable Support for SAP GUI for Windows

This task describes how to enable SAP GUI for Windows to work with UFT.

1. ### Prerequisite: Make sure that SAP GUI Scripting is installed

   When you install your SAP GUI for Windows application, you must select the **SAP GUI Scripting** installation option. If you did not select this option when you installed the SAP GUI for Windows application, it is essential that you reinstall it and select this option before setting the other configuration options described in this chapter.

   > **Note:** SAP provides a range of security mechanisms that enable the administrator to limit the use of SAP GUI Scripting by system, by group, by user, and by scripting functionality. To test SAP GUI for Windows applications, you must ensure that these security mechanisms are not activated. For details on the various security options, see the online SAP GUI Scripting Security Guide at the SAP Service Marketplace.

2. ### Enable scripting on the SAP application (server-side)

   a. Confirm that you have the proper support package and kernel patch levels installed. For details, see "Package and Patch Versions Requirements - SAP Application Server and SAP GUI for Windows" on page 201.

   b. Enable scripting on your SAP application. (By default, scripting is disabled.) You do this by entering the Maintain Profile Parameters window with administrative permissions and setting the `sapgui/user_scripting` profile parameter to TRUE on the application server.

      - To enable scripting for all users, set this parameter on all application servers.
      - To enable scripting for a specific group of users, set the parameter only on application servers with the appropriate access restriction settings.

      For more details, see "How to Enable Scripting on the SAP Application (Server-Side)" on page 197.

> **Note:** If you connect to a server on which scripting is disabled, an error message displays when you try to record on your SAP GUI for Windows application.

3. **Enable scripting on the SAP application (client-side)**

   You can do this on your SAP client only if the **SAP GUI Scripting** option is installed. If this option is not installed, reinstall your SAP GUI for Windows application and be sure to select the **SAP GUI Scripting** check box. For details, see your SAP GUI for Windows documentation.

4. **Eliminate warning messages**

   By default, you regularly receive two warning messages when using UFT with an SAP GUI for Windows application:

   - When UFT connects to the Scripting API, the following warning message is displayed: `A script is trying to attach to the GUI`.

   - When UFT opens a new connection using the Scripting API, the following warning message is displayed: `A script is opening a connection to system <system_name>`.

   It is recommended to disable these warning messages in the SAP GUI for Windows application when working with UFT.

5. **Check the connection speed on the SAP server**

   Confirm that the **Low speed connection** option is NOT selected for the server to which you are connecting before recording and running GUI tests.

   This is because when you log on to SAP using the **Low speed connection** option to communicate with the server, the SAP server does not send sufficient information for UFT to properly record and run tests. (UFT displays an error message if the **Low speed connection** option is selected.)

   For details, see SAP OSS note #587202.

6. **Set F1 Help to use the modal dialog box mode**

   Confirm that the modal dialog box option is selected. This enables UFT to record the display of **F1** Help in your tests. (The **F1** Help in your SAP GUI for Windows application can be displayed using either the Performance Assistant or as a modal dialog box.)

7. **Set F4 Help to use the dialog display mode**

   Confirm that your client is set to load **F4** Help screens in Dialog mode. (The SAP GUI for Windows application cannot load **F4** Help screens in Control mode when using the SAP GUI Scripting API (Enable Scripting option.)

   > **Note:** This is a per-user setting. You must set this option on each client that you want to test using the UFT Add-in for SAP Solutions. Alternatively, the SAP system administrator can change the system default for you.

How to Enable Scripting on the SAP Application (Server-Side)

UFT records and runs steps based directly on the API events that are sent from the client to the SAP server because UFT communicates directly with the SAP GUI Scripting API. Therefore, to record and run tests and business components on your SAP GUI for Windows application, you must enable scripting on both the server and client computers.

After you confirm that you have the proper support package and kernel patch levels installed, you must enable scripting on your SAP application. By default, scripting is disabled.

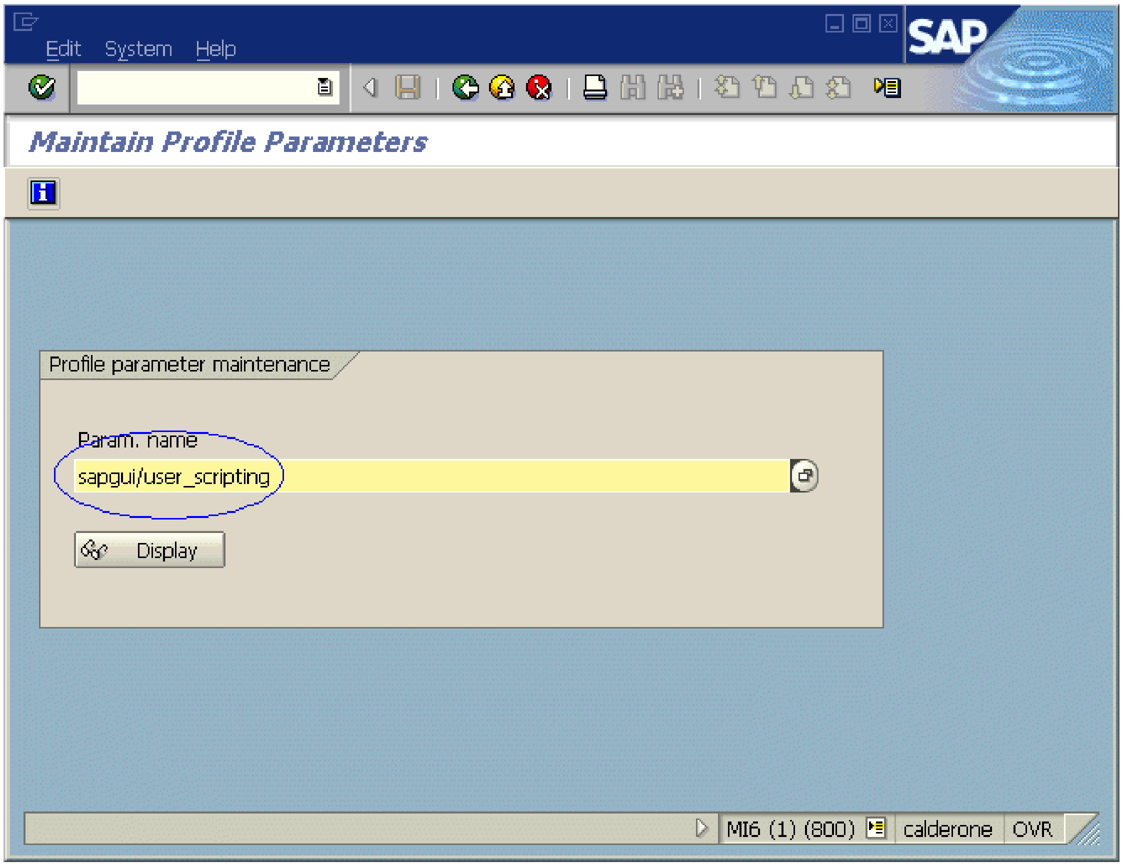
You enable scripting by entering the Maintain Profile Parameters window with administrative permissions and setting the `sapgui/user_scripting` profile parameter to `TRUE` on the application server.

To enable scripting for all users, set this parameter on all application servers. To enable scripting for a specific group of users, set the parameter only on application servers with the appropriate access restriction settings.

Note: If you connect to a server on which scripting is disabled, an error message displays when you try to record on your SAP GUI for Windows application.

To change the profile parameter:

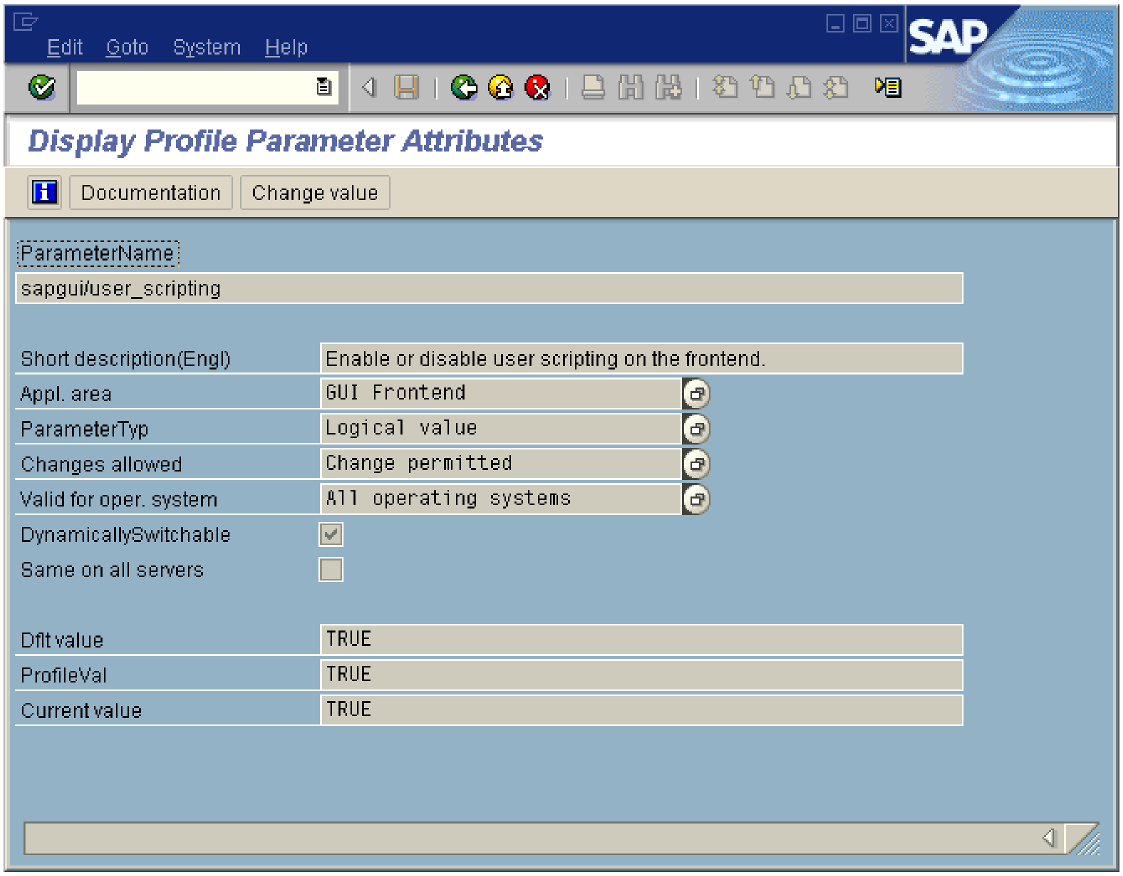
1. Enter `/nrz11` in the **OKCode** edit box to open transaction rz11.
2. In the **Param. Name** box of the Maintain Profile Parameters window, enter `sapgui/user_scripting` and click the **Display** button.



Param. name
sapgui/user_scripting

Note: If the message **Parameter name is unknown** is displayed in the status bar, your client lacks the required support package (see "Package and Patch Versions Requirements - SAP Application Server and SAP GUI for Windows" on page 201). Download and install the support package that corresponds to the SAP release you are using and then begin this task again.

The Display Profile Parameter Attributes window opens.



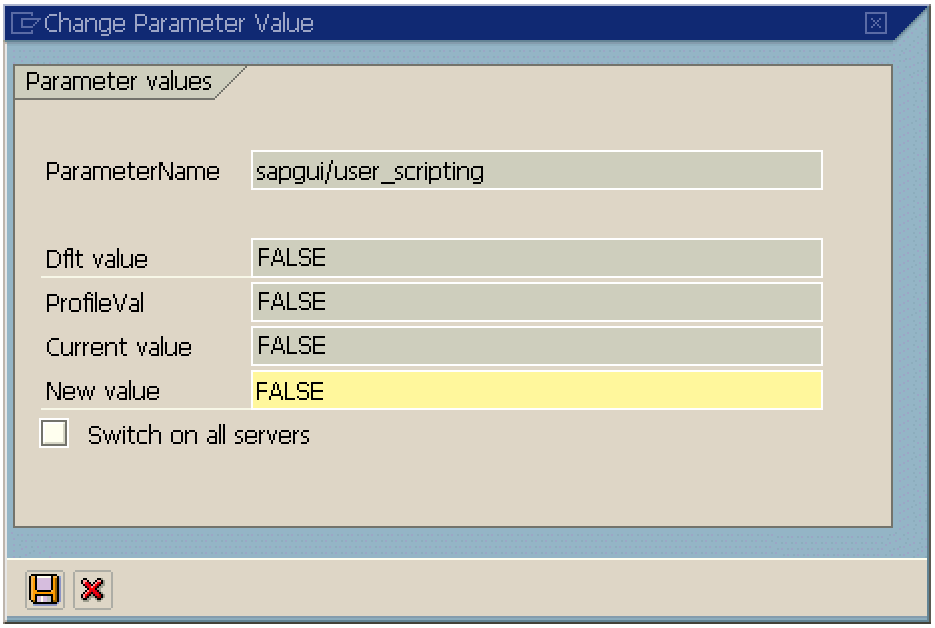
Display Profile Parameter Attributes

ParameterName

sapgui/user_scripting

Short description(Engl)	Enable or disable user scripting on the frontend.
Appl. area	GUI Frontend
ParameterTyp	Logical value
Changes allowed	Change permitted
Valid for oper. system	All operating systems
DynamicallySwitchable	☑
Same on all servers	□
Dflt value	TRUE
ProfileVal	TRUE
Current value	TRUE

3. If **ProfileVal** is FALSE, you must modify its value. To modify it, click the **Change value** button. The Change Parameter Value window opens.



Change Parameter Value

Parameter values

ParameterName	sapgui/user_scripting
Dflt value	FALSE
ProfileVal	FALSE
Current value	FALSE
New value	FALSE

□ Switch on all servers

4. Enter TRUE (in capital letters) in the **New value** box and click **Save** 💾.

   Note: The change takes effect only when you log on to the system. Therefore, before beginning to work with UFT, you must log off and log on again. You may also need to restart the SAP Service from the SAP Console.

   If you find that even after restarting the SAP Service from the SAP Console and logging on again to the client, your change to the **ProfileVal** parameter was not saved, you may have an outdated kernel version. In this case, either restart the application server, or download and import the required kernel patch, as specified below.

Release	Kernel Version	Patch Level
6.10	6.10	391
6.20	all versions	all levels
6.40	all versions	all levels
7.10	all versions	all levels

   For details, see SAP OSS note # 480149.

Considerations - Windows-based SAP Add-in for SAP Solutions

When recording and running tests or business components on SAP GUI for Windows applications, consider the following:

- When working in tests, the Record and Run Settings dialog box in UFT enables you to specify a server and client to open at the beginning of every test record and run session. The servers available in the dialog box are the same as those available in the SAP Logon Pad and SAP Logon dialog box.
- When you record a business component on an SAP GUI for Windows session, the Record and Run Settings dialog box is not available. Instead, you need to open the SAP session manually or include statements in your business component that connect to the SAP server (using the `SAPGuiUtil` test object).
- You can also record specific operations in your SAP GUI for Windows Application in Standard Windows Recording mode, if required. For details, see "How to Record on Standard Windows Controls During an SAP GUI for Windows Recording Session" on page 215.
- As you record a test or business component on your SAP GUI for Windows application, UFT records the operations you perform. UFT works directly with the SAP GUI Scripting API to record your operations. Therefore, although UFT records a step for each operation you perform, it adds the steps to your test only when API events are sent to UFT (when information is sent to the SAP server).

  For details on the SAP GUI Scripting API events, see your SAP documentation.
- When you select a test step in UFT, the corresponding object is highlighted in the Active Screen (unless you chose not to capture Active Screen information when you recorded your test). However, the values of the object properties stored with the Active Screen are the values of the properties at the time that the steps were added to the test (when you performed the step that sent information

to the SAP server). These values may potentially be different from the values of the properties at the time that the selected step was actually performed. For details on Active Screen capture levels, see the section on the Custom Active Screen Capture Settings Dialog Box in the *HP Unified Functional Testing User Guide*.

Environment Variables for Windows-based SAP Applications

You can use environment variables to specify details for the applications you want to use during a recording or run session. These variables can also be used in external library files for automation scripts.

If you define any of these environment variables, they override the values in the **Server description**, **User**, **Password**, **Client**, and **Language** boxes in the SAP Tab of the Record and Run Settings dialog box.

Use the variable names listed in the table below to define SAP application details:

Option	Variable Name	Description
Server description	SAP_SERVER_ENV	The description of the server to which you want to connect.
User	SAP_USERNAME_ENV	The user name used to log on to the specified client number.
Password	SAP_PASSWORD_ENV	The encrypted password for the specified user name.
Client	SAP_CLIENT_ENV	The client number.
Language	SAP_LANGUAGE_ENV	The language that you want the specified SAP GUI for Windows application to display.

For details on defining and working with environment variables, see the *HP Unified Functional Testing User Guide*.

Package and Patch Versions Requirements - SAP Application Server and SAP GUI for Windows

To test your application using UFT, you must confirm that you have the correct support package and kernel patch levels for your software component release. The following tables show the **minimum** required versions and levels. You must have these versions and levels or higher:

Software Component	Release	Support Package	Kernel Patch Level
SAP_APPL	31I	SAPKH31I96	Kernel 3.1I level 650
SAP_APPL	40B	SAPKH40B71	Kernel 4.0B level 903
SAP_APPL	45B	SAPKH45B49	Kernel 4.5B level 753

Software Component	Release	Support Package	Kernel Patch Level
SAP_BASIS	46B	SAPKB46B37	Kernel 4.6D level 948
SAP_BASIS	46C	SAPKB46C29	Kernel 4.6D level 948
SAP_BASIS	46D	SAPKB46D17	Kernel 4.6D level 948
SAP_BASIS	610	SAPKB61012	Kernel 6.10 level 360

For details, see SAP OSS note # 480149.

Known Issues - Windows-based SAP

This section contains general troubleshooting and limitation information about the Windows-based SAP add-in, and includes the following sections:

- "Creating and Running Testing Documents" below
- "Working with Windows-based SAP Controls" on the next page
- "Checkpoints, Output Values, and the Object Spy" on page 204
- "Test Objects, Methods, and Properties" on page 204
- "SAP Scripting API" on page 205
- "SAP Scripting API" on page 205
- "SAP Structured Parameters" on page 206

Creating and Running Testing Documents

- Running a test on HTML elements embedded in an SAP GUI for Windows application may result in an "Object is disabled" error. This may happen if the HTML control is not ready for the test run.

  Workaround: Add a `Sync` statement such as `SAPGuiSession.Sync` or a `Wait` statement to the script in order to run the test successfully.

- By default, the recording and running of steps on HTML elements embedded in an SAP GUI for Windows application is performed using the UFT Web Add-in. In some cases, steps recorded using the Web Add-in are inserted into the script before SAP Add-in steps that use the SAP Scripting API.

  Workaround: Use the option of recording HTML elements embedded in SAP GUI application using the SAP Scripting Interface. To do so, stop recording, select the **Record HTML elements using SAPGui Scripting interface** check box in the SAP pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> SAP > General** node). Then close and reopen the test and then begin recording again.

- The `SAP Gantt` chart (`SAP Bar Chart`) and `Image`/`Picture` controls are supported by the SAP GUI for Windows alternative recording mechanism. The current support for these controls is limited. You can override the default recording behavior for SAP Windows test objects, or add limited recording support for other SAP GUI for Windows objects.

- If you insert a call to an external action or a copy of an action, and that action includes an `SAPGuiTable.Input`, `SAPGuiGrid.Input`, or `SAPGuiAPOGrid.Input` statement, the corresponding input data sheet is not copied to the Data pane with the action.

  Workaround: Insert and run `Datatable.AddSheet` and `Datatable.ImportSheet` statements to import the sheet referenced by the action's `Input` method. Ensure that the name of the data sheet exactly matches the name specified in the corresponding `Input` statement.
- In the SAP Enterprise Portal environment, occasional synchronization problems may occur during the test run when alternating between SAP Web and SAP Windows environments.

  Workaround: Add a `WaitProperty` or `Wait` statement between the Web steps and the Windows steps.
- UFT can connect to your SAP Logon or SAP Logon Pad application for recording and running tests on SAP GUI for Windows sessions. If you use both SAP Logon and SAP Logon Pad processes on your computer, UFT connects to the latest process that was launched.
- Use the SAP Tab of the Record and Run Settings Dialog Box to instruct UFT to open your SAP GUI for Windows application. Do not use the Windows Applications tab of the dialog box for this purpose.

Working with Windows-based SAP Controls

- Separate toolbar controls (ones that are not part of a grid or other object) are supported by the `SapGuiToolbar` test object (**GuiComponentType** is `202`), and the Object Spy recognizes them because they are separate objects.

  Note that tree controls do not have associated toolbars. Toolbars displayed on top of tree controls are recognized as separate toolbars, and are therefore supported as described above.
- Toolbars inside grid controls are supported by the `SapGuiToolbar` test object (GuiComponentType is 204). However, the Object Spy does not recognize these toolbars because they are part of the grid. You cannot add these toolbars to the object repository using the **Add to repository** option from the Active Screen or the **Add Objects** option in the Object Repository window. To add these toolbars to the object repository, record on them.
- Toolbars inside other controls (such as a toolbar within a text area control) are not supported.
- Microsoft Office controls within the SAP window are not supported.
- If you record the step of pressing an **F4** key, and that key press results in setting new values for multiple fields, a step is recorded only for the field from which the **F4** key was pressed, and therefore, only that field will be populated during the run.
- The SAP Editor control is not supported.
- UFT fails to run steps on SAP tree nodes that contain the "`;`" character.
- UFT does not automatically record standard Windows dialog boxes used by your SAP GUI for Windows application (such as the Open File and Save As dialog boxes). This is because the SAP scripting API does not support these dialog boxes. This may also occur when using SAP GUI for Windows with GuiXT.

  Workaround: Do one of the following:

  - Change to Standard Windows Recording mode (select Standard Windows Recording from the **Recording Modes** drop-down in the Record toolbar) to record on these objects. (Make sure that you switch to **Standard Windows Recording** mode *before* you perform the operation that opens the standard Windows control in your SAP application.)
  - Use low-level recording to record on these objects.
  - Use programmatic descriptions to run steps on these objects.

Checkpoints, Output Values, and the Object Spy

- To ensure that the correct object properties are captured with your checkpoint, always record a step that results in communication with the server (such as pressing **ENTER**) *before* inserting a checkpoint or output value.
- You cannot use the Object Spy or create checkpoints for the controls listed below. However, you can successfully record and run steps on them.
  - Toolbar buttons in grid controls.
  - Internal controls in tree or table objects.
    (For example, a radio button in a table cell or a check box in a tree.)
- Creating checkpoints or using the Object Spy on an object that is located in a currently inactive SAP screen (for example, if the screen is behind an invoked dialog box) is not supported. However, you can create checkpoints on status bar messages (displayed in an inactive window) using the **Record status bar messages** option (**Tools > Options > GUI Testing** tab **> SAP** node **> Record status bar messages**).
- When running old 6.20 tests on a 6.40 client, checkpoints on radio buttons, check boxes, edit boxes, or regular buttons may fail due to changes to tooltip property values for these objects in the 6.40 client.
- UFT can estimate the number of rows in a table control, but it cannot retrieve the exact number because only the table content that is visible on the client is actually available. Data from non-visible rows are stored only on the back-end server. Therefore, when inserting or modifying checkpoints for a table control object, the number of rows specified in the Define/Modify Row Range dialog box may not be accurate.
- Do not perform any operations on the SAP GUI window (such as changing the transaction state or navigating to another window) while UFT retrieves the data for a table checkpoint even if it seems to take a long time, as this may cause severe problems.
- When inserting a checkpoint on a table or grid from the Active Screen, the actual table must be open in your SAP GUI for Windows application to extract the correct information from the table or grid.

Test Objects, Methods, and Properties

- When using the `SAPGuiTableInput` method, check the scrolling mode of the current table. If you parameterize a table with a Data pane sheet that contains more rows in the sheet than are displayed in the table's current view, UFT tries to scroll down the table while running the test, to insert more rows from the data sheet. UFT supports two ways of scrolling rows in tables—by pressing the **ENTER** key, or by pressing the **PAGEDOWN** key. By default, the Add-in for SAP Solutions tries **PAGEDOWN** if needed. You can configure the required mode using the second argument of the `Input` method.

For details, see the *HP Unified Functional Testing Add-ins Guide*.

- Right-click operations are not supported for the `SAPGuiTextArea` object.
- Drag-and-drop operations in the SAP Gui for Windows application are disabled when UFT is open.

Using the Active Screen

- Active Screen images are based on captured screen bitmaps. Therefore, objects that are not visible in the SAP GUI for Windows view are not part of the Active Screen image. You cannot add objects to the script from the Active Screen if they were not in the captured view.
- Drop-down menus are not captured in the Active Screen. Active Screen technology captures the data after the menu is closed and the menu item is selected.
- While recording, UFT captures one Active Screen image for several steps. UFT records steps only when the SAP GUI for Windows client sends information to the SAP back-end server. When this occurs, all steps that were performed between the previous communication and the current one are added to the script. The last screen that was sent to the server is captured by the Active Screen for all steps recorded during that communication.
- When recording on Web elements inside SAP GUI for Windows applications, HTML images are not captured.
- Adding objects to the object repository (using the **View/Add Object** option, or creating checkpoint or output value steps) from an Active Screen created from a step recorded on a Web element inside a SAP GUI for Windows application generates an incorrect object hierarchy in the object repository.

SAP Scripting API

- For security reasons, the SAP scripting API prevents the recording of passwords. When you record the operation of inserting a password in a password box, UFT records a `Set` statement using asterisks (****) as the method argument value.

  Workaround: Do one of the following:

  - Configure and enable the **Auto-logon** settings in the SAP Tab of the Record and Run Settings Dialog Box.
  - Insert a step using one of the `SAPGuiUtil` object's `AutoLogon` methods.
  - Record the password normally during the recording session. After the recording session, modify the password step to use the `SetSecure` method, and enter the encrypted password value or parameterize the value.

  For details, see the **SAP Windows** section of the *HP UFT Object Model Reference for GUI Testing*(**Help > HP Unified Functional Testing Help > Object Model Reference for GUI Testing > SAP Windows**).

SAP Structured Parameters

When you launch UFT by clicking the **Edit Test Script** button directly in the SAP Solution Manager Test Automation:Initial Screen transaction(Transaction Code: stce) or in the SAP Solution Manager Configuration transaction (Transaction Code :Solar02), clicking the **Maintain SAP Parameter** button in UFT might not return you to the correct page in SAP Solution Manager.

Workaround: Use the **External Test** button in the Change Test Configuration transaction to launch UFT.

When you create a test in the Change Test Script transaction of SAP Solution Manager and then click the **Back** button, UFT may not show the test.

Workaround: Save and close UFT and click the **External Test** button to call UFT.

When you click the **Maintain SAP Parameter** button or the **Back/External Test** button to switch from UFT to SAP, you may receive an error in SAP Solution Manager: `OBJECT_OBJREF_NOT_ASSIGNED`.

Windows-Based SAP Support - Test Objects

This chapter includes:

Checkpoints and Output Values in SAP GUI for Windows

- When inserting a table checkpoint (tests only), consider how other steps performed on the table may affect the checkpoint.

  Example 1: If you have a step in your test that clicks the `Total` toolbar button on a grid control, that click refreshes all data in the table. The refresh could potentially cause a table checkpoint on a cell in the table to fail.

  Example 2: If you click a toolbar button in a grid control that adds rows to your table before creating a table checkpoint, the extra rows are captured as part of the grid checkpoint (if you capture all rows). Therefore, confirm that the same rows are displayed during the run session.
- To insert a new table checkpoint while editing your test or business component, the actual table or grid must be open to the appropriate level or view. This is true even if your Active Screen (tests only) contains a capture of the table or grid.
- In general, it is not necessary to open the table or grid in the application to edit an existing checkpoint. However, if you want to modify the row range for the checkpoint, the actual table or grid must be open to the appropriate level or view.
- When creating a checkpoint on ActiveX grid controls (these generally have toolbars), UFT captures the data from all columns and all rows in the grid in the table checkpoint. If you do not need to check data from all rows in your grid, you can specify the rows you want to include in the checkpoint in the Define Row Range dialog box. You can also increase or decrease the number of rows included in the checkpoint at a later time.
- The **Visible Rows** option in the Define/Modify Row Range Dialog Box is not available for checkpoints created on grid controls.

Using the Auto-Parameterize Option to Parameterize Table and Grid Cell Values

When working with tests, UFT records a `SetCellData` statement, by default, each time you modify the value of a cell in a table or grid. If you want to modify the values of several cells in a single table or grid, and then parameterize your test so that different values are entered into the cells each time your test action runs, you can do this by parameterizing each statement individually, or by enabling the **Auto-parameterize table and grid controls** option.

When this option is selected, UFT automatically captures all values you set for a particular table or grid during a recording session and stores them in a special data sheet in the Data pane. UFT inserts a single `SAPGuiTable.Input`, `SAPGuiGrid.Input`, or `SAPGuiAPOGrid.Input` statement into your test, which refers to this new data sheet. Before running the test, you can easily modify the values or add additional sets of data to the data sheet for each action iteration.

To learn more:

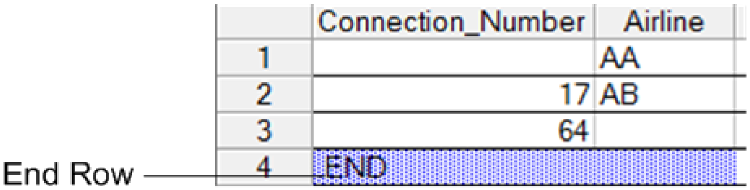
How UFT Records in Auto-Parameterize Mode

In tests, when you record with the **Auto-parameterize table and grid controls** option and you perform an operation that sends data to the SAP server after setting table or grid cell values, UFT:

- Creates a new data sheet to represent the table or grid. Each data sheet is a sub-sheet of the action in which the table or grid operations were recorded. The data sheet name is always the action name followed by a period (.) and the internal name of the table or grid. For example: `Action1.FLIGHT_TABLE`
- Adds a column to the data sheet for each table or grid column in which you record. (Columns in which you did not set any cell data are not added to the data sheet.)

  The name of the column in the data sheet is generally the same as the name of the column in your application.

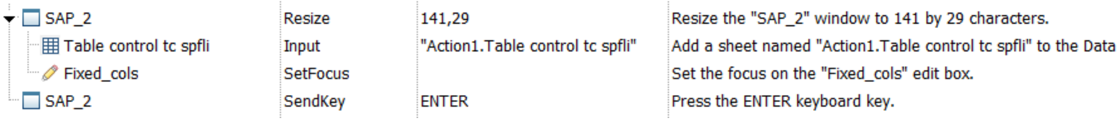
  If a column in the application does not have a header, or more than one column header has the same name, UFT inserts a column with a name in the format: _ _*<index>*, where *<index>* represents the column number according to its location when you record the `Input` step.
- Inserts the values you set during the recording session into the appropriate cells in the data sheet. Each row in which you entered data is represented by a row in the data sheet. Place-holder (empty) rows are added for rows above the rows in which you recorded. For example, if you set data in rows 2, 4, and 7, seven rows are added to the data sheet. The cells in rows 1, 3, 5, and 6 do not contain any data.
- Inserts an additional **end row** where the value of the first cell in the row is `.END`.



	Connection_Number	Airline
1		AA
2	17	AB
3	64	
4	END	

End Row

- Inserts an `Input <DataSheetName>` statement (followed by a `SelectCell` statement) into your test.



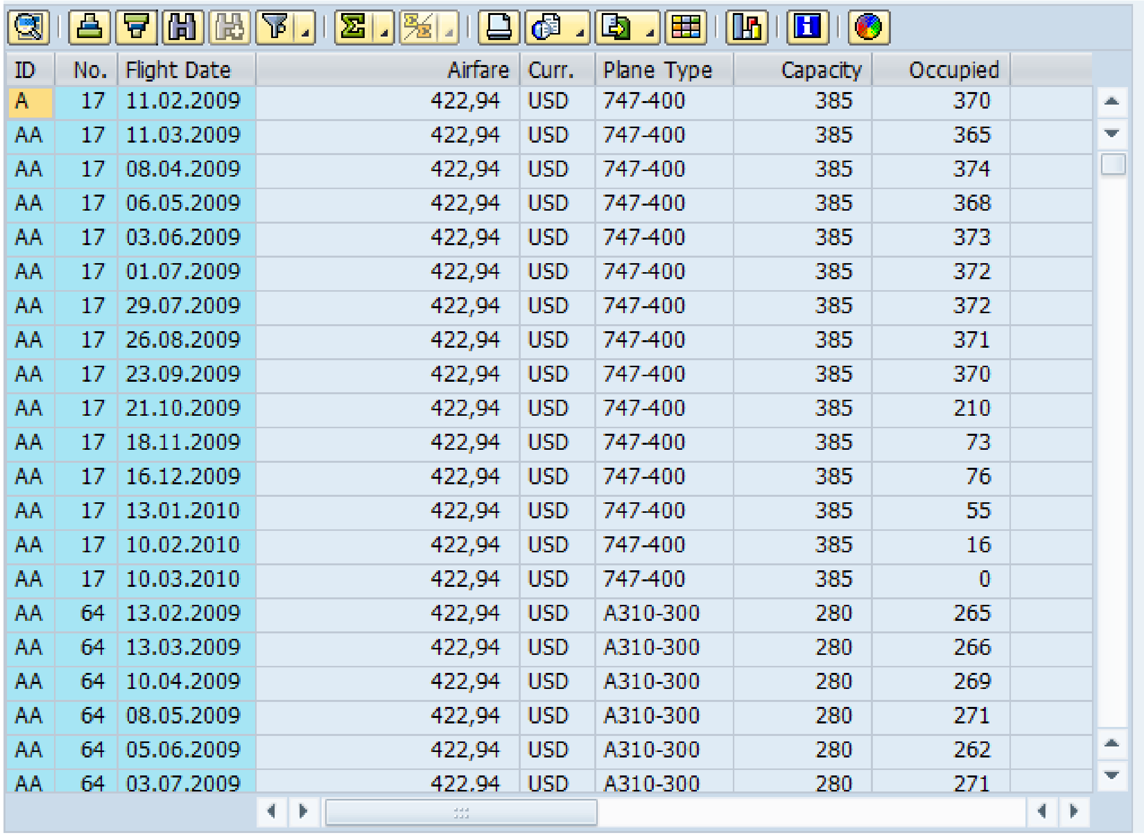
SAP_2	Resize	141,29	Resize the "SAP_2" window to 141 by 29 characters.
Table control tc spfli	Input	"Action1.Table control tc spfli"	Add a sheet named "Action1.Table control tc spfli" to the Data
Fixed_cols	SetFocus		Set the focus on the "Fixed_cols" edit box.
SAP_2	SendKey	ENTER	Press the ENTER keyboard key.

UFT records these steps in the Editor as follows:

```
SAPGuiSession("Session").SAPGuiWindow("SAP_2").Resize 141,29
SAPGuiSession("Session").SAPGuiWindow("SAP_2").SAPGuiTable("Table control tc
spfli").Input "Action1.Table control tc spfli"
SAPGuiSession("Session").SAPGuiWindow("SAP_2").SAPGuiEdit("Fixed_
cols").SetFocus
SAPGuiSession("Session").SAPGuiWindow("SAP_2").SendKey ENTER
```

The `Input` statement instructs UFT to enter values from the data sheet into the table or grid corresponding to the data sheet name, similar to an automatically parameterized statement referring to a special sheet in the Data pane.

Suppose you update values in a table control containing airline flight information. You update some airline codes, add state and country names to some of the departure and destination cities, update one of the destination airport codes, and update some of the departure times. The edited table in your application may look something like this:



ID	No.	Flight Date	Airfare	Curr.	Plane Type	Capacity	Occupied
A	17	11.02.2009	422,94	USD	747-400	385	370
AA	17	11.03.2009	422,94	USD	747-400	385	365
AA	17	08.04.2009	422,94	USD	747-400	385	374
AA	17	06.05.2009	422,94	USD	747-400	385	368
AA	17	03.06.2009	422,94	USD	747-400	385	373
AA	17	01.07.2009	422,94	USD	747-400	385	372
AA	17	29.07.2009	422,94	USD	747-400	385	372
AA	17	26.08.2009	422,94	USD	747-400	385	371
AA	17	23.09.2009	422,94	USD	747-400	385	370
AA	17	21.10.2009	422,94	USD	747-400	385	210
AA	17	18.11.2009	422,94	USD	747-400	385	73
AA	17	16.12.2009	422,94	USD	747-400	385	76
AA	17	13.01.2010	422,94	USD	747-400	385	55
AA	17	10.02.2010	422,94	USD	747-400	385	16
AA	17	10.03.2010	422,94	USD	747-400	385	0
AA	64	13.02.2009	422,94	USD	A310-300	280	265
AA	64	13.03.2009	422,94	USD	A310-300	280	266
AA	64	10.04.2009	422,94	USD	A310-300	280	269
AA	64	08.05.2009	422,94	USD	A310-300	280	271
AA	64	05.06.2009	422,94	USD	A310-300	280	262
AA	64	03.07.2009	422,94	USD	A310-300	280	271

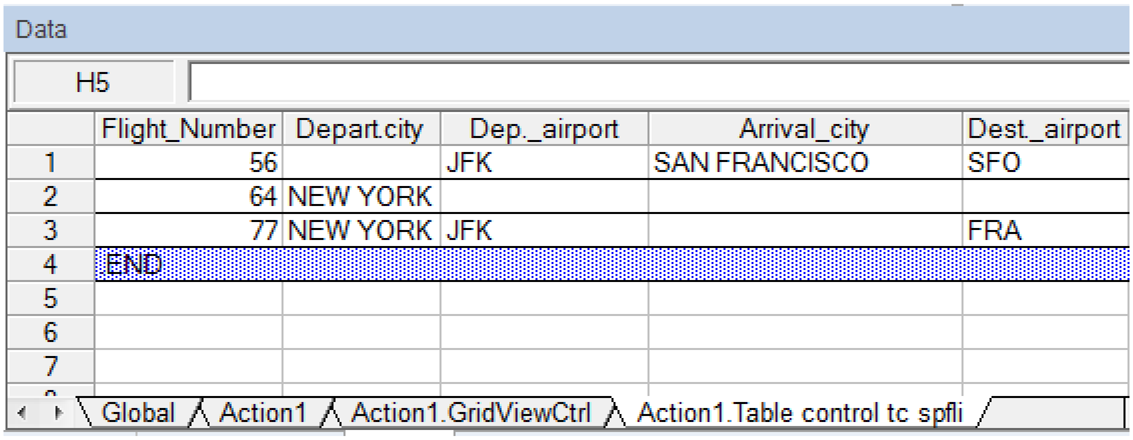
UFT inserts the following Input statement in your test to represent the data input:

```
SAPGuiSession("Session").SAPGuiWindow("SAP R/3").SAPGuiTable("SPFLI").Input
"Action1.SPFLI"
```

Note: If you record on a table or grid that scrolls using the **ENTER** key rather than the **PAGEDOWN** key, you may need to manually add the **ScrollMethod** optional argument. For details,

> see "Data in Rows that Require Scrolling" on page 213.

The corresponding data sheet in your Data pane looks like this:



	Flight_Number	Depart.city	Dep._airport	Arrival_city	Dest._airport
1	56		JFK	SAN FRANCISCO	SFO
2	64	NEW YORK			
3	77	NEW YORK	JFK		FRA
4	END				
5					
6					
7					

There are three rows in the data sheet, because data was modified in the first three rows of the table or grid in the application. Note that the data sheet does not contain columns for the **Airfare** and **Plane Type** columns, because no values were modified in those columns during the recording session.

Parameterized Cell Values in the Input Data Sheet

When working in tests, after you record an Input statement to create an input data sheet, you can modify the values to be used in the run session, and you can create multiple sets of table or grid cell data to be used in different iterations of an action.

As described above, when you record the Input statement, UFT records the values you set in the appropriate rows and columns in the input data sheet for that table or grid. Below the data it adds an end row (shaded in blue) with the text .END in the first cell of the row. This row indicates the end of the first set of data for the table or grid. This set of data and its corresponding end row represents a single *data set*.

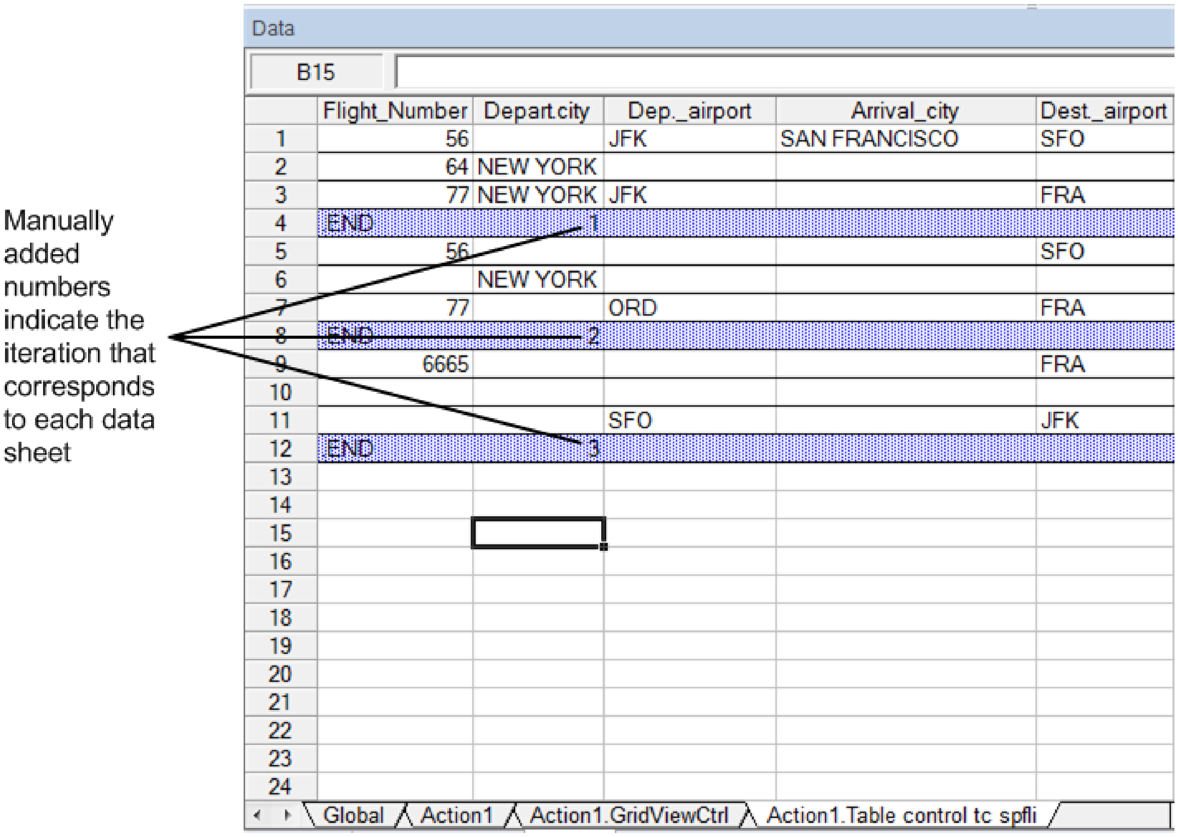
To supply different data values for each action iteration, you add new data sets. You add a new data set for a table or grid by entering the values in the appropriate rows and columns below the previous end row. To indicate the end of the new data set, copy and paste the end row from the first set of data to the row below the new set of data. You can include a different number of rows in each data set.

> **Note:** The Input statement can run successfully only if it can find the end row. Therefore, the first cell of the end row must contain only the text .END. You can enter text into other cells in that row, if needed. For example, you can enter a number in the second cell of the end row to indicate the iteration number corresponding to that set of data.

Because the input data sheets are added as a sub-sheet of the current action, the Input statement uses the data set corresponding to the current action iteration. For example, if you set the action to run on all iterations and your action sheet includes five rows of data, then your input data sheet should also include five data sets (and five .END rows).

The input data sheet below contains three sets of data. The first set contains data for the top three rows of the table or grid. The second set contains data for the top two rows of the table or grid. The third set contains data for rows 2-5. The blank first row (row 8 in the data sheet), indicates that no data should be entered or modified in the first row of the table or grid.

Note that a number was manually entered into the second cell of each **END** row to make it easier to identify the action iteration to which each data set corresponds.



Manually added numbers indicate the iteration that corresponds to each data sheet

	Flight_Number	Depart.city	Dep._airport	Arrival_city	Dest._airport
1	56		JFK	SAN FRANCISCO	SFO
2	64	NEW YORK			
3	77	NEW YORK	JFK		FRA
4	END	1			
5	56				SFO
6		NEW YORK			
7	77		ORD		FRA
8	END	2			
9	6665				FRA
10					
11			SFO		JFK
12	END	3			
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

Considerations for Auto-Parameterization

Consider the following when using the **Auto-parameterize table and grid controls** option:

- UFT inserts an `Input` statement and a new input data sheet each time information including modified table or grid cell data is sent to the server. If you set data in the cells of a particular table or grid both before and after sending information to the server, you will have more than one input data sheet (and more than one `Input` statement) representing the same table or grid. For best results:
  - Enter data only in the visible rows of the table or grid while recording, especially if scrolling results in sending information to the server. You can add additional rows to the recorded data set while editing your test.

- Perform sorting, calculations, and other such operations either before beginning or after you finish entering data in a table or grid.

- The end of each data set in the input table or grid must be indicated by an end row with only the text `.END` in the first cell of the row.
- You can enter additional text, such as comments or an iteration number, in other cells of the `.END` row.
- You can include a different number of rows in each data set.

  If you enter data for rows that require scrolling to display them in your application, you may need to modify your `Input` statement. For details, see "Data in Rows that Require Scrolling" below.
- When recording, UFT adds a column to the input data sheet only for table or grid columns in which you set data. You can add additional columns from your table or grid to the data sheet while editing your test. Double-click the column header in the data sheet to rename it. Enter the name of your table or grid column. If the table or grid column name has spaces, replace the spaces with underscores.
- In general, the columns in your data sheet can be in any order, as long as the column names match the column names in your table or grid. However, if you record data in a column without a column header name or if more than one column in the table or grid has the same header name, UFT adds a column to the data sheet in the format: __*<index>*, where *<index>* indicates the number of the column in the table or grid when you record the Input statement, for example, `__1` or `__2`. You can also use this format for columns in the data sheet if the column header names in your table or grid may change from iteration to iteration.
- To use multiple sets of data from an input data sheet, you must have at least one other Data pane parameter in your action that is set to use **Current action sheet (local)**. Also, confirm that the action is set to run multiple iterations in the Run Tab of the Action Call Properties Dialog Box.
- The number of data sets in your input data sheet should match the number of rows in the corresponding action data sheet.

  If your input data sheet contains fewer data sets than the number of rows in the action sheet, no data will be inserted in the table or grid during those action iterations. For example, if the action runs five iterations, and your input data sheet contains only four data sets, during the fifth iteration no data will be entered into the table or grid when the `Input` statement runs.

  If your data sheet contains more data sets than the number of rows in the action sheet, those data sets will not be used.

Data in Rows that Require Scrolling

When working in tests, UFT inserts a new `Input` statement and creates a new input data sheet each time you send information to the server that includes table or grid cell data. Therefore, if scrolling results in sending data to the server, it is recommended to add data only to visible cells during the recording session. If you want to enter data into additional rows during the run session, you can add those rows to the data sheet manually while editing your test.

If you create an input data set for rows that are not visible on the table or grid in your application, then UFT must scroll the table or grid during the run session to insert the data for those rows. If you create an input data set for a row that needs to be added to the table or grid, UFT must send a command to add the row. By default, UFT sends a `PageDown` command if the rows in the data sheet exceed those currently displayed in the application. If UFT needs to use the **ENTER** key to add additional rows to the table or grid, then you need to manually add the optional `ScrollMethod` argument (with the value `ENTER`) to your `Input` statement before running your test.

For example:

```
SAPGuiSession("Session").SAPGuiWindow("Create Standard").SAPGuiTable
("SAPMV45ATCRTL_V_ERF_").Input "Action1.All items", ENTER
```

Low-Level or Analog Mode Recording on SAP GUI for Windows

When working in tests, if you are unable to record steps on an object in the normal recording mode, or if you want to record mouse clicks and keyboard input with the exact x- and y-coordinates, you can record steps on those objects using low-level or analog recording (select **Low-Level Recording** or **Analog Recording** from the **Recording Mode** drop-down in the Record toolbar during a recording session).

When recording in one of these modes, your steps are added to your test (or to the analog file) as you record them rather than when information is sent to the server. If you begin recording in low-level or analog mode, do not switch back to the normal recording mode until you perform a step that results in communication with the SAP server. Switching between one of these modes and the normal recording mode before the server communication, may result in your steps being recorded twice (once in low-level/analog mode and once in normal mode).

For details on low-level and analog recording, see the *HP Unified Functional Testing User Guide*.

Spooling Data from a Table

If you want to spool all the data from an SAP GUI for Windows table into an external file, use the **GetCellData** method to loop through each cell in the table. You can then save the information to an external file.

The following example uses the **GetCellData** method to list the data of each cell in a table of 10 rows and 10 columns:

```
For i=1 to 10
   for j=1 to 10
       col="#" & j
       Dat=SAPGuiSession("Session").SAPGuiWindow("Create Standard").SAPGuiTable
("SAPMV45ATCTRL_U_ERF_").GetCellData (i, col)
       'Enter lines of code that use the value of the returned Dat variable
   next
```

```
next
```

For details on the **GetCellData** method, see the **SAP GUI for Windows** section of the *HP UFT Object Model Reference for GUI Testing*.

How to Record on Standard Windows Controls During an SAP GUI for Windows Recording Session

To enable UFT to record steps on standard Windows controls during an SAP GUI for Windows recording session, you must switch to **Standard Windows Recording** mode *prior* to performing steps on these controls. (If you switch to **Standard Windows Recording** mode *after* performing an operation on a standard Windows control, both UFT and the SAP application may sometimes become unresponsive.)

This task describes how to toggle between the relevant recording options.

To switch to Standard Windows recording mode while recording a test in an SAP GUI for Windows application:

On the Record toolbar, select **Standard Windows Recording** from the **Recording Modes** drop-down, or press **ALT+SHIFT+F3**.

To record steps as SAP GUI for Windows objects again:

Do one of the following:

- On the Record toolbar, select **Default** from the **Recording Modes** drop-down.
- Stop the recording session.

This restores the normal recording mode for SAP GUI for Windows.

UFT-SAP Solution Manager Integration

This section includes

UFT-SAP Solution Manager Integration - Overview

Note: Unless otherwise specified, references to Solution Manager in this Help file apply to all currently supported versions of SAP eCATT (SAP Extended Computer Aided Test Tool) and SAP Solution Manager. Note that some features and options may not be supported in the specific edition of Solution Manager or eCATT that you are using.

For a list of the supported versions of Solution Manager or eCATT, see the *HP Unified Functional Testing Product Availability Matrix*.

In addition to ALM, HP's Web-based test management tool, you can also store and manage GUI tests in SAP Solution Manager.

UFT Add-in for SAP Solutions integrates with SAP Solution Manager. This means that you can use Solution Manager with UFT to run quality tests in environments that span beyond Windows and SAP environments including complex, multi-platform, highly-integrated composite, legacy, and proprietary enterprise applications.

Note: UFT cannot connect to both Solution Manager and ALM in the same session. Therefore, you cannot use Solution Manager to manage business components and application areas.

You can work with GUI tests stored in Solution Manager in standalone or integrated mode. The current mode is indicated in the UFT title bar.

- **"Standalone Mode"** (described on page 219**).** The test is opened from UFT.
- **"Integrated Mode"** (described on page220**).** The test is opened from Solution Manager.

Solution Manager support is available only when:

- **SAP Frontend software** is installed on your computer (including support for Unicode).
- **SAP GUI for Windows software** installed on your computer, including support for RFC libraries. You add support for RFC libraries by selecting the **Unicode RFC Libraries** check box (under **Development Tools**) during the SAP installation.
- The **UFT Add-in for SAP Solutions** is installed and loaded. For details, see "How to Manage UFT Add-ins" on page 22.
- **Solution Manager integration components** are installed.

Test Management in SAP Solution Manager

You can store and manage GUI tests for your SAP application in the file system or in a test management tool, such as HP ALM or SAP Solution Manager, depending on your testing needs.

To work with SAP Solution Manager, you must configure your Solution Manager server to work with UFT. After the server is configured, you can connect to Solution Manager from UFT in standalone mode, or you can connect to UFT from Solution Manager in integrated mode. For details, see "How to Configure Solution Manager to Work with UFT" on page 221.

You can create tests from UFT or from Solution Manager, store tests and associated resource files in the Solution Manager database, edit tests, run tests, and review run results. For details see, "How to Work with Tests in Solution Manager in Standalone Mode" on page 223.

You can also call and pass values from a Solution Manager test script to a GUI test. For details, see "How to Transfer Data To and From GUI Tests in Integrated Mode Using Test Parameters" on page 230.

For details on performing basic Solution Manager test management operations, see:

- "How to Configure Solution Manager to Work with UFT" on page 221
- "How to Work with Tests in Solution Manager in Standalone Mode" on page 223
- "How to Run a Test Stored in Solution Manager" on page 228
- "How to Display or Edit a GUI Test from Solution Manager in Integrated Mode" on page 229
- "How to Transfer Data To and From GUI Tests in Integrated Mode Using Test Parameters" on page 230

Resource Files in Solution Manager

When you save a GUI test in Solution Manager, make sure you store all associated resource files in Solution Manager so that any user who opens the test from Solution Manager will have access to all of the test's resource files.

Like test names, all test resource files stored in Solution Manager must begin with a valid prefix according to the server settings. For example, if your Solution Manager server requires all file names to begin with z, you would use the following naming convention: `z<filename>` (for example: `zSOR_dwdm`). You can set the default prefix for files in the Solution Manager pane of the Options dialog box.

When you create a file in UFT, such as a new shared object repository or recovery file, you can create the file as you normally would in UFT and then save the file directly to Solution Manager.

You can also upload existing files that are stored in the file system (such as external data table files, function library files, shared object repository files, recovery files, and environment variable files).

For details on uploading resource files to Solution Manager, see "How to Work with Tests in Solution Manager in Standalone Mode" on page 223.

Solution Manager Testing Modes: Standalone or Integrated

The table below describes the basic differences between the standalone and integrated testing modes.

	Standalone Mode	Integrated Mode
Open test from	UFT	Solution Manager
Solution Manager - UFT	Connect to Solution Manager from UFT using the Solution Manager Connection Dialog Box.	Solution Manager automatically establishes the Solution Manager - UFT connection.

	Standalone Mode	**Integrated Mode**
connection		
Available UFT features	All UFT features are available. You can open and work with any test in Solution Manager or in the file system.	You can work only with the currently open test. **File > Open**, **File > New**, and the **Recent** files list options are disabled. If you select **File > Save As**, UFT warns you that it will disconnect from Solution Manager and switch UFT to standalone mode.
Resource files	When you open the test, you can also edit and save all the test's resource files, including those stored in Solution Manager.	When you open the test, test resources stored in Solution Manager are opened in read-only mode.
Save location	Tests and uploaded files are automatically saved to the local package (**$TMP**) in Solution Manager.	You can save tests to any package (including non-local packages).
Solution Manager dependence	Although UFT is connected to Solution Manager, you can work and navigate in Solution Manager independently.	Solution Manager is locked while the test is open in UFT. To release Solution Manager, close UFT.
Run results	All run results are stored in the file system. They cannot be accessed from your Solution Manager log list.	Run results are stored to the network drive you specify in the **Solution Manager** pane of the Options dialog box and in the Solution Manager server. You can access the run results from the Solution Manager log.

Standalone Mode

You can connect to Solution Manager from UFT. This is known as **standalone mode**. After you connect to Solution Manager in standalone mode, you can:

- Store tests in the Solution Manager database.
- Open existing tests from the Solution Manager database.
- Upload files to or download files from Solution Manager.
- Store a test's external resource files in Solution Manager. For example, you can store shared object repository files, data table files, function library files, environment variable files, and recovery files in your Solution Manager database. UFT provides a special set of Solution Manager-specific options that enable you to control certain elements of the Solution Manager-UFT integration.
- Pass values from a Solution Manager test script to a GUI test, or vice versa, using GUI test parameters. For example, if you want to create tests or actions that you can use for different purposes or in different scenarios based on the data supplied to them, you can take advantage of the **Automatically parameterize steps using Test Parameters** option (in the **General** node of the GUI Testing tab in the Options dialog box (**Tools > Options > GUI Testing** tab **> General** node)). This option instructs UFT to automatically parameterize all the operation arguments in the steps of one or more actions in your test, at the end of a UFT recording session. You can then supply the values for

these test parameters from Solution Manager. For more details on parameters, see the *HP Unified Functional Testing User Guide*.

Note:

You can also perform many of these operations from Solution Manager in integrated mode. For details, see "Integrated Mode" below. For a comparison of Solution Manager testing modes, see "Solution Manager Testing Modes: Standalone or Integrated" on page 218.

You can also download resource files already stored in Solution Manager and save them in the file system.

Integrated Mode

You can connect to UFT from Solution Manager. This is called **integrated mode**. When you work in integrated mode, only UFT features related to the Solution Manager test are available in UFT. When you run tests in integrated mode, your run session results are accessible in the Solution Manager log.

When you log on to a Solution Manager server that is configured to integrate with UFT, you can view, edit, and run GUI tests that are stored in Solution Manager. You can also use the standard Solution Manager commands to copy, rename, and delete GUI tests, just as you would with any other file stored in Solution Manager.

When you open a GUI test from Solution Manager, UFT opens in integrated mode. In this mode, you can use all UFT features that are associated with the open test. However, you cannot save the open test with another name.

You can run a test in integrated mode by using the **Run** option in UFT or using the **Execute Test Script** (**F8**) option for a selected GUI test in Solution Manager. You can also execute a Solution Manager test script (or *blob*—Binary Large Object) that calls a GUI test. Creating Solution Manager scripts that call GUI tests is useful if you want to pass or retrieve values to or from a GUI test.

For details on configuring Solution Manager to work with UFT, see "How to Configure Solution Manager to Work with UFT" on the next page.

Note: You can also work with tests stored in Solution Manager from the UFT interface in standalone mode. For details, see "Standalone Mode" on the previous page. For a comparison of Solution Manager testing modes, see "Solution Manager Testing Modes: Standalone or Integrated" on page 218.

SAP Structured Parameters

When you work in integrated mode with SAP Solution Manager, you can use **structure**-type test parameters to pass complex values such as XML values or arrays from a Solution Manager test script to a GUI test, or vice versa, You create and maintain the structured parameters in SAP Solution Manager. Then you can map action parameters to the structured parameters in your test. When you run your test, UFT receives parameter values from SAP Solution Manager; and resolves the mapped local parameter with the actual value from SAP Solution Manager.

For more details, see "How to Work with SAP Structured Parameters" on page 231.

How to Configure Solution Manager to Work with UFT

This task describes how to configure Solution Manager to work with UFT so that you can use the Solution Manager-UFT integration features available with the UFT Add-in for SAP Solutions.

This task includes the following steps:

- "Prerequisites" below
- "Set external tool parameters in the ECCUST_ET table" below
- "Apply necessary roles or profiles to Solution Manager-UFT Users" on the next page
- "Register UFT to work with Solution Manager" on the next page

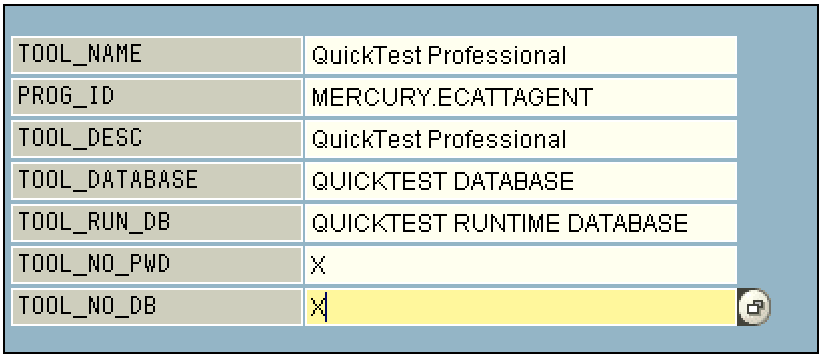
Prerequisites

You (or a Solution Manager system administrator) must install the appropriate support package and configure the Solution Manager server to work with UFT.

Set external tool parameters in the ECCUST_ET table

This step enables Solution Manager to communicate with UFT. (You perform this procedure only once in the system.)

1. Navigate to transaction **se17**. The General Table Display window opens.
2. In the **Table Name** box, enter ECCUST_ET and press **ENTER**.
3. The Display Table ECCUST_ET window opens and displays an empty table with the required parameter names.
4. Enter the values exactly as shown below:



TOOL_NAME	QuickTest Professional
PROG_ID	MERCURY.ECATTAGENT
TOOL_DESC	QuickTest Professional
TOOL_DATABASE	QUICKTEST DATABASE
TOOL_RUN_DB	QUICKTEST RUNTIME DATABASE
TOOL_NO_PWD	X
TOOL_NO_DB	X

> **Note:** You can also use the function module **SET_EXTERNAL_TOOL** to create entries in the customizing table. For details, see your Solution Manager documentation.

Apply necessary roles or profiles to Solution Manager-UFT Users

1. Make sure you have permission to:
   - Run Solution Manager scripts
   - Edit Solution Manager scripts
   - Work with an external tool (UFT) in integrated mode
   - Connect to Solution Manager from an external tool (UFT) in standalone mode
2. Confirm with your system administrator that the user name you use is assigned the necessary roles or profiles to perform the above tasks *before* you begin working with the UFT-Solution Manager integration. For example, to work with UFT in standalone mode, you must be assigned the role **S_ECET** or the profile **SAP_ECET** in the Solution Manager system. This is because each of these tasks requires special roles or profiles.

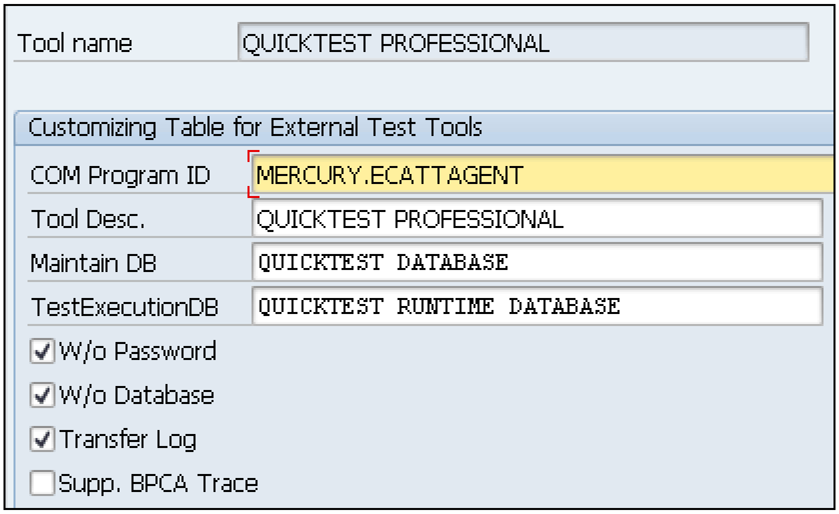
   For details, contact your system administrator or see your SAP and Solution Manager documentation.

Register UFT to work with Solution Manager

To enable UFT to communicate with Solution Manager, you must register UFT and then verify the registration. You perform this procedure only once in the system.

1. Navigate to transaction **SPRO**, click **SAP Reference IMG**, and browse to **SAP Solution Manager > Capabilities (Optional) > Test Management > External Integration > External Test Tool with eCATT > Register Test Tool**.
2. Click **New Entries**.

3. Enter the values exactly as shown below:



Tool name: QUICKTEST PROFESSIONAL

Customizing Table for External Test Tools

COM Program ID: MERCURY.ECATTAGENT

Tool Desc.: QUICKTEST PROFESSIONAL

Maintain DB: QUICKTEST DATABASE

TestExecutionDB: QUICKTEST RUNTIME DATABASE

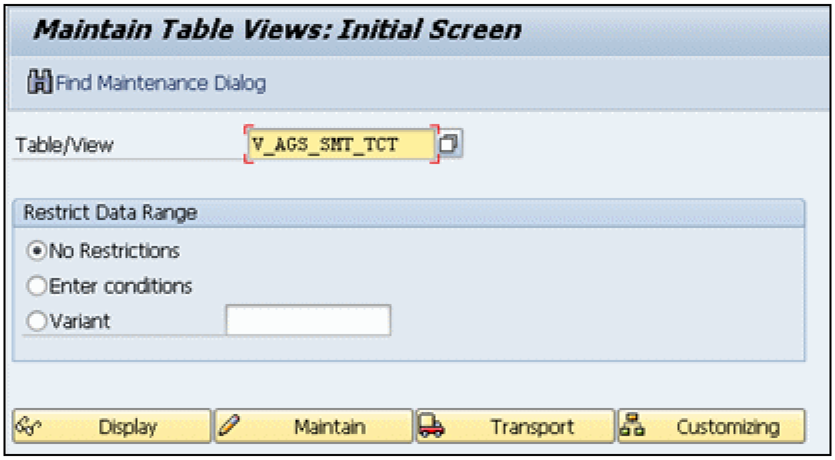
☑ W/o Password

☑ W/o Database

☑ Transfer Log

☐ Supp. BPCA Trace

4. Navigate to transaction **SM30**, and enter **V_AGS_SMT_TCT**, as shown in the example below.



Maintain Table Views: Initial Screen

Table/View: V_AGS_SMT_TCT

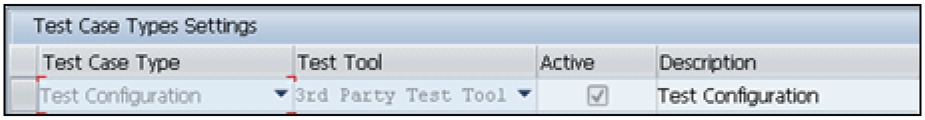
Restrict Data Range

● No Restrictions

○ Enter conditions

○ Variant

5. Click **Display** and verify that a row exists with the following information:



Test Case Types Settings

Test Case Type	Test Tool	Active	Description
Test Configuration	3rd Party Test Tool	☑	Test Configuration

UFT is now registered to work with your SAP application.

How to Work with Tests in Solution Manager in Standalone Mode

This task describes how to:

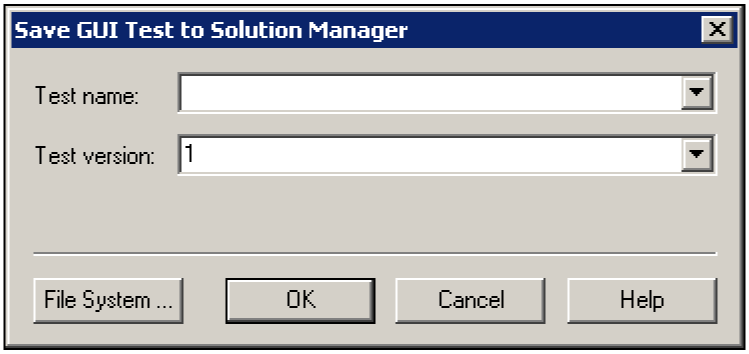
- "Save a test in standalone mode" on the next page
- "Open a test from Solution Manager in standalone mode" on the next page
- "Upload external resource files from the file system to Solution Manager" on page 225
- "Create a new shared object repository file and store it in Solution Manager" on page 226

- "Copy or export an object repository to Solution Manager" on page 226
- "Create a new recovery file in Solution Manager" on page 227

> **Note:** You can also open, edit, and save existing tests that are stored in Solution Manager, and you can save existing tests with a new name in the Solution Manager database or in the file system.

Save a test in standalone mode

1. In UFT, create or open a test.
2. From UFT, connect to a Solution Manager server. UFT connects to Solution Manager in standalone mode.
3. In UFT, select **File > Save As**. The Save GUI Test to Solution Manager dialog box opens.



Save GUI Test to Solution Manager

Test name:

Test version: 1

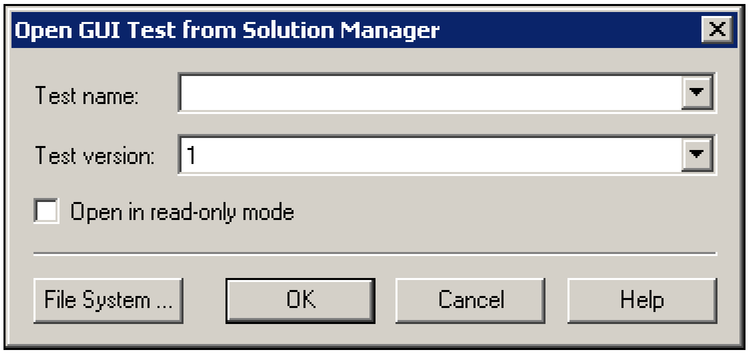
4. Do one of the following
   - To save a test directory to the file system, click **File System**.. The Save Test dialog box opens. For user interface details, see the *HP Unified Functional Testing User Guide*.
   - To save the test to Solution Manager, enter the required information and click **OK**. When the save process finishes, the status bar displays the word **Ready**, and the test is saved to the local package (**$TMP**) in Solution Manager. When the save process is complete, the UFT title bar displays the test information in the following format:

```
[Solution Manager] TestName: Version Number (Mode)
```

Open a test from Solution Manager in standalone mode

1. Connect to a Solution Manager server.

2. In UFT, select **File > Open** > **Test** to open the test. The Open Test from Solution Manager Dialog Box opens.



Test version: 1

□ Open in read-only mode

> **Note:** The Open GUI Test from Solution Manager dialog box opens when UFT is connected to a Solution Manager server. To open a test directly from the file system while you are connected to Solution Manager, click the **File System** button to open the Open Test dialog box.

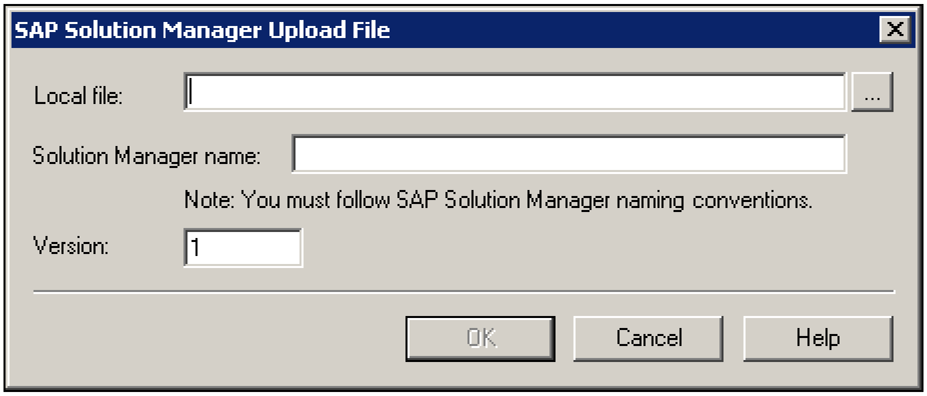
3. Enter the required information and click **OK**.

   When the test opens, the UFT title bar displays the test information in the following format:

```
[Solution Manager] TestName: VersionNumber (Mode)
```

Upload external resource files from the file system to Solution Manager

1. Create and save the resource file in the file system.
2. Connect to Solution Manager.
3. Select **File > Upload File to Solution Manager** option. The Upload File to Solution Manager Dialog Box opens.



Note: You must follow SAP Solution Manager naming conventions.

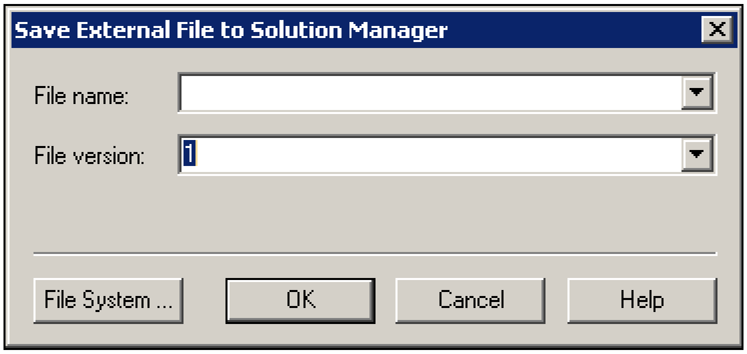
Version: 1

4. Browse or enter the file path of the **Local file** you want to upload.
5. Specify the **Solution** name and **Version** number you want to assign to the uploaded file.
6. Associate the uploaded file with your test in the appropriate UFT dialog box. For more details on associating Data pane files, library files, environment variable files, and shared object repositories

with your test, see the *HP Unified Functional Testing User Guide*.

Create a new shared object repository file and store it in Solution Manager

1. Open a blank test.
2. Select **Resources > Object Repository Manager** and add test objects as needed.
3. Select **File > Save**. The Save External File to Solution Manager Dialog Box opens.


Save External File to Solution Manager

File name:

File version: 1

4. In the **File name** field, enter the name you want to use for the shared object repository according to the naming conventions of the Solution Manager server. For example, if your Solution Manager server requires all file names to begin with `z`, save the file in the following format: `z<filename>`. For example: `zSOR_dwdm`
5. In the **File version** field, enter the version number you want to use for the shared object repository.
6. If a warning message opens, click **Yes** to create the new object repository file in Solution Manager.

For more details on creating object repository files, see the *HP Unified Functional Testing User Guide*.

Copy or export an object repository to Solution Manager

1. Open the test whose object repository you want to copy or export.

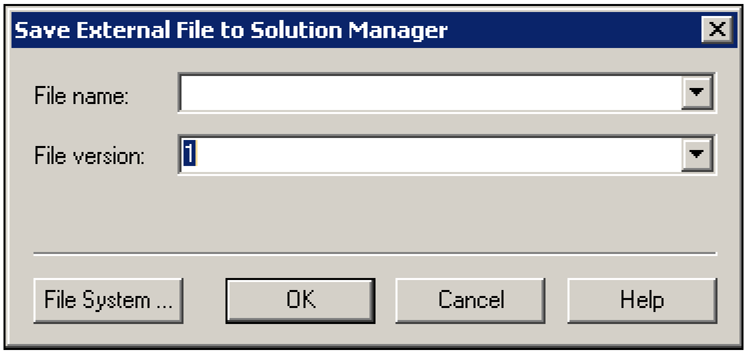
   Note: If you are exporting objects from a local object repository:

   - You must select the action whose object repository you want to export.
   - The object repository name must contain at least 14 characters.

2. Select one of the following:
   - **Resources > Object Repository Manager** to open the shared Object Repository Manager.
   - **Resources > Object Repository** to open the local Object Repository for the selected action.
3. Do one of the following:
   - In the shared Object Repository Manager, select **File > Save As** to save a copy of the object repository file with a new name in Solution Manager.

- In the Object Repository Window, select **File > Export Local Objects** to export the object repository to a shared object repository file in Solution Manager.

The Save External File to Solution Manager Dialog Box opens.



File name:

File version: 1

4. Enter the required information and click **OK**.

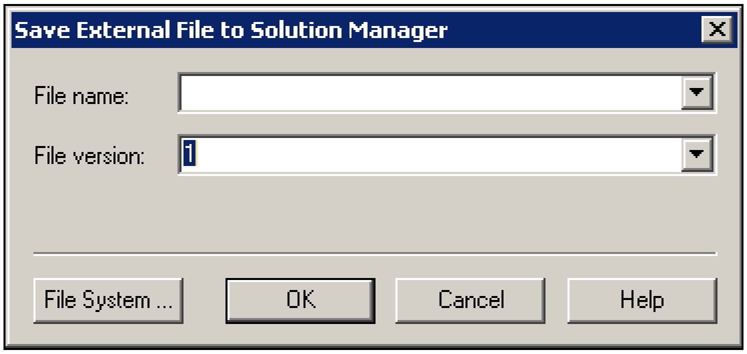
   For details on exporting and saving object repository files, see the *HP Unified Functional Testing User Guide*.

Create a new recovery file in Solution Manager

1. Select **Resources > Recovery Scenario Manager**. The Recovery Scenario Manager opens.
2. Click the **New Scenario** button. The Recovery Scenario Wizard opens. Follow the instructions in the wizard to create a new scenario. When you are finished, the scenario is displayed in the Recovery Scenario Manager

   To add more scenarios to the new scenario file, repeat this step.

   When you are ready to save the scenario file, click **Save**. The Save External File to Solution Manager Dialog Box opens.



File name:

File version: 1

3. Enter the required information and click **OK**.

   For details on creating and saving recovery files, see the *HP Unified Functional Testing User Guide*.

How to Run a Test Stored in Solution Manager

This task describes how to run tests from UFT. The run results are stored in the location you specify in the file system. You cannot access these results from Solution Manager.

When working with UFT in standalone mode, you run a test stored in a Solution Manager database just like any other UFT test.

This task describes how to:

- "Run a test in standalone" below
- "Run a UFT test from Solution Manager in Integrated Mode using the Execute Test Script option" on the next page
- "View results of a GUI test run in integrated mode" on the next page

Run a test in standalone

1. Open UFT in standalone mode.
2. In UFT, open the test you want to run.
3. Click the **Run** button or select **Run > Run**. The Run Dialog Box opens.
4. Accept the default results folder or browse to select another one.

   Note:

   - The default results folder is created under the folder where the cache (local) copy of your test is stored. You set the location of your **Solution Manager test cache folder** in the **Solution Manager** pane of the Options dialog box.
   - When running tests in standalone mode, no Solution Manager log is created.
   - To run the test and overwrite the previous run session results, select the **Temporary run results folder (overwriting older temporary results)** option.
   - UFT stores temporary run session results for all tests in `<System Drive>:\%Temp%\TempResults`. The path in the text box of the **Temporary run results folder (overwriting older temporary results)** option is read-only and cannot be changed.

5. Click **OK**. The Run dialog box closes and UFT begins running the test.

   When the run session ends, the run results open (unless the **View results when run session ends** check box is cleared in the **Run Sessions** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> General** tab **> Run Sessions** node).

Run a UFT test from Solution Manager in Integrated Mode using the Execute Test Script option

For details, see your SAP documentation.

View results of a GUI test run in integrated mode

You can view the results of a GUI test that was run from Solution Manager in the following ways:

- **In the Solution Manager Log Display.** You can view the results of the test or the results of a specific event, such as a checkpoint, in the Solution Manager log. You can view the folder in which the results are saved in the **UNCPathToLocalLog** line of the Solution Manager log.
- **In UFT.** You can view the run results in the run results, which you can either access from UFT (as separate tab in the document pane) or open directly from your browser.

  If a test includes steps that log on to Solution Manager using the SAP Tab of the Record and Run Settings dialog box, the logon steps are displayed in the run results tree.

  You can set the Run Results Viewer to open automatically after a test runs from Solution Manager. To do this, in Solution Manager, select the **Log Display** check box in the **Shared** tab in **Start Options** window.
- **Via the generated XML Report.** Each time you run a GUI test from Solution Manager, an `.xml` file is generated. This file contains all details of the run session. To view the file, click the line containing the text: `XML-DATA` in the Solution Manager log.

How to Display or Edit a GUI Test from Solution Manager in Integrated Mode

This task describes how to display or edit any existing GUI test that is stored in Solution Manager. When you open the test, UFT opens in integrated and read-only mode. When you display or open a GUI test in integrated mode, you can work only with the open test. You cannot open another test or save the open test with another name.

Despite this, resource files that are saved with the test (for example, a local repository or the test's local data table) are editable. To edit external resource files, open the test in standalone mode.

> **Note:** If you select the UFT **File > Save As** menu command when working in integrated mode, UFT displays a warning message indicating that you can save a test with a new name in the file system, but doing so disconnects UFT from Solution Manager and switches UFT to standalone mode.

For more details on integrated and standalone modes, see "Standalone Mode" on page 219 and "Integrated Mode" on page 220.

This task describes how to:

- "Display or open a GUI test from Solution Manager" on the next page
- "Create a new GUI test from Solution Manager" on the next page

Display or open a GUI test from Solution Manager

1. Log on to Solution Manager and open a test script. Make sure to specify Unified Functional Testing as the external tool. For details on how to open test scripts in Solution Manager, see your SAP documentation.

   You can open the test in:

   - **Read-only (Display) mode.** (If the test uses external resource files, the test and its resources open in read-only mode by default.)

   - **Edit mode.** This enables you to use most UFT options. For details, see the *HP Unified Functional Testing User Guide*.

2. To return to Solution Manager, close UFT.

Create a new GUI test from Solution Manager

1. Log on to Solution Manager. Then create and save a test script. Make sure to specify Unified Functional Testing as the external tool. For details on how to open test scripts in Solution Manager, see your SAP documentation.

   When you create the script, UFT opens with a blank test.
2. Create the test in UFT. For details on creating GUI tests in UFT, see the other chapters in this guide and the *HP Unified Functional Testing User Guide*.
3. In UFT, select **File > Save As**. A dialog box opens in Solution Manager.
4. In Solution Manager, specify the package in which you want to store the test. Confirm that the other edit boxes contain correct values.

   > If the test has external resource files, they are stored by default in the **$TMP** (local) package. If you select another package for the test, you must manually move any external resource files to the same package.

5. In Solution Manager, save the test. UFT is restored in integrated mode and displays the saved test for additional editing.
6. To return to Solution Manager, close UFT.

How to Transfer Data To and From GUI Tests in Integrated Mode Using Test Parameters

You can pass values from a Solution Manager test script to a GUI test, or vice versa, using GUI test parameters.

To send values to your input arguments, you must run your test via a call from a Solution Manager test script. After you define input and output arguments for your GUI test, you can insert a call to that test from a Solution Manager test script and specify argument values for the input arguments.

Prerequisites

Define test parameters and use them in your GUI test. For details, see the section on the "Parameters Tab (Properties Pane - Testing)" in the *HP Unified Functional Testing User Guide*.

If you are working with SAP structured parameters, see also "How to Work with SAP Structured Parameters" below.

Call a GUI test and specify arguments from Solution Manager

To send values to your input arguments from Solution Manager, you must run your test via a call from a Solution Manager test script.

> **Tip:** You can enter the name of a Solution Manager parameter from the Solution Manager script as the value of a GUI input parameter.
>
> After you define input and output arguments for your GUI test, you can insert a call to that test from a Solution Manager script and specify argument values for the input arguments.

How to Work with SAP Structured Parameters

When you work in integrated mode with SAP Solution manager, you can pass values from a Solution Manager test script to a GUI test, or vice versa, using the structure value type for your test parameters.

You create and maintain the structured parameters in SAP Solution Manager. After you have defined your test parameters via SAP Solution Manager you can map action parameters to the structured parameters in the test. When you run a test, UFT receives the defined structure from SAP Solution Manager, and resolves the mapped local parameter with the actual structured parameter value from SAP Solution Manager.

Create or modify the structured parameters of a test

1. From SAP Solution Manager, Launch your test as an external test.

   UFT opens with your test displayed.

2. In the Parameters tab of the Properties pane, click the Maintain SAP Parameters icon . If the Properties Pane is not already open, select **View > Properties** to open it.

   SAP Solutions Manager opens and UFT is hidden.

   > **Note:** SAP Structured Parameters can be maintained only in SAP Solution Manager.

3. In SAP Solutions Manager, create or modify the structure parameters you want to use for your test, save your changes and click **Back**.

   UFT re-opens with the changes you made now available.

Assign or modify the structured parameters for an action

To use the SAP structured parameter to run the test, you must define parameters of type structure, associate the test and action parameters, and then map the action's structured parameter to the test's structured parameter. You can also map a simple type action parameter to a single element in a structured parameter defined for the test.

1. Select the relevant action.
2. In the Parameters tab of the Properties pane, you can add or remove parameters, as described in Add/Edit Input/Output Parameter Dialog Box (Properties Pane - GUI Testing) in the *HP Unified Functional Testing User Guide*. If the Properties Pane is not already open, select **View > Properties** to open it.

   > **Note:** If the test contains structured parameters, you can add parameters with the structure type to the action.

3. Map action parameters to the test structured parameters
   a. Right-click the relevant actions.
   b. In the context menu, select **Action Call Properties**.
   c. In the Action Call Properties Dialog Box > Parameter Values tab, in the **Value** cell/column of an input parameter or the **Store In** cell/column of an output parameter, click the **Configure Value** button.
   d. In either the Value Configuration Options Dialog Box (for input parameters) or the Storage Location Options Dialog Box (for output parameters), select the **Parameter** radio button and click **Browse**.

      The Value Map dialog box opens.
   e. Define the mapping, as described in Value Map Dialog Box.

      You can select the root node to map the entire structure, or a sub tree node to map to an embedded structure, or you can select a leaf node to map to a specific value in the structure.
   f. Click **OK**.

      The parameters are mapped

> **Note:** If an action is called inside another action, you can map a parameter to an input parameter of the parent action. If the action is called after another action, you can map a parameter to an output parameter of any previous action.
>
> For more details on test and action parameters, see the *HP Unified Functional Testing User Guide*.

Use structured parameters in a script

The examples below show how you can use structured parameters directly from a script.

```
<?xml version="1.0" encoding="utf-16"?>
<ZMOVIE>
  <TITLE>Avatar</TITLE>
  <DIRECTOR>
    <FIRST_NAME>James</FIRST_NAME>
    <LAST_NAME>Cameron</LAST_NAME>
    <BIRTHDAY>16-8-1954</BIRTHDAY>
  </DIRECTOR>
  <REL_DATE>10-12-2009</REL_DATE>
  <GENRE>SF</GENRE>
  <STARRING>
    <item>
      <FIRST_NAME>Michelle</FIRST_NAME>
      <LAST_NAME>Rodriguez</LAST_NAME>
    </item>
    <item>
      <FIRST_NAME>Stephen</FIRST_NAME>
      <LAST_NAME>Lang</LAST_NAME>
    </item>
    <item>
      <FIRST_NAME>Zoe</FIRST_NAME>
      <LAST_NAME>Saldana</LAST_NAME>
    </item>
  </STARRING>
</ZMOVIE>
```

- To access an element in a structured parameter, type the parameter name followed by a colon (:) and then the element path. Use a period (.) between elements and their sub-elements. For example:

  ```
  Print Parameter(“Param1:ZMOVIE.DIRECTOR.FIRST_NAME”)
  ```

  Output:

  ```
  James
  ```

  ```
  Print Parameter(“Param1:ZMOVIE.STARRING.item[1].FIRST_NAME”)
  ```

  Output:

  ```
  Michelle
  ```

  Note: UFT provides statement completion for structured parameters, displaying the elements available for the relevant structure type.

- If the path represents an element that contains additional sub-elements, the returned value will be a XML string. The path follows the XPath expression rule

  ```
  Print Parameter(“Param1:ZMOVIE.DIRECTOR”)
  ```

  Output:

  ```
  <DIRECTOR>
      <FIRST_NAME>James</FIRST_NAME>
      <LAST_NAME>Cameron</LAST_NAME>
      <BIRTHDAY>16-8-1954</BIRTHDAY>
    </DIRECTOR>
  ```

- If the structure is an array or a table, you can use it in a loop:

  ```
  rowCount = Parameter("Param1:ZMOVIE.STARRING.item.count()")
  For Iterator = 1 To rowCount Step 1
      first_name = "Param1:ZMOVIE.STARRING.item[" & Iterator & "].FIRST_NAME"
      last_name = "Param1:ZMOVIE.STARRING.item[" &Iterator &"].LAST_NAME"
      print Parameter(first_name) & " " & Parameter(last_name)
  Next
  ```

  Output:

  ```
  Michelle Rodriguez
  Stephen Lang
  Zoe Saldana
  ```

Note: You can omit the root element from the path. For example,

```
 Print Parameter("Param1:ZMOVIE.DIRECTOR.FIRST_NAME")
```

Can also be written as

```
 Print Parameter("Param1:DIRECTOR.FIRST_NAME")
```

Part 13: Siebel Add-in

This section includes:

Siebel Add-in - Quick Reference

You can use the UFT Siebel Add-in to test Siebel user-interface objects (controls).

The following tables summarize basic information about the Siebel Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	This is a Web-based add-in. Much of its functionality is the same as other Web-based add-ins. See "Web-Based Application Support" on page 25.
Supported Environments	For details on supported Siebel environments, see the **Siebel Add-in** section of the *HP Unified Functional Testing Product Availability Matrix*. If you are testing SiebelOpenUI applications, the SiebelOpenUI Add-in is supported as a child add-in of the Web Add-in and appears in the Add-in Manager as a child add-in of the Web Add-in. The SiebelOpenUI Add-in must be installed as one of the Web 2.0 toolkits. You should load the Web Add-in and the SiebelOpenUI Add-in, but do not load the Siebel Add-in. If you load both the Siebel and the SiebelOpenUI add-ins, the add-ins sometimes conflict with each other, and prevent successful object recognition.
Important Information	• You can use Siebel Test Express to automatically generate a new object repository, or update an existing object repository. For details, see "Siebel Test Express" on page 252. • For general considerations, see "Considerations - Siebel Add-in" on page 240.
Test Object Methods and Properties	The Siebel Add-in provides test objects, methods, and properties that can be used when testing objects in Siebel applications. For details, see the **Siebel** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "Considerations - Siebel Add-in" on page 240. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	"Known Issues - Siebel Add-in" on page 248

Prerequisites	
Opening Your Application	You must open UFT and set Record and Run options before opening your Siebel application. Open the application only after you begin the recording session.
Add-in Dependencies	None
Other	• To test a Siebel 7.7.x or later application, you must: • Modify the Siebel Test Automation module configuration. • Instruct your Siebel application to generate test automation information.

	See "Siebel 7.7.x or Later - Test Automation Module Configuration" on page 246. • To test your Web application in Mozilla Firefox version 33 and later, you must enable the Functional Testing Extension in one of the following ways: • If the **Select Your Add-ons** screen is displayed when you open Firefox, select to enable the Functional Testing Extension. • If the **Install Add-on** tab opens and displays Functional Testing Extension when opening Firefox, select the **Allow this installation check box** and click **Continue**. Otherwise: i. In Firefox, open the browser menu. ii. In the menu, click **Add-ons**. iii. In the Add-ons Manager tab, select the **Extensions** node. iv. In the Functional Testing Extension row, click the **Enable** button. To test your Web application in Mozilla Firefox versions earlier than 33, you must enable the legacy Firefox agent: a. Open the **<UFT installation folder>\Installations\Firefox** folder. b. From the Firefox folder, drag the **Legacy.xpi** file into Firefox. c. In Firefox, open the browser menu. d. In the menu, click Add-ons. e. In the Add-ons Manager tab, select the Extensions node. f. In the Functional Testing Extension row, disable the Functional Testing 12.50 extension and enable the extension you added to Firefox.

Configuration	
Options Dialog Box	Use the **Web** pane. (Make sure that a GUI test is open and select **Tools > Options > GUI Testing** tab **> Web > General** node.)
Record and Run Settings Dialog Box (tests only)	Use the **Siebel** tab. (**Record > Record and Run Settings**)
Test Settings Dialog Box (tests only)	Use the **Web** pane. (File > Settings > Web node)
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Web** section. (Tools > Options > **GUI Testing** tab **>** Active Screen node > Custom Level) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane	• Use the **Web** pane. In the application area, click **Additional Settings** > **Web** in the sidebar. • Use the **Applications** pane.

(business components only)	In the application area, select **Additional Settings > Applications** in the sidebar. In the **Siebel version** box, specify the Siebel version for the applications on which you want to record your business component. The version that you choose remains selected for all subsequent business components.

Siebel Add-in - Testing and Configuration

This chapter includes:

Siebel Add-in - Overview

The Siebel eBusiness platform is widely used in many organizations for their business process applications. UFT can create and run tests and business components on these applications using special test objects and operations (methods and properties) that are customized for Siebel.

The customized Siebel test objects, methods, and properties make scripts simpler to read, maintain, enhance, and parameterize, enabling both advanced and novice users to create sophisticated tests and business components on Siebel applications.

UFT supports testing on both standard-interactivity and high-interactivity Siebel applications:

- **Standard-interactivity applications** download data as it becomes necessary. This interface is designed for users accessing the application from outside the corporate network.
- **High-interactivity applications** download the majority of the required data at one time, requiring fewer navigations. This interface is designed for heavy use, for example, by call centers.

Considerations - Siebel Add-in

General Considerations

- UFT learns objects in Siebel 7.7.x or later applications in a different way than in Siebel 7.0.x and 7.5.x applications. The Siebel Add-in has two different groups of test objects. The test object used to represent an object in your application depends on the Siebel version of your application and the implementation of the object. For details, see "Siebel Test Object Model - Overview" on the next page.
- When you load the Siebel Add-in, the Web event recording configurations designed for this add-in are loaded and are used whenever you record on a Siebel object. The Siebel Web event recording configurations do not affect the way UFT behaves when you record on other non-Siebel Web objects. For details, see "Event Recording Configuration for Web-Based Applications" on page 30.
- When you load the Siebel Add-in, the object identification settings are also automatically customized for Siebel. You do not need to make any changes to them. Therefore, the Siebel and Web options in the Object Identification dialog box are unavailable.
- Loading the ActiveX and Siebel add-ins together may cause problems when recording on some ActiveX methods.

Siebel 7.7.x or Later

- As you record a test or business component on your Siebel 7.7.x or later application, UFT records the operations you perform. UFT works directly with the Siebel Test Automation API (`SiebelAx_Test_Automation_18306.exe`) to record your operations. Therefore, although UFT records a step for each operation you perform, it adds the steps to your test or business component only when API events are sent to UFT (when information is sent to the Siebel server).

- When test automation is activated on a Siebel 7.7.x or later server and requested in the URL, the Siebel Web Engine (SWE) generates additional information about each object in the Siebel application when constructing the Web page. Each object has a specific set of properties, events, and methods that provide functionality for the Siebel application. The Siebel Test Automation API maps to these objects to enable you to manipulate your Siebel application from UFT when recording and running tests or business components on the Siebel application.

Siebel 7.0.x/7.5.x

The Siebel Add-in can also identify Siebel objects by the **siebel attached text** property (the static text displayed with a Siebel object), rather than by the HTML name of the object. This enables you to maintain the test or business component with dynamically created pages.

Siebel Test Object Model - Overview

The Siebel test object model is comprised of two different groups of test objects: test objects with the prefix **Sbl** and test objects with the prefix **Sieb**. If you are recording on a Siebel 7.0.x or 7.5.x application, UFT learns only **Sbl** test objects. If you are learning objects on a Siebel 7.7.x or later application, UFT may learn only **Sieb** test objects or a combination of **Sbl** and **Sieb** test objects, depending on the way in which your Siebel application was implemented.

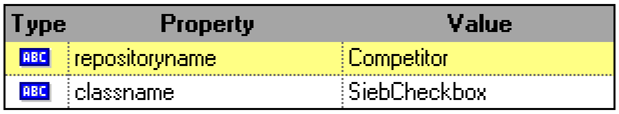
For details on each of the Siebel test objects, see the **Siebel** section of the *HP UFT Object Model Reference for GUI Testing*.

When you perform an operation on your Siebel application while recording a test or business component, UFT:

- identifies the object on which you performed the operation and creates the appropriate test object in the test or business component.
- reads the current value of the object's properties in your application and stores them in the object repository as the test object's property values.
- chooses a unique name for the test object, generally using the value of one of its prominent properties.
- records the operation (method) that you performed on the object and displays the operation as a step in the Keyword View and as a statement in the Editor.

For example, suppose you select a check box for a specific account on a page of your Siebel application. This check box has the label **Competitor**.

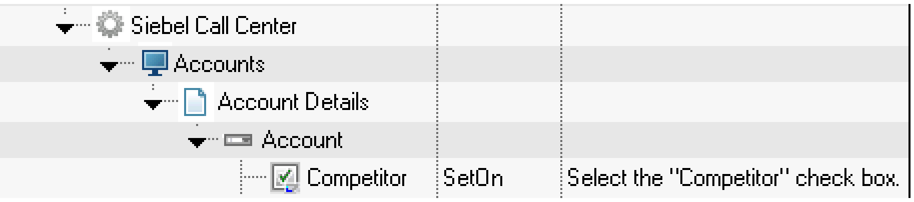
UFT identifies the check box as a SiebCheckbox object. It creates a SiebCheckbox test object with the name **Competitor** and records the following properties and values as the description for the **Competitor** SiebCheckbox.



Type	Property	Value
ABC	repositoryname	Competitor
ABC	classname	SiebCheckbox

It also records that you performed a `SetOn` method to select the `SiebCheckbox` object.

UFT displays your step in the Keyword View like this:



Siebel Call Center		
Accounts		
Account Details		
Account		
Competitor	SetOn	Select the "Competitor" check box.

UFT displays your step in the Editor like this:

```
SiebApplication("Siebel Call Center").SiebScreen("Accounts").SiebView("Account
Details").SiebApplet("Account").SiebCheckbox("Competitor").SetOn
```

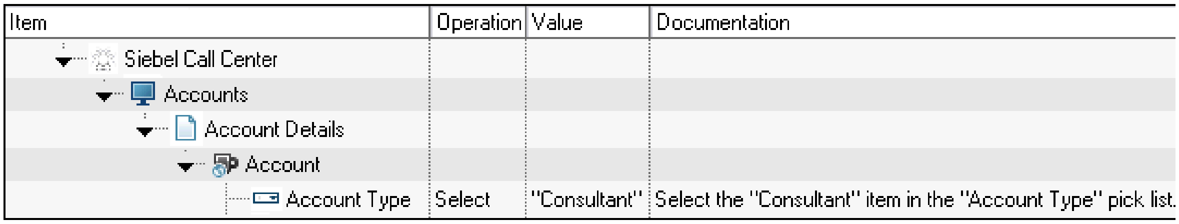
When you run a test or business component, UFT identifies each object in your application by its test object class and its *description*: the set of identification properties and values used to uniquely identify the object. In the above example, during the run session, UFT searches the object repository for the SiebCheckbox object named `Competitor` to look up its description. Based on the description it finds (**repositoryname** = `Competitor` and **classname** = `SiebCheckbox`), UFT searches the application for a SiebCheckbox object named **Competitor**. When it finds the object, UFT performs the **SetOn** method on the object to select the check box.

To learn more, see:

Recording Steps on Siebel Objects

When you record an operation on a Siebel object, UFT inserts a step with the relevant Siebel object in the Keyword View and adds the corresponding statement in the Editor.

For example, if you select an item from a list, the Keyword View may be displayed as follows:



Item	Operation	Value	Documentation
Siebel Call Center			
Accounts			
Account Details			
Account			
Account Type	Select	"Consultant"	Select the "Consultant" item in the "Account Type" pick list.

UFT records this step in the Editor as:

```
SiebApplication("Siebel Call Center").SiebScreen("Accounts").SiebView("Account
Details").SiebApplet("Account").SiebPicklist("Account Type").Select "Consultant"
```

Tip: It is recommended to log out of your Siebel application at the end of the recording session before closing the browser.

If you have the Siebel Add-in installed, you can use UFT to generate an object repository for your application. For details, see "Siebel Test Express" on page 252

Native Operations and Properties in Siebel 7.0.x and 7.5.x Applications

In addition to the Siebel-specific test objects and operations, you can also use the **Object** property to access native (internal) operations and properties of the HTML or ActiveX elements that wrap Siebel objects. The **Object** property is available for all Siebel 7.0.x and 7.5.x objects.

Tip: You can use the Object Spy to view the native operations and properties of an object in your application.

The **Object** property is also useful for checking the value of properties that are not available using a standard Siebel checkpoint.

The following example uses the **Object** property to access the raw HTML element that represents the SblTabStrip object, retrieve its HTML tag name and size, and display this information in message boxes

```
set obj = Browser("Siebel Call").Page("Siebel Call").Frame("Siebel
Call").SblTabStrip("ScreenTabStrip").Object
msgbox obj.tagName
msgbox obj.height
msgbox obj.width
```

Note: Relying on native properties may be problematic if you are upgrading your Siebel application to a newer version, in which objects may have a different structure. For example, the conversion of HTML objects to ActiveX objects in the Internet Explorer Option Pack.

For details on using the Object property, see the *HP Unified Functional Testing User Guide*.

Siebel Add-in - Checkpoints and Output Values

After you create your test or business component, you can enhance it by adding checkpoints, retrieving output values, parameterizing values, and inserting Siebel objects, methods and properties.

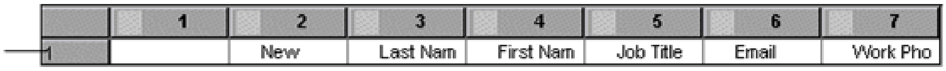
You check most Siebel objects or output their property values in the same way as you do for other objects supported by UFT, with exceptions for **SblTable** objects and **Sieb** tabular test objects.

Considerations - Siebel Add-in Checkpoints and Output Values

- You check SblTable objects and output their values in the same way as you do for other table objects supported by UFT—using the Table Checkpoint Properties dialog box or Table Output Value Properties dialog box—with the following differences:
  - In Siebel 7.0.x or 7.5.x high-interactivity applications, you must have your Siebel application open to the page that contains the table while creating a table checkpoint or output value.

    When creating table checkpoints or output values, do not include the header line of the SblTable object when selecting cells to check or output. To clear the selection in this first row of cells, double-click row heading **1** to the left of the table.

    Double-click to clear all cells in the row

	1	2	3	4	5	6	7
1		New	Last Nam	First Nam	Job Title	Email	Work Pho

    > **Tip:** When working with SblTable objects, you can spool all of the visible data from a table into an external file. For details, see "Spooling Data from a Siebel Table" on the next page.

  - Specific test objects in Siebel 7.7.x applications (with **Sieb** prefixes) have tabular characteristics. UFT treats **Sieb** tabular test objects as table-type objects and enables you to check both their content and/or their identification properties. You can also output content and/or identification property values for use in your test or business component. The following **Sieb** test objects have tabular characteristics: SiebCommunicationsToolbar, SiebList, SiebMenu, SiebPageTabs, SiebPDQ, SiebPicklist, SiebScreenViews, SiebThreadbar, SiebToolbar, and SiebViewApplets.

    > **Tip:** When working with **Sieb** tabular objects, you can spool all of the visible data from the object into an external file. For details, see "Spooling Data from a Siebel Table" on the next page.

- When testing high-interactivity applications:
  - If the **Sieb** tabular object is not open in your Siebel application when you create a checkpoint, the Table Checkpoint Properties dialog box contains only the Properties tab and the option to select which type of information to check (content or properties) is disabled.

  - If the **Sieb** tabular object is not open in your Siebel application when you create the output value, the Table Output Value Properties dialog box contains only the Properties tab, and the option to select which type of information to output (content or properties) is disabled.

- If you want to access an inner object contained in a SiebList object, hold the **CTRL** key while you click the SiebList object with the pointing hand mechanism.

To learn more, see:

Spooling Data from a Siebel Table

If you want to spool all the visible data from a SblTable or a **Sieb** tabular object (such as a SiebList object) into an external file, you can loop through each cell in the table and then save the information to an external file.

The following example uses the **GetCellData** method to list the data of each cell in a **SblTable** object with 10 rows and 10 columns:

```
For i=0 to 10
       For j=0 to 10
               Dat=Browser("Siebel eChannel").Page("Siebel eChannel_8").
               Frame("Campaign Explorer").SblTable("Campaign").
               GetCellData (i, j)
               SaveToExternalFile (Dat)
       Next
Next
```

The following example uses the **RowsCount** and **ColumnsCount** methods to list the data of each cell in a SiebList object:

```
RowsCount = SiebApplication("Siebel Call Center").SiebScreen
("Accounts").SiebView("My Accounts").SiebApplet("Accounts").SiebList
("List").RowsCount
ColsCount = SiebApplication("Siebel Call Center").SiebScreen
("Accounts").SiebView("My Accounts").SiebApplet("Accounts").SiebList
("List").ColumnsCount
For i=0 to RowsCount-1
    For j=0 to ColsCount-1
        ColumnName = SiebApplication("Siebel Call Center").SiebScreen
("Accounts").SiebView("My Accounts").SiebApplet("Accounts").SiebList
("List").GetColumnRepositoryNameByIndex(j)
       Dat=SiebApplication("Siebel Call Center").SiebScreen("Accounts").SiebView("My
Accounts").SiebApplet("Accounts").SiebList("List").GetCellText(ColumnName,i)
       SaveToExternalFile (Dat)
       Next
Next
```

For details on the **GetCellData**, **RowsCount**, and **ColumnsCount** methods, see the **Siebel** section of the *HP UFT Object Model Reference for GUI Testing*.

Siebel 7.7.x or Later - Test Automation Module Configuration

UFT support for Siebel 7.7.x or later applications is based on the Siebel Test Automation API (`SiebelAx_Test_Automation_18306.exe`). Before you can create or run tests or business components on your Siebel 7.7.x or later application, you must modify the Siebel Test Automation module configuration and instruct your Siebel application to generate test automation information.

You do not need to make any configuration changes in Siebel 7.0.x and 7.5.x applications to create and run tests or business components on these Siebel application versions.

To test your Siebel 7.7.x or later application using the Siebel Add-in, you must confirm that your Siebel server has the Siebel Test Automation module installed and correctly configured to perform test automation. For detailed information, see the section that describes how to set up your functional testing environment in *Testing Siebel eBusiness Applications Version 7.7*, provided with your Siebel installation.

Generating Test Automation Information - Siebel Application

To create and run tests or business components on your Siebel 7.7.x or later application, you must instruct the Siebel Web Engine (SWE) to generate test automation information for the Siebel application, using a SWE command. To do so, append the `SWECmd=AutoOn` token to the URL of your Siebel server. For example: `http://hostname/callcenter/start.swe?SWECmd=AutoOn`. If you do not append this token, the SWE does not generate test automation information.

If you select the **Open the following application when a record or run session begins** option in the Siebel tab of the Record and Run Settings dialog box, UFT automatically appends the Siebel Test Automation information to the URL (you do not need to specify it manually in the URL). For details on the Record and Run Settings dialog box options, see "How to Define Environment Variables for Siebel Applications" on the next page.

If you select the **Open the following application when a record or run session begins** option in the Siebel tab of the Record and Run Settings dialog box, UFT automatically appends the Siebel Test Automation information to the URL (you do not need to specify it manually in the URL). For details on the Record and Run Settings dialog box options, see "How to Define Environment Variables for Siebel Applications" on the next page.

Note: If a session timeout error occurs in your Siebel 7.7.x or later application, the Siebel Test Automation URL parameter values are not saved. After you log out and log in again, you must navigate to the correct URL that contains the required Siebel Test Automation parameter values (including password parameter values, if any—see below).

Generating Test Automation Information - Secured Siebel Application

If a password for generating test automation information is defined on your Siebel Server, you must also indicate that password in the URL (in addition to the `SWECommand=AutoOn` token described above). The URL token is in the format `AutoToken=password`. For example: `http://hostname/callcenter/start.swe?SWECmd=AutoOn&AutoToken=mYPass`. This enables UFT to run the Siebel Test Automation API `SiebelAx_Test_Automation_18306.exe` even in secure mode.

If a password is defined for the Siebel Server and you do not append this token to the URL, the SWE does not generate test automation information.

For details on whether your Siebel Server is secured for test automation, contact your Siebel system administrator.

If you select the **Open the following application when a record or run session begins** option in the Siebel tab of the Record and Run Settings dialog box, click the **Advanced** button, and specify the password in the **Siebel automation access code** box in the Advanced Siebel Record and Run Settings dialog box, UFT automatically appends the password information to the URL (you do not need to specify it manually in the URL). For details on the Record and Run Settings dialog box options, see "How to Define Environment Variables for Siebel Applications" below.

How to Define Environment Variables for Siebel Applications

Note:

- If you define any of these environment variables, it overrides the corresponding values in the Siebel Tab (Record and Run Settings Dialog Box) (for components), or the Applications pane in the application area's Additional Settings pane (for application areas).
- For details on defining and working with environment variables, see "Environment Variables in Record and Run Settings" on page 20.

Use the variable names listed in the following table to define Siebel application details:

Option	Variable Name	Description
Siebel version	`APPLICATION_ENV`	The Siebel version for the applications on which you want to record your test or business component. **Possible values:** • `77` • `7075` This option is available for tests and business components.
Address	`URL_ENV`	The URL of the application you want to open. This option is available only for tests.

Option	Variable Name	Description
Auto-login	AUTO_LOGIN_ENV	Indicates whether to automatically log in to the application to open. This option is available only for tests. **Possible values:** • `True` • `False`
User	USER_NAME_ENV	The user name used to log in to the application to open. This option is available only for tests.
Password	PASSWORD_ENV	The encrypted password for the application to open. This option is available only for tests.
Log out of the application when the test closes	LOGOUT_ENV	Indicates whether to automatically log out of the application when the test closes. This option is available only for tests. **Possible values:** • `True` • `False`

Known Issues - Siebel Add-in

This section contains general troubleshooting and limitation information about the Siebel Add-in.

General

Recording on multiple Siebel application versions in the same computer may cause steps not to be recorded.

Checkpoints and the Object Spy

- To create a table content checkpoint or output value for the appropriate object type (for example, SiebList, SiebPicklist, or SiebPageTabs) when editing your test or business component, you must open the application to the exact screen in which the object appears. Otherwise, only the Properties tab is displayed in the Table Checkpoint dialog box or Table Output Value dialog box.
- Checkpoints created for SiebList objects that contain a **Total** row may fail during a run session if the action that led to the update of the **Total** row was not recorded.
- The Object Spy and checkpoints identify expanded calculator and calendar popup objects as `Window ("Siebel control popup")`.

This section also includes troubleshooting and limitation information about the following Siebel versions:

- "Siebel 7.7.x or Later" on the next page
- "Siebel 7.0.x and 7.5.x " on page 250

Siebel 7.7.x or Later

- Certain objects, methods, or properties may be available from within UFT even though they are not described in the documentation. This is because UFT retrieves the latest `SiebelObject.xml` file when loading the Siebel add-in and opening a Siebel application, and because the documentation is updated according to version of the `.xml` file that is available at the time of the UFT product release.
- Certain objects, for example, in the SmartScript module, do not have a value for the repository name property and are therefore not recorded and are not recognized by the Object Spy.

  Workaround: Use low-level recording.
- Gantt chart operations and RichText editor toolbar operations are not recorded.

  Workaround: Use low-level recording.
- The appointment calendar object can be recorded only if the ActiveX Add-in is enabled.
- If you record the creation of a new appointment in an appointment calendar, the test or business component may fail when you run it.

  Workaround: Manually add an `onkeypress` FireEvent to the `WebElement` before the `Set` step.
- The Active Screen is empty for steps recorded on pop-up tables.
- Inner objects that are placed in cells of a `SiebList` object cannot be accessed in the standard way, even if they are recorded. This may cause the following limitations:
  - The entire SiebList object is highlighted if the test or business component script line contains an operation on a SiebList inner object.
  - The **ChildObjects** method for SiebList objects returns 0.
  - The Add Objects option in the Object Repository window cannot be used to add `SiebList` inner objects to the object repository.
- If a warning message opens while recording your test or business component, for example, if you insert invalid data, UFT may record these operations in the incorrect order.

  Workaround: Manually change the order of the steps in your test after recording.
- Context-sensitive help (**F1** Help) may not be available for Siebel 7.7.x or later objects and/or methods that were added by Siebel after the UFT 11.50 release. In addition, auto-documentation (in the Keyword View Documentation column) and step documentation (in the Step Generator) may not be available for these objects and/or methods.
- When using Siebel version 8.1.1.11, the **SiebCalculator.ClickKeys** method may not work when running the test of the application calculator

  Workaround: Enter the value of the calculator directly into the edit field instead of using the **ClickKey**/**ClickKeys** method to enter the value.

Siebel 7.0.x and 7.5.x

Creating and Running Testing Documents

- UFT does not support recording on Siebel applications using keyboard shortcuts.

  Workaround: Use the mouse to record on Siebel applications.

- UFT does not record the scrolling of a set of records in an SblTable.

  Workaround: While recording, scroll the table row by row.

  > **Tip:** You can use the Editor to manually edit the statement to scroll multiple rows.

- By default, UFT does not record Editor control operations (used mainly in long **Description** fields).

  Workaround: Use low-level recording, making sure you record the scrolling to the control if needed.

Working with Siebel Controls

- When you click the **Search** icon for the first time during a browser session, a frame opens that is different from all other search frames. When running test iterations, the correct frame may not be identified.

  Workaround: Close the browser at the end of every iteration.

- Each Siebel version includes changes/modifications to the user interface. As a result, steps last modified in previous Siebel versions on elements that no longer exist in the interface will probably fail and should be replaced.

  For example, the button arrow used to view the next set of records on the top line of the Siebel table that appears in earlier versions of Siebel was replaced in Siebel version 7.5.2 with a scroll bar at the side of the table. In this case, replace `Image("Next Record").Click` with an operation on the scroll bar.

- The name of the first column in an SblTable object cannot be retrieved.

  Workaround: Use the column index to perform the operation on the cells in the first column.

Standard-Interactivity (SI) Applications

- In some SI application dialog boxes, in cases where selecting a check box causes a navigation to occur (for example, in a check box table column, such as the **New** column), UFT may not record the subsequent steps or may record them inaccurately.

  Workaround: To continue recording accurately, click anywhere in the page before the next operation.

- When recording on a Currency Calculator pop-up control, clicking **OK** immediately after entering a currency value may result in a recording error.

  Workaround: Before clicking **OK** in a Currency Calculator pop-up control within a SblAdvancedEdit object, select another control within the pop-up and click **OK**.

High-Interactivity (HI) Applications

- Depending on your browser's security settings and the Siebel patches that are installed, several dialog boxes may open when logging in to your Siebel application. It is recommended to run tests or business components when all required Siebel patches are downloaded and installed. If for some reason, you cannot do this, manually delete the `Sync` steps added between the steps recorded on the security alerts.
- UFT cannot record a `SblTable.Sort` operation if it is the first operation inside an MVG (Multi-Value Group) applet.

  Workaround: Click anywhere in the MVG applet and then sort it.
- When recording on a SblAdvancedEdit object that opens a pop-up object, UFT records only the **Set** method and does not record the operations within the pop-up object. However, if you open a table from the pop-up object, UFT does record the operations performed within this secondary table. These statements are not required in the test or business component, since the operation of inserting the Pickup table selected item into the main table is also recorded. In some cases, these redundant statements interfere with the run session.

  Workaround: If the test or business component does not run as expected, delete the statements recorded on secondary tables opened from a pop-up object.
- When adding an attachment to a Siebel table, UFT records additional statements that may interfere with the run session.

  Workaround: After recording, delete the `OpenCellElement` and `Add` statements that were recorded when you added an attachment.
- When inserting a value into a Siebel table cell using the Currency Calculator control, UFT may record a new `SelectCell` step before the `SetCellData` if you move the cursor to another cell before clicking in the cell in which you entered a value.

  Workaround: While recording, always close the Currency Calculator by pressing the **ENTER** key. If, for some reason, the Currency Calculator was not closed using the **ENTER** key, you can manually change the order between the `SetCellData` and `SelectCell` steps.

Siebel Test Express

This chapter includes:

Using Siebel Test Express to Generate or Update Shared Object Repositories

If the Siebel Add-in is installed on UFT, you can use Siebel Test Express to automatically generate a new shared object repository, or to update an existing object repository.

You can create new shared object repositories using the Create Object Repository Wizard. Using the wizard you can select the applications or top-level application objects for which to create an object repository. Siebel Test Express scans the Siebel application and creates test objects for every child object contained in the applications or top-level objects that you specify. After you have created the shared object repository, you can save it to the file system or to an ALM project using the Object Repository Manager.

You can also use Siebel Test Express to update an existing object repository. The Update Object Repository Wizard enables you to select the applications or top-level objects to include in the update, as well as the date from which to search for and include new or modified objects. The date refers to when the objects were last added or modified in the object repository.

After you update an object repository, the Object Repository Merge Tool merges the new and modified objects with objects from your existing object repository.

This chapter explains how to create or update an object repository using Siebel Test Express. For details on working with object repositories in general, see the *HP Unified Functional Testing User Guide*.

For details on creating and updating object repositories using Siebel Test Express, see "How to Use Siebel Test Express to Generate or Update a Shared Object Repository" below.

How to Use Siebel Test Express to Generate or Update a Shared Object Repository

This task describes how to use Siebel Test Express to generate a new shared object repository for a Siebel application or to update an existing shared object repository.

This task includes the following steps:

- "Prerequisites" below
- "Create or update a shared object repository" on the next page
- "(Optional) Use the Object Repository Merge Tool to merge the updated Siebel object repository" on the next page
- "Save the shared object repository" on the next page

1. **Prerequisites**

    - To successfully run Siebel Test Express, the Siebel Add-in must be installed and loaded.

- Siebel Test Express supports Siebel 7.7 or later high-interactivity applications that are based on the Siebel Test Automation API.

- To work with Siebel Test Express in UFT, ensure that the Siebel Test Automation API version installed on your server is one that supports Siebel Test Express.

2. **Create or update a shared object repository**

   a. Select **Resources > Object Repository Manager**. The Object Repository Manager opens.

   b. (Optional) To update an existing object repository, open the object repository file you want to update in editable format.

      > **Note:** By default, the object repository file opens in read-only mode. To open it in editable format, either clear the **Open in read-only mode** check box in the Open Shared Object Repository window, or enable editing by selecting **File > Enable Editing** after you open the repository.

   c. Open the Create Object Repository Wizard

   d. Follow the steps of the wizard to create the new shared object repository.

      After the import process ends, the Object Repository Merge Tool opens. This may take a few minutes.

3. **(Optional) Use the Object Repository Merge Tool to merge the updated Siebel object repository**

   Conflicts between objects in the primary and secondary repository files are resolved automatically by the Merge Tool according to the default resolution settings. After the merge, the Merge Tool displays the Statistics dialog box, which lists the files that were merged, and the number and type of any conflicts that were resolved during the merge. You can accept or modify these resolutions to match your needs.

   For details on working with the Object Repository Merge Tool, see the *HP Unified Functional Testing User Guide*.

4. **Save the shared object repository**

   Save the shared object repository to the file system or to an ALM project. For details on working with or saving shared object repositories, see the section on the Object Repository Manager in the *HP Unified Functional Testing User Guide*.

Part 14: Standard Windows Testing Support

This section includes:

"Standard Windows Support -Quick Reference" on page 256

"Known Issues - Standard Windows" on page 258

Standard Windows Support -Quick Reference

You can use the standard Windows testing support provided by UFT to test user-interface objects (controls) developed using the Win32 API or MFC platforms. UFT standard Windows testing support is built-in and does not require you to load any UFT add-in.

The following tables summarize basic information about standard Windows testing support and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	The standard Windows testing support functions like a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. See "Windows-Based Application Support" on page 52
Important Information	UFT uses built-in standard Windows testing support and standard Windows test objects to identify the following: • Objects from other environments if the relevant add-in is not installed and loaded. • Stingray, VisualAge Smalltalk, and Qt (widget toolkit) controls when the relevant add-in is installed and loaded. For details, see the relevant add-in documentation. • Many windowless objects, if they were developed using the MSAA (Microsoft Active Accessibility) API. For example, the controls within the Microsoft Office ribbons are identified as independent objects.
Test Object Methods and Properties	Standard Windows testing support provides test objects, methods, and properties that can be used when testing objects in standard Windows applications. For more information, see the **Standard Windows** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "Supported Checkpoints " on page 383and "Supported Output Values " on page 385Per Add-In. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	"Known Issues - Standard Windows" on page 258

Prerequisites	
Opening Your Application	You can open your standard Windows application before or after opening UFT. Standard Windows testing support is always loaded in UFT. It is therefore not an available option in the Add-in Manager.
Add-in Dependencies	None

Configuration	
Options Dialog Box	Use the **Windows Applications** pane. (**Tools > Options > GUI Testing** tab **> Windows Applications** node)

Record and Run Settings Dialog Box (tests only)	Use the **Windows Applications** tab. (**Record > Record and Run Settings**) **Note:** UFT recognizes standard Windows objects only in applications that are opened after changing the settings in the Windows Applications tab of the Record and Run Settings dialog box.
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Windows applications** section. (**Tools > Options > GUI Testing** tab > **Active Screen** node > **Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, select **Additional Settings > Applications** in the sidebar. See the section on the Applications pane in the *HP Unified Functional Testing User Guide*.

Known Issues - Standard Windows

This section describes troubleshooting and limitations for working with Standard Windows test objects.

- When recording on WinMenu objects, the Active Screen is not captured.
- You cannot insert a checkpoint on a WinMenu object.

  Workaround: Use the **CheckProperty** and **CheckItemProperty** methods to check specific property and item property values.
- If you record using Windows logo key shortcuts, the recording may be inaccurate.

  Workaround: Use the **Start** menu instead of the Windows logo key when recording.
- Changing the style of a **WinCalendar** (from single selection to multi-selection, for example) will cause the run session to fail.
- When using the pointing hand mechanism from the Object Spy to point to MFC static text or tab controls, UFT may fail to return the correct object.

  Workaround: Add the object to the object repository. To do this, point to the object's parent window, select the parent window object in the Object Selection dialog box, click **OK**, and perform one of the following in the Define Object Filter dialog box:

  - Select the **All object types** option to add all of the objects in the parent window to the object repository.

  - Select the **Selected object types** option, click the **Select** button, and then select the specific object type(s) you want to add to the object repository.

  After you add the object to the object repository, you can use the **GetROProperty** method to retrieve the run-time values of its properties. For example:

  ```
  width = Dialog("Login").Static("Agent Name:").GetROProperty("width")
  MsgBox width
  ```

- Checkpoints are not supported for WinComboBox objects of style `Simple ComboBox`.
- Windowless objects developed using an API other than the MSAA API are not identified.
- The description properties of a windowless control must include the **acc_name** property. By default, this property is not available in the list properties when you add a new test object.

  Workaround: Add the **acc_name** property to the list of properties. To do this from the Define New Test Object Dialog Box, in the Test object details area, click the **Add description properties** button ➕ . In the Add Properties dialog box, click the **Define new property** button ✳ and add the **acc_name** property.

Part 15: Stingray Add-in

This section includes:

Stingray Add-in - Quick Reference

The following tables summarize basic information about the Stingray Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	This is a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. See "Windows-Based Application Support" on page 52.
Supported Environments	The UFT Stingray Add-in recognizes and records on supported Stingray Objective Grid and Stingray Objective Toolkit controls. For details on supported Stingray environments, see the **Stingray Add-in** section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	"Considerations for Working with the Stingray Add-in " on page 263
Test Object Methods and Properties	The Stingray Add-in uses a sub-set of the standard Windows test objects, methods, and properties, which can be used when testing objects (controls) in Stingray applications. For details, see the **Stingray** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	"Known Issues - Stingray Add-in" on page 267

Prerequisites	
Opening Your Application	You can open your Stingray application before or after opening UFT.
Add-in Dependencies	None
Other	You must configure the Stingray Add-in to work with your application. See "Setting Up Stingray Object Support" on page 263.

Configuration	
Wizard	Stingray Support Configuration Wizard
Options Dialog Box	• Use the **Stingray** pane. (Make sure that a GUI test is open and select **Tools > Options > GUI Testing** tab **> Stingray** node.) • Use the **Windows Applications** pane. (**Tools > Options** > **GUI Testing** tab **>Windows Applications** node)
Record and Run	Use the **Windows Applications** tab.

Settings Dialog Box (tests only)	(**Record > Record and Run Settings**) **Note:** • In addition to the settings in the Record and Run Settings dialog box, you must also configure UFT to recognize your Stingray applications in the **Stingray** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Stingray** node). • If you select the **Record and Run only on** radio button in the Record and Run Settings dialog box, the settings also apply to (limit) the applications that are recognized for Object Spy and other pointing hand operations.
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Windows applications** section. (Tools > Options > **GUI Testing** tab **> Active Screen** node > **Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, click **Additional Settings > Applications** in the sidebar. See the section on the Applications pane in the *HP Unified Functional Testing User Guide*.

Stingray Add-in - Testing and Configuration

This chapter includes:

Setting Up Stingray Object Support

Before you begin working, you need to configure the Stingray Add-in to work with your application. UFT support for Stingray objects is based on an agent entity that exists in the Stingray application. This agent interacts with UFT to enable record and run operations. There are two different modes for establishing the agent entity:

- **Run-time Agent Mode** UFT injects an agent `.dll` into the application's process during run-time. This is the recommended mode. For details, see "Stingray Run-time Agent (Agent DLL)" below.
- **Precompiled Agent Mode.** You make slight modifications to your Visual C++ project in addition to configuring the Stingray Add-in. Use this mode only if the run-time agent mode is unsuitable or cannot be used. For details, see "Stingray Precompiled Agent Mode" on the next page.

You choose your preferred mode and configure support for the Stingray Add-in using the Stingray Support Configuration Wizard. For details, see Stingray Support Configuration Wizard.

After you configure support for the Stingray Add-in, you can fine-tune the configuration options, if needed. For details, see the Stingray pane in the Options dialog box.

Considerations for Working with the Stingray Add-in

UFT stores Stingray support configuration for each configured Stingray application separately. By default, UFT uses the latest configured Stingray agent version for all Stingray applications except those applications that are already configured.

For example, suppose you have two Stingray applications; application `grid1.exe` that uses Stingray Grid control version 9.03, and application `tree1.exe` that uses Stingray TreeView control version 11.00.

You can configure UFT to support both applications as follows:

1. Run the Stingray Support Configuration Wizard and configure support for the `grid1.exe` application. UFT saves the configuration for this application.
2. Run the Stingray Support Configuration Wizard again and configure support for the `tree1.exe` application. UFT saves the configuration for this application.

After performing these steps, UFT will support the `grid1.exe` application and support all Stingray applications that have Stingray TreeView controls version 11.00, including the `tree1.exe` application.

Stingray Run-time Agent (Agent DLL)

When you choose the run-time agent mode, UFT injects an agent DLL into the application's process during run-time. This recommended mode is non-intrusive and does not require any modifications to the source code of the application being tested.

You can use the run-time agent mode only with Stingray applications that are created with dynamically-linked MFC libraries. You can verify if your MFC libraries are linked dynamically or statically by launching the Stingray Support Configuration Wizard. If the wizard identifies that your Stingray application uses statically-linked MFC libraries, it issues a warning.

The run-time agent mode supports the most commonly used major Stingray versions, as well as some—but not all—minor versions. For a list of supported version combinations, see the *HP Unified Functional Testing Product Availability Matrix*. You can also verify if your Stingray application version is supported by launching the Stingray Support Configuration Wizard. If the wizard identifies that your Stingray application version is not supported, it issues a warning.

Note: The Stingray Add-in is designed to support only applications that are compiled in Release mode.

If you cannot use the run-time agent mode for any reason, you can still work with your Stingray application using the precompiled agent mode, instead. For details, see "Stingray Precompiled Agent Mode" below, or contact HP Software Support.

Stingray Precompiled Agent Mode

If your application is statically linked with the MFC libraries, you can use the precompiled agent mode to enable Stingray object support. The precompiled agent mode requires you to make slight modifications to your Visual C++ project to enable UFT to support your Stingray application. If you select the precompiled agent mode in the Stingray Support Configuration Wizard, you can compile your project using the Stingray Add-in agent files.

Note: If your Stingray application project was compiled with an earlier version of the Stingray Add-in agent, your project already contains the required support code. To take advantage of the latest functionality provided with this add-in, it is recommended to remove the existing Stingray Add-in agent files from your project and recompile using the latest agent files.

Setting up Stingray support using the precompiled agent mode requires adding one support header file to your application's Visual C++ project and copying one library file to your Visual C++ project directory. After you complete these steps, you can compile your application, as usual.

Note: Use the precompiled agent mode only if the run-time agent mode is unsuitable or cannot be used.

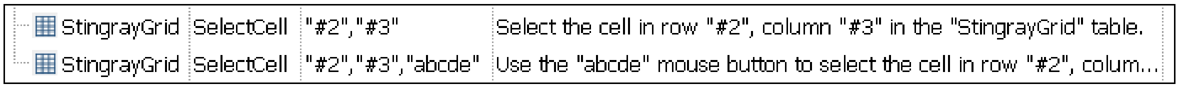
Record Cell Editing Options - Example

Suppose that during a recording session, you place the cursor in an edit-type cell that already contains the value `abc`. You place the cursor before the `b`, delete the `b` and `c` characters, and then you type `bcde`.

If you are using the **WinTable.SetCellData statements** option, UFT records the following in the Editor:

```
Window("GRIDAPP").Window("GridAp1").WinTable("StingrayGrid").SelectCell "#2",
"#3"
Window("GRIDAPP").Window("GridAp1").WinTable("StingrayGrid").SelectCell "#2",
"#3", "abcde"
```

UFT inserts these steps as follows in the Keyword View:

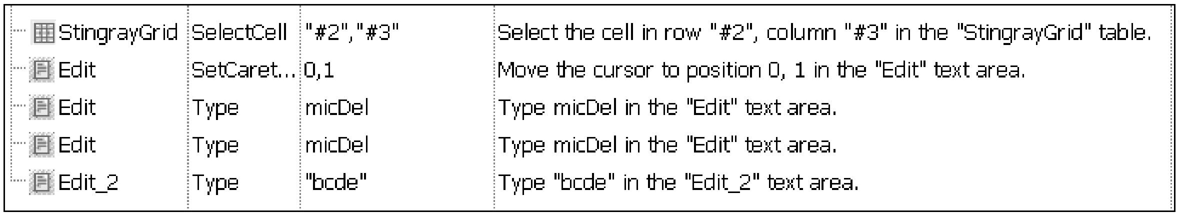


StingrayGrid	SelectCell	"#2","#3"	Select the cell in row "#2", column "#3" in the "StingrayGrid" table.
StingrayGrid	SelectCell	"#2","#3","abcde"	Use the "abcde" mouse button to select the cell in row "#2", colum...

If you are using the **WinEditor statements** option, UFT records the following in the Editor:

```
Window("GRIDAPP").Window("GridAp1").WinTable("StingrayGrid").SelectCell "#2",
"#3"
Window("GRIDAPP").Window("GridAp1").WinEditor("Edit").SetCaretPos 0,1
Window("GRIDAPP").Window("GridAp1").WinEditor("Edit").Type micDel
Window("GRIDAPP").Window("GridAp1").WinEditor("Edit").Type micDel
Window("GRIDAPP").Window("GridAp1").WinEditor("Edit_2").Type "bcde"
```

UFT inserts these steps as follows in the Keyword View:



StingrayGrid	SelectCell	"#2","#3"	Select the cell in row "#2", column "#3" in the "StingrayGrid" table.
Edit	SetCaret...	0,1	Move the cursor to position 0, 1 in the "Edit" text area.
Edit	Type	micDel	Type micDel in the "Edit" text area.
Edit	Type	micDel	Type micDel in the "Edit" text area.
Edit_2	Type	"bcde"	Type "bcde" in the "Edit_2" text area.

How to Set Up Your Stingray Project Using the Precompiled Agent Mode

Note:

- Use the precompiled agent mode only if the run-time agent mode is unsuitable or cannot be used.
- For a conceptual overview, see "Stingray Precompiled Agent Mode" on the previous page.

This task includes the following steps:

- "Prerequisites" on the next page
- "Copy StgAgentLib.h and StgAgentLib.lib files" on the next page
- "Add #include "StgAgentLib.h" to a .cpp file" on page 267

- "Add the ReleaseWRVC(); function call" on the next page
- "Make sure that the Precompiled Agent option is selected in the Stingray Support Configuration Wizard" on the next page
- "Results" on the next page

1. **Prerequisites**

   - Both Stingray Objective Grid and Stingray Objective Toolkit must be installed on your computer, even if your application contains only one type of Stingray control, such as a grid control or a tab control.

   - The installed versions must match the version combinations supported for this add-in. For a list of supported version combinations, see the *HP Unified Functional Testing Product Availability Matrix*.

     > **Note:** If you do not have the required Stingray Objective Grid and Stingray Objective Toolkit version combination, contact HP Software Support for assistance.

   - If your Stingray application was previously compiled with agent files from an earlier version of the Stingray Add-in, remove the existing agent files from your project.

     > **Caution:** If you choose not to replace your existing Stingray Add-in agent files with the latest agent files, do not continue with this procedure. Although you will be able to work with the UFT Stingray Add-in, you will not be able to take advantage of the latest functionality.

2. **Copy StgAgentLib.h and StgAgentLib.lib files**

   a. Copy the `StgAgentLib.h` header file from `<UFT Installation Folder>\bin\StingrayAgent\AgentLib\src\StgAgentLib.h` to your Visual C++ project directory. (You can optionally add the header file to the list of header files in your workspace.)

   b. Check the version of the Stingray Objective Grid or Stingray Objective Toolkit used by your application and search for the corresponding support library file, `StgAgentLib.lib`.

      For example, if your application is not compiled in Unicode and uses Objective Grid version 9.03 and Objective Toolkit version 8.03 linked with MFC version 7.1, search for the library file in: `<UFT Installation Folder>\bin\StingrayAgent\AgentLib\bin\MFC71\OG903_OT803`

      If the application is linked with MFC80, is compiled in Unicode and uses Objective Grid version 10.0 and Objective Toolkit version 9.0, search for the library file in: `<UFT InstallationFolder>\bin\StingrayAgent\AgentLib\bin\MFC80\OG1000U_OT900U`

      > **Note:** Each support library file specifies a combination of Objective Grid and Objective Toolkit versions. You must choose a combination of Objective Grid or Objective Toolkit

> versions, even if your application uses only one of these Stingray tools. For a list of supported Stingray version combinations, see the *HP Unified Functional Testing Product Availability Matrix*.

c. Copy the `StgAgentLib.lib` support library file to your Visual C++ project directory.

3. Add #include "StgAgentLib.h" to a .cpp file

Add the `#include "StgAgentLib.h"` statement to one of your `cpp` files, such as, `MainFrm.cpp`.

4. Add the ReleaseWRVC(); function call

Insert the `ReleaseWRVC();` function call in one of the functions called when your application terminates, for example, `CMainFrame::OnDestroy()`.

> **Note:** Inserting this function call instructs the agent to perform required clean up operations related to the support library code.

5. Make sure that the Precompiled Agent option is selected in the Stingray Support Configuration Wizard

Follow the steps in the Stingray Support Configuration Wizard (**Start > All Programs > HP Software > HP Unified Functional Testing > Tools > Stingray Support Configuration Wizard**).

6. Results

When you build your application executable, the added header file automatically links the `StgAgentLib.lib` support library to your application statically, enabling the library code to be activated automatically during the run session.

Known Issues - Stingray Add-in

This section describes troubleshooting and limitations for the Stingray Add-in.

General

- Applying Stingray Support Configuration settings to all users on the computer has no effect on users that have opened UFT at least once.

  Workaround: Apply Stingray Support Configuration settings separately for each user that has opened UFT at least once.

- UFT does not support both Unicode and non-Unicode in the same application when the Stingray Add-in is loaded.

Creating and Running Tests and Components

- If your Stingray application was built using the precompiled agent mode and you have used the Stingray Support Configuration Wizard at least once to set a Stingray run-time agent, then recording, learning, or running steps on the application may fail.
- By default, only single-threaded Stingray applications are supported.

  To provide support for multithreaded applications, in UFT, select **Tools > Options > GUI Testing** tab **> Stingray** node. Select the **Support multithreaded Stingray applications** check box and click **OK**. Close and restart UFT.
- The Stingray Add-in does not support Objective Edit or Objective Chart controls.
- The **ExpandAll** method is not supported for Stingray tree controls.
- When working with nested tab controls, you may need to manually modify the corresponding entries in the object repository to enable unique identification. For example, you may need to add an ordinal identifier to the existing description.
- Sometimes, the MFC internal map that correlates a window handle of a control with the Visual C++ object may not contain an entry for all Stingray controls. In such cases, the Stingray Add-in may fail to recognize certain Stingray controls because it relies on this map when retrieving information from the application.

  Workaround: The Stingray Add-in contains an auxiliary mechanism that serves as a fallback for the lack of MFC map entries in the situation described above. To activate this mechanism, in UFT, select **Tools > Options > GUI Testing** tab **> Stingray** node. Select the **Cache MFC map** check box and click **OK**. Close and restart UFT.

  > **Note:** This mechanism is not activated by default because it imposes some performance overhead.

- By default, edit boxes, check boxes, and drop-down (combo) lists are supported when recording on a Stingray grid. Other types of controls embedded in Stingray grids may be supported partially or may not be supported at all.

  > **Note:** The CGXTabbedComboBox control and the CGXCheckBoxEx control type are not supported during recording.

  Workaround: To work with controls other than the supported ones, manually add `SetCellData` statements to your test or business component (instead of recording user actions inside cells).
- **GetCellData** and **SetCellData** methods are limited to 3000 characters.

- By default, only the following grid classes are supported:
  - CGXBrowserView
  - CGXBrowserWnd
  - CGXGridWnd
  - CGXGridView
  - CGXGridHandleView
- When Stingray tree control items have tooltips, recording the selection of an item by clicking its label may fail.

  Workaround: Select the requested item by performing a click on the item's icon.

Part 16: Terminal Emulator Add-in

This section includes:

Terminal Emulator Add-in - Quick Reference

The following tables summarize basic information about the Terminal Emulator Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	This is a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. See "Windows-Based Application Support" on page 52.
Supported Environments	For details on supported emulators, see the **Terminal Emulator Add-in** section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	- Before using the Terminal Emulator Add-in for the first time, you must enable UFT to identify your terminal emulator. - You must configure your terminal emulator settings to work with UFT. See "How to Set Your HLLAPI Terminal Emulator to Work with UFT" on page 282.
Test Object Methods and Properties	The Terminal Emulator Add-in provides test objects, methods, and properties, which can be used when testing objects (controls) in Terminal Emulator applications. For details, see the **Terminal Emulators** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	- See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. - See "Checkpoints and Output Values - Terminal Emulators" on page 290. - See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	"Known Issues - Terminal Emulator" on page 291

Prerequisites	
Opening Your Application	You can open your Terminal Emulator application before or after opening UFT and creating a test.
Add-in Dependencies	None

Configuration	
Wizard	Terminal Emulator Configuration Wizard
Options Dialog Box	- Use the **Terminal Emulator** pane. (Make sure that a GUI test is open and select **Tools > Options > GUI Testing** tab **>Terminal Emulator** node.) - Use the **Windows Applications** pane. (**Tools > Options > GUI Testing** tab **> Windows Applications** node)
Custom Active Screen Capture Settings Dialog Box	Use the Terminal Emulator section in the dialog box. (**Tools > Options > GUI Testing** tab **> Active Screen** node > **Custom Level**)

(tests only)	See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, click **Additional Settings > Applications** in the sidebar. See the section on the Applications pane in the *HP Unified Functional Testing User Guide*.

Terminal Emulator Add-in - Testing and Configuration

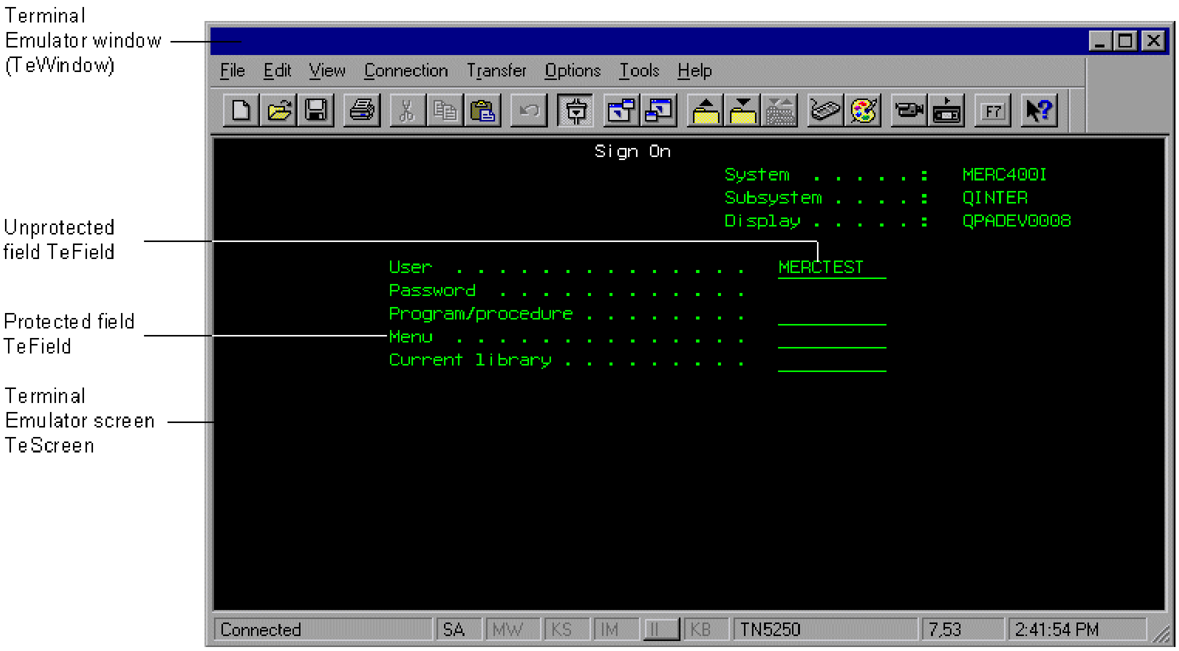
This chapter includes:

Terminal Emulator Add-in - Overview

You can use UFT with the Terminal Emulator Add-in to test terminal emulator applications that support HLLAPI (High Level Language Application Programming Interface) as well as those that do not, for example, emulator sessions configured to work with the VT100 protocol (using the **Text-only** option). HLLAPI allows a PC application to communicate with a mainframe application with extended capabilities.

UFT distinguishes between the window of the terminal emulator and the screens in the host application. The terminal emulator window consists of the frame, menus, toolbar, and status bar of the terminal emulator itself. This window remains constant throughout each terminal emulator session.

The terminal emulator screen refers to the area of the window in which the application is displayed. Each time the host responds to user input to the application, the screen changes.


Terminal Emulator window (TeWindow)
Unprotected field TeField
Protected field TeField
Terminal Emulator screen TeScreen
File
Edit
View
Connection
Transfer
Options
Tools
Help
F7

```
                                  Sign On
                                        System . . . . . :   MERC400I
                                        Subsystem . . . . :   QINTER
                                        Display . . . . . :   QPADEV0008

               User . . . . . . . . . . . . . .   MERCTEST
               Password . . . . . . . . . . . .
               Program/procedure . . . . . . . .
               Menu . . . . . . . . . . . . . .
               Current library . . . . . . . .
```

```
Connected   SA   MW   KS   IM   II   KB   TN5250   7,53   2:41:54 PM
```

If your emulator supports HLLAPI, UFT recognizes the screen and field objects in your emulator screen. If your emulator does not support HLLAPI, or you have configured UFT in **Text-only** mode, UFT records operations in terms of the text as it appears in the rows and columns of your emulator screen.

The UFT Terminal Emulator Add-in includes preconfigured settings for several terminal emulators. The Terminal Emulator Add-in also enables you to configure the settings for most other terminal emulators using the Terminal Emulator Configuration Wizard.

To configure your HLLAPI emulator to work with UFT, see "How to Set Your HLLAPI Terminal Emulator to Work with UFT" on page 282.

Recording Tests and Components on Terminal Emulator Applications

As you record, the test or business component reflects the objects in your application and the type of operation you perform (such as pressing function keys or typing in fields). Each object has a defined set of properties that determines its behavior and appearance. UFT learns these properties and uses them to identify and locate objects during a run session.

> **Tip:** You can launch your terminal emulator using the **SystemUtil.Run** method as the first step of your test or business component. For more details, see the section in the *HP Unified Functional Testing User Guide* on running and closing applications programmatically, and the **Standard Windows** section of the *HP UFT Object Model Reference for GUI Testing*.

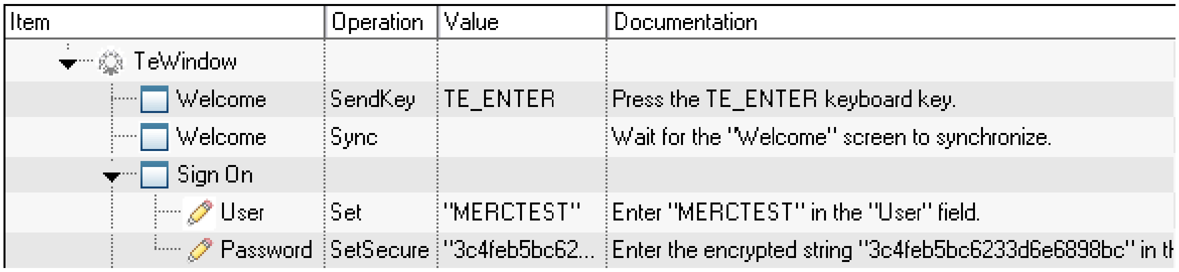
By default, when you record a test or business component, UFT automatically inserts synchronization points so that during a run session, execution will be delayed until the application is ready to receive input. You can also add synchronization points manually. For more details, see "How to Synchronize Steps on Terminal Emulators" on page 288.

The following is a sample of a UFT test recorded on a terminal emulator application that fully supports HLLAPI.

While recording, the user pressed the **ENTER** key in the first screen of an application, waited for the screen to change, and then typed the name MERCTEST and a password in the appropriate fields.

```
TeWindow("TeWindow").TeScreen("Welcome").SendKey TE_ENTER
TeWindow("TeWindow").TeScreen("Welcome").Sync
TeWindow("TeWindow").TeScreen("Sign On").TeField("User").Set "MERCTEST"
TeWindow("TeWindow").TeScreen("Sign On").TeField("Password").SetSecure
"3c4feb5bc6233d6e6898bc"
```

UFT displays this test in the Keyword View like this:



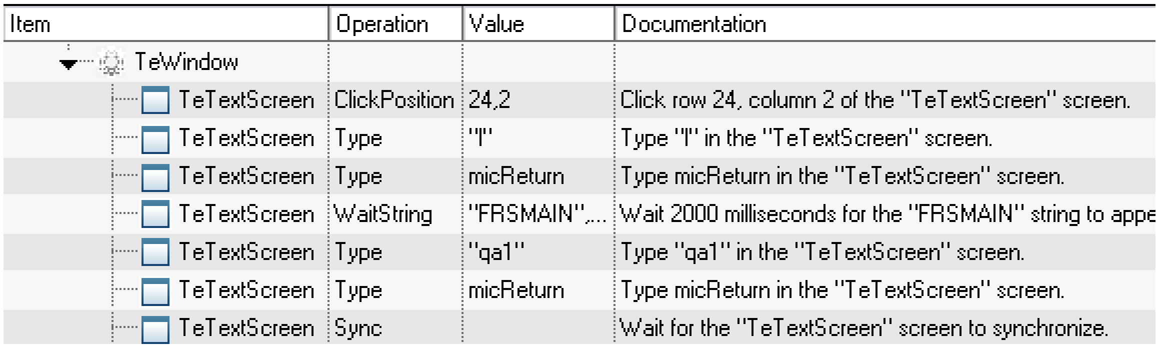
Item	Operation	Value	Documentation
TeWindow			
Welcome	SendKey	TE_ENTER	Press the TE_ENTER keyboard key.
Welcome	Sync		Wait for the "Welcome" screen to synchronize.
Sign On			
User	Set	"MERCTEST"	Enter "MERCTEST" in the "User" field.
Password	SetSecure	"3c4feb5bc62...	Enter the encrypted string "3c4feb5bc6233d6e6898bc" in t

The following is a sample test on a terminal emulator that does not support HLLAPI or that has been configured to support text-only HLLAPI operations.

Note that UFT records the TeTextScreen object instead of the TeScreen object and that it does not record TeField objects. The operations are recorded in terms of keyboard and mouse operations on the text screen, rather than operations within fields.

```
TeWindow("TeWindow").TeTextScreen("TeTextScreen").ClickPosition 24,2
TeWindow("TeWindow").TeTextScreen("TeTextScreen").Type "l"
TeWindow("TeWindow").TeTextScreen("TeTextScreen").Type micReturn
TeWindow("TeWindow").TeTextScreen
("TeTextScreen").WaitString"FRSMAIN",1,2,1,8,2000
TeWindow("TeWindow").TeTextScreen("TeTextScreen").Type "qa1"
TeWindow("TeWindow").TeTextScreen("TeTextScreen").Type micReturn
TeWindow("TeWindow").TeTextScreen("TeTextScreen").Sync
```

UFT displays this test in the Keyword View like this:



Item	Operation	Value	Documentation
TeWindow			
TeTextScreen	ClickPosition	24,2	Click row 24, column 2 of the "TeTextScreen" screen.
TeTextScreen	Type	"l"	Type "l" in the "TeTextScreen" screen.
TeTextScreen	Type	micReturn	Type micReturn in the "TeTextScreen" screen.
TeTextScreen	WaitString	"FRSMAIN",...	Wait 2000 milliseconds for the "FRSMAIN" string to appe
TeTextScreen	Type	"qa1"	Type "qa1" in the "TeTextScreen" screen.
TeTextScreen	Type	micReturn	Type micReturn in the "TeTextScreen" screen.
TeTextScreen	Sync		Wait for the "TeTextScreen" screen to synchronize.

This section also includes "Considerations for Recording and Running Tests and Components on Terminal Emulators" below.

Considerations for Recording and Running Tests and Components on Terminal Emulators

- Connect your emulator to the host and ensure that the emulator is configured properly. For details, see "How to Set Your HLLAPI Terminal Emulator to Work with UFT" on page 282.
- Make sure that only one terminal emulator session is open. (Multiple open sessions may cause problems with recording and running tests or business components.)
- If your test or business component includes calls to WinRunner tests, make sure that these tests do not use the WinRunner Terminal Emulator Add-in. Similarly, when running WinRunner tests with the WinRunner Terminal Emulator Add-in, make sure that these tests do not use the UFT Terminal Emulator Add-in if they include calls to UFT tests.
- If you are using an emulator that is configured as fully supporting HLLAPI and you need to record specific steps in terms of keyboard and mouse operations on the text screen (instead of operations within fields), you can change the recording mode for your emulator by adjusting the configuration. For details, see "How to Manage Terminal Emulator Configuration Settings" on page 282.
- UFT does not record operations on the toolbar and status bar in the terminal emulator window. However, you can insert checkpoints or output values for the status bar of the terminal emulator

window while recording. For more details, see "Checkpoints and Output Values - Terminal Emulators" on page 290.

Run Session Synchronization

When testing a terminal emulator application, many factors can affect its speed of operation and therefore can potentially interfere with the run session. For example, host response time can vary depending on the system load.

Synchronizing your run session helps to ensure that UFT performs the next step in the test or business component only when your terminal emulator application is ready to continue. This prevents incidental differences in host response time and other factors from affecting successive run sessions.

The following table illustrates the synchronization options available for various terminal emulator applications:

Emulator type	Synchronization options
All emulator types	You can instruct UFT to delay the run session: • For a specified period of time • Until a specific string appears in a defined area • Until a specified property achieves a defined value
Emulators that fully support HLLAPI	You can synchronize the run session with the response time of the host. By default, during a record session, UFT automatically generates a `Sync` statement for the TeScreen object each time the emulator waits for a response from the host.
Emulators that do not support HLLAPI	When you record using a terminal emulator that does not support HLLAPI, or that has been configured as supporting text-only HLLAPI operations, UFT automatically generates a `Sync` statement for the TeTextScreen object each time a specified key is pressed. The default is the **ENTER** key. UFT waits a specified period of time, to allow the host sufficient response time.

For a list of tasks describing how to synchronize, see "How to Synchronize Steps on Terminal Emulators" on page 288.

Terminal Emulator Recovery Scenarios

UFT allows you to define recovery scenarios for your tests or business components, to cater for various unexpected events, such as crashes and error situations, which can disrupt your tests or business components and distort your results.

You can use the values of the **Emulator status** property and the other properties of the TeWindow object to define specific recovery scenarios for your terminal emulator application tests or business components.

The possible values for the **Emulator status** property are:

- **Busy.** Emulator is communicating with the server.
- **Disconnected.** Emulator is not connected to the server.
- **Locked.** Emulator cannot currently accept input.
- **Ready.** Emulator is waiting for input.
- **Unavailable.** Emulator status cannot be identified.

For each emulator status, you can create a recovery scenario that performs an appropriate recovery operation. For example:

- **Disconnected.** Reconnect to the server, using a function call recovery operation that includes recorded steps for connecting, API commands in a VB Script, or a keyboard shortcut key, according to the capabilities of your terminal emulator.
- **Ready.** Perform specific operations according to the content of a displayed error message, including pressing the relevant key.
- **Locked.** Activate the emulator's **RESET** key, or use a handler function to disconnect from the server and reconnect.

For more details on defining recovery scenarios, see the *HP Unified Functional Testing User Guide*.

How to Configure an Emulator to Work with the Terminal Emulator Add-in

This section describes how to configure an emulator to work with the Terminal Emulator Add-in:

Attachmate EXTRA!

To connect your EXTRA! terminal emulator to UFT:

1. Open EXTRA!.
2. In EXTRA!, select **Options > Global Preferences**. The Global Preferences dialog box opens.
3. Click the **Advanced** tab.
4. In the HLLAPI shortname list, select the uppercase letter **A** as the **Short Name**.
5. Click the browse button, browse to and select your session profile, and click **OK**.
6. Save the profile before you start testing with UFT. This enables you to configure the terminal emulator once and then reuse the saved settings.

Attachmate myEXTRA! Terminal Viewer

To connect your myEXTRA! terminal viewer to UFT:

1. Open the myEXTRA! Management and Control Services window.
2. In the Management and Control Services window, select **Products > Terminal Viewers**. The Terminal Viewers tree is displayed in the left pane.
3. In the Terminal Viewers tree, select the required terminal.
4. In the right pane, select the required session and click **Properties**.
5. In the Properties pane, click **Configure** to configure the connection.
6. In the **General** tab of the Configure pane, select the **Support HLLAPI** check box and set the session name to **A**.
7. Save the session.
8. If this is the first time that you are connecting to a myEXTRA! terminal viewer, install the HLLAPI DLL, as follows:
   a. Click **Preferences**.
   b. Click the **Install HLLAPI Client Components** link.

Attachmate INFOConnect

To connect your INFOConnect terminal emulator to UFT:

1. Open Attachmate INFOConnect.
2. Select **Options > Global Preferences** from the main menu.
3. Select the **Advanced** tab.
4. Select **A** as the session short name.
5. To associate the session short name (A), with your session, click **Browse** and locate your session profile in the file system.
6. Click **OK**.

Hummingbird HostExplorer

To connect your HostExplorer terminal emulator to UFT:

1. Open HostExplorer.
2. From the HostExplorer main menu, select **File > Save Session Profile**.
3. In the Save Profile dialog box, set the **HLLAPI Short Name** to the uppercase letter **A**.
4. From the main menu, select **Options > API Settings**.
5. In the API Global Settings dialog box, select the **Update screen after PS update** and **Auto sync** options.
6. Click **OK**.

Alternatively:

1. Open HostExplorer.
2. Open a saved session.
3. Select **Options > Edit Session Profile**.
4. Select **Terminal > API** in the categories tree.
5. Select **A** as the session short name and click **OK**.
6. Save the session profile.

IBM Personal Communications (PCOM)

The preconfigured settings enable UFT to work with IBM PCOM terminal emulators.

IBM WebSphere Host On-Demand

To connect your WebSphere Host On-Demand terminal emulator to UFT:

1. Open the WebSphere Host On-Demand EHLLAPI Enablement Tool. (If you do not have this tool, contact IBM for details on how to acquire and install it.)
2. To enable UFT to record on the IBM WebSphere Host On-Demand terminal emulator, define the session options as follows:
   a. Click **Configure** and select **Properties** from the list. Then select **Preferences > Start Options** and set **Auto-Start HLLAPI Enabler** to **Yes**.
   b. Set the **Start In Separate Window** option to **Yes**.
   c. Set the **Alternate Terminal** option to **Disable**.

   Make sure that the server and client are not installed on a computer on which another terminal emulator is installed.

NetManange RUMBA

To connect your RUMBA terminal emulator to UFT:

1. Open RUMBA.
2. In RUMBA, select **Options > API**. The API Options dialog box opens.
3. Click the **Identification** tab.
4. In the **Session Short Name** field, type the uppercase letter **A**.
5. Click **OK**.
6. Save the profile.

> **Tip:** It is recommended to save the profile before you start testing with UFT. This enables you to configure the terminal emulator once and then reuse the saved settings.

NetManage RUMBA Web-to-Host

To connect your RUMBA Web-to-Host terminal emulator to UFT:

1. Open the RUMBA Web-to-Host Session Configuration Manager and open a session.
2. In addition to your standard configuration steps in the Configuration Manager:
   a. Select **Pro client** from the **Implementation** drop-down list.
   b. Click **HLLAPI Configuration** and select **A** from the **Session Short Name** drop-down list.
3. Save the profile.

> **Note:**
>
> - For versions 5.x: Only Mainframe Display is supported for the Java client Only Replay is supported for both Java client and Pro client.
>
> - For version 6.x: Java Client is not supported. Only Replay is supported for Pro client.

For more details on supported versions RUMBA Web-to-Host, see the *HP Unified Functional Testing Product Availability Matrix*.

Seagull BlueZone

To connect your BlueZone terminal emulator to UFT:

1. Open BlueZone.
2. In BlueZone, select **Options > API**. The API Properties dialog box opens.
3. Click the **Options** tab.
4. In the **Short NameSession Identifier** field, type the uppercase letter **A**.
5. Click **OK**.
6. Save the session.

WRQ Reflection

To connect your Reflection terminal emulator to UFT:

1. Open a new or existing session.
2. Select **Setup > Terminal**.
3. In the **Short Name** field, type the uppercase letter **A**.
4. Click **OK**.

Zephyr Passport

To connect your Zephyr Passport terminal emulator to UFT:

1. Open a new or existing session.
2. Check that the session shortname **(A) Passport.zws** appears in the window title bar.

How to Set Your HLLAPI Terminal Emulator to Work with UFT

The steps below provide a general overview of how to enable testing on your terminal emulator application when working with an emulator that supports HLLAPI. For details on how to configure a specific emulator, see "How to Configure an Emulator to Work with the Terminal Emulator Add-in" on page 278.

1. Connect your emulator to the host before running the Terminal Emulator Configuration Wizard and before recording each test or business component.
2. Assign the uppercase letter **A** as the short name for the current emulator session.
3. (Optional) Restart the emulator after changing these settings.

Note: For details on supported emulator versions and protocols, see the *HP Unified Functional Testing Product Availability Matrix*.

How to Manage Terminal Emulator Configuration Settings

The following steps describe how to manage your terminal emulator configuration settings.

- "Change configuration settings" on the next page
- "Restore default settings for the selected preconfigured emulator" on the next page
- "Restore settings for a user-defined configuration" on the next page

Change configuration settings

The Terminal Emulator Configuration Adjustments dialog box contains check boxes, radio buttons, and options that require a numeric or text value.

1. Open the Terminal Emulator Configuration Adjustments Dialog Box.
2. Enter a numeric or text value for an option:
   a. Click the option once to highlight it.
   b. Click the option again or press **F2** to access the value to be changed.
   c. Change the value as necessary.
   d. Click another location in the dialog box to set the value.
3. Click **OK** to update the current terminal emulator configuration and close the dialog box.

Restore default settings for the selected preconfigured emulator

1. Open the Terminal Emulator Configuration Adjustments Dialog Box.
2. Click the **Reset** button. (This button is enabled only if a preconfigured emulator is selected.)

Restore settings for a user-defined configuration

1. Locate the saved registry file that contains the configuration settings in the `<UFT installation folder>\dat` folder on your computer. The file has a `.reg` extension. (The path for the `dat` folder in a typical installation is: `%ProgramFiles%\HP\Unified Functional Testing\dat`.)
2. Double-click the registry file to activate the registry file. A confirmation message opens.
3. Click **Yes**. A message opens confirming that the information was copied into the registry.
4. Click **OK**. The settings in the saved file are restored.

   > **Tip:** You can also restore the settings for a user-defined terminal emulator, if these settings were saved previously using the wizard.

How to Copy Existing Terminal Emulator Configurations

This task describes how to copy a terminal emulator configuration from another user who has already configured the UFT settings for a specific emulator using the Terminal Emulator Configuration Wizard.

For example, if the settings for your terminal emulator were configured and saved to a file on another computer (or on a network drive), you can copy this file to your computer, instead of running the wizard and configuring the settings yourself.

This task includes the following steps:

- "Prerequisites" below
- "Copy the registry file to your computer" below
- "Register the file" below
- "Set the new emulator as the default emulator - Optional" below
- "Modify the emulator settings - Optional" below
- "Results" below

1. Prerequisites

- The existing configuration file must be saved to a registry file, using the **Save terminal emulator settings to file** option in the wizard's final page.

- Before you copy the saved configuration, make sure you know the vendor name and the emulator name assigned to the configuration, and the exact name and location of the file. The file has a `.reg` extension.

2. Copy the registry file to your computer

a. Locate the registry file containing the configuration settings for your emulator. The file has a `.reg` extension.

b. Copy the file to the `<UFT installation folder>\dat` folder on your computer.

   The path for the `dat` folder in a typical installation is: `%ProgramFiles%\HP\Unified Functional Testing\dat`

3. Register the file

a. Double-click the registry file to open the Registry Editor message box.

b. Click **Yes** to add the information into the registry. A message opens confirming that the information has been copied into the registry.

c. Click **OK**. The emulator name assigned to this configuration is added to the list of available terminal emulators for your UFT installation.

4. Set the new emulator as the default emulator - Optional

a. Open UFT with the Terminal Emulator Add-in loaded.

b. Select the new emulator name from the list in the **Tools > Options > GUI Testing** tab **> Terminal Emulator** pane, and set it as your default emulator.

5. Modify the emulator settings - Optional

a. Open UFT with the Terminal Emulator Add-in loaded.

b. Open the Terminal Emulator Configuration Wizard.

6. Results

After you copy a configuration file from another location, the emulator name assigned to this configuration is added to the list of available terminal emulators for your UFT installation.

Note: If you copy a configuration file after starting UFT, you need to close and reopen UFT to see the updated list of available emulators.

How to Check the Validity of a Terminal Emulator Configuration

1. Make sure that a GUI test is open.
2. Open the Terminal Emulator pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Terminal Emulator** node).
3. Click **Validate**.

   If a problem is detected, a brief description (error response) is displayed in the pane. For details on handling the error, click **Troubleshoot** to open a Help page that displays error-specific information.

Validating a Terminal Emulator - Possible Error Responses

The following possible error responses may be displayed in the **Terminal Emulator** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Terminal Emulator** node) when you click the **Validate** button:

- "Invalid HLLAPI DLL" below
- "Cannot detect an open session" on the next page
- "Cannot locate the main window class " on the next page
- "Cannot detect the emulator screen" on the next page
- "Cannot connect to the open session" on the next page
- "Cannot retrieve session text" on page 287
- "Cannot detect open session, or Cannot locate the main window class" on page 287
- "HLLAPI DLL not found" on page 287
- "More than one session open" on page 287
- "Unknown error" on page 287

Invalid HLLAPI DLL

The required HLLAPI or EHLLAPI function cannot be found, because the configured DLL is invalid.

Ensure that you have configured the correct DLL path and name in the Terminal Emulator Configuration Wizard (**Tools > Options** > **GUI Testing** tab **> Terminal Emulator** node **> Open Wizard**).

For more details, see the table listing the DLL names used by supported terminal emulators in the Configure HLLAPI Properties Page of the Terminal Emulator Configuration Wizard, or the documentation provided by your emulator provider.

Cannot detect an open session

UFT cannot detect an open terminal emulator session.

- Ensure that you have opened a current session in your terminal emulator.
- For HLLAPI emulators, ensure that the emulator short session name is set to the uppercase letter **A**. You may need to restart the emulator after changing this setting.

Cannot locate the main window class

UFT cannot find the terminal emulator main window class name.

- Ensure that the terminal emulator main window class name is configured correctly in the Terminal Emulator Configuration Wizard (**Tools > Options > GUI Testing** tab **> Terminal Emulator** node **> Open Wizard**).
- If the main window class name has a postfix that changes each time you launch the emulator, enter only the non-changing portion of the name in the Terminal Emulator Configuration Wizard.

Cannot detect the emulator screen

UFT cannot find the terminal emulator main window class name.

- Ensure that the terminal emulator main window class name is configured correctly in the Terminal Emulator Configuration Wizard (**Tools > Options > GUI Testing** tab **> Terminal Emulator** node **> Open Wizard**).
- If the main window class name has a postfix that changes each time you launch the emulator, enter only the non-changing portion of the name in the Terminal Emulator Configuration Wizard.

Cannot connect to the open session

Although a current session is open, invoking an HLLAPI function resulted in an error.

Restart UFT and then restart the emulator. If this does not resolve the problem, contact your emulator provider.

Cannot retrieve session text

UFT cannot display text captured in the current session.

- HLLAPI Emulators—Restart UFT and then restart the emulator. If this does not resolve the problem, contact your emulator provider.
- Non-HLLAPI Emulators—Click **Validate** again. If the error message is repeated, check that the emulator screen is brought to the front during the validate process (even when using remote access). If this is the case, contact HP Customer Support.

Cannot detect open session, or Cannot locate the main window class

UFT cannot detect an open terminal emulator session, or find the terminal emulator main window class name.

- Ensure that you have opened a current session in your terminal emulator.
- Ensure that the terminal emulator main window class name is configured correctly in the Terminal Emulator Configuration Wizard (**Tools > Options > GUI Testing** tab **> Terminal Emulator** node **> Open Wizard**).
- If the main window class name has a postfix that changes each time you launch the emulator, enter only the non-changing portion of the name in the Terminal Emulator Configuration Wizard.

HLLAPI DLL not found

UFT cannot find the HLLAPI DLL specified for the selected emulator.

Ensure that you have configured the correct DLL path and name in the Terminal Emulator Configuration Wizard (**Tools > Options > GUI Testing** tab **> Terminal Emulator** node **> Open Wizard**).

For more details, see the table listing the DLL names used by supported terminal emulators in the Configure HLLAPI Properties page of the Terminal Emulator Configuration Wizard, or the documentation provided by your emulator provider.

More than one session open

More than one terminal emulator session is currently open.

Close additional sessions.

Unknown error

The validation process failed due to an unknown error.

Restart UFT and then restart the emulator.

How to Synchronize Steps on Terminal Emulators

The following steps describe how to perform various types of synchronization operations. For conceptual details, see "Run Session Synchronization " on page 277.

- "Insert a synchronization step while recording" below
- "Set synchronization timeout" below
- "Insert a synchronization point for an object" below
- "Wait for a specified text string" on the next page

Insert a synchronization step while recording

1. Select **Design > Emulator Synchronization**.
2. (Optional) Specify a timeout in milliseconds for the `Sync` statement, after which the run session continues regardless of the status of the emulator. If you do not specify a timeout value, UFT uses the default timeout interval, as described in "Set synchronization timeout" below.

   Note:

   - You can adjust your emulator configuration to prevent UFT from automatically inserting `Sync` steps for TeScreen objects in your test or business component.
   - You can specify the keys that generate `Sync` steps for TeTextScreen objects.

   For details, see "How to Manage Terminal Emulator Configuration Settings" on page 282

Set synchronization timeout

In the Run Pane of the Test Settings Dialog Box (**File > Settings > Run** node), set the **Object Synchronization Timeout**. For details, see the *HP Unified Functional Testing User Guide.*

This enables you to specify the maximum interval (in milliseconds) that UFT waits before running each test step.

Note:

- This option is not available for business components.
- This setting is also used as the default timeout for the **Sync** and **WaitString** methods for both the TeScreen and the TeTextScreen objects if a timeout argument is not specified.

Insert a synchronization point for an object

Select **Design > Synchronization Point.** For details, see the *HP Unified Functional Testing User Guide.*

When you insert a synchronization point into your test or business component, UFT generates a `WaitProperty` statement in the Editor. This statement instructs UFT to pause the test or business component until a particular object property achieves the value you specify.

Example:

If you want the run session to wait until the **Text** property of the **Result** field has a value of `Successful`, insert the following statement:

```
TeScreen("LogOn").TeField("Result").WaitProperty "Text", "Successful"
```

Wait for a specified text string

UFT's **WaitString** method delays the run session until a specific text string appears in a specified rectangle on the terminal emulator screen. The specified text string can be a constant string or a regular expression.

To insert a WaitString statement while recording:

1. Select **Design > Emulator WaitString**. Your cursor becomes a crosshairs pointer.
2. Drag the pointer to draw a rectangle on your emulator screen containing the text string for which you want the run session to wait. UFT inserts a step into your test or business component with the following syntax:

   TeScreen object:

   ```
   TeScreen(description).WaitString   String [,   TopRow,   LeftColumn,
   BottomRow,   RightColumn,   Timeout,   RegExp]
   ```

   TeTextScreen object:

   ```
   TeTextScreen(description).WaitString   String, [TopRow,   LeftColumn,
   BottomRow,   RightColumn,   Timeout,   RegExp]
   ```

   The position on the screen is defined by the values of the four corners of the rectangle, each corner with its own argument.
3. Optionally, you can:
   - Specify that the value specified in the **String** argument is a regular expression by setting the value of the **RegExp** argument to `True`. Regular expressions enable UFT to identify objects and text strings with varying values. For more details on regular expressions, see the *HP Unified Functional Testing User Guide*.

   - Add a timeout value in milliseconds after which the run session continues regardless of whether the text string appears on the screen. If you do not specify this value, UFT uses the default timeout interval. For details, see "Set synchronization timeout" on the previous page.

Checkpoints and Output Values - Terminal Emulators

While recording your test, you can add text checkpoints for the following:

- TeScreen and TeTextScreen objects
- status bar of the terminal emulator window
- dialog boxes that open after menu options are selected

While editing your test or business component, you can:

- add text checkpoints for TeScreen objects.
- add text checkpoints for TeTextScreen objects if the test was recorded using an emulator with full HLLAPI support that was configured to record in **Text screen** mode. For details on changing the emulator mode, see "How to Manage Terminal Emulator Configuration Settings" on page 282.
- output property or text values from the objects in your terminal emulator application to use in your test or business component.

Guidelines for Using Checkpoints and Output Values

- You can create bitmap checkpoints for TeWindow, TeScreen and TeTextScreen objects, but not for TeField objects.
- You can create text output values (tests only) only for TeScreen and TeTextScreen objects.
- In the terminal emulator window you can add text checkpoints or output values (tests only) and standard checkpoints and output values for the status bar and the dialog boxes that open from the menu options. UFT recognizes these as standard Windows objects. For more details on the properties of standard Windows objects, see the **Standard Windows** section of the *HP UFT Object Model Reference for GUI Testing*.

For details on standard, text, and bitmap checkpoints, and on standard and text output values, see the *HP Unified Functional Testing User Guide*.

Known Issues - Terminal Emulator

This section contains general troubleshooting and limitation information about the Web add-in, and includes the following sections:

- "Installing and Loading the Terminal Emulator Add-in" below
- "Connecting and Disconnecting from the Terminal Emulator Add-in" below
- "Configuration and Settings" on the next page
- "Creating and Running Tests and Components" on the next page
- "Working with Terminal Emulator Controls" on page 294
- "Test Objects, Methods, and Properties" on page 294
- "Checkpoints and Output Values " on page 295
- "Multilingual Support" on page 295

Installing and Loading the Terminal Emulator Add-in

- When installing a Hummingbird HostExplorer terminal emulator or patches, make sure that UFT is closed.
- If the UFT Terminal Emulator Add-in is installed and loaded, but there is no terminal emulator installed on your computer, the following error message is displayed: `UFT Terminal Emulator support is not configured correctly. Either the terminal emulator is not installed on your computer or the HLLAPI DLL was not found.`

  Workaround: When you open UFT, clear the **Terminal Emulators** check box in the Add-in Manager.

  > **Note:** You can prevent this message from appearing by adjusting your emulator's configuration settings. For more details, see "How to Manage Terminal Emulator Configuration Settings" on page 282.

- You may experience unexpected behavior after you install an EXTRA! emulator. You may not be able to run UFT or various features may stop working. This happens because the EXTRA! installation may have copied and registered an outdated version of the `atl.dll` file on your computer.

  Workaround: Locate the `atl.dll` in your system folder (`WINNT\system32`). Its version should be 3.0 or higher. Register it with the regsvr32 utility.

Connecting and Disconnecting from the Terminal Emulator Add-in

- If you have more than one terminal emulator session open, UFT does not recognize either session.

  Workaround: While recording or running your test or business component, make sure that only one terminal emulator session is connected at a time.

- If your test or business component contains steps that disconnect the current emulator session during the run session, followed immediately by a `TeScreen.Sync` command, the test or business component run might stop responding or take a long time to respond.

  Workaround: Remove the `Sync` command from the test or business component, or replace it with a `Wait` statement. For more details, see the **Utility Objects** section of the *HP UFT Object Model Reference for GUI Testing*.
- Inserting a checkpoint, creating a new test or business component, or opening an existing test or business component when the emulator session is busy may cause unexpected problems.

  Workaround: Check the connection status of your emulator on the status line of the emulator screen before performing any of these operations.
- Unexpected behavior may occur after disconnecting from a Host On-Demand session while recording.

  Workaround: Stop recording before disconnecting from the session. Then, manually add a step that disconnects from the session.
- You may experience unexpected behavior if the terminal emulator is closed while UFT is recording.

Configuration and Settings

- When working with an emulator that does not support HLLAPI, or with an emulator that has been configured as supporting text-only HLLAPI operations, do not change the size of the terminal emulator window after configuring the emulator settings.
- To enable support for a NetManage Web-To-Host Java Client session that is configured to open in a separate window, specify the title of your session window using the **Tools > Options > GUI Testing** tab **> Terminal Emulator > Adjust Configuration > Object identification settings > Identify emulator window based on title bar prefix** option.

  Tip: You may need to clear this value when switching to another configuration.
- When using the Terminal Emulator Configuration Wizard to configure the screen sizes of NetManage RUMBA Web-to-Host, you cannot use the **Mark Text Area** option to draw on top of the emulator window.

  Workaround: Configure the text area position of the screen manually.

Creating and Running Tests and Components

- When using the OCR mechanism in order to perform steps requiring text recognition on non-HLLAPI emulators, the steps run slowly due to the required processing power of the OCR mechanism. Therefore, when testing non-HLLAPI emulators, it is recommended to select the default text recognition option: **First Windows API then OCR** in the Text Recognition pane of the Options dialog box. (For details on this option, see the *HP Unified Functional Testing User Guide*.)
- The UFT Terminal Emulator Add-in can identify emulator window objects only when the emulator is connected. For example, you cannot use the following statement to connect to an emulator session:

```
TeWindow("TeWindow").WinMenu("Menu").Select "Communication;Connect"
```

Workaround: You can record any steps that need to be performed prior to connection with the emulator. These steps are recorded as if the Terminal Emulator Add-in is not loaded. After the emulator is connected, stop the recording session and begin a new recording session to record terminal emulator objects.

- When using an emulator that supports HLLAPI, if your emulator session disconnects from the host while recording, UFT no longer recognizes the emulator, even after reconnecting.

  Workaround: Stop recording, reconnect the session, and continue recording.

- When recording on a Hummingbird HostExplorer emulator, menu and toolbar operations in the emulator window are disabled.

  Workaround: Stop recording, select the required menu item or click the required toolbar button, and continue recording.

- When using an emulator that supports HLLAPI, closing the emulator window while recording may cause unexpected results.

  Workaround: Stop recording before closing the emulator window.

- The UFT Terminal Emulator Add-in does not support recording operations on toolbar objects in terminal emulator applications.

  Workaround: Record on the corresponding menu command for the toolbar button. Alternatively, you can use low-level recording to record operations on toolbars. For more details about low-level recording, see the *HP Unified Functional Testing User Guide*.

- If you record a test or business component using one terminal emulator, it may not run correctly on another terminal emulator. For example, tests recorded on RUMBA may not run on IBM PCOM.

- HostExplorer has a bug in the HLLAPI `GetKey` function. As a result, UFT will stop recording terminal emulator keyboard events after recording for a while, and the emulator might stop responding to keyboard events.

  Workaround: Contact Hummingbird customer support to get the patch that fixes the problem with the HLLAPI `GetKey` function (where it stops responding after several calls).

- Clicking, typing, or moving objects in the terminal emulator window while UFT is running a test or business component may cause unexpected results.

  Workaround: Wait until the end of the test or business component, or pause the test or business component execution before using the emulator.n

- To record and run tests or business components on Hummingbird 9.0 5250 sessions, you need to install a patch for Hummingbird.

  Workaround: Contact Hummingbird customer support to get the patch that fixes the problem with HLLAPI where all 5250 fields appear protected.

- You might encounter unexpected results when you run the Reflection HLL API in multiple threads mode.

Working with Terminal Emulator Controls

- When working with Attachmate Terminal Viewer 3.1 5250 session, all of the fields that appear on the screen before the first unprotected field are recognized as a single field.
- UFT may not recognize a TeField object in a NetManage RUMBA session immediately after installing the emulator.

  Workaround: Restart your computer after installing RUMBA, even if the installation does not request a restart.

Test Objects, Methods, and Properties

- When using the **SendKey** method to unlock a terminal emulator, for example, `TeWindow ("TeWindow").TeScreen("screen5296"). SendKey TE_RESET`, some emulators (such as Host On-Demand) may not be unlocked.

  Workaround: Specify the keyboard event to send for the RESET command, using the **Tools > Options > GUI Testing** tab **> Terminal Emulator** pane **> Adjust Configuration > Run Settings > Run steps containing special emulator keys using keyboard events > Keys for RESET function** option.
- By default, UFT uses the **attached text** and **protected** properties in TeField test object descriptions. If the attached text for a field changes from session to session, UFT cannot find the field during the run session.

  Workaround: Open the Object Repository Window or the Object Repository Window for the object. Remove the **attached text** property from the field's description and add another property (or properties) such as **start row**, **start column**, or **index** to uniquely identify the object.

  > **Tip:** You can also create a smart identification definition for TeField objects so that your recorded test or business component can run successfully even if the **attached text** property value for a particular TeField object changes. (Select **Tools > Object Identification > Enable Smart Identification** and click **Configure**.) For more details on Smart Identification, see the *HP Unified Functional Testing User Guide*.

- You cannot use the **label** property in a programmatic description of the TeScreen object. However, since only one screen can exist in the given TeWindow at any one time, you can use `TeScreen ("MicClass:=TeScreen")`.

  For example:

  ```
  TeWindow("short name:=A").TeScreen("MicClass:=TeScreen").TeField("attached
  text:=User", "Protected:=False").Set "33333"
  ```

- The TeTextScreen properties **current column** and **current row** are available only for emulators that support HLLAPI.
- The **location** property is not recorded for TeField objects.

  Workaround: Use the **index** property instead.

Checkpoints and Output Values

In some cases, a bitmap checkpoint on a TeScreen may fail because the cursor shows in the expected bitmap, and not in the actual bitmap (or the other way around).

Workaround: Set the emulator cursor to a slow blink rate, or not to blink at all. This enhances the probability that the cursor is not captured in the bitmap.

Multilingual Support

When working with the IBM PCOM emulator, UFT may ignore special European language characters while recording or running a test or business component.

Workaround: Set the code page for your IBM PCOM emulator in UFT, using the **Tools > Options > GUI Testing** tab **> Terminal Emulator > Adjust Configuration > Emulator settings > Code page number (IBM PCOM only)** option.

Tip: Try setting the **Code page number (IBM PCOM only)** option to 1252.

Part 17: VisualAge Smalltalk Add-in

This section includes:

VisualAge Smalltalk Add-in - Quick Reference

You can use the UFT VisualAge Smalltalk Add-in to test VisualAge Smalltalk user-interface objects (controls).

The following tables summarize basic information about the VisualAge Smalltalk Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	This is a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. See "Windows-Based Application Support" on page 52.
Supported Environments	For details on supported VisualAge Smalltalk environments, see the VisualAge Smalltalk Add-in section of the *HP Unified Functional Testing Product Availability Matrix*.
Important Information	You must configure your VisualAge Smalltalk environment by importing the `qt-adapter.dat` file and then recompiling your application. See "How to Configure the VisualAge Smalltalk Add-in" on page 299.
Test Object Methods and Properties	The VisualAge Smalltalk Add-in uses a sub-set of the standard Windows test objects, methods, and properties, which can be used when testing objects in VisualAge Smalltalk applications. For details, see the **Visual Age Small Talk** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382

Prerequisites	
Opening Your Application	You can open your VisualAge Smalltalk application before or after opening UFT.
Add-in Dependencies	None

Configuration	
Configuring Your Application	You configure your VisualAge Smalltalk environment by importing the `qt-adapter.dat` file and then recompiling your application. See "How to Configure the VisualAge Smalltalk Add-in" on page 299.
Record and Run Settings Dialog Box (tests only)	Use the **Windows Applications** tab. (**Record > Record and Run Settings**) **Note:** • UFT can recognize only VisualAge Smalltalk applications that have been precompiled with the `qt-adapter` agent. For details, see "How to Configure the VisualAge Smalltalk Add-in" on page 299. • The **Record and Run only on** radio button applies only to record and run sessions. UFT recognizes all VisualAge Smalltalk objects for Object Spy and pointing hand operations,

	regardless of the settings in the Record and Run Settings dialog box.
Custom Active Screen Capture Settings Dialog Box (tests only)	**Tools > Options > GUI Testing** tab **> Active Screen** node > **Custom Level** See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, select **Additional Settings > Applications** in the sidebar. See the section the Applications pane in the *HP Unified Functional Testing User Guide*.

How to Configure the VisualAge Smalltalk Add-in

This task describes how to configure the VisualAge Smalltalk Add-in by importing the `qt-adapter.dat` file to your VisualAge Smalltalk development environment and then recompiling your application to include the **qt-adapter** agent.

1. Start VisualAge Smalltalk.
2. In the System Transcript window, select **Tools > Browse Configuration Maps**.
3. In the Configuration Maps Browser window, right-click the **AllNames** pane and select **Import > Selected Versions**.
4. In the **Information Required** box, enter the IP address or host name of the server, or leave the text box blank to use the native (fileio) access. Click **OK**. The Selection Required dialog box opens.
5. In your file system, browse to the `<UFT installation folder>/dat` folder and select `qt-adapter.dat`.
6. In the Selection Required dialog box, do the following:
    - In the **Names** pane, select **Unified Functional Testing**.
    - In the **Versions** pane, select **UFT Adapter 1.0**.
    - Click the **>>** button and click **OK**.
7. In the Configuration Maps Browser window, do the following:
    - In the **AllNames** pane, click **Unified Functional Testing**.
    - In the **Editions and Versions** pane, click **UFT Adapter 1.0**. A list of available applications displays in the **Applications** pane.
    - Right-click the **Editions and Versions** pane and select **Load**.
8. To save your changes, select **File > Save Image**, or click **OK** in the Warning dialog box when closing the VisualAge Smalltalk application.
9. Recompile your VisualAge Smalltalk application with the **qt-adapter** agent.

You are now ready to create and run tests on VisualAge Smalltalk applications.

Part 18: Visual Basic Add-in

This section includes:

Visual Basic Add-in - Quick Reference

You can use the UFT Visual Basic Add-in to test Visual Basic user-interface objects (controls).

The following tables summarize basic information about the **Visual Basic Add-in** and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	This is a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. See "Windows-Based Application Support" on page 52.
Supported Environments	For details on supported Visual Basic environments, see the **Visual Basic Add-in** section of the *HP Unified Functional Testing Product Availability Matrix*.
Test Object Methods and Properties	The Visual Basic Add-in provides test objects, methods, and properties that can be used when testing objects in Visual Basic applications. For details, see the **Visual Basic** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	See "Known Issues - Visual Basic Add-in" on page 303.

Prerequisites	
Opening Your Application	You can open your Visual Basic application before or after opening UFT.
Add-in Dependencies	None

Configuration	
Options Dialog Box	Use the **Windows Applications** pane. (**Tools > Options > GUI Testing** tab **> Windows Applications** node)
Record and Run Settings Dialog Box (tests only)	Use the **Windows Applications** tab. (**Record > Record and Run Settings**) **Note:** • If you select the **Record and Run only on** radio button, the settings may also apply to (limit) the applications that are recognized for Object Spy and other pointing hand operations. • UFT recognizes Visual Basic objects only in applications that are opened after changing the settings in the Windows Applications tab of the Record and Run Settings dialog box.
Custom Active Screen Capture Settings Dialog	Use the **Windows applications** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node > **Custom Level**)

Box (tests only)	See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, select **Additional Settings > Applications** in the sidebar. See the section on the Applications pane in the *HP Unified Functional Testing User Guide*.

Known Issues - Visual Basic Add-in

This section describes troubleshooting and limitations for the Visual Basic Add-in.

- When working with the Visual Basic Add-in, it is recommended to select the **Record and run on these applications (opened on session start)** option and then to specify the application name in the Windows Applications Tab of the Record and Run Settings dialog box.

  If you select the **Record and run test on any open Windows-based application** option, you should open the Visual Basic application after the first time you start recording.
- Combo box objects of style `Simple ComboBox` are not supported.
- Visual Basic .NET applications are supported by the UFT .NET Add-in.

Part 19: Web Add-in

This section includes:

Web Add-in - Quick Reference

You can use the Web Add-in to test HTML user-interface objects (controls).

The following tables summarize basic information about the Web Add-in and how it relates to some commonly-used aspects of UFT. This information is also relevant for all child add-ins that extend the Web Add-in.

General Information	
Add-in Type	Much of the functionality of this add-in is the same as other Web-based add-ins. • See "Web-Based Application Support" on page 25.
Supported Environments	• For details on supported Web browsers and versions, see the *HP Unified Functional Testing Product Availability Matrix*. • See also Child Add-ins, below.
Child Add-ins	• UFT also provides a set of add-ins that support testing specialized controls from a number of Web 2.0 toolkits using test object classes that were developed by HP using Web Add-in Extensibility. These add-ins are displayed as child nodes of the Web Add-in in the Add-in Manager. For details, see "Web 2.0 Toolkit Support " on page 368.
Test Object Methods and Properties	The Web Add-in provides test objects, methods, and properties that can be used when testing objects in Web applications. For details, see the **Web** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "Checkpoints for Web Pages" on page 29. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Extending the Web Add-in	"Web Add-in Extensibility" enables you to develop support for testing third-party and custom Web controls that are not supported out-of-the-box by the UFT Web Add-in.
Other	• When you load the Siebel Add-in in addition to the Web Add-in, the object identification settings are automatically customized. For this reason, the Web Add-in is not available in the **Environment** list in the Object Identification dialog box (**Tools > Object Identification**), even though the Web Add-in is loaded. For details, see "Siebel Add-in - Overview" on page 240. • You can create steps on more than one browser tab, if your browser supports tabbed browsing.

Prerequisites	
Opening Your Application	You must open UFT before opening your Web application.
Testing in Mozilla Firefox	The Functional Testing Extension for Firefox is supported from Firefox versions 33 and higher. If you need to test versions of Firefox earlier than 33, you need to enable UFT support for these Firefox versions. To test your Web application in Mozilla Firefox version 33 and later, you must enable the Functional Testing Extension in one of the following ways:

	• If the **Select Your Add-ons** screen is displayed when you open Firefox, select to enable the Functional Testing Extension. • If the **Install Add-on** tab opens and displays Functional Testing Extension when opening Firefox, select the **Allow this installation check box** and click **Continue**. Otherwise: a. In Firefox, open the browser menu. b. In the menu, click **Add-ons**. c. In the Add-ons Manager tab, select the **Extensions** node. d. In the Functional Testing Extension row, click the **Enable** button. To test your Web application in Mozilla Firefox versions earlier than 33, you must enable the legacy Firefox agent: 1. Open the **<UFT installation folder>\Installations\Firefox** folder. 2. From the Firefox folder, drag the **Legacy.xpi** file into Firefox. 3. In Firefox, open the browser menu. 4. In the menu, click Add-ons. 5. In the Add-ons Manager tab, select the Extensions node. 6. In the Functional Testing Extension row, disable the Functional Testing 12.50 extension and enable the extension you added to Firefox. **Note:** Only one version of the Unified Functional Testing Extension can be enabled in Firefox at a time. For more details, see "Working With Mozilla Firefox" on page 334.
Testing in Google Chrome	• UFT communicates with the Functional Testing Agent Chrome Extension to test Web applications running in Google Chrome. The extension is available on the Chrome web store and downloads automatically when possible, for Chrome versions 31 or later. If the extension does not download, go to https://chrome.google.com/webstore/detail/kgpdpdnaoephdehalonapacdgjhamnbc and download it manually. If you do not have an Internet connection or are working with Chrome version 30 or earlier, see "How to Enable the HP Functional Testing Agent Chrome Extension" on page 346. **IMPORTANT:** If you have a previous version of the Functional Testing Agent for Google Chrome installed, you must manually remove this extension before enabling the new version. • If you need to test local HTML pages in Google Chrome, you must make additional configuration changes. For details, see "How to Enable UFT to Test Local HTML Pages in Google Chrome" on page 347.
Testing in Microsoft Edge	• If you are using the Microsoft Edge Insider version, you should use version 10576 or later. However, due to changes in the Web Driver insider build by Microsoft, later versions may not work with UFT. • If you update the Insider build of Edge, you need to update the Microsoft Web Driver

	version in the UFT installation. Copy your **WebDriver.exe** files to the **<UFT installation folder>\bin\** folder to enable UFT to work with the updated version of Edge. - In order to record and run tests on Microsoft Edge browsers, you must start the Edge Agent for Functional Testing. UFT cannot spy, record, or run tests on an already open Edge session. You can start the Edge Agent for Functional Testing from one of the following locations: - The desktop shortcut - **Start -> All apps -> HP Software -> Edge Agent for Functional Testing** - In the Record and Run Settings dialog box, select **Edge** as the **Browser** type
Testing in Apple Safari on a Remote Mac	See "Working With Apple Safari on a Remote Mac Computer" on page 336.
Add-in Dependencies	None

Configuration	
Options Dialog Box	Use the **Web** pane. (Make sure that a GUI test is open and select **Tools > Options > GUI Testing** tab **> Web > General** node.)
Record and Run Settings Dialog Box (tests only)	Use the **Web** tab. (**Record > Record and Run Settings**)
Test Settings Dialog Box (tests only)	Use the **Web** pane. (File > Settings > Web pane)
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Web** section. (**Tools > Options > GUI Testing** tab **> Active Screen** node > **Custom Level**) See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Web** pane. In the application area, select **Additional Settings > Web** in the sidebar. - See the section on defining Application Settings for your application area in the *HP Unified Functional Testing User Guide*.

Web Add-in - Testing and Configuration

This chapter includes:

Event Recording Configuration for Web Objects - Overview

When you record on a Web application, UFT generates steps by recording the events you perform on the Web objects in your application. An **event** is a notification that occurs in response to an operation, such as a change in state, or as a result of the user clicking the mouse or pressing a key while working in a Web application.

You may need to record more or fewer events than UFT automatically records by default. If so, you can modify the default event recording settings for Web objects using the Web Event Recording Configuration Dialog Box to use one of three predefined configurations, or you can customize the individual event recording configuration settings to meet your specific needs.

For example, UFT does not generally record mouseover events on link objects. If, however, you have mouseover behavior connected to a link, it may be important for you to record the mouseover event. In this case, you could customize the configuration to record mouseover events on link objects whenever they are connected to a behavior.

Considerations for Configuring Web Event Recording for Web Objects

- Event configuration is a global setting and therefore affects all steps that are recorded after you change the settings.
- Changing the event configuration settings does not affect steps that have already been recorded. If you find that UFT recorded more or less than you need, change the event recording configuration and then re-record the steps that are affected by the change.
- Changes to the custom Web event recording configuration settings do not affect open browsers. To apply your changes, make the changes you need in the Web Event Recording Configuration dialog box, refresh any open browsers, and then start a new recording session.
- The settings in the Web Event Recording Configuration Dialog Box affect recording only for objects that UFT recognizes as Web test objects. The recording configuration for other Web-based objects (such as Siebel, PeopleSoft, .NET Web Forms, and SAP Web controls) is defined by environment-specific XML configuration files.

  > **Note:** For the purposes of Web event recording, UFT treats Web test objects that are child objects of a `PSFrame` test object as PeopleSoft objects and thus applies the settings in the PeopleSoft event configuration XML file when recording those objects.

- You can restore predefined settings after you set custom settings by resetting the event recording configuration settings to the basic level from the Web Event Recording Configuration Dialog Box. You can also restore the default custom level settings from the Custom Web Event Recording Configuration Dialog Box.

To learn more, see:

- "Event Listening and Recording for Web Objects" below
- "Considerations - Event Listening and Recording" on the next page

Event Listening and Recording for Web Objects

For each event, you can instruct UFT to:

- listen every time the event occurs on the object.
- listen only if an event handler is attached to the event.
- listen only if a DHTML behavior is attached to the event.
- listen if either an event handler or DHTML behavior are attached to the event.
- never listen to the event.

An event **handler** is code in a Web page, typically a function or routine written in a scripting language, that receives control when the corresponding event occurs.

> **Note:** UFT supports event handlers that are attached using an `on*` attribute (such as `onclick` or `onmouseover`). It does not support other event handlers, such as those attached using an `addEventListener` or `attachEvent` command.

A DHTML **behavior** encapsulates specific functionality or behavior on a page. When applied to a standard HTML element on a page, a behavior enhances that element's default behavior.

For each event, you can enable recording, disable recording, or enable recording only if the next event is dependent on the selected event.

For example, suppose a `mouseover` behavior modifies an image link. You may not want to record the `mouseover` event each time you happen to move the pointer over this image. It is essential, though, that the `mouseover` event be recorded before a click event on the same object because only the image that is displayed after the `mouseover` event enables the link event. This option applies only to the `Image` and `WebArea` objects.

For task details, see "How to Manage Listening and Recording Events for Web Objects" on page 315.

Recording Right Mouse Button Clicks

UFT enables you to record click events made using left, center, and right mouse buttons. By default, only left clicks are recorded, but you can modify the configuration to record clicks from the right and center buttons, as well.

UFT records the `Click` statement when the `OnClick` event is triggered. UFT differentiates between the mouse buttons by listening for events configured for each of the mouse buttons. By default, it listens for the OnMouseUp event, but you can also configure it to listen for the OnMouseDown event using the Web Event Recording Configuration Dialog box.

> **Note:**

- UFT does not record the simultaneous clicking of more than one mouse button.
- UFT does not record the right-click that opens the browser context menu, or the selection of an item from the context menu. For details on modifying the script manually to enable these options, visit the HP Software Self-solve knowledge base and search for document ID `KM185231`.

For details, see "How to Configure UFT to Record Mouse Clicks" on page 44.

Considerations - Event Listening and Recording

It can sometimes be difficult to find the ideal listen and recording settings. When defining these settings, keep in mind the following guidelines:

- If settings for different objects in the Objects pane conflict, UFT gives first priority to settings for specific `HTML Tag Objects` and second priority to `Web Objects` settings. UFT applies the settings for **Any Web Object** only to Web objects that do not belong to any other loaded Web-based environment and were not defined in the **HTML Tag Object** or **Web Objects** areas.
- To record an event on an object, you must instruct UFT to listen for the event, and to record the event when it occurs. You can listen for an event on a child object, even if a parent object contains the handler or behavior, or you can listen for an event on a parent object, even if the child object contains the handler or behavior.

  However, you must enable recording for the event on the `source object` (the object on which the event actually occurs, regardless of which parent object contains the handler or behavior). For an example of this, see "Event Listening and Recording - Use-case Scenario" below.
- Instructing UFT to listen for many events on many objects may lower performance, so it is recommended to limit **Listen** settings to the required objects.
- In Internet Explorer, listening to the object on which the event occurs (the source object) can, in rare situations, interfere with the event.

  If you find that your application works properly until you begin recording on the application using UFT, your **Listen** settings may be interfering.
- If this problem occurs with a mouse event, try selecting the appropriate **Use standard Windows mouse events** options in the **Web > Advanced** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Web > Advanced** node).
- If this problem occurs with a keyboard or internal event, or the **Use standard Windows mouse events** option does not solve your problem, set the **Listen** settings for the event to **Never** on the source object (but keep the record setting enabled on the source object), and set the **Listen** settings to **Always** for a parent object.

Event Listening and Recording - Use-case Scenario

When you are creating your test, you may want UFT to record a specific event on an object. As a result, you must instruct UFT to listen for the event and to record the event when it occurs.

In this use-case scenario, you are trying to record an onmouseoverevent for a table cell containing two images. When the mouse moves over either of the images contained in the table cell, the event bubbles up to the cell, and the bubbling action includes information on the image that the mouse moved over. You want to record the steps performed on the images.

In order to enable UFT to record the image mouseover event, you can do a number of things:

- In the Custom Web Event Recording Configuration Dialog Box, you configure the mouseover event for the <TD> tag (table cell) to **If Handler**. You also disable the **Record** for the cell to **Never**, thereby disabling the recording option. This enables UFT to "hear" the mouseover event on the table cell when it happens in the application but not record the event as part of the test flow. (This is important because the actual "work" of the application is done with the images contained in the table cells.)
- Also in the Custom Web Event Recording Configuration Dialog Box, you disable listening on the <IMG> tag (the image) by setting the **Listen** option to **Never**. In addition, you set the Record option on the image(s) to Enable. This enables UFT to record the actual action on the images.

  By setting the recording to be done on the images, but listening to be done on the table cells, you have taught UFT that while something happens (the images appear) when you mouseover the table cell, the important part and the objects to include in the test flow are the images that appear when performing a mouseover on the table cell.

You can also record the actions on the images by setting the **Listen** option on the <IMG> tag to **Always** (which enables UFT to listen for the mouseover event even though the image does not contain a behavior or event handler). You then set **Record** option on the image to **Enable**.

For task details on setting event listening and recording options, see "How to Manage Custom Web Event Recording Configurations" on page 314.

Web Add-in Extensibility

UFT Web Add-in Extensibility enables you to develop support for testing third-party and custom Web controls that are not supported out-of-the-box by the UFT Web Add-in.

If the test object class that UFT uses to represent a control does not provide the operations and properties necessary to operate on your control, you can use Web Add-in Extensibility to create a new test object class.

You can then map the control to the new test object class, and design the test object class behavior in JavaScript. You can program how operations are performed on the control, how properties are retrieved, and more.

You can also teach UFT to treat a control that contains a set of lower-level controls as a single functional control, instead of relating to each lower-level control separately.

To implement Web Add-in Extensibility, you need to be familiar with:

- UFT and its Object Model Reference
- The behavior of the custom control (operations, properties, events)
- Web programming (HTML and JavaScript)
- XML (basic knowledge)

"Extensibility Accelerator for HP Functional Testing" (described on page 313) is an IDE that facilitates the design, development, and deployment of Web Add-in Extensibility support. You can install it from the **Add-in Extensibility and Web 2.0 Toolkits** option in the UFT setup program.

Extensibility Accelerator also provides samples of support developed using Web Add-in Extensibility, which you can use to gain a better understanding of how to create your own support.

For details on implementing Web Add-in Extensibility, see the Web Add-in Extensibility Help, available from the UFT Extensibility Documentation program group (**Start > All Programs > HP Software > Unified Functional Testing > Extensibility > Documentation** or the `<UFT installation folder>\help\Extensibility` folder).

Note: For details on accessing UFT and UFT tools and files in Windows 8.X or higher and Windows Server 2012, see "Accessing UFT in Windows 8.X or Higher Operating Systems" on page 387.

A printer-friendly (PDF) version of the *HP UFT Web Add-in Extensibility Developer Guide* is available in the `<UFT installation folder>\help\Extensibility` folder.

Extensibility Accelerator for HP Functional Testing

An increasing number of Web applications are making use of Web 2.0-based toolkits, such as ASP.NET AJAX, Dojo, YahooUI, GWT, and JQueryUI to add dynamic and interactive content to their sites. The controls in these toolkits are complex and require sophisticated and flexible testing capabilities.

UFT Web Add-in Extensibility enables you to extend the Web Add-in to customize how UFT recognizes and interacts with different types of controls. Until now, using Web Add-in Extensibility consisted of manually developing and maintaining toolkit support sets.

Extensibility Accelerator for HP Functional Testing is an IDE that facilitates the design, development, and deployment of these support sets. It makes it faster and easier to create the required extensibility XML files so that you can invest your main efforts in the development of the JavaScript functions that will enable UFT to work with your custom Web controls.

The Extensibility Accelerator user interface helps you define new test object classes, operations, and properties. It also provides a point-and-click mechanism you can use to map the test object classes you defined to controls in your application. Extensibility Accelerator deployment capabilities enable you to automatically deploy your new toolkit support set to UFT or to package it so that you can share it with other UFT users.

The Extensibility Accelerator for HP Functional Testing installation is available from the **Add-in Extensibility and Web 2.0 Toolkits** option in the Unified Functional Testing setup program.

> **Note:** As part of the installation process, an html page opens in your browser. To complete the installation successfully, this page must be opened in Internet Explorer.

How to Manage Custom Web Event Recording Configurations

This task describes the different ways you can define, modify, export, and reset custom Web event recording configurations.

This task includes the following steps:

- "Add objects to the HTML Tag Objects list" below
- "Modify a custom configuration file manually - Optional" below
- "Reset configuration settings to a pre-configured basic level" below

Add objects to the HTML Tag Objects list

1. In th Custom Web Event Recording Configuration dialog box (**Record > Web Event Recording Configuration**), select **Object > Add**. A `New Object` object is displayed in the HTML Tag Objects list.
2. Click **New Object** cell and enter the exact `HTML Tag` name.

   By default the new object is set to listen and record `onclick` events with handlers attached.

   You can load additional objects by importing an event configuration file (saved with an .xml extension). In the Custom Web Event Recording Configuration dialog box, select **File > Load Configuration** and locate the .xml file you need.

Load a custom configuration from an XML file

1. Select **File > Load Configuration**. The Open dialog box opens.
2. Locate the event configuration file (`.xml`) that you want to load and click **Open**. The dialog box closes and the selected configuration is loaded.

Modify a custom configuration file manually - Optional

Open the `.xml` file that you saved in any text editor, and modify the file according to your needs. To enable UFT to recognize the modifications that you made, the `.xml` file must keep its original structure. For details on the XML file structure, see "Web Event Recording Configuration XML File Structure" on page 31.

Reset configuration settings to a pre-configured basic level

- **From the Custom Web Event Recording Configuration dialog box.** In the **Reset to** box, select the predefined event recording level you want, and click **Reset**. All event settings are restored to the defaults for the level you selected.

- **From the Web Event Recording Configuration dialog box.** Reset basic level configuration settings by selecting **Default Settings**. The configuration slider is displayed again, and all event settings are restored to the **Basic** event recording configuration level.

Note: When you choose to reset predefined settings, your custom settings are cleared completely. If you do not want to lose your changes, make sure to save your settings in an event configuration file.

How to Manage Listening and Recording Events for Web Objects

This task describes the different ways you can manage listening and recording events for Web objects.

Note: The listen and record settings are mutually independent. This means that you can choose to listen to an event for a particular object, but not record it, or you can choose not to listen to an event for an object, but still record the event. For details, see "Considerations - Event Listening and Recording" on page 311.

This task contains the following steps:

- "Add listening events for an object" below
- "Specify the listening criterion for an event" below
- "Set the recording status for an event" on the next page
- "Configure UFT to record mouse click events" on the next page

Add listening events for an object

1. In the Custom Web Event Recording Configuration dialog box (**Record > Web Event Recording Configuration**), select the object to which you want to add an event, or select **Any Web Object**.
2. Select **Event > Add**. A list of available events opens.
3. Select the event you want to add. The event is displayed in the **Event Name** column in alphabetical order. By default, UFT listens to the event when a handler is attached and always records the event (as long as it is listened to at some level).

Specify the listening criterion for an event

1. Select the object for which you want to modify the listening criterion or select **Any Web Object**.
2. In the row of the event you want to modify, select the listening criterion you want from the **Listen** column:

- **Always, If Handler**
- **If Behavior**
- **If Handler or Behavior**
- **Never**.

Set the recording status for an event

1. Select the object for which you want to modify the recording status or select **Any Web Object**.
2. In the row of the event you want to modify, select a recording status from the **Record** column.

Configure UFT to record mouse click events

For details, see "How to Configure UFT to Record Mouse Clicks" on page 44.

Troubleshooting and Limitations - Web Add-in

This section contains troubleshooting and limitation information about working with the Web Add-in. For details on browser-specific limitations, see "Known Issues - Internet Explorer and Microsoft Edge" on page 354, "Known Issues - Mozilla Firefox" on page 357, and "Known Issues - Google Chrome and Apple Safari" on page 360.

Object Identification

- If UFT does not recognize your objects in the correct location, check to see that you are viewing the page at 100%, and are not zooming in or out of the page.

  For example, if you view the page at 90% or 120%, you may be required to click or select an area to the left or the right of the actual object in order to recognize it.
- If you open UFT with the Siebel Add-in loaded, the Web Add-in does not appear in the Object Identification dialog box.

  Workaround: Change the value of the **HKEY_CURRENT_USER\Software\Mercury Interactive\QuickTest Professional\MicTest\Packages\SiebelPackage\Settings\AllowWebToConfig** registry key value to **1**.
- If your application objects do not implement the `aria-selected` attribute in the application's controls, certain identification properties, such as the **selected**, **items count**, **selected items**, **selection**, and **value** return empty values.
- If the child items in a WebTree object are generated dynamically (for example, they are not visible or present in the application until the parent node is expanded), UFT may not be able to select the items in the tree automatically using the **.Select** method.

  Workaround: Manually add steps to make the nodes visible or expand tree nodes to create the object in the application.

Recording

- Autocomplete is not supported during recording sessions. When recording on an autocomplete control, enter the full string instead of selecting the suggestion provided by the control. The step is recorded in the same way as other (non-autocomplete) controls.

  Workaround: You can disable the AutoComplete feature in Microsoft Internet Explorer by selecting **Tools > Internet Options > Advanced** and deselecting the **Use inline AutoComplete** under the Browsing options.

- If a WebTree object contains separate objects inside the tree (such as a checkbox object), these child objects are not recorded.

  Workaround: Do one of the following:

  - Spy on the child object to get the relative Xpath value of the tree item. Then, add a **WebTree.Select** method, with the Xpath value you retrieved from the spy for the *XPath* argument of the .Select method.

  - Add the object into the object repository and manually add it to the test or component.

Web Add-in - Multiple Browser Support

This chapter includes:

Testing Applications on Multiple Browsers

Web applications and Web controls may be implemented or displayed differently on different browsers. This may affect the behavior of your tests and components, especially if you design them on one browser, and then run them on another. The run results may also differ when running the same test or component on different browsers. For example, if properties are implemented or stored differently on different browsers, UFT may use different properties for object identification or checkpoints depending on the browser you use to open the application.

If you are aware of differences in your application's behavior on different browsers, you may be able to design your tests and components to be browser-independent by anticipating these differences.

There are a number of areas where potential issues can exist:

- Object Identification
- Creating a Single Test for Cross-Browser Testing
- Running Cross Browser Tests

For details on steps to assist you with cross browser testing, see "How to Set Up Multiple Browser Testing" on page 341.

For a use-case scenario, see "Using Descriptive Programming for Multiple Browser Testing - Use-case Scenario" on page 326.

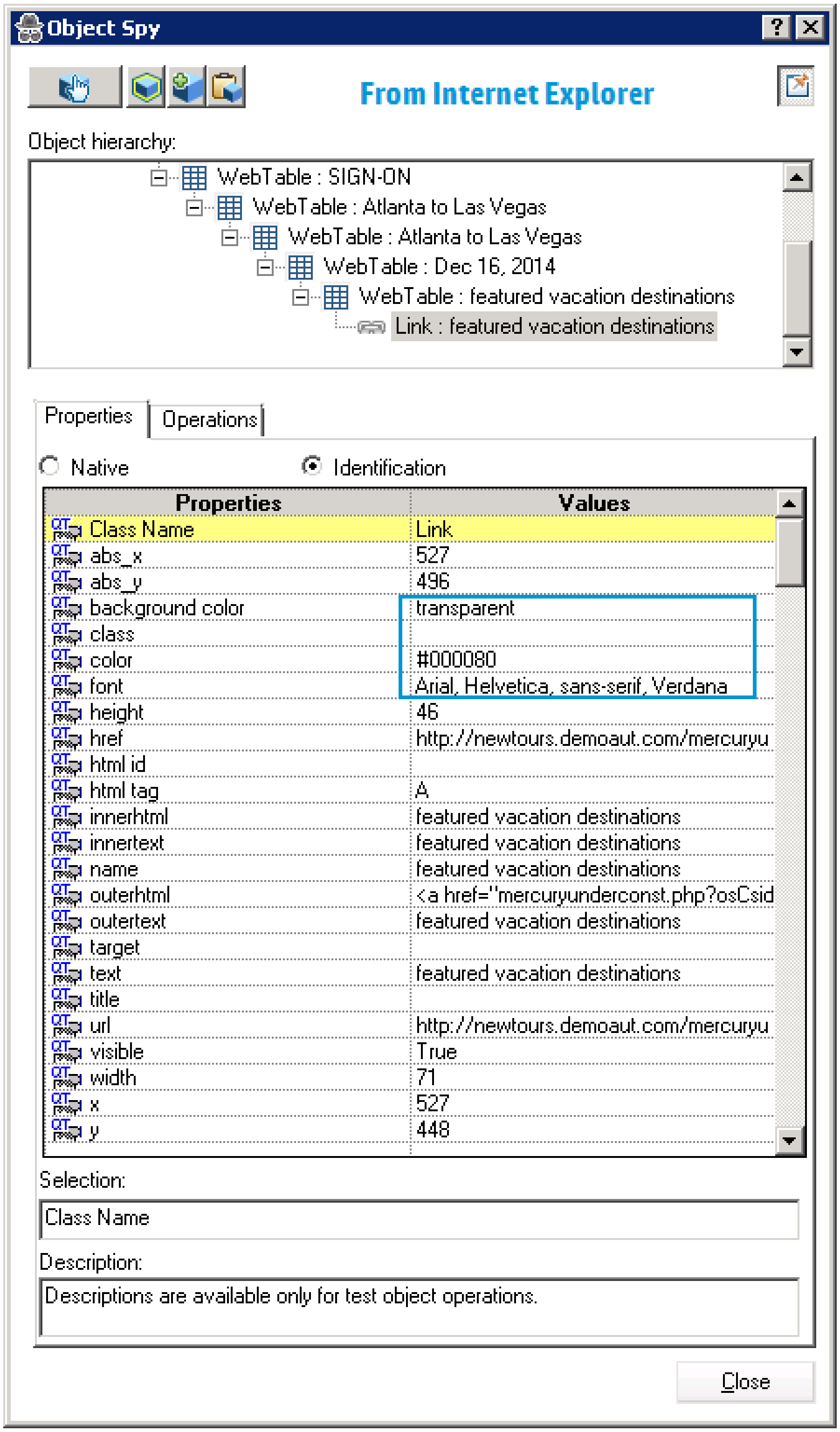
Working with Multiple Browsers - Object Identification Issues

When testing web applications and web pages in multiple browsers, one of the foremost challenges is identification of the application/page controls or objects. Due to differences in browser architecture, each of the browsers recognizes and displays the controls and/or objects differently. This can be a visual difference or a property difference that is invisible to the eye. However, because UFT uses these properties (both the visual and hidden ones) as described in the HTML tags, object identification can present issues between browser types.

This can be due to something as basic as different browser layout settings. For example, each browser type structures their toolbar, bookmark, and tab layout differently. However, because of this, the amount of available space for the browser content differs, and likewise the display of the content differs. If you are using location-based identification properties to identify different objects in an application, the layout of the browser can change these properties.

Object property differences also provide a point of potential issue. Within each browser, the properties for a given object can be different (even when your application or Web page uses a CSS to standardize the appearance of application or page elements). For example:

- Link controls are displayed differently on Firefox and Chrome than in Internet Explorer. A link from the Mercury Tours website is identified differently between each of the browsers (with the font, color, and background color properties highlighted):



Object hierarchy:

- WebTable : SIGN-ON
  - WebTable : Atlanta to Las Vegas
    - WebTable : Atlanta to Las Vegas
      - WebTable : Dec 16, 2014
        - WebTable : featured vacation destinations
          - Link : featured vacation destinations

○ Native ● Identification

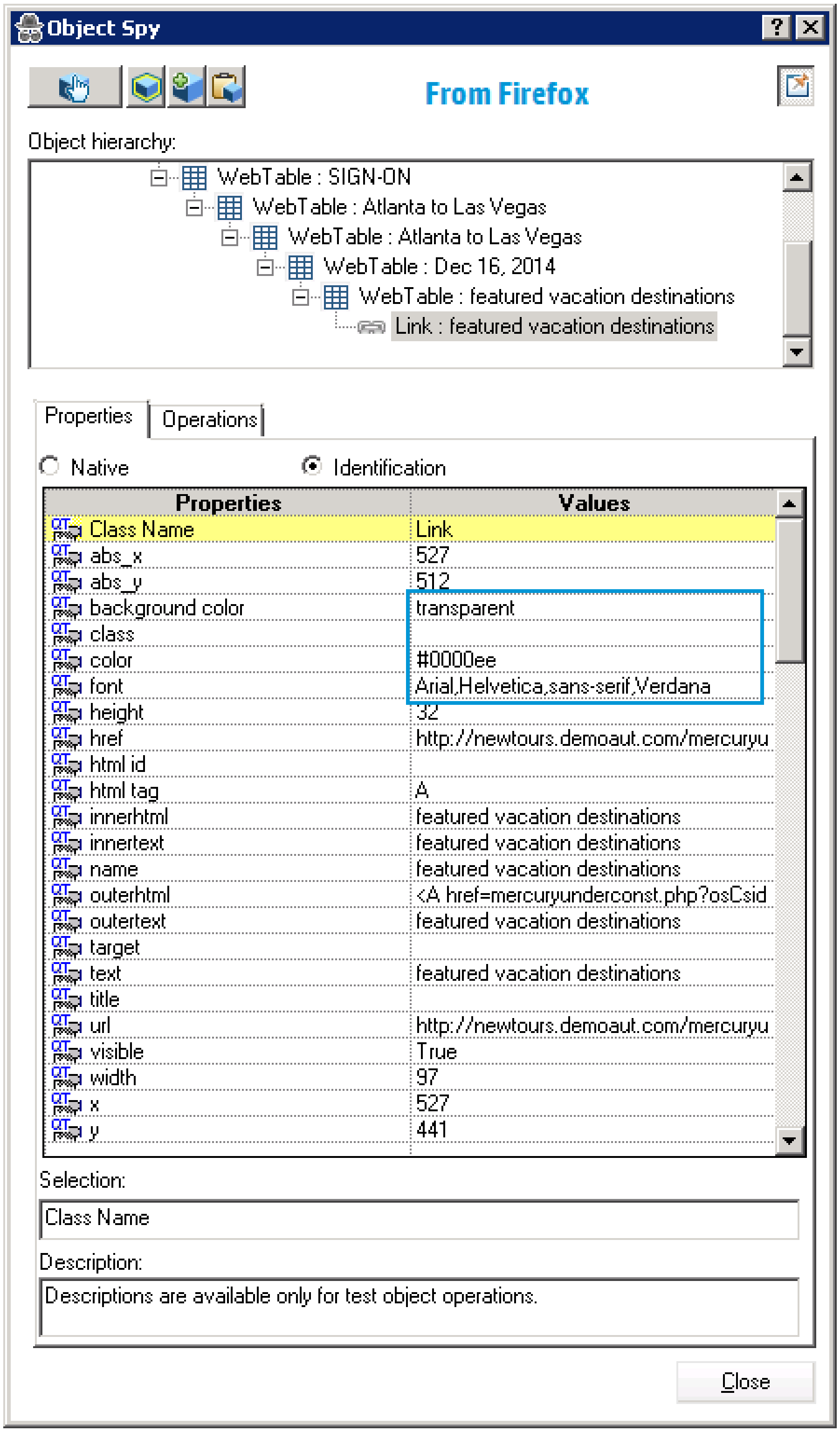
Properties	Values
Class Name	Link
abs_x	527
abs_y	496
background color	transparent
class	
color	#000080
font	Arial, Helvetica, sans-serif, Verdana
height	46
href	http://newtours.demoaut.com/mercuryu
html id	
html tag	A
innerhtml	featured vacation destinations
innertext	featured vacation destinations
name	featured vacation destinations
outerhtml	<a href="mercuryunderconst.php?osCsid
outertext	featured vacation destinations
target	
text	featured vacation destinations
title	
url	http://newtours.demoaut.com/mercuryu
visible	True
width	71
x	527
y	448

Selection:

Class Name

Description:

Descriptions are available only for test object operations.



Object hierarchy:

```
WebTable : SIGN-ON
  WebTable : Atlanta to Las Vegas
    WebTable : Atlanta to Las Vegas
      WebTable : Dec 16, 2014
        WebTable : featured vacation destinations
          Link : featured vacation destinations
```

○ Native ● Identification

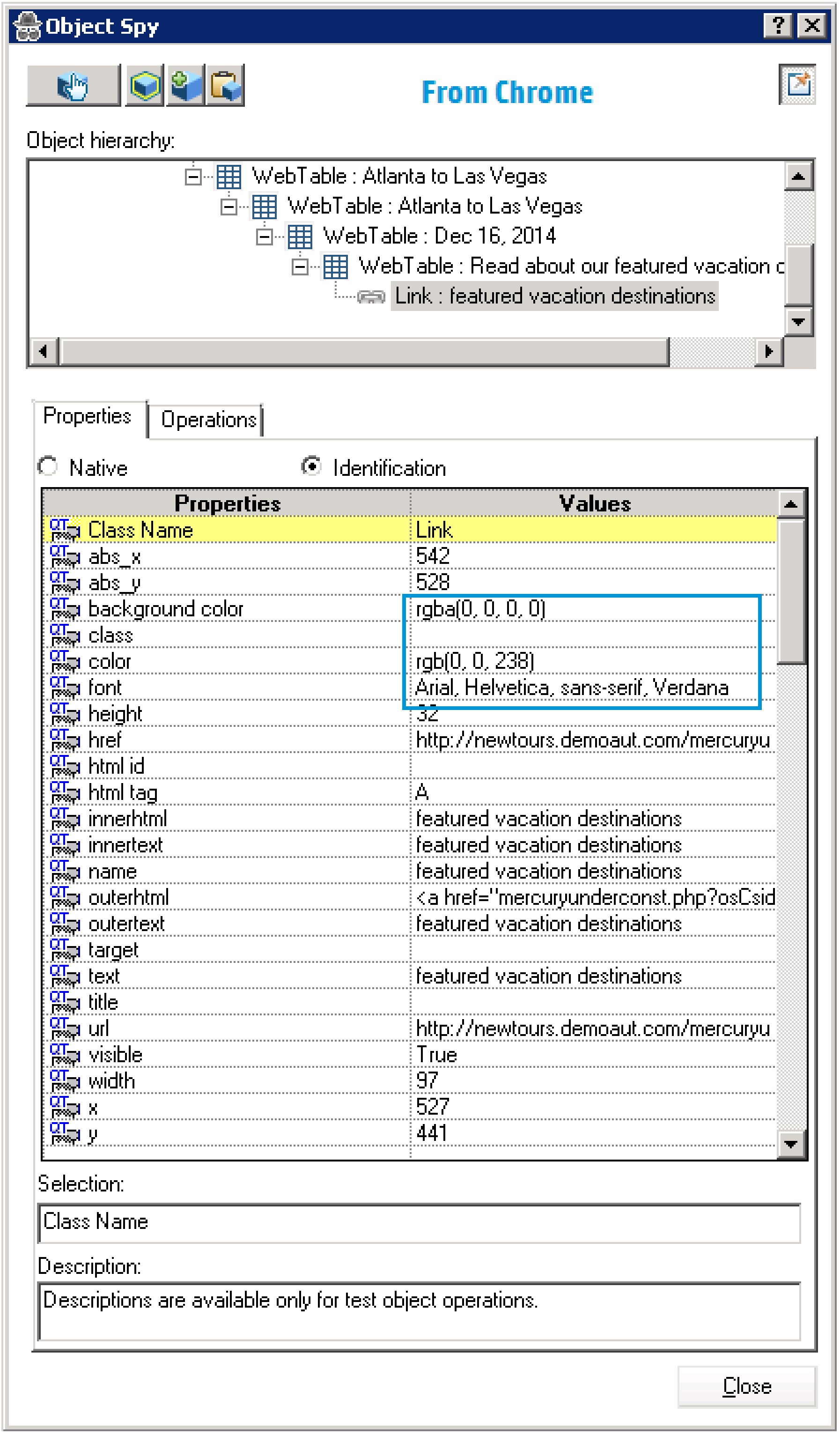
Properties	Values
Class Name	Link
abs_x	527
abs_y	512
background color	transparent
class	
color	#0000ee
font	Arial,Helvetica,sans-serif,Verdana
height	32
href	http://newtours.demoaut.com/mercuryu
html id	
html tag	A
innerhtml	featured vacation destinations
innertext	featured vacation destinations
name	featured vacation destinations
outerhtml	<A href=mercuryunderconst.php?osCsid
outertext	featured vacation destinations
target	
text	featured vacation destinations
title	
url	http://newtours.demoaut.com/mercuryu
visible	True
width	97
x	527
y	441

Selection:

Class Name

Description:

Descriptions are available only for test object operations.



Object Spy
From Chrome
Object hierarchy:
WebTable : Atlanta to Las Vegas
WebTable : Atlanta to Las Vegas
WebTable : Dec 16, 2014
WebTable : Read about our featured vacation c
Link : featured vacation destinations
Properties
Operations
○ Native
● Identification

Properties	Values
Class Name	Link
abs_x	542
abs_y	528
background color	rgba(0, 0, 0, 0)
class	
color	rgb(0, 0, 238)
font	Arial, Helvetica, sans-serif, Verdana
height	32
href	http://newtours.demoaut.com/mercuryu
html id	
html tag	A
innerhtml	featured vacation destinations
innertext	featured vacation destinations
name	featured vacation destinations
outerhtml	<a href="mercuryunderconst.php?osCsid
outertext	featured vacation destinations
target	
text	featured vacation destinations
title	
url	http://newtours.demoaut.com/mercuryu
visible	True
width	97
x	527
y	441

Selection:

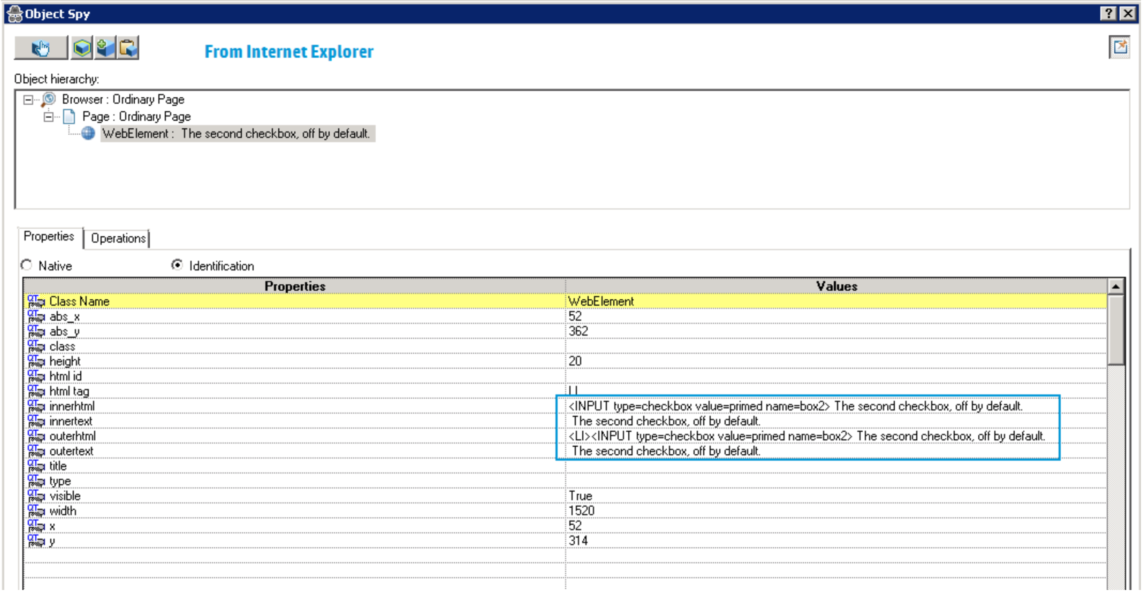
Class Name

Description:

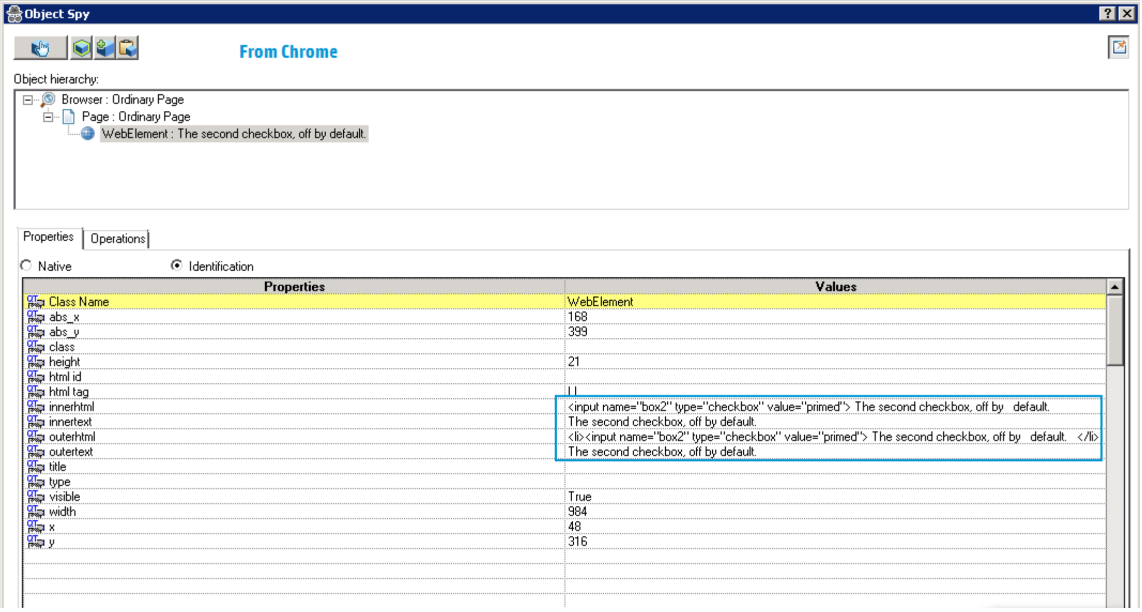
Descriptions are available only for test object operations.

If you were using these properties to ensure correct identification of the link object, or using these properties in a checkpoint, you would achieve varying results.

- When using Chrome or Safari, the **innertext**, **outertext**, **innerhtml** and **outerhtml** property values may differ from other browsers:



Properties	Values
Class Name	WebElement
abs_x	52
abs_y	362
class	
height	20
html id	
html tag	LI
innerhtml	<INPUT type=checkbox value=primed name=box2> The second checkbox, off by default.
innertext	The second checkbox, off by default.
outerhtml	<LI><INPUT type=checkbox value=primed name=box2> The second checkbox, off by default.
outertext	The second checkbox, off by default.
title	
type	
visible	True
width	1520
x	52
y	314



Properties	Values
Class Name	WebElement
abs_x	168
abs_y	399
class	
height	21
html id	
html tag	LI
innerhtml	<input name="box2" type="checkbox" value="primed"> The second checkbox, off by default.
innertext	The second checkbox, off by default.
outerhtml	<li><input name="box2" type="checkbox" value="primed"> The second checkbox, off by default. </li>
outertext	The second checkbox, off by default.
title	
type	
visible	True
width	984
x	48
y	316

Note that while the content of the innerhtml and outerhtml is basically the same - the browsers are definitely representing the properties differently. This can potentially cause identification problems for objects, especially if the property values are critical elements in identifying the object.

- In some cases, applications or Web sites detect which browser you are using and change the actual HTML content of the page. In this case, the identification properties that UFT uses to identify the object in the browser could be looking for a specific HTML tag, which may or may not exist in a different browser.

- Some HTML5 input types are not supported in older browsers or browser versions. This means that a control might have different properties, depending on the browser you use. If you record a test on a browser that supports HTML5 but run it on a browser that does not support HTML5, or vice versa, UFT might not be able to match the object description in your test to an object in the Web page being tested.

Testing Applications on Multiple Browsers - Creating a Single Test for All Browser Testing

When you are testing your application or Web page on multiple browsers, you are trying to see that the application or Web page performs the same between browser types (unless designed otherwise). When you set up your test, you would also expect that the same test can be used for each browser type, with minimal maintenance and updating to account for browser differences. However, creating a single test for cross browser testing provides a set of challenges:

Having the correct objects with the correct properties for each browser	In UFT, a test of your application accesses the object repository or repositories for your test, which contains the necessary objects to test the application's objects. Ideally, you would create a single object repository or object repositories (per application section or Web page). Then, you would run the test in all the browser versions using that single object repository or set of object repositories, and UFT could identify the objects in the application or Web page without issue. In reality, providing the correct objects in the correct object repository is not always simple. Firstly, there are the object identification issues. If UFT identifies a certain object very differently between browser types or versions, you may need to create separate repositories for each browser type to enable UFT to find the right object. However, when the test runs on a specific browser, you need the correct object repository for that test run. When you have a scenario such as this, you can enable UFT to dynamically add an object repository at the beginning of the test run. For details, see "Dynamically load an object repository during the test run" on page 344.
Dynamically created objects that are not included in an object repository	In some cases, you may also have dynamically created objects that are displayed on a page as a result of previous operations performed in the application. However, in the process of creating the test and the object repositories, these objects are not identified (as they do not exist when UFT is learning the application initially). Like many other objects, these objects can be created and identified very different between browsers, making it even more difficult for UFT to identify them. To help UFT identify these objects, you can use descriptive programming. For details, see the section on Programmatic Descriptions in the *HP Unified Functional Testing User Guide*.
Dynamic page updates	Each browser version can also have dynamic updates to the browser or page as part of its normal workflow. For example, alert dialogs are different between each of the browser versions, making it difficult to UFT to know how to recognize, handle or ignore the dialogs. As a result, if you create test steps to close the alert dialog using one browser type, the other browser types may have trouble recognizing or performing steps on the dialog. In other cases, these dialogs do not exist in the other browsers. In some cases, the browser may not even enable you to continue the test if the alert dialog is not closed, thereby causing the test to fail, simply because it did not recognize the dialog and perform the correct steps on it. In the case of the browser dialog boxes, there are special methods that can ensure you handle the pop-up dialogs appropriately, including the **Browser.HandleDialog**, **Browser.GetDialogText**, and the **Browser.DialogExists** methods. (Note that even these methods do not work exactly the same between

	browsers also.) In other cases, you can add steps to your test to account for browser-specific behavior. For details, see "Add steps for browser specific behavior" on page 345.
Browser-specific or application-specific behavior for user actions	There are scenarios where the same application operation - such as pressing the **Back** button - may result in very different behavior between browsers. For example, in an appointment booking application, pressing the **Back** button for Internet Explorer returns you to the previously viewed page, while pressing **Back** in Firefox or Chrome logs you out of the application. However, because of such problems, your test must be prepared to address the different behaviors. There are some potential solutions to help: • Navigate to a specific URL/location in the application instead of a previous/next page (such as in the example above) • Insert **Wait** steps that pause the test until an application or an application object achieves a certain state (which can be checked using the **Exist** property for an object) For details, see "Add steps for browser specific behavior" on page 345

Testing Applications on Multiple Browsers - Running the Test on Multiple Browsers

After you create a single test of your application or Web page to use in different browsers, you still must run it to actually test the application or Web page. You have a number of options on how to run the test across different browser types:

Manually configure the browser type for each test run	UFT provides you the opportunity to select the browser type before each test run. You can do this in one of the following places: • **The Web tab of the Record and Run Settings dialog box.** In the Web tab, you can select the browser type from the drop-down list. Then, when you run the test, UFT opens the appropriate browser and runs the test. • **A user-defined environment variable specified in the Environment pane of the Test Settings dialog box.** UFT uses the BROWSER_ENV environment variable, and the requisite values for each browser type to enable you to set this variable before each test run. When you enter a value for the BROWSER_ENV variable, UFT automatically opens up the necessary browser (ignoring any other browser launch settings). However, this requires manual intervention by the person running the test, and does not enable you to run subsequent tests of the application or Web page on the different browser types in sequence. For details, see "Configure the Record and Run settings to launch a browser" on page 341 or "Set the value of the BROWSER_ENV environment variable to launch a specific browser" on page 342
Instruct UFT to open a browser type defined by a parameter in the test step	Instead of manually setting the browser before each test run (which thereby defeats the purpose of automated testing), you can insert a parameter into a test step that defines the browser to open. (You can also define a single reusable action that opens the browser, which can be reused in all the tests of your application or Web page.) The values for this parameter (which are the `.exe` programs for each browser) are then defined in

	the Data pane. When UFT reaches this test step, it reads the data pane and decides which browser needs to open based on the selected data. This removes the need for you or another person to manually configure settings or variables in a test before running the test, enabling you automatically test your application or Web page on all browser types and/or versions. If you create a reusable action with the step that opens the browser, the parameter and data must be added to every test that calls this external action. For task details on how to set up automatic opening of browser types from UFT, see "Configure UFT to automatically launch a browser using a data parameter" on page 343.
Use a test parameter or data table parameter to launch the appropriate browser	In the Record and Run Settings dialog box (Web tab), you can instruct UFT to use either a test parameter or data table parameter to launch the browser. You set the parameter at the beginning of the test run (for a test parameter) or insert the BROWSER_ENV value in the Data table in the Data pane. Then, when UFT runs the test, it launches the correct browser according to the values you inserted. For details, see "Configure UFT to automatically launch a browser with a parameter using the Record and Run Settings" on page 343.

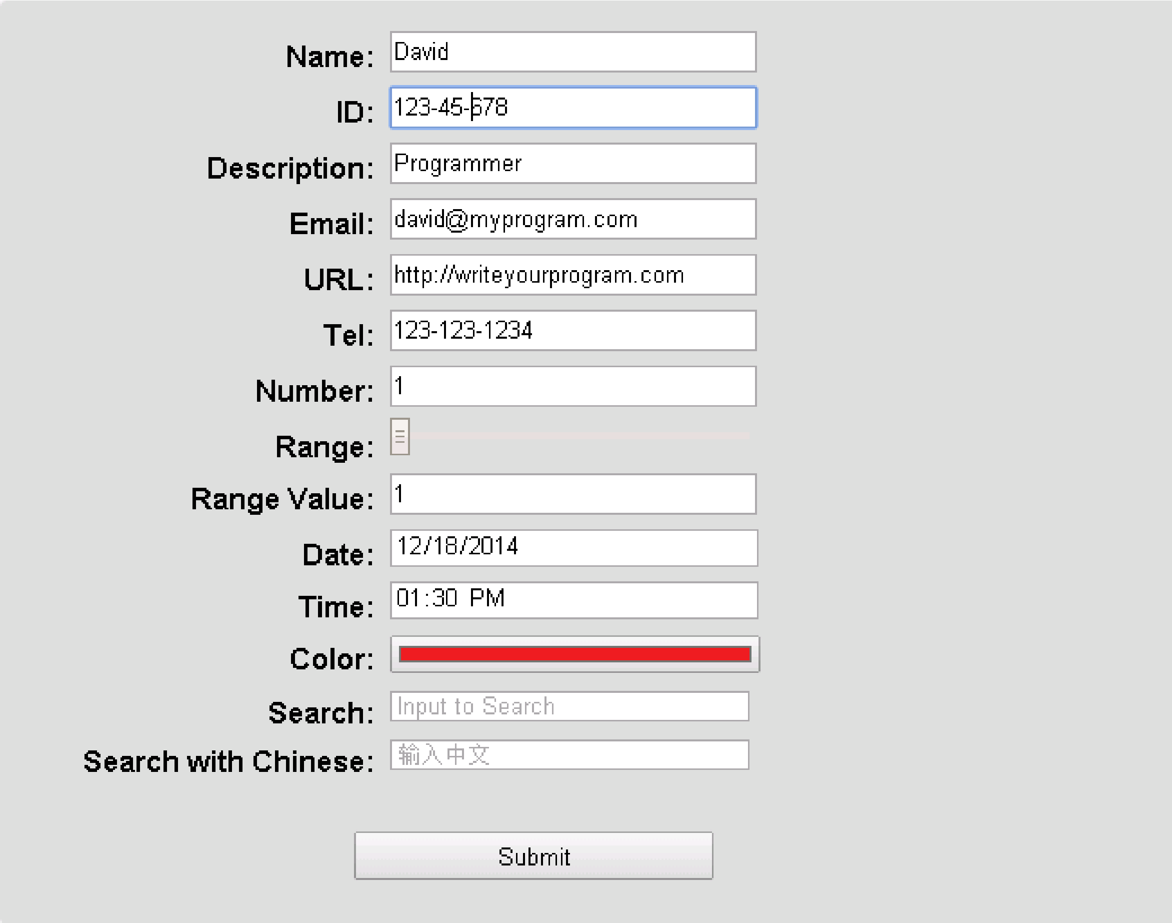
Using Descriptive Programming for Multiple Browser Testing - Use-case Scenario

One of the challenging parts of cross-browser testing of your applications or Web pages is the object identification of objects in different browser types. Since each browser type can read the HTML code of your application and translate this differently, UFT may have trouble identifying the same objects in different browsers.

One technique that you can use when UFT is not identifying objects correctly is descriptive programming. When you insert a programmatic description into your test instead of the actual test object name, UFT searches for the object in your application matching the description.

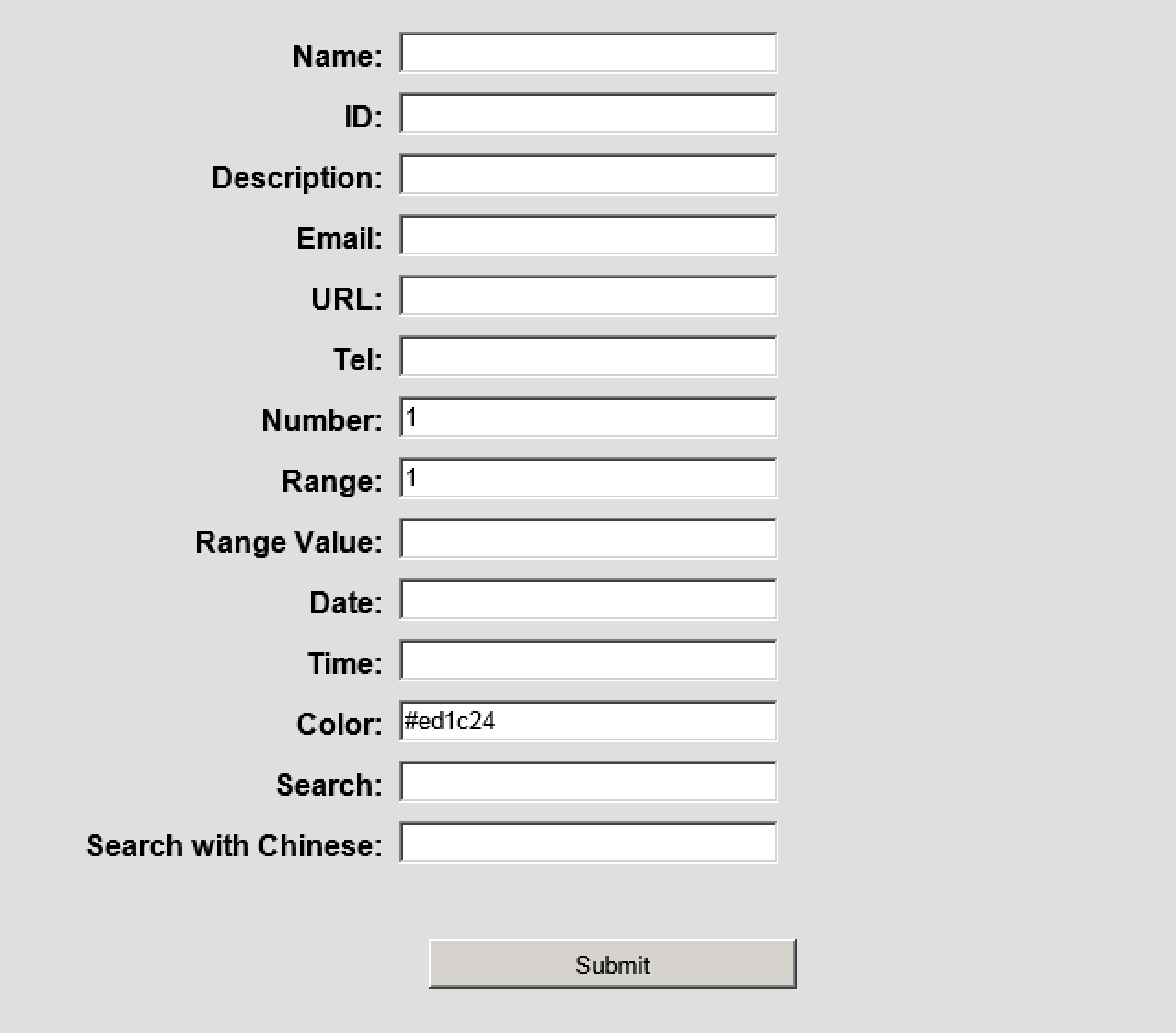
In this use-case scenario, you can see how UFT can find a problematic object using description instead of the test object name for the object (as stored in the object repository.).

In your application, you are trying to test this area of your application, containing a number of edit fields:



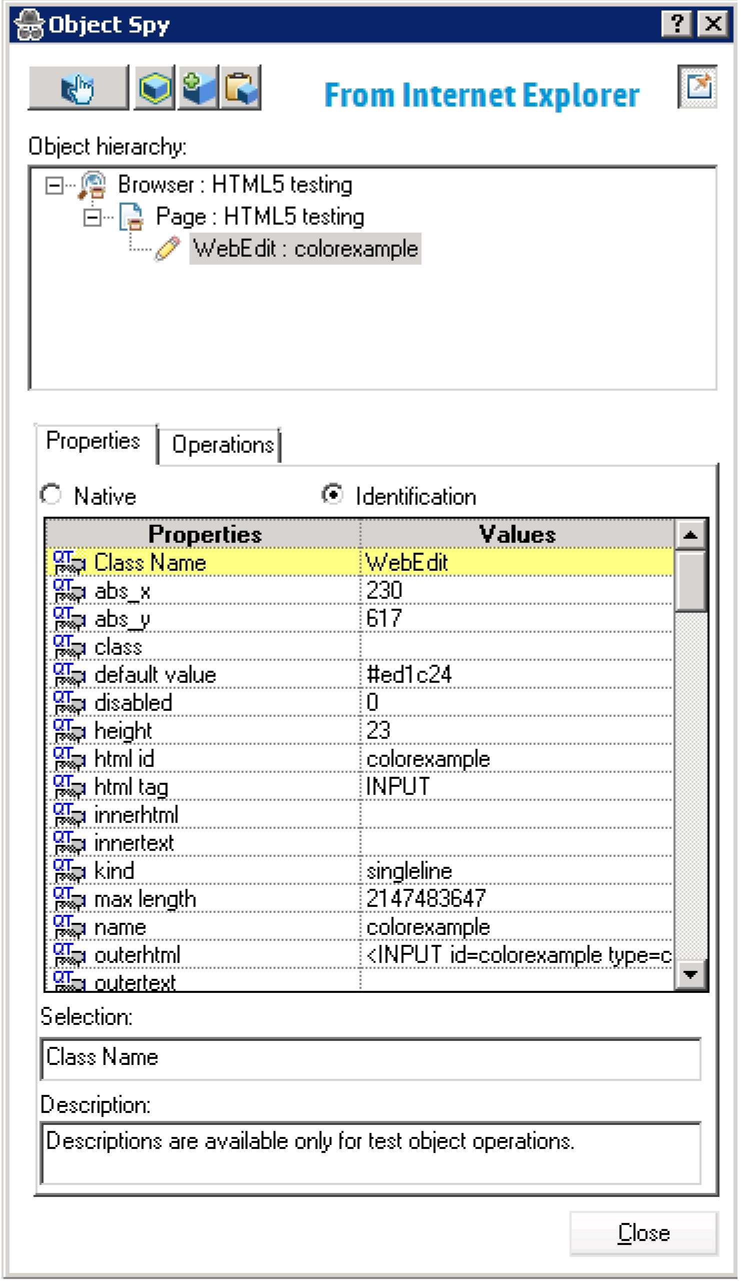
Name:	David
ID:	123-45-678
Description:	Programmer
Email:	david@myprogram.com
URL:	http://writeyourprogram.com
Tel:	123-123-1234
Number:	1
Range:	
Range Value:	1
Date:	12/18/2014
Time:	01:30 PM
Color:	🟥
Search:	Input to Search
Search with Chinese:	输入中文

In Chrome and Firefox, the application area displays as seen above. However, in Internet Explorer, the window has a different appearance, particularly the **Color** field:



Name:	
ID:	
Description:	
Email:	
URL:	
Tel:	
Number:	1
Range:	1
Range Value:	
Date:	
Time:	
Color:	#ed1c24
Search:	
Search with Chinese:	

Even though the visual appearance is different, a closer look shows that the object properties of the **Color** field are basically the same:



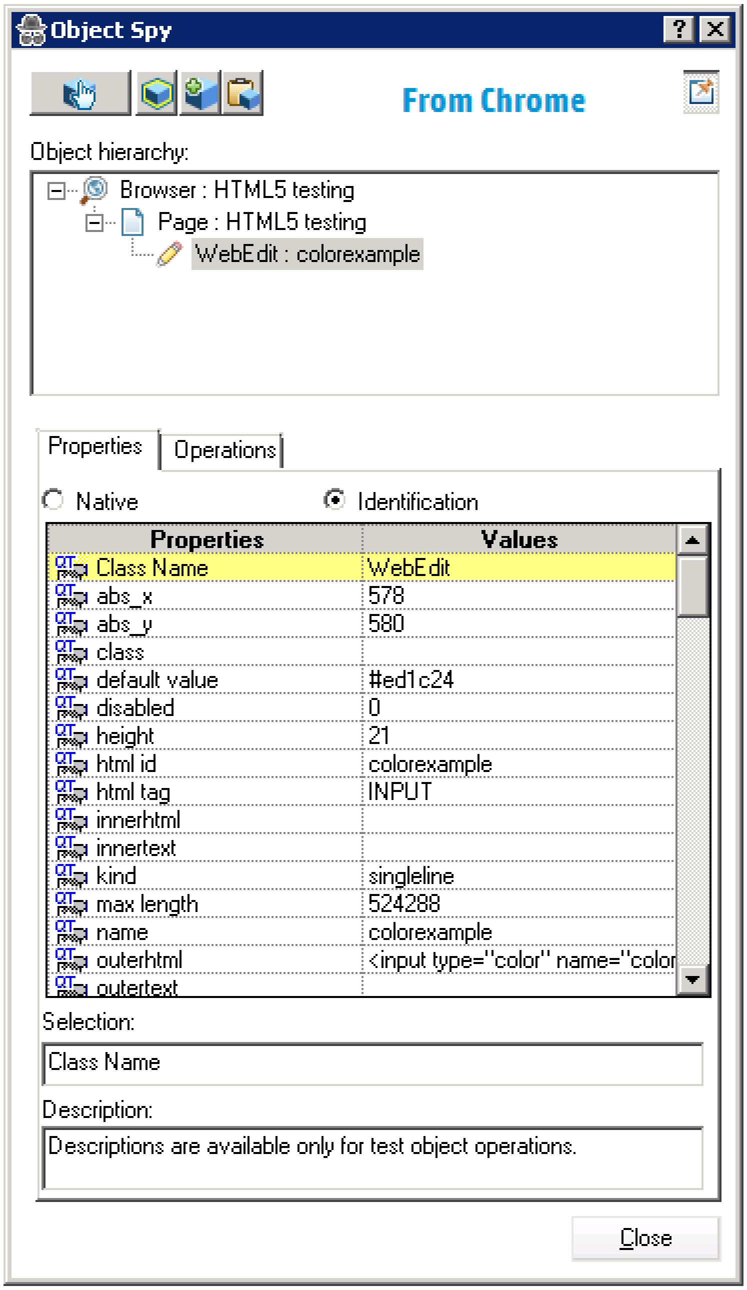
Properties	Values
Class Name	WebEdit
abs_x	230
abs_y	617
class	
default value	#ed1c24
disabled	0
height	23
html id	colorexample
html tag	INPUT
innerhtml	
innertext	
kind	singleline
max length	2147483647
name	colorexample
outerhtml	<INPUT id=colorexample type=c
outertext	

Selection:

Class Name

Description:

Descriptions are available only for test object operations.



Object hierarchy:

```
Browser : HTML5 testing
    Page : HTML5 testing
        WebEdit : colorexample
```

○ Native ● Identification

Properties	Values
Class Name	WebEdit
abs_x	578
abs_y	580
class	
default value	#ed1c24
disabled	0
height	21
html id	colorexample
html tag	INPUT
innerhtml	
innertext	
kind	singleline
max length	524288
name	colorexample
outerhtml	<input type="color" name="color
outertext	

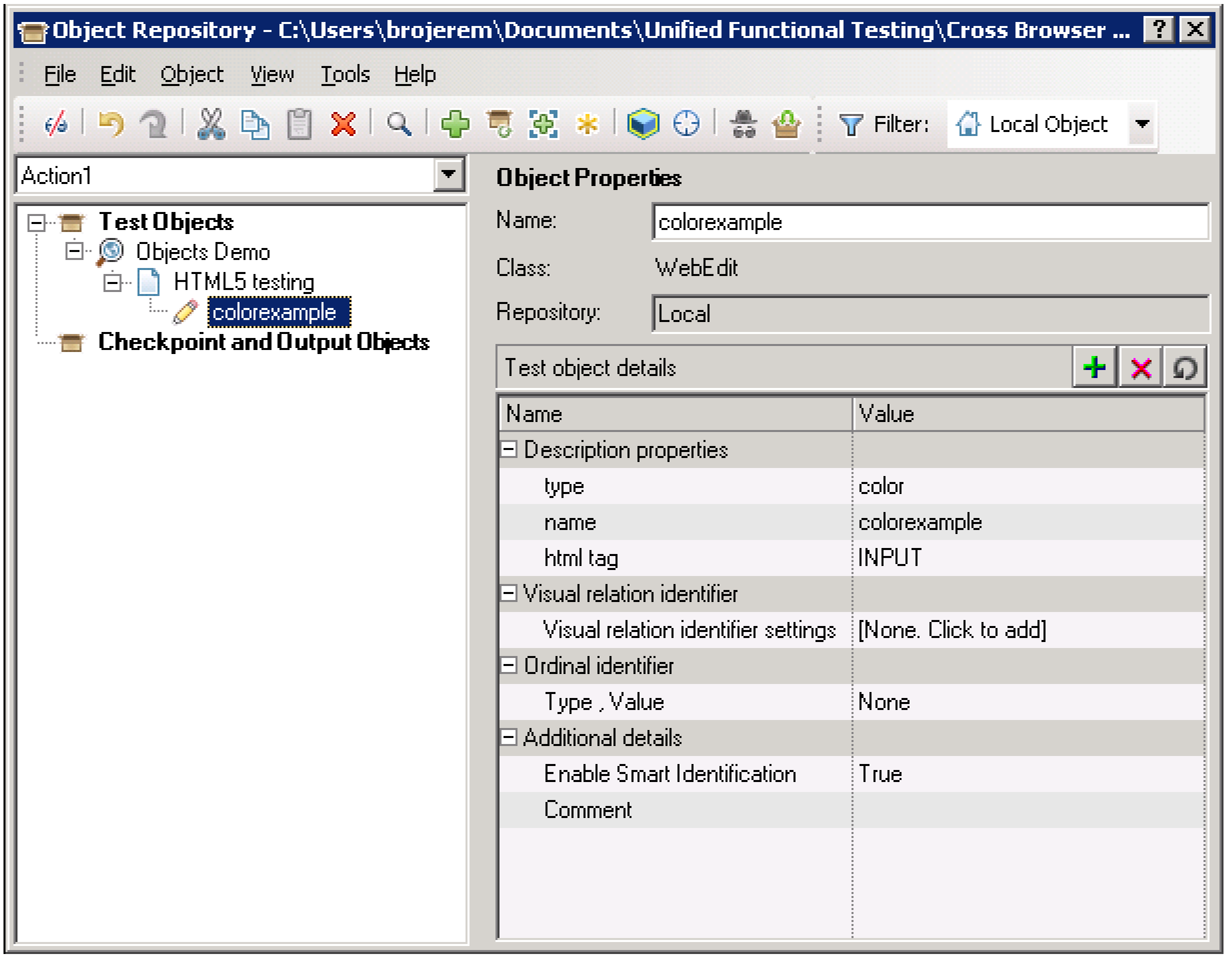
Selection:

Class Name

Description:

Descriptions are available only for test object operations.

In the object repository, the Color field object is recognized as a WebEdit object with the name **colorexample** (as it was by the Object Spy):



Name: colorexample

Class: WebEdit

Repository: Local

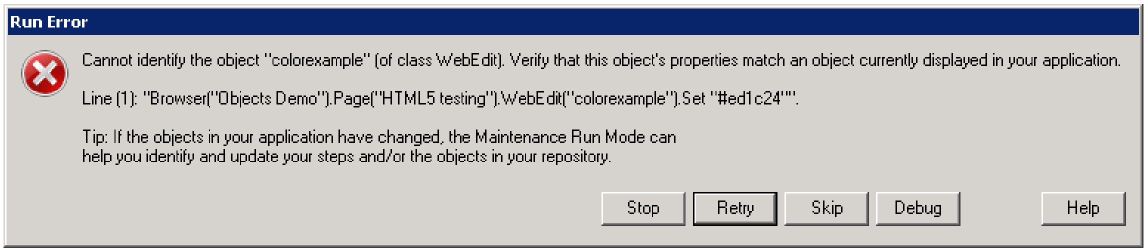
Name	Value
Description properties	
type	color
name	colorexample
html tag	INPUT
Visual relation identifier	
Visual relation identifier settings	[None. Click to add]
Ordinal identifier	
Type , Value	None
Additional details	
Enable Smart Identification	True
Comment	

Based on this, when you insert a test step for this object, it is displayed like this:

```
Browser("Objects Demo").Page("HTML5 testing").WebEdit("colorexample").Set
```

However, when you run the test step, there are varying results:

- The step runs on Chrome and Firefox without problem.
- The step fails on Internet Explorer:

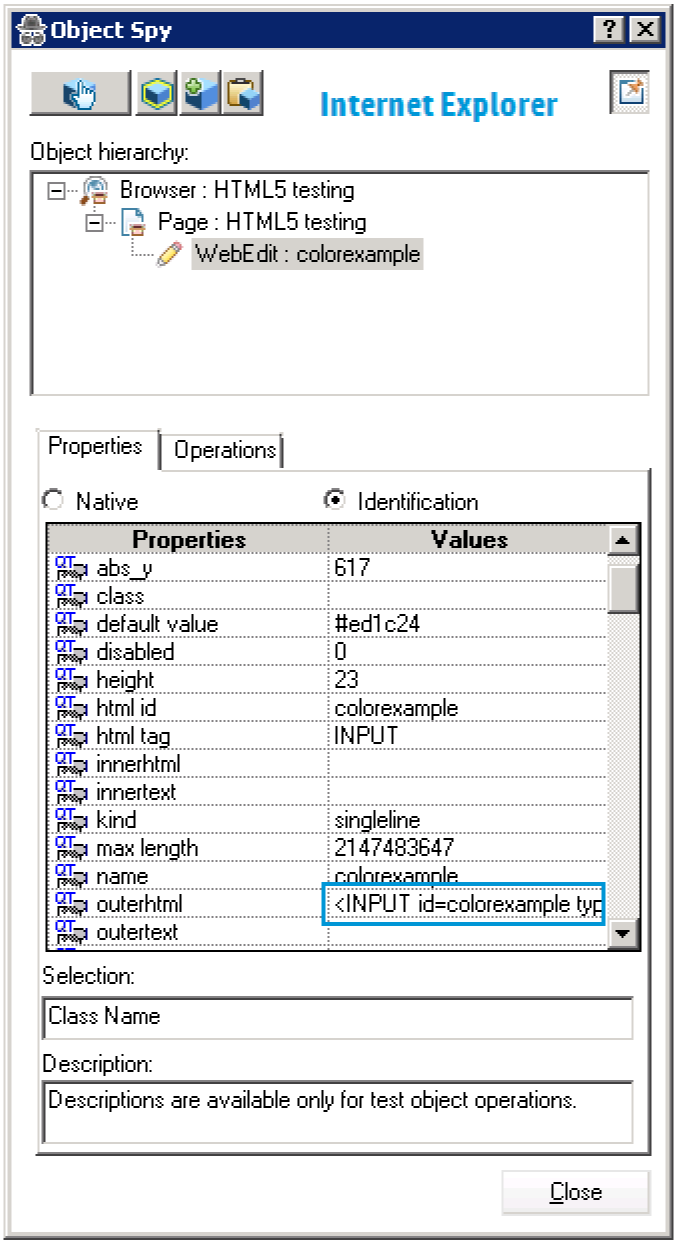


Cannot identify the object "colorexample" (of class WebEdit). Verify that this object's properties match an object currently displayed in your application.

Line (1): "Browser("Objects Demo").Page("HTML5 testing").WebEdit("colorexample").Set "#ed1c24"".

Tip: If the objects in your application have changed, the Maintenance Run Mode can help you identify and update your steps and/or the objects in your repository.

A closer look at the properties in the Object Spy for the **colorexample** object shows slight differences in the properties between Internet Explorer and Chrome:



Browser : HTML5 testing
Page : HTML5 testing
WebEdit : colorexample

○ Native ● Identification

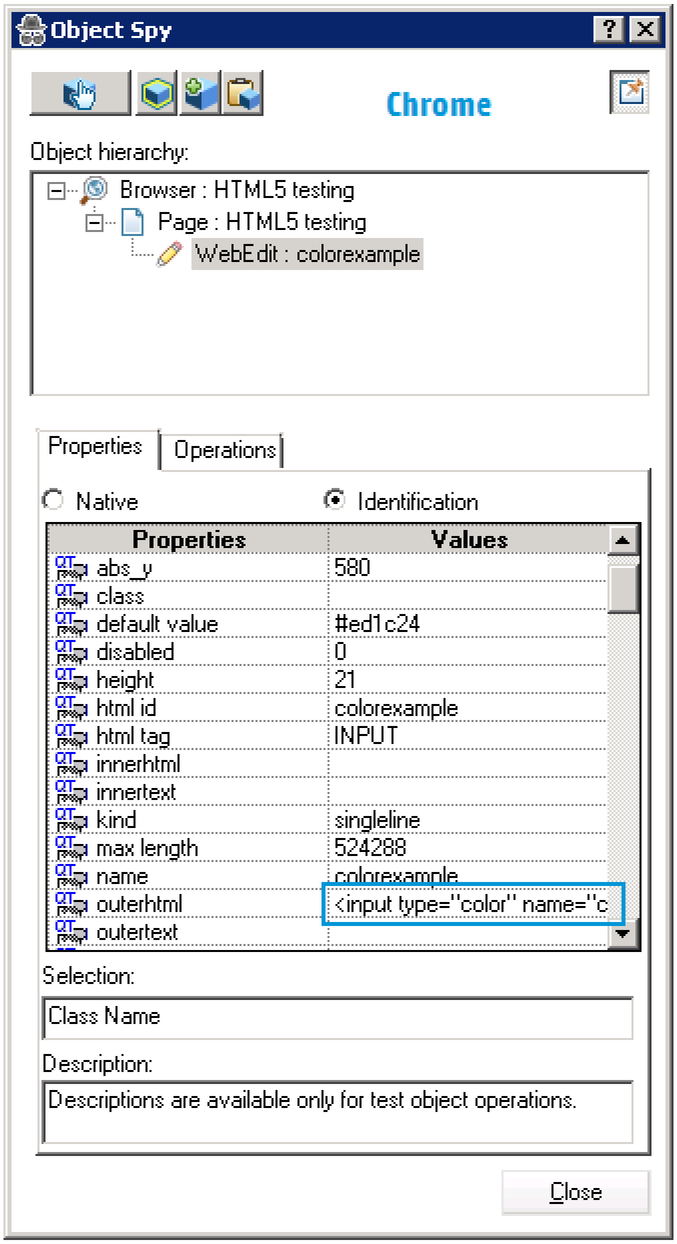
Properties	Values
abs_y	617
class	
default value	#ed1c24
disabled	0
height	23
html id	colorexample
html tag	INPUT
innerhtml	
innertext	
kind	singleline
max length	2147483647
name	colorexample
outerhtml	<INPUT id=colorexample typ
outertext	

Selection:

Class Name

Description:

Descriptions are available only for test object operations.



Object hierarchy:

Browser : HTML5 testing
Page : HTML5 testing
WebEdit : colorexample

○ Native ● Identification

Properties	Values
abs_y	580
class	
default value	#ed1c24
disabled	0
height	21
html id	colorexample
html tag	INPUT
innerhtml	
innertext	
kind	singleline
max length	524288
name	colorexample
outerhtml	<input type="color" name="c
outertext	

Selection:

Class Name

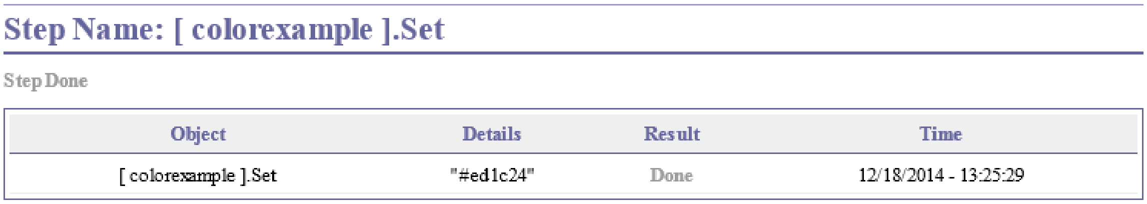
Description:

Descriptions are available only for test object operations.

In this case, the property difference is causing UFT to not identify the object in Chrome. As a result, you can modify the step using descriptive programming:

```
Browser("Objects Demo").Page("HTML5 testing").WebEdit("name:=colorexample",
"htmltag:=INPUT").Set "#ed1c24"
```

Using this statement, when the test runs, the step runs without a problem:



Step Name: [colorexample].Set

Step Done

Object	Details	Result	Time
[colorexample].Set	"#ed1c24"	Done	12/18/2014 - 13:25:29

Thus, by changing the test step to use descriptive programming, UFT is able to identify the object and run the test step across all browsers.

Working With Mozilla Firefox

UFT tests and business components are generally cross-browser—you can record Web steps on Microsoft Internet Explorer or Mozilla Firefox, or you can create steps with the keyword-driven methodology using any supported browser. You can run Web steps in any supported browser.

For general considerations on working with Web browsers, see "Considerations - Web-Based Application Support" on page 26.

The following sections describe specific items to consider when working with Mozilla Firefox:

- "Running Steps on Mozilla Firefox Browser Controls" below
- "Running Steps on Mozilla Firefox Dialog Boxes" on the next page
- "Checkpoints and Output Values" on the next page

Running Steps on Mozilla Firefox Browser Controls

Generally, steps that were recorded on Microsoft Internet Explorer will run on Mozilla Firefox without requiring any modification. However, there are several differences to consider:

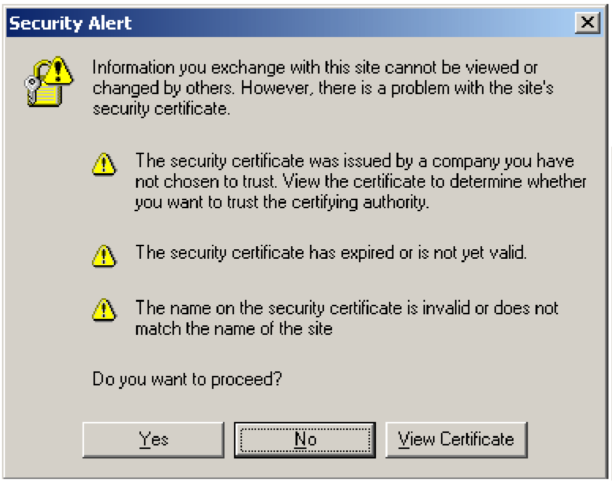
- UFT does not support Mozilla Firefox menus or sidebars.
- UFT supports specific Browser menu operations that are represented by the following toolbar buttons:
  - **Back**
  - **Forward**
  - **Home**
  - **Refresh**
  - **Stop**

All other toolbars and toolbar buttons are not supported. If you record steps on any unsupported menu or toolbar objects when working with Microsoft Internet Explorer, you may need to remove or replace the steps before running the test or business component on Mozilla Firefox.

Running Steps on Mozilla Firefox Dialog Boxes

- Due to the difference in standard dialog boxes, pop-up recovery scenarios that use the **Click button with label** recovery operation and were built for Microsoft Internet Explorer will not work for Mozilla Firefox, and vice versa.
- Mozilla Firefox uses different standard dialog boxes than the Windows standard dialog boxes used by Microsoft Internet Explorer. If you create steps on such dialog boxes, you should create additional steps to be used when running on Mozilla Firefox, and precede them with an `If` statement to check which browser is running.

  For example, the following two dialog boxes are a security alert of the same Web site. The one on the left is from Microsoft Internet Explorer, and the one on the right is from Mozilla Firefox. Although they both look like a Windows dialog box, the Mozilla Firefox one is actually a browser window.



Security Alert

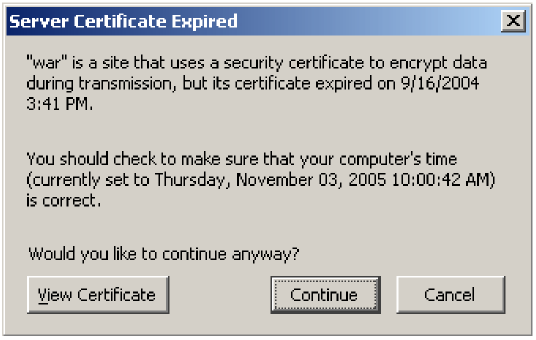
Information you exchange with this site cannot be viewed or changed by others. However, there is a problem with the site's security certificate.

The security certificate was issued by a company you have not chosen to trust. View the certificate to determine whether you want to trust the certifying authority.

The security certificate has expired or is not yet valid.

The name on the security certificate is invalid or does not match the name of the site

Do you want to proceed?



Server Certificate Expired

"war" is a site that uses a security certificate to encrypt data during transmission, but its certificate expired on 9/16/2004 3:41 PM.

You should check to make sure that your computer's time (currently set to Thursday, November 03, 2005 10:00:42 AM) is correct.

Would you like to continue anyway?

Checkpoints and Output Values

Cross-browser UFT operations may affect the results of some types of checkpoints and output values:

- Standard or page checkpoints for links and images that are created on Internet Explorer using Record, or using the Active Screen, may not pass when run using Mozilla-based browsers, even if the checkpoints pass when the test is run using Internet Explorer.
- Standard checkpoints for links and images created on Active Screen captures that were captured from a Mozilla-based browser may not pass when run using Internet Explorer, even if the checkpoints pass when the test is run using the Mozilla-based browser.

  You can use regular expressions if you want to create checkpoints for links and images that run on both Internet Explorer and Mozilla-based browsers. For details on regular expressions, see the section on understanding and using regular expressions in the *HP Unified Functional Testing User Guide*.

- Standard checkpoints that use the `inner_html` property may not pass when run using Mozilla-based browsers because blanks, slashes, backslashes, or other special characters are handled differently in different browser types.
- Before running text/text area checkpoint or output value steps, you must set the text recognition options to use only OCR, by selecting the **Use Only OCR** option in the **Text Recognition** pane of the Options dialog box (**Tools > Options > GUI Testing** tab **> Text Recognition** node).

Working With Apple Safari on a Remote Mac Computer

You can use UFT to test Web applications on an Apple Safari browser that is running on a remote Mac computer. UFT uses the WebSockets protocol to connect to the Mac computer that you specify. Note that only Web test object steps can run on Safari. All other steps, including Utility object steps, such as **SystemUtil.Run**, run locally on the UFT computer.

To test Web applications on the Safari browser, you must install the UFT Connection Agent and the Unified Functional Testing Agent Safari browser extension on your Mac computer. For details on how to do this, see "The UFT Connection Agent for Mac Computers" on page 338.

Recording steps and learning objects (in the Object Repository Window or Manager) are not supported on the Safari browser. However, you can use the Remote Object Spy on a Safari browser to view the properties and operations of Web controls, and optionally, add the corresponding test objects to your object repository.

Creating and Editing Tests and Components that Run on Safari

It may be more convenient to create and edit your object repositories, tests and components working with a supported browser installed locally on the UFT computer,and then connect to a remote Mac computer, fine-tune your tests, and run them on Safari.

> **Tip:** Use Google Chrome to create, edit, and debug your tests and components, as Chrome and Safari render Web pages similarly.

Once your basic test is designed, you can connect UFT to a remote Mac computer running Safari, and fine-tune or debug your test based on the object properties available on Safari:

- Use the Remote Object Spy to see how UFT recognizes the objects in your application.
- View object properties using statement completion for the **Object** method.

  > **Note:** Statement completion for the Object method is only available if the connection to the remote Mac is fast enough.

- Create standard checkpoints and output value steps on objects displayed in the Safari browser

  Use the **Design > Checkpoint** and **Design > Output Value > Standard Output Value** commands.

Multiple UFT-Mac Connections

- Multiple users from different UFT instances can connect to the same Mac simultaneously using different ports.

  Each user must install the UFT Connection Agent and UFT Safari extension in their Mac user account, and configure the relevant port number in UFT, in the connection agent on the Mac.
- The Mac connection information is in the Record and Run settings, which are defined per test, therefore you can connect to different Macs or different ports when running different tests.

  However, UFT can connect to only one Mac at any time.

How UFT Handles Connection Attempts When a Previous Connection Exists

UFT attempts to set up a remote connection using the RemoteConnection.Connect method, but...	**Result**
... it is already connected to the **same Mac and port with the same security level**.	The existing connection is used and a statement about this is added to the test results.
... it is already connected using a **different Mac, port, or security level**.	A run error occurs on the **Connect** step

UFT attempts to set up a remote connection using the Record and Run settings, but...	**Result**
... it is already connected **with the same security level or higher** (to the same Mac and port, or different ones). **Note:** This means UFT initiates a connection without SSL, or it is initiating an SSL connection and the existing connection is also using SSL.	The existing connection is used and a warning is added to the test results. **Note:** This may lead to a situation where steps that were to be carried out on the new connection on a different Mac or port, are carried out on the existing one.
... it is already connected **with a lower security level** (to the same Mac and port, or different ones). **Note:** This means UFT initiates an SSL connection but the existing connection is not using SSL.	The existing connection is closed and a new connection is initiated. (The new connection can succeed only if the UFT Connection Agent on the Mac is also set up to require an SSL connection.) Notifications about the connection changes are added to the test results. **Note:** This behavior prevents communication intended for a secure connection from being carried out on a non-secured connection.

For details about how to connect UFT to the remote Mac computer, see "How to Connect to a Remote Mac Computer" on page 347.

For additional details about working with UFT and the Safari browser, see "Known Issues - Google Chrome and Apple Safari" on page 360.

For general considerations on working with Web browsers, see "Considerations - Web-Based Application Support" on page 26.

The UFT Connection Agent for Mac Computers

This section includes:

- "What is the UFT Connection Agent?" below
- "What happens when UFT activates the Remote Object Spy?" below
- "What Do I Need to Do to Upgrade from UFT 12.00" below
- "What Do I Need to Configure on the Mac so UFT Can Test Web Applications?" on the next page
- "How Do I Secure the Communication Between UFT and the Mac Computer" on the next page

What is the UFT Connection Agent?

The UFT Connection Agent is a service installed on your Apple Mac computer, which enables UFT to communicate with the Safari browser using the WebSockets protocol. This enables UFT to run tests on Web applications running in Safari on the Mac and to spy on objects in these applications.

When you install the UFT Connection Agent, the agent service is installed on your Mac, and the Unified Functional Testing Agent extension is installed on the Apple Safari browser.

The UFT Connection Agent runs automatically after installation and after each restart of the Mac and communicates with UFT on the one hand and the Unified Functional Testing Agent Safari extension on the other.

What happens when UFT activates the Remote Object Spy?

When UFT initiates a Spy session (using the Remote Object Spy), the mouse on the Mac computer can be used only for spying on Web objects in Safari.

The Unified Functional Testing Agent extension icon in the Safari toolbar changes to a UFT Spy button , which you can use to suspend and then resume the Spy session.

For more details on using UFT to spy on Web objects in Safari, see the section on the Remote Object Spy in the *HP Unified Functional Testing User Guide*.

What Do I Need to Do to Upgrade from UFT 12.00

If you previously used UFT 12.00 to test Web applications on Safari, then after you upgrade UFT you must reinstall the UFT Connection Agent on the Mac from the current UFT version.

The UFT Connection Agent preferences and the Unified Functional Testing Agent Safari extension preferences are reset to their defaults.

If you want to use non-default preferences, for example, if you configured UFT to use a port other than the default 8822 for remote connections, then you must reconfigure these preferences on the Mac computer.

This is required because of significant changes in the UFT Connection Agent's preferences. For example, the UFT Connection Agent now uses different ports to communicate with UFT and the Safari extension. In UFT 12.00, the same port was used for both communications.

What Do I Need to Configure on the Mac so UFT Can Test Web Applications?

By default, you do not need to modify the preferences set for the UFT Connection Agent and the Unified Functional Testing Agent extension.

- UFT and the connection agent communicate using port **8822**
- The connection agent and the UFT Safari extension communicate using port **8823**.

However, in some situations, you might want to specify different ports. For example:

- If another application on the Mac uses these ports.
- If multiple UFT users need to connect to the same Mac computer. Each UFT user can use a connection agent installed under a different Mac user account, with a different port number configured.

Caution: If you modify the port numbers, make sure that:

- The **UFT port** defined in the UFT Connection Agent preferences matches the one defined in UFT.

  For details on setting this in UFT, see "How to Connect to a Remote Mac Computer" on page 347.
- The **Safari port** defined in the UFT Connection Agent preferences matches the one defined in the Unified Functional Testing Agent extension in Safari.

In addition to the port numbers, you can configure the level of log messages to collect. By default, log messages are collected from the connection agent, but not the Safari extension.

How Do I Secure the Communication Between UFT and the Mac Computer

When UFT communicates with the Mac, UFT acts as a client and the UFT Connection Agent acts as a server.

You can secure this communication on different levels:

1. You can set up client authentication by defining a passphrase for UFT to use when contacting the Mac.
2. You can secure the communication between UFT and the UFT Connection Agent by requiring that they use an SSL connection.

For more details, see "Securing the Communication With the Remote Mac Computer" on the next page

For task details on configuring the UFT Connection Agent preferences, the Unified Functional Testing Agent Safari extension preferences, and the security settings, see "Configure the UFT Connection Agent Preferences (Optional)" on page 350.

Securing the Communication With the Remote Mac Computer

When UFT connects to a remote Mac computer, it can access the Safari application and perform steps on Web applications running in Safari. Therefore, it is important to secure this connection, to prevent inappropriate access to your Mac and Web pages that the Mac can access.

When UFT communicates with the Mac, UFT acts as a client and the UFT Connection Agent acts as a server.

You can secure this communication on different levels. You can:

Set up client authentication by defining a passphrase for UFT to use when connecting to the Mac.

Define the same passphrase in UFT's **Remote Connection** pane in the Options dialog box (**Tools > Options > GUI Testing > Remote Connection**) and in the UFT Connection Agent's preferences.

By default, the passphrase is empty. To provide better security, provide a passphrase that is long, complicated, and difficult to guess.

UFT uses this passphrase whenever it initiates a connection with any Mac computer.

The UFT Connection Agent accepts a connection request only if the passphrase included in the request matches the passphrase defined in the agent's preferences.

You can define the same passphrase on multiple UFT instances (on different computers, or in different user accounts on the same computer), and multiple instances of the UFT Connection Agent, (on different Mac computers or in different Mac user accounts). This way, you can set up a group of computers that all share the same passphrase and are used for similar testing purposes (like a virtual lab).

Secure the communication between UFT (the client) and the UFT Connection Agent (the server) by requiring that they use an SSL connection.

In the UFT Connection Agent preferences, set the following:

- Specify whether communications with this agent must take place over SSL connections (**use SSL**)
- If they must, then:
  - Specify the path to an **SSL certificate file** for the server to use for the communication. (Chain certificate files are also supported)
  - Specify the path to the **SSL private key** that matches the certificate.

In UFT:

- In the **Remote Connection** pane in the Options dialog box (**Tools > Options > GUI Testing > Remote Connection**), specify the path to an **SSL CA certificate file** that UFT can use to validate the SSL certificate provided by the server. (Certificate bundles are also supported.)

- When defining the details for a specific remote connection, you specify whether the connection should **use SSL**. This can be done in the Remote Connection dialog box, in the Record and Run settings (on a per-test basis), or using the RemoteConnection utility method in a test step. For details, see "How to Connect to a Remote Mac Computer" on page 347.
- For a connection to succeed, the **use SSL** option must have the same value in UFT and the UFT Connection Agent.

  At different times, UFT can connect to different UFT Connection Agents, by using different Mac or port numbers. You can instruct UFT to initiate non-SSL connections with agents that you know do not require SSL, and SSL connections with agents that you know require it. UFT uses the CA certificate file for certificate validation only on connections initiated using SSL.

How to Set Up Multiple Browser Testing

This task describes some of the techniques you can use to enable effective cross-browser testing for your application or Web page.

Tip: For a use-case scenario related to this task, see "Using Descriptive Programming for Multiple Browser Testing - Use-case Scenario" on page 326.

This task includes the following steps:

- "Prerequisite- turn off auto updates for the browsers" below
- "Configure the Record and Run settings to launch a browser" below
- "Set the value of the BROWSER_ENV environment variable to launch a specific browser" on the next page
- "Configure UFT to automatically launch a browser with a parameter using the Record and Run Settings" on page 343
- "Configure UFT to automatically launch a browser using a data parameter" on page 343
- "Dynamically load an object repository during the test run" on page 344
- "Add steps for browser specific behavior" on page 345

Prerequisite- turn off auto updates for the browsers

To ensure that you are testing on the specific browser version you want, turn off the automatic update feature for your browser.

Configure the Record and Run settings to launch a browser

Using the Record and Run settings, you can change the browser on which you run the test for each test run.

1. Select **Record > Record and Run Settings**.
2. In the Record and Run Settings dialog box, select the **Web** tab.

3. In the Web tab, select the **Open the following address when a record or run session begins:** option.
4. In the web address drop-down list, enter a Web address to open or select a Web address from the drop-down list.
5. In the **Open the following browser when a record or run session beings:** drop-down list, select the browser on which you want to run your test.

   > **Note:** If you choose Apple Safari, you must provide additional connection information. For details, see "How to Connect to a Remote Mac Computer" on page 347

   When you start the test run, the specified browser opens the Web address entered.

Set the value of the BROWSER_ENV environment variable to launch a specific browser

Using the **BROWSER_ENV** environment value, you can change the browser to launch each test run, and in some cases specify a specific browser version (if installed).

1. Select **File > Settings**.
2. In the Settings dialog box, select the **Environment** node.
3. In the Environment node, from the **Variable type** drop-down list, select **User-defined**.
4. In the user-defined variables list, click the **Add** button ✚.
5. In the Add New Environment Parameter dialog box, in the **Name** field, enter `BROWSER_ENV` (case-sensitive).
6. In the **Value** field, enter the value (case-sensitive) for the browser to open:

IE	Opens the installed version of Internet Explorer.
IE64	Opens the installed 64-bit version of Internet Explorer.
CHROME	Opens the installed version of Google Chrome.
FIREFOX	Opens the latest installed and supported version of Firefox.
FIREFOX64	Opens the latest version of 64-bit Mozilla Firefox that is both installed on the computer and supported by UFT.
FF<version#>	Opens a specified version of Firefox.
SAFARI	Opens Safari on the remote Mac computer connected to UFT.
EDGE	Opens the installed version of Microsoft Edge with the Edge Agent for Functional Testing already enabled.

7. Click **OK** to save the Name and Value of the variable.
8. In the Test Settings dialog box, click **Apply** and **OK** to save the variable and close the dialog box.

Configure UFT to automatically launch a browser with a parameter using the Record and Run Settings

You can instruct UFT to automatically launch a specific browser for a test run using the Record and Run Settings:

1. Select **Record > Record and Run Settings**.
2. In the Record and Run Settings dialog box, select the **Web** tab.
3. In the Web tab, select the **Open the following when a record and run session begins:** option.
4. (Optional) In the **Address** field, enter the address to which to open the browser.

   You can leave the **Browser** drop-down list as the default value.
5. In the **Parameter type** drop-down list, select the parameter type: **Global Data Table** or **Test Parameter**.
6. In the **Parameter Name** field, enter the parameter name. (The default parameter name is `Browser`.)
7. Click **Apply** to save the changes and **OK** to close the dialog box.

   UFT automatically adds a column to the Global tab in the Data pane or a test parameter.
8. Before running the test, do one of the following, depending on the parameter type selected:

For a Global Data Table parameter	In the **Global** tab of the Data pane, set the value of the parameter.	**Value to use:** - **IE.** Opens Internet Explorer. - **IE64.** Opens a 64-bit version of Internet Explorer. - **CHROME.** Opens Google Chrome. - **FIREFOX.** Opens the latest version of Mozilla Firefox that is both installed on the computer and supported by UFT. - **FIREFOX64.** Opens the latest version of 64-bit Mozilla Firefox that is both installed on the computer and supported by UFT. - **FF<VersionNumber>.** Opens the specified version of Mozilla Firefox. For example: `FF36` (version 3.6), `FF40` (version 4.0), `FF140` (version 14.0). - **SAFARI.** Opens Safari on the remote Mac computer connected to UFT (defined in the Web tab of the Record and Run Settings dialog box or in the `REMOTE_HOST` environment variable).
For a Test Parameter	a. In the toolbar, click the **Run** button ▷. b. In the Run dialog box, select the **Input Parameters** tab. c. In the **Value** column for the parameter, enter the value of the parameter	

Configure UFT to automatically launch a browser using a data parameter

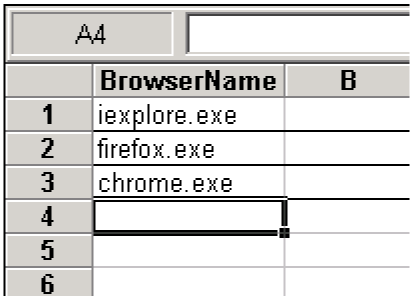
1. (Optional) Create a reusable action to use in all your tests for launching the browsers.

2. In the Data pane, open the **Global** tab.
3. In the Global tab, double-click the header of the first column in the table or the first column of the column where you want to store the parameter.
4. In the Change Parameter Name dialog box, enter the name for the parameter and click **OK**.

   For example, you could name this parameter **BrowserName** (to identify it as the name of the browser to open).

   The column name of the selected column is renamed to reflect the renamed parameter.
5. In the data table, enter the .exe names for the browsers you want to open.

   For example, if you need to run the test on Internet Explorer, Firefox, and Chrome, you would enter `iexplore.exe`, `firefox.exe`, and `chrome.exe` in the first three rows of the column, respectively:

   A4

	BrowserName	B
1	iexplore.exe	
2	firefox.exe	
3	chrome.exe	
4		
5		
6		

6. Add a test step with the following format:

   ```
   SystemUtil.Run DataTable("<parameter name>", dtGlobalSheet), <address to
   open the browser to>
   ```

   For example, if you wanted to open up to the Mercury Tours site, you could enter the following:

   ```
   SystemUtil.Run DataTable("BrowserName", dtGlobalSheet),
   http://newtours.demoaut.com
   ```

Note: If you add this step to a reusable action which is then called by other tests, the relevant rows must be added in the Global tab of all tests that call that action.

Dynamically load an object repository during the test run

If your test requires you to have different object repositories for each browser type, you can load the relevant object repositories as part of the test run without having to manually configure anything before the test run:

1. In the Data pane, open the **Global** tab.
2. In the Global tab, double-click the header of the first column in the table or the first column of the column where you want to store the parameter.
3. In the Change Parameter Name dialog box, enter the name for the parameter and click **OK**.

For example, you could name this parameter **Browser** (to identify it as the name of the browser on which to run the test).

The column name of the selected column is renamed to reflect the renamed parameter.

4. In the data table, enter the names for the browsers on which you want to run the test.
5. Add a test step with the following format:

```
If DataTable("<data table parameter>") = <Browser 1> Then
       RepositoriesCollection.Add "<location to object repository>"
ElseIf DataTable("<data table parameter>") = <Browser 2> Then
       RepositoriesCollection.Add "<location to object repository>"
End If
```

Example

```
If DataTable("Browser") = "Internet Explorer" Then
       RepositoriesCollection.Add "C:\IE.tsr"
ElseIf DataTable("Browser") = "Chrome" Then
       RepositoriesCollection.Add "C:\Chrome.tsr"
End If
```

6. Add the additional steps for the application/Web page.

   When the test runs, the appropriate object repository loads, and the test steps use the objects in the loaded object repository.

Add steps for browser specific behavior

If you need to add steps to perform browser specific behavior in the course of the test, you can use test parameters to create steps for this behavior.

1. In the canvas, select an action.
2. In the Properties pane, select the **Parameters** tab.
3. In the Parameters tab, click the **Add** button.
4. In the Add Parameter dialog box, provide a name for the parameter. For example, you could name the parameter **ActiveBrowser** to show that the value of the parameter represents the browser currently in use.
5. Add steps to the test. You can use the value of the parameter by using the Parameter object:

```
Select Case Parameter("<parameter name>")
       Case "<Browser 1>"
       'Do something specific for browser 1
       Case "<Browser 2>"
       'Do something specific for browser 2
```

```
End Select
```

Note: You can add additional Case statement as needed for each browser type.

When the test runs, the test steps run as specified in the necessary **Case** statement.

How to Enable the HP Functional Testing Agent Chrome Extension

Note: For the most up-to-date list of supported versions of Google Chrome, see the *HP Unified Functional Testing Product Availability Matrix*.

UFT communicates with the Functional Testing Agent Chrome Extension to test Web applications running in Google Chrome.

IMPORTANT: If you have a version of the Functional Testing Agent for Google Chrome from version 12.00 or earlier installed, you must manually remove this extension before enabling the new version.

- **If you are connected to the internet and Chrome updates automatically**, Google Chrome automatically downloads and installs the Agent the first time you open your Chrome browser.

  If you do not have an internet connection at that moment, Chrome will try to download and install the UFT Agent each time you open Chrome.

  After downloading the Agent, Chrome prompts you to activate the Agent.
- **If you do not have an internet connection, or if Chrome does not update automatically**, enable the extension manually as follows:

Chrome version 31 or later	• If you are connected to the internet, install and enable the Extension from the Web Store: https://chrome.google.com/webstore/detail/kgpdpdnaoephdehalonapacdgjhamnbc • If you are not connected to the internet, see "For Google Chrome versions 31 and later" below.
Chrome version 30 or earlier	See "For Google Chrome versions 30 and earlier" on the next page.

For Google Chrome versions 31 and later

1. Select **Tools > Extensions** in Google Chrome.

   Note: You can also access this page by opening the **chrome://extensions** page in the Google Chrome browser.

The Extensions page opens.

2. In the Extensions page, select the **Developer mode** option. Additional options are displayed after you select this option.
3. Click on the **Load unpacked extension** button.
4. In the Browse for Folder dialog, navigate to the **<UFT installation folder>\Installations\Chrome** folder and select the **AgentLegacy.crx** file.
5. In the Confirm New Extension dialog, click **Add** when prompted,

   The Functional Testing Agent is now displayed in the Chrome extensions list.

For Google Chrome versions 30 and earlier

1. If you have a previous version of the UFT Agent for Google Chrome installed, manually remove this extension.
2. Open the Chrome folder included with the UFT installation, found at **<UFT installation folder>\Installations\Chrome**.
3. Select **Tools > Extensions** in Google Chrome.

   > **Note:** You can also access this page by opening the **chrome://extensions** page in Google Chrome. The Extensions page opens.

4. From the **<UFT installation folder>\Installations\Chrome** folder, drag the **AgentLegacy.crx** file to the **chrome://extension** page.
5. In the Confirm New Extension dialog, click Add to install the extension.

   The Functional Testing Agent for Google Chrome is now displayed in the Chrome extensions list.

How to Enable UFT to Test Local HTML Pages in Google Chrome

By default, the ability to run extensions on local HTML files is disabled in Google Chrome. Do the following to allow the UFT Google Chrome extension to run on local HTML files:

1. In Google Chrome, browse to the following URL: `chrome://extensions`
2. Locate the UFT extension, named Unified Functional Testing Agent.
3. Click the arrow ▸ located to the left of the icon to expand details about the extension.

   Select **Allow access to file URLs**. Your selection is automatically saved.

How to Connect to a Remote Mac Computer

This task describes how to control the UFT connection to a remote Mac computer, to enable testing Web applications on the Safari browser.

For details on how to work with a connected remote computer and how UFT handles connection attempts when a previous connection exists, see "Working With Apple Safari on a Remote Mac Computer" on page 336.

This task includes the following steps:

- "Prerequisite" below
- "Use the Remote Connection dialog box to control the connection to the Mac while designing your test" below
- "In the Record and Run Settings dialog box, specify the remote Mac computer to use when running the test or component" on the next page
- "Alternatively, you can add steps to your test or component to control the remote connection to the Mac during the run session" on the next page
- "Configuring the Port Number to Use for the UFT-Mac Connection" on the next page

Prerequisite

To test Web applications on the Safari browser, you must install the UFT Connection Agent and the Unified Functional Testing Agent Safari browser extension on your Mac computer. For details on how to do this, see "The UFT Connection Agent for Mac Computers" on page 338.

Use the Remote Connection dialog box to control the connection to the Mac while designing your test

- Click the Remote Connection button in UFT's toolbar.

  In the dialog that opens, enter the host name or IP Address to use for the Mac.

  Optionally, append a port number to the host name. For details, see "Configuring the Port Number to Use for the UFT-Mac Connection" on the next page.

- If the UFT Connection Agent on the Mac is configured to expect an SSL connection,you must select the **Use SSL** option.

  To use an SSL connection to secure the communication between UFT and the Mac, make sure that the relevant certificates and key are defined in the Options dialog box in UFT (**Tools > Options >GUI Testing > Remote Connection**) and in the UFT Connection Agent preferences on the Mac. For details, see the "Securing the Communication With the Remote Mac Computer" on page 340.

- Use the **Connect/Disconnect** button on this dialog to control the connection status while you edit the test.
- This dialog also displays the current status of the connection.
- Before you run the test, make sure that you use one of the methods below to set up the UFT-Mac connection for the run session.

In the Record and Run Settings dialog box, specify the remote Mac computer to use when running the test or component

Do one of the following:

- Select **Record > Record and Run Settings** to open the Record and Run Settings dialog box.
  a. In the Web tab, select **Open the following browser when a record or run session begins**.
  b. Select **Apple Safari (on remote Mac computer)** from the list of browsers.
  c. Set the host (and port) information.
  d. Select whether to initiate an SSL connection.
  e. Select whether to disconnect from the Mac at the end of the run session, and whether to close the browser.
- Set the environment variables **REMOTE_HOST**, **BROWSER_ENV**, **URL_ENV**, and **USE_SSL** (the last two being optional).

  In these environment variables, you specify the Mac connection details, the `SAFARI` browser, and, optionally, the URL to open in the browser.

  If you need an SSL-secured connection, set the **USE_SSL** variable to `TRUE`. For details, see "Environment Variables for a Web-Based Environment" on page 46.

UFT sets up the connection with the specified Mac and runs the Safari browser at the beginning of the run session, whether the test runs it from UFT’s UI, or from an ALM test set.

Alternatively, you can add steps to your test or component to control the remote connection to the Mac during the run session

Use the **RemoteConnection** utility object and its methods: **Connect (***hostname*, [*useSSL*]**)**, **Disconnect**, **IsConnected** to set up and disconnect the connection with the Mac.

Use `RemoteConnection.Run (Safari, <URL>)`, to run the Safari browser on the remote Mac after you establish the connection.

For details, see the **Utility Objects** section of the *HP UFT Object Model Reference for GUI Testing*.

Configuring the Port Number to Use for the UFT-Mac Connection

By default, UFT connects to the Mac using port **8822**. However, in some situations, you might want to use a different port. For example:

- If another application on the Mac uses this port.
- If multiple UFT users need to connect to the same Mac computer. Each UFT user can use a connection agent installed under a different Mac user account, with a different port number configured.

To use a different port, append the port number to the host name: *<hostname>***:***<port number>*.

Make sure to configure the same port number on the Mac, in the **UFT port** option in the UFT Connection Agent preferences.

How to Install and Configure UFT Connection Agent on Your Mac

The UFT Connection Agent is a service installed on your Apple Mac computer, which enables UFT to communicate with the Safari browser using the WebSockets protocol. This enables UFT to run tests on Web applications running in Safari on the Mac and to spy on objects in these applications. For details, see "The UFT Connection Agent for Mac Computers" on page 338.

This task describes installing and configuring the UFT Connection Agent, and includes the following steps:

- "Install or Uninstall the UFT Connection Agent" below
- "Configure the UFT Connection Agent Preferences (Optional)" below
- "Configure the Unified Functional Testing Agent Extension in Safari (Optional)" on page 352
- "Troubleshooting the UFT Connection Agent" on page 353

Install or Uninstall the UFT Connection Agent

- You must have administrator permissions to install the UFT Connection Agent.
- All Mac users that use the UFT Connection Agent must have the agent installed in their Mac user account.

1. Copy the installer image file (**UFTConnectionAgent.dmg**) from the **<UFT installation folder>/Installations/Safari** folder to the Mac.
2. Open the **UFTConnectionAgent.dmg** image file.
3. Double-click (**HP UFT Connection Agent.pkg**) to start the installation wizard, or **Uninstall** to remove the agent from your Mac.

   This installs or removes both the UFT Connection Agent and the Unified Functional Testing Agent Safari extension.

   Note: If Safari or the System Preferences pane are open when you uninstall the agent, reopen them for the uninstallation to take effect.

Configure the UFT Connection Agent Preferences (Optional)

1. To check or modify the status of the UFT Connection Agent, or to update its preferences, open **System Preferences** and double-click **HP UFT Connection Agent**.

2. You can modify any of the following preferences (separately for each Mac user):

   - **Connection Port Numbers**
     - **Safari port.** The port on which the UFT Connection Agent communicates with the Unified Functional Testing Agent Safari extension. (**Default:** 8823)

       This number must match the **Remote Agent Port** number defined in the Unified Functional Testing Agent extension in Safari.
     - **UFT port.** The port on which UFT communicates with the UFT Connection Agent. (**Default:** 8822)

       This number must match the number defined in UFT for initiating the remote connection to the Mac.
   - **Security Configuration**
     - **Passphrase.** The passphrase that UFT must use for authentication when initiating a remote connection to the Mac computer.

       This string must match the passphrase defined in UFT's **Remote Connection** pane in the Options dialog box (**Tools > Options > GUI Testing > Remote Connection**).

       The passphrase can be empty, but a long and complicated passphrase that is difficult to guess provides better security.
     - **Use SSL.** Indicates that UFT must use SSL when initiating the connection to the Mac computer.

       If you select this option, then:

       - The **Use SSL** option, available in UFT when initiating a remote connection, must also be selected.
       - You must specify the paths to the **SSL certificate file** to use for the communication and its **SSL private key**.

         These files must be accessible to the UFT Connection Agent when it sets up the connection. (Chain certificate files are also supported)
       - In UFT (**Tools > Options > GUI Testing > Remote Connection**), specify the **CA certificate** that UFT can use to validate the **SSL certificate file** when received from the UFT Connection Agent.

     For more details, see "Securing the Communication With the Remote Mac Computer" on page 340.
   - **Log Messages Configuration**
     - **Log folder.** The folder in which to save activity log messages.

       Make sure you have write permissions for this folder.
     - **Agent log level.** The level of information to save in the agent log (Fatal, Error, Warning, Debug).

       The log is saved in the **UFTAgent.log** file in the specified folder.

   - **UFT Safari extension logs.** Specifies whether to maintain a log of the Unified Functional Testing Agent Safari extension activity in addition to the UFT Connection Agent log. (**Default:** OFF).
     There is no need to turn these logs on, unless HP Support personnel request it.

     This log is saved in the **SafariLog.log** file in the same folder.

     > **Note:** To activate the Unified Functional Testing Agent Safari extension log, you must also select **Enable Remote Logging** in the extension's preferences in Safari.

3. Make sure the Safari browser is closed and then click **Apply & Save** to save your changes and restart the agent with the new preferences.
   - The agent's status is displayed in the HP UFT Connection Agent preference pane.

     Check the status to make sure the agent runs successfully with the new preferences. If it does not, check the `UFTAgent.log` file for problem details.

   - If you set the **UFT Safari extension logs** option to `ON` and the remote logger service that logs the Safari extension activity fails to run, this option is automatically set back to `OFF`. Check the **SafariLog.log** file for problem details.

Configure the Unified Functional Testing Agent Extension in Safari (Optional)

1. Open the Unified Functional Testing Agent extension in Safari.
   a. Select **Safari > Preferences**
   b. In the Preferences dialog box, select the **Extensions** tab.
   c. In the Extensions list in the left pane of the dialog box, select the Unified Functional Testing Agent extension.
2. In the right pane, you can modify any of the following preferences:
   - **Remote Agent Port:** The port number on which the UFT Connection Agent communicates with the Safari browser. (**Default:** 8823)

     > **Caution:** This number must match the **Safari port** number defined in the UFT Connection Agent preferences.

   - **Show Object Spy popover when Spy starts:** If you turned off the notification displayed on Safari when UFT initiates a Spy session, you can turn it back on using this option.

   - Options related to maintaining a log of the Unified Functional Testing Agent Safari extension activity.There is no need to modify these options, unless HP Support personnel request it.
     - **Default Logging Level.** The level of information to save in the Unified Functional Testing Agent Safari extension log file. (All, Trace, Debug, Info, Warn, Error, Fatal, Off)
     - **Enable Remote Logging.** Specifies whether to maintain a log of the Unified Functional Testing Agent Safari extension activity in addition to the UFT Connection Agent log. (By

default, this option is cleared.)

This log is saved in the `SafariLog.log` file in the same folder as the UFT Connection Agent logs.

> **Note:** To activate the Unified Functional Testing Agent Safari extension log, you must also select **UFT Safari Extension logs** in the UFT Connection Agent preferences.

- Leave the **Logging Exceptions** box empty. This is intended for use by HP Support only.

Troubleshooting the UFT Connection Agent

- If the agent remains in **not running** status after you update its preferences, check the **UFTAgent.log** file for problem details.

  For example, the ports you specified might be busy. They may be used by another application, or they may be in use by a UFT Connection Agent installed on the Mac under another user's account.

  Alternatively, you might have entered a port number that is restricted by Apple. Consult the Apple support site regarding restricted or blocked ports.

- If UFT fails to connect to the Mac, make sure that the security settings defined in UFT match those defined in the UFT Connection Agent. For more details, see "Securing the Communication With the Remote Mac Computer" on page 340.

- If UFT fails to run tests on Safari or to recognize that it is installed on the Mac:

  - Make sure that **Safari port** number defined in the UFT Connection Agent preferences, matches the **Remote Agent Port** number defined in the Unified Functional Testing Agent extension.

    Make sure that the **UFT port** number defined in the UFT Connection Agent preferences, matches the number defined in UFT for initiating the remote connection to the Mac.

  - Make sure that you are not using a port number that is blocked by Safari. Consult the Apple support site regarding restricted or blocked ports.

- If you manually remove the Unified Functional Testing Agent extension from Safari, or the *HP* UFT Connection Agent preferences pane from the System Preferences, you can reinstall them by reinstalling the UFT Connection Agent on the Mac.

  Reinstalling the UFT Connection Agent resets its preferences to their defaults. Make sure to update the preferences, if necessary, so that the correct port numbers are defined in the agent preferences and in the Safari extension.

- If you turn on the UFT Safari extension logs, and when you save the preferences, the log option is set to `OFF`, check the **SafariLog.log** file for problem details.

  For example, the port used for these logs is the **Safari port + 1**. If this port is busy, the remote logger service fails.

Known Issues - Internet Explorer and Microsoft Edge

Internet Explorer

General

If Internet Explorer 9 displays the message: `Speeding up browsing by disabling add-ons`, choose **Don't disable** or select a bigger threshold value.

Test Objects, Methods, and Properties

- Recognition of test objects when using AutoXPath is very slow for web pages in Quirks Mode and Almost Standards Mode.

  Workaround: Convert the web page into Standards Mode by adding or changing the DOCTYPE of the page into `<!DOCTYPE.htlm>` or `<!DOCTYPE.HTML PUBLIC "-//W3C//DTD HTML 4.01//EN" "http://www.w3.org/TR/html4/strict.dtd"` or disabling AutoXPath capabilities in UFT by clearing the **Learn and run using automatic XPath identifiers** in the **Web > Advanced** pane (**Tools > Options > GUI Testing** tab **> Web > Advanced** node).

- When using the `RunScript` or RunScriptFromFile methods, Alert, Confirm, or Prompt dialogs are not displayed.

  Workaround: When writing a `RunScript` method, use the following method syntax:

  ```
  Set wnd=Browser("<browser name>").Page("<page name>").RunScript("window")
  wnd.alert()
  ```

  or

  ```
  Browser("<browser name>").Page("<page name>").RunScript "setTimeout(function ()
  {alert(); }, 0)"
  ```

- The `WebXML` test object is not supported on Internet Explorer 9 or later running in standard mode. Accordingly, features related to `WebXML` test objects, such as XML checkpoints and output value steps, are not supported on such browsers.
- In some cases, UFT does not support or recognize `about:blank` tabs in Internet Explorer 11.
- When using Internet Explorer 9, the **innertext**, **outertext**, **innerhtml** and **outerhtml** property values may differ from earlier versions of Internet Explorer. Therefore, using these values in parameters or running checkpoints that use these property values may cause the steps to fail.

Recording

- When recording a test on Internet Explorer 8 or earlier with the Active Screen enabled, performance on the site may become very slow. This is due to a performance issue in the JavaScript engine used in these browsers.

Workaround: Record the test using Internet Explorer 9, or disable the Active Screen. For details, see the *HP Unified Functional Testing User Guide*.

- If you are using Internet Explorer with:
  - UAC enabled
  - Protected mode enabled for either the Internet zone or the Intranet zone (**Internet Options > Security** tab)
  - Protected mode disabled for the other zone (the Internet or Intranet zone)

  UFT does not record steps when switching between an Internet site and an Intranet site.

  Workaround: Set the integrity level (Protected mode enabled or not enabled) to be the same for the Internet and Intranet zones.
- If you record a click on an area of an image map that is not mapped to a URL in Microsoft Internet Explorer, UFT will perform a click on the first mapped area of that map during the run session.
- UFT does not record on customized toolbar buttons in Microsoft Internet Explorer. (It records only on the toolbar buttons that are displayed by default in the browser.)
- UFT does not record on the Find window of the Microsoft Internet Explorer browser.
- UFT may respond slowly during a recording session if the drop-down boxes in a Web page contain a lot of data.

  Workaround: Learn the objects on a Web page that contains a lot of data (instead of recording).
- In Internet Explorer, the AutoComplete operation on edit fields is not recorded.

  Workaround: You can disable the AutoComplete feature in Microsoft Internet Explorer by selecting **Tools > Internet Options > Advanced** and deselecting the **Use inline AutoComplete** under the **Browsing** options in Microsoft Internet Explorer.
- When recording on an combo box object in which the role property is `"listbox"` (and is recorded as a **WebList** object), when you select a value from the object with the **.Select** method, UFT adds additional **WebEdit.Set** steps to the test.

  Workaround: Delete the unneeded WebEdit.Set steps.

Active Screen

When using Internet Explorer versions 10 or 11, if you use the Active Screen to view objects or add steps to a test or component, the Active Screen does not capture the updated state of the Web page.

Workaround: Open the Developer Tools for the Web page and change the **Document Mode** to **8** or lower.

Microsoft Edge

General

- You must open the Edge browser session using the Edge Agent for Functional Testing. UFT cannot spy, record, or run tests on an existing Edge browser session.

You can start the Edge Agent for Functional Testing from one of the following locations:

- The desktop shortcut
- **Start -> All apps -> HP Software -> Edge Agent for Functional Testing**
- In the Record and Run Settings dialog box, select **Edge** as the **Browser** type

- If you are using the Microsoft Edge insider version, you must have insider version 10576 or later. However, due to changes in the Web Driver insider build by Microsoft, later versions may not work with UFT.
- Each step performed by Edge has a short delay due to the Edge Agent's injection of Javascript in the browser.
- All Web 2.0 toolkits (ASP .NET AJAX, Dojo, Ext-JS, GWT, jQueryUI, SiebelOpenUI, and YahooUI), are not supported when using Edge versions 10576 and earlier.
- The Ext-JS, SiebelOpenUI, and YahooUI are not supported on any Edge versions.
- If you open a tab in an Edge browser with the Edge Agent for Functional Testing, you should perform at least one action in the browser to enable UFT to use the necessary mechanism to communicate with this tab.
- When identifying objects in an application or running test using multiple tabs in an Edge browser, the focus may unexpectedly switch between tabs in the browser window. This does not affect your test run or object identification.

Object Identification

- If you open multiple tabs on an Edge browser, then manually close a tab, UFT will experience unexpected behavior when attempting to spy on the remaining tabs.

  Workaround: Open only one tab at a time when using Edge with UFT or open/close tabs using UFT test object methods.

Test Objects, Methods, and Properties

- The following test objects, methods, and other Web-specific functionalities are not supported:
  - **Browser.Home**
  - **Browser.ClearCache**
  - **Browser.DeleteCookies**
  - **Browser.Stop**
  - **Browser.FullScreen**
  - **Browser.IsSiblingTab**

  - **Browser.Object**
  - **WebFile** object
  - **ViewLink** object
  - Browser **About:*** pages
- The following test objects are not supported when using Edge versions before 10576:
  - Frame and Frameset objects
  - **Dialog** objects
- Multiple tab are not supported on Edge versions 10576 earlier.
- Multiple Edge browsers windows are not supported.
- The **Web > Advanced** settings in the Options dialog box (**Tools > Options > GUI Testing** tab **> Web > Advanced** node)are not supported.

Recording

Recording is not supported.

Active Screen

The Active Screen is not supported on Edge browsers.

Known Issues - Mozilla Firefox

General Limitations

- If two minor versions of Mozilla Firefox are installed on the same computer, and the earlier version was installed after the later version, UFT may not recognize which is the latest version.
- If you are working on a computer where the UAC (User Account Control) option is set to ON, UFT does not support testing on Mozilla Firefox browsers that were installed (or upgraded to a new version) after you installed UFT.

  Workaround: After installing Mozilla Firefox on the environment described above, log in as an administrator and open UFT. This enables UFT to install files that are required for Mozilla Firefox support.
- The legacy Functional Testing Agent for Firefox is supported only for Firefox versions 39 and earlier.
- The legacy Functional Testing Agent for Firefox (found at **<UFT installation folder>\Installations\Firefox\AgentLegacy.xpi**) may experience unexpected results on a Windows 8 operating system.

- UFT does not support anonymous content elements in non-XUL frames. (For example, the buttons in the Mozilla Firefox SSL exception page.)
- It is recommended to disable other Mozilla Firefox add-ins when performing tests of your Web application or Web page.
- The SAP WDJ Add-in is not supported on Firefox browsers.
- If you have the Add-ons Manager enabled, in the Web tab of the Run and Record Settings dialog box, if you set Firefox to open to a specific URL, Firefox does not open to the specified URL at the beginning of a recording or run session.

  Workaround: Disable the Add-ons Manager before using Firefox.

Recording

- Recording on Mozilla Firefox pages is only possible when the page is fully loaded.
- When recording steps in Mozilla Firefox, additional steps may be recorded.

  Workaround: Manually remove the extraneous steps after the recording session ends.
- Low-level recording is not supported on Firefox.
- The following methods are not supported for recording on Mozilla Firefox:
  - **Browser.Home**
  - **Browser.FullScreen**
- When recording on some Mozilla Firefox versions, if you perform a search on **google.com** by entering the search string and then pressing **Enter**, the **Submit** operation is not recorded. Subsequently, when you run the test, UFT enters the search string but does not perform the search.

  Workaround: Do one of the following:
  - When recording the search operation, click the search button instead of pressing **Enter**.
  - Manually add the **Submit** (or **Click**) step to the test or component.
- The `If Handler` option in the Web Event Recording Configuration Dialog Box works on Mozilla Firefox browsers only if the handler is assigned as an attribute (for example, `<A onclick = "some code"/>`) and not if it is assigned as a property (for example, `aObj.onclick = function() {some code}`)
- The Active Screen is not supported for use with Mozilla Firefox browsers.
- UFT does not record steps performed on browser dialog boxes (such as alert, confirmation, or prompt) if these dialog boxes are opened from a new browser tab.
- When recording on Mozilla Firefox, UFT does not use the location identifier identification property to learn the object.
- When accessing FTP servers using Mozilla Firefox, UFT does not record actions on the server authentication dialogs.

Test Objects, Methods, Properties, and Checkpoints

- UFT does not support accessing browser dialog boxes (such as alert, confirmation, or prompt) directly in Mozilla Firefox.

  Workarounds for Firefox only:

  - Use the **HandleDialog** or **GetDialogText** methods described in the **Web** section of the *HP UFT Object Model Reference for GUI Testing*.
  - If the **Browser("xxx").Dialog("xxx").Page("xxx")** object is recognized, either use a recovery scenario with the **HandleDialog** method, or a **Browser("xxx").Dialog("xxx").Page("xxx").Type** step to handle the pop-up dialog box. For example, use an Enter key to click the default button and close the dialog box.
- The Object Spy and Checkpoint Properties dialog boxes do not retrieve the current value of edit boxes in Mozilla Firefox dialog boxes.
- The Object Spy and Navigate and Learn dialog boxes do not retrieve the current value of tabmodal dialogs in Mozilla Firefox.
- The `Type` property of the `WebButton` test object has a different default value in Microsoft Internet Explorer and Mozilla Firefox. In Microsoft Internet Explorer the default value is `Button`, but in Mozilla Firefox the default value is `Submit`.

  Workaround: Do not use the `Type` property in the description of a `WebButton` test object.
- When using Mozilla Firefox, the `innertext`, `outertext`, `innerhtml` and `outerhtml` property values may differ from other browsers. Therefore, using these values in parameters or running checkpoints that use these property values may cause the steps to fail.
- The following test objects, methods, and other Web-specific functionalities are not supported in Firefox:
  - iFrame (with a Javascript source) and Frameset objects are not supported in Mozilla Firefox browsers.
  - Firefox Start Page
  - about://* pages
  - Modal or modaless dialog boxes
  - **ViewLink** test object
  - **WebXML** test object (and, accordingly, XML checkpoints and output value steps)
  - **Browser.Object** method
  - **Browser.Stop**

- Text area checkpoints are not supported on Mozilla Firefox.
- If you drag a tab to create a separate window in Firefox, UFT stops recognizing, recording, or running any web objects in the new window.
- If you need to test Java applets in Mozilla Firefox browsers, you must use the legacy Functional Testing Agent for Firefox, found in the **<UFT installation folder>\Installations\Firefox** folder.

  > **Note:** The legacy Functional Testing Agent for Firefox is supported for Firefox versions 39 and earlier.

- If you take a snapshot of an ASPAjaxRichTextArea object on FireFox, it might not be displayed correctly in the Active screen.
- If a test or business component contains a step that closes a Mozilla Firefox browser, UFT may behave unexpectedly when that step is reached during a run session.

  Workaround: Do not include a step that closes a Mozilla Firefox browser.

- If you open the Search toolbar or developer toolbar in Mozilla Firefox, when you spy on an object or highlight an object in the object repository, the highlight rectangle is displayed in the wrong location in the browser window.

  Workaround: Float the toolbar in the browser window.

- When using the **RunScript** method on Mozilla Firefox browsers, you should disable the Content Security Policy before running the test:
  a. In Firefox, native to **about:config**.
  b. Search for **security.csp.enable**.
  c. Change the value to `false`.

Known Issues - Google Chrome and Apple Safari

Google Chrome and Apple Safari

See below for additional issues relevant only to Chrome or Safari.

Functionality and Settings

- Web pages that modify the browser's JavaScript functionality (for example, a Web page that replaces the JSON object) may cause UFT to behave unexpectedly.
- The font and color properties for link objects contain different values in different browsers. Therefore, if you create standard checkpoints in Microsoft Internet Explorer and select the **font** and **color** properties, running these checkpoints in Chrome or Safari may cause the checkpoints to fail.
- If you have multiple Chrome or Safari users defined, you must delete all users.

Test Objects, Methods and Properties

- When using Chrome or Safari, the **innertext**, **outertext**, **innerhtml** and **outerhtml** property values may differ from other browsers. Therefore, using these values in parameters or running checkpoints that use these property values may cause the steps to fail.
- The following test objects, methods, and other Web-specific functionalities are not supported in Chrome or Safari:
  - **ViewLink** test object
  - chrome://* pages
  - about://* pages
  - **Browser.Home** method
  - **Browser.FullScreen** method
  - **Browser.Object** method
  - **Browser.Stop**
  - Modal or modaless dialog boxes
  - Developer Tools pane. (Running steps on Chrome or Safari while the Developer Tools pane is open is supported.)
  - Dialog boxes opened by the browser, such as Alert, Confirmation, or Prompt messages on versions of Chrome earlier than 26.
  - **WebXML** test object (and, accordingly, XML checkpoints and output value steps).
  - Web-based environments, such as Web-based SAP, Siebel, Java, .NET Web Forms, and so on.

Google Chrome

- In the following cases, you must manually enable the Functional Testing Agent for Google Chrome extension:
  - You have no internet connection
  - You have not enabled the automatic updates for Google Chrome
  - You are using Google Chrome versions 31 or earlier.

    For details on manually enabling the Extension, see "How to Enable the HP Functional Testing Agent Chrome Extension" on page 346.

- Recording on Google Chrome is supported only from versions 31 and higher.
- If you have the Chrome developer tools currently open, UFT cannot spy on Web objects.
- If you have a Chrome alert or warning dialog open, UFT cannot run or record tests or components on the browser.

  Workaround: Close the alert or warning dialog before trying to run or record a test or component.
- Internal Google Chrome pages, such as the `about:blank` page, Google Chrome sign-in page, Google Chrome Web Store, and Google Chrome's default tabs homepage are not recognized as Web pages but **WinObject**s.
- When working with Chrome version 36 or earlier, UFT does not support Web test objects located inside iFrame controls with a `blank` or `about:blank` **SRC** identification property value.
- Page checkpoints and bitmap checkpoints may fail when running on Google Chrome because of differences between Chrome and Internet Explorer. For page checkpoints this is related to differences in the handling of casing in HTML source files.
- Text checkpoints fail when running on Google Chrome.
- When recording on Google Chrome, UFT does not use the **location** identification property to learn the object.
- When spying on a Web file in Google Chrome, you get a fakepath for a Webfile value property.
- If you manually uninstall the UFT Agent extension from Chrome, you must manually reinstall it if you reinstall UFT.
- The Active Screen is not supported for use with Google Chrome browsers.
- The Page/Frame options (**Tools > Options > GUI Testing** tab **> Web > Page/Frame Options** node) are not supported for recording in Google Chrome.
- If the **Record Coordinates** option is selected in the Web > Advanced pane of the Options dialog box (**Tools > Options > GUI Testing** tab > **Web > Advanced** > **Record Settings** section), UFT does not record correct coordinates on images in Google Chrome browsers.

  Workaround: Manually add the correct coordinates for the image after recording.
- iFrame and Frameset objects are not supported in Google Chrome browsers.
- Using the Object Spy on Alert or Confirm dialogs in Google Chrome causes unexpected behavior in UFT.
- When testing applications on Google Chrome in Windows 10, UFT does not record many user actions.

  Workaround: In Chrome, do the following:

  a. Navigate to the **chrome://flags/** page.

  b. In the flags page, disable the **Enable touch events** option.
- When accessing FTP servers using Google Chrome, UFT does not record actions on the server authentication dialogs.

Apple Safari

- Only Web test object steps can run on Safari. All other steps run locally on the UFT computer.
- Recording steps on Safari is not supported.
- Web 2.0 test objects or Web Add-in Extensibility-based test objects are not supported on Safari Browsers
- UFT does not recognize internal Safari pages, such as the New Tab page.
- The following functionalities are not supported when working with the Safari browser:
  - Learning objects in the Object Repository Window or Object Repository Manager (you can learn objects using the Remote Object Spy)
  - Maintenance Mode
  - Highlighting an object from the object repository in the application
  - Creating an Active Screen or using the Update Run Mode to update the Active Screen
  - Checkpoints and output values that are not standard (such as File Content checkpoints and output values, Text checkpoints and output values, and Bitmap checkpoints).

    Note that Page checkpoints are supported, with the following limitations:

    - Page checkpoints and bitmap checkpoints may fail when running on Google Chrome because of differences between Chrome and Internet Explorer. For page checkpoints this is related to differences in the handling of casing in HTML source files.
    - The value of the **load time** identification property for Page and Frame test objects is always `0` when running on Safari. In Page checkpoints, the **load time** property is selected by default, therefore Page checkpoints may fail when running on Safari.

      Workaround: Deselect the **load time** property in Page checkpoints that need to run on Safari.
- The following test objects and test object methods are not supported when running on Safari:
  - **WebFile.Set** method
  - **Browser.ClearCache** method
  - **Browser.DeleteCookies** method
  - **Drag** & **Drop** methods (on all Web test objects)
  - Web test objects located inside iFrame controls with a `blank` or `about:blank` **SRC** identification property value.
- Depending on the performance of your connection to the Mac, statement completion for the **Object** property might not work.

- During a run session, steps that click on a Web object that is supposed to open a new browser tab fail to open the new tab.

  Workaround: Disable the popup blocker in Safari. (**Safari > Preferences > Security**, clear the **Block pop-up windows** check box).

- When running tests or components on Safari, recovery scenarios are not supported.
- Running tests or components on Safari using the **Mouse** replay type is not supported.

  Make sure that **Event** is selected as the **Replay type** in the **Run settings** section of the **Web > Advanced** options pane **(Tools > Options > GUI Testing** tab **> Web** pane **> Advanced** node**)**.

- In the automation object model, **WebLauncher.Browser** does not support the Safari browser. To connect to a remote Mac during a test run and open the Safari browser, use the **RemoteConnection** utility object and its methods. For details, see the **Utility Objects** section of the *HP UFT Object Model Reference for GUI Testing*.

Part 20: Web 2.0 Add-ins

This section includes:

Web 2.0 Add-ins - Quick Reference

You can use the Web 2.0 Add-ins to test HTML user-interface objects (controls) in Web 2.0 environments.

The Web 2.0 Add-ins include the following:

- ASP .NET AJAX
- Dojo
- Google Web Toolkit (GWT)
- jQueryUI
- Siebel Open UI
- EXT-JS
- Yahoo User Interface (Yahoo UI)

The following tables summarize basic information about the Web 2.0 Add-ins and how they relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	Much of the functionality of these add-ins is the same as other Web add-ins. These add-ins extend the capabilities of the Web Add-in functionalities. • See the section on the "Web Add-in" on page 304 and "Web-Based Application Support" on page 25.
Supported Environments	For details on supported Web 2.0 toolkits and versions, see the *HP Unified Functional Testing Product Availability Matrix*.
Test Object Methods and Properties	The Web 2.0 Add-ins provide test objects, methods, and properties that can be used when testing objects in Web applications. For details, see the relevant toolkit section in the **Web 2.0 toolkits section** of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382

Prerequisites	
Opening Your Application	You must open UFT before opening your Web application.
Add-in Dependencies	You must have the Web Add-in installed and loaded.
Other Important Information for SiebelOpenUI users	• When working with SiebelOpenUI objects, load the Web Add-in and the SiebelOpenUI Add-in, but do not load the Siebel Add-in. If you load both the Siebel and the SiebelOpenUI add-ins, the add-ins sometimes conflict with each other, and prevent successful object recognition. • In order to enable UFT to run tests for SiebelOpenUI objects, you must associate a special

	function library with your test. This function library is found at `<UFT installation folder>\dat\Extensibility\Web\Toolkits\SiebelOpenUI\Function Libraries\SiebelOpenUI.qfl`. You can set this function library as the default function library in the Resources pane in the Test Settings dialog box. For details, see the section on the Test Settings Resources pane in the *HP Unified Functional Testing User Guide*.
Other Important Information for EXT-JS users	In order to enable UFT to run tests for EXT-JS objects, you must associate a special function library with your test. This function library is found at `<UFT installation folder>\dat\Extensibility\Web\Toolkits\ExtJS\Function Libraries\ExtJS.qfl`. You can set this function library as the default function library in the Resources pane in the Test Settings dialog box. For details, see the section on the Test Settings Resources pane in the *HP Unified Functional Testing User Guide*.

Configuration	
Options Dialog Box	Use the **Web** pane. (Make sure that a GUI test is open and select **Tools > Options > GUI Testing** tab **> Web > General** node.)
Record and Run Settings Dialog Box (tests only)	Use the **Web** tab. (**Record > Record and Run Settings**)
Test Settings Dialog Box (tests only)	Use the **Web** pane (**File > Settings > Web** pane).
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Web** section (**Tools > Options > GUI Testing** tab **> Active Screen** node > **Custom Level**). See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Web** pane. In the application area, select **Additional Settings > Web** in the sidebar. • See the section on defining Application Settings for your application area in the *HP Unified Functional Testing User Guide*.

Web 2.0 Toolkit Support

The Complexities of Testing Web 2.0 Controls

Web 2.0 sites often include a feature-rich, user-friendly interface based on client-side interactivity frameworks. The controls in these sites are generally created using a combination of HTML and client-side JavaScript code that create complex, interactive application objects.

Many groups and organizations have published Web 2.0 toolkits. These toolkits comprise open source JavaScript libraries that define Web 2.0 controls. Developers can use or customize these toolkits to build Web 2.0 applications instead of developing Web 2.0 controls from scratch.

The UFT Web Add-in does not recognize these complex controls and, instead, relates to the HTML elements that comprise them. This results in low-level steps on generic Web test objects. Such steps may be difficult to create, read, and maintain.

Testing Web 2.0 Controls with UFT Web 2.0 Add-in Support

UFT Web Add-in Extensibility makes it possible to develop Web-based add-ins that can identify the controls in a Web 2.0 application in a way that better matches the intended purpose and functionality of those controls.

UFT provides built-in Web Add-in Extensibility support for several public Web 2.0 toolkits. The support for each toolkit is packaged as a child add-in of the Web Add-in. If you install the Web 2.0 Toolkit Support, you can load this support by selecting the relevant toolkit name in the Add-in Manager. The Web 2.0 Toolkit Support Setup is available from the **Add-in Extensibility and Web 2.0 Toolkits** option in the UFT setup, or on your UFT computer:
<UFT installation folder>\Installations\Web2AddinSetup\Web2AddinSetup.exe.

The operations supported for each Web 2.0 test object class are a combination of custom operations developed for that test object class and operations directly inherited from the corresponding (base) Web Add-in test object class.

You work with a Web 2.0 toolkit add-in much the same way as you work with the regular Web Add-in. When the toolkit support is loaded, you can learn, record, create checkpoints, run steps, and use all standard UFT functionality on controls from these toolkits.

UFT provides support for the following toolkits:

- ASP .NET Ajax - http://www.asp.net/ajax/
- Dojo - http://www.dojotoolkit.org

- Google Web Toolkit (GWT) - http://code.google.com/webtoolkit/
- jQuery UI - http://jqueryui.com/
- Siebel Open UI
- Yahoo User Interface (Yahoo UI) - http://developer.yahoo.com/yui/
- EXT-JS: http://www.sencha.com/products/extjs/S

For details on the test objects and operations supported for these toolkits, see the **Web 2.0 Toolkits** section of the *HP UFT Object Model Reference for GUI Testing*.

Considerations for Working with Web 2.0 Add-ins

- **jQuery Library Injection.** The Web 2.0 Add-in support is based on the jQuery JavaScript library. Therefore, if you load any Web 2.0 add-in, UFT injects the jQuery JavaScript library into every Web page that opens in a browser while UFT is open (unless a jQuery library is already included in the page).

  The specific jQuery UI file injected for each Web 2.0 add-in is specified in the add-in's toolkit XML file, located in: `<UFT installation>\dat\Extensibility\Web\Toolkits\<ToolkitName>\<ToolkitName>.xml`.

- **F1 Help Support.** When you press **F1** on a test object operation that was inherited from the Web Add-in, the Help displays information about that operation for the Web Add-in test object class from which the operation was inherited, and not for the extensibility-based test object class used in your step.

  Additionally, the details in the Help file reflect the behavior of the test objects and operations in the XML files provided with UFT. If these files were customized or modified in any way, the details in the Help files supplied with UFT may no longer be accurate.

  In general, when the content of the extensibility files for a Web 2.0 toolkit is modified, the Help file should also be changed as described in "Customization Guidelines" on page 371. In these cases, you should contact the person or organization who customized the files as your first contact point for support.

- **Checkpoints and Output Values.** Inserting checkpoints and output values on Web 2.0 objects is supported only when recording steps.

- **Container Objects.** Some Web 2.0 objects that visually or behaviorally seem to contain other objects in a Web application are not learned as container objects in terms of the test object hierarchy. For example, this is the case for the `YUIDialogBox` and `GWTDialogBox` test objects.

- **Identification property values.** When working in Mozilla Firefox, the value of the `selected item` or `selected` identification property is not available in the Object Spy for some Web 2.0 test object classes. The same is true when updating property values from the application in the object repository. This is because the value is only retrievable when the browser is in focus.

  Workaround: Retrieve the property value without removing focus from the browser. For example:

  ```
  Browser("Dijit Tree Test").Page("Dijit Tree Test").DojoTree("mytree").Select
  ```

```
"Continents;Africa"
msgbox Browser("Dijit Tree Test").Page("Dijit Tree Test").DojoTree("mytree").
GetROProperty("selected item")
```

- **Object Type Identification.** In the toolkit XML file, the `<HTMLTags>` and `<Conditions>` elements in the **<Identification>** section for the relevant test object class define how UFT maps Web controls to that class.

  In the example below, UFT identifies a control as a `GWTToggleButton` test object (when the GWT Add-in is loaded) if it has a `<div>` HTML tag and a `className` HTML property with a value that matches the regular expression: `.*gwt-ToggleButton.*`

```
<Control TestObjectClass="GWTToggleButton">
   <Settings>
   <Variable name="default_imp_file" value="JavaScript\GWTToggleButton.js"/>
   </Settings>
   <Identification>
        <Browser name="*">
          <HTMLTags>
          <Tag name="div"/>
          </HTMLTags>
          <Conditions type="IdentifyIfPropMatch">
<!-- The search string in this condition is treated as a regular expression
and is therefore equivalent to .*gwt-ToggleButton.* -->
           <Condition prop_name="className" expected_value="gwt-ToggleButton" is_
reg_exp="true"/>
          </Conditions>
       </Browser>
```

  In some cases (for example, when `<Conditions type="CallIDFuncIfPropMatch">`), a JavaScript function that contains identification criteria is also used to help map controls to a test object class.

  Keep in mind that the support provided in the HP-furnished Web 2.0 add-ins is dependent on the HTML and DOM structure of the controls. If developers of a Web 2.0-based application change the values of a control's properties, then the values defined for the `<HTMLTags>` and `<Conditions>` elements of the toolkit XML files (or JavaScript files) may not enable UFT to correctly identify those controls.

  If UFT is not identifying an object in your application as you expect, you can view or adjust these values in the relevant toolkit support files.

  The toolkit XML files are located in: `<UFT installation>\dat\Extensibility\Web\Toolkits\<ToolkitName>\<ToolkitName>.xml`

  The JavaScript files are in a `JavaScript` folder under the above folder.

  If you modify this (or any) HP-furnished toolkit support set file, follow the guidelines described in "Customization Guidelines" on the next page.

For more details on the way UFT identifies supported controls and for details on the implementation of the supported operations, see the comments provided in the XML and JavaScript files for the relevant toolkit support set.

Customization Guidelines

If you are familiar with Web Add-in Extensibility, then you can customize or further extend the built-in Web 2.0 support to match the needs of the Web 2.0 toolkit application you are testing.

Additionally, if you have installed **Extensibility Accelerator**, you can use this IDE to make it faster and easier to design and develop the required extensibility XML files so that you can invest your main efforts in the development of the JavaScript functions that will enable UFT to work with your custom Web controls.

Extensibility Accelerator also comes with built-in projects for the UFT Web 2.0 add-ins. You can use these projects to help you learn the Extensibility Accelerator features or to more easily add to or modify the provided support files.

If you customize or further extend any of the HP-furnished Web Add-in Extensibility files, you should also do the following:

- Make a copy of, or otherwise back up, the original HP-provided files.
- Change the name and description that are displayed in the Add-in Manager for the toolkit. Include the text: "`Provided by <YourOrganization>`" in the Add-in Manager description (in the `Controls\Description` element of the toolkit XML file).
- Create your own Help file to be opened for the customized test object classes or operations. You must use a different file name than the HP-provided Help file. (Change the file name in the `HelpInfo` element of the Test Object XML file.)

> **Note:** When installing the Web 2.0 add-ins, if a previous version of a selected add-in is installed on your computer, the setup stores the previous files in a backup folder before installing. You may need to merge any customizations you made to the previous version into the new version.

For details on how to make these changes and how to customize the support files, see the UFT Web Add-in Extensibility documentation, available in the `<UFT installation folder>\help\Extensibility` folder.

For details on working with Extensibility Accelerator, see the *HP UFT Extensibility Accelerator for HP Functional Testing User Guide*.

Known Issues - Web 2.0 Add-ins

This section contains troubleshooting and limitation information about working with the Web 2.0 Add-ins.

General Limitations

- When working with test objects that are supported using Web Add-in Extensibility, such as Web 2.0 test objects, if you create a checkpoint from the Active Screen, or try to view the object's properties from the Active Screen, some property values may be empty.

  > **Note:** Using the Active Screen for Google Chrome is not supported.

- When working with Web 2.0 toolkits on Firefox browsers, it is recommended to load only one toolkit at a time.

Browser Specific Limitations

- Due to synchronization issues, if you navigate to a new Web page in Internet Explorer or Mozilla Firefox while recording, then UFT may not record certain operations on certain ASP .NET Ajax or jQuery UI objects in the page. Similarly, when running steps that navigate to a new page, UFT may fail to perform certain steps on certain ASP .NET Ajax or jQuery UI objects.

  Workaround: If the problem occurs while recording, refresh the Web page and record the step again. If the problem occurs while running, insert a `Wait()` statement before the problematic step.

- Web 2.0 test objects or Web Add-in Extensibility-based test objects are not supported on Safari browsers.

ASP .NET AJAX

- When working with the Web 2.0 ASPAjax Add-in, running scripts in the Active Screen is not enabled by default.

  Workaround:

  a. In the Options dialog box, enable running scripts in the Active Screen. In **Tools > Options > GUI Testing** tab **> Active Screen** node, set **Run scripts** to **Enabled**.

  b. Close and reopen your test or component for the setting to take effect.

Dojo

You cannot not record on objects created with Dojo 1.10 in Internet Explorer 10 or 11.

Workaround: Record the objects on Internet Explorer 9, Firefox, or Chrome.

EXT-JS

When loading the Ext-JS toolkit, ensure that the Siebel Add-in is not loaded.

Siebel Open UI

- In order to enable UFT to run tests for SiebelOpenUI objects, you must associate a special function library with your test.

This function library is found at `<UFT installation folder>\dat\Extensibility\Web\Toolkits\SiebelOpenUI\Function Libraries\SiebelOpenUI.qfl`.

You can set this function library as the default function library in the Resources pane in the Test Settings dialog box. For details, see the section on the Test Settings Resources pane in the *HP Unified Functional Testing User Guide*.

- By default, all SiebelOpenUI objects appear as child objects of the same Page object, even for objects embedded in objects that are opened from the main page.

  If you need to group objects under separate Page objects, select the **Every navigation** option under the **Create a new page test object for section** in the **Page/Frame Options** pane of the Options Dialog box (**Tools > Options > GUI Testing** tab > **Web** pane > **Page/Frame Options**).

- When recording entering information for a SblOUIAdvancedEdit object, UFT records the Set method for the entered information after the opening of another object.

  Workaround: Manually change the order of the steps after recording.

- When selecting a method for Siebel OpenUI objects, the autocompletion list displays some of the object's internal methods. These methods should not be used in your test.

Part 21: Windows Runtime Add-in

This section includes:

Chapter 35: Windows Runtime Add-in - Quick Reference

You can use the Windows Runtime Add-in to test Windows Runtime applications (from the Windows Store) created to run on Windows Runtime environments (Windows 8.x and later, Windows RT, or Windows Server 2012).

> **Note:** If you are testing a non-Windows Runtime application (that opens from the Desktop section in Windows 8.x or higher or Windows Server 2012), you should use the Standard Windows Add-in. For details on the Standard Windows add-in, see "Standard Windows Support -Quick Reference" on page 256.

The following tables summarize basic information about the Windows Runtime Add-in and how it relates to some commonly-used aspects of UFT.

General Information	
Add-in Type	• The standard Windows testing support functions like a Windows-based add-in. Much of its functionality is the same as other Windows-based add-ins. For details, see "Windows-Based Application Support" on page 52. • There are some significant differences between the Windows Runtime add-in and the other Windows-based add-ins, due to the changes implemented in Windows 8.x and Windows Server 2012. For details, see "Using the Windows Runtime Add-in in UFT - Overview" on page 377.
Supported Environments	• For details on supported technologies and versions, see the *HP Unified Functional Testing Product Availability Matrix*.
Test Object Methods and Properties	The Windows Runtime Add-in provides test objects, methods, and properties that can be used when testing objects in Windows Runtime applications. For details, see the **Windows Runtime** section of the *HP UFT Object Model Reference for GUI Testing*.
Checkpoints and Output Values	• See the sections describing checkpoints and output values in the *HP Unified Functional Testing User Guide*. • See "GUI Checkpoints and Output Values Per Add-in" on page 382
Troubleshooting and Limitations	See "Known Issues - Windows Runtime" on page 379.
UFT4WinRT Service	When you install UFT, a service named `UFT4WinRT` is installed on your computer. By default, this service is running on your computer. This service enables you to use UFT in the Windows Runtime environment by running UFT with the UAC for the user enabled. This service enables you to use common UFT tools, such as the Object Spy, Navigate and Learn toolbar, and recording for a Windows Runtime application.

Prerequisites	
Opening Your Application	You can open your Windows Runtime application before or after opening UFT. When UFT is installed on a computer running Windows 8.x or later or Windows Server 2012, the Windows Runtime testing support is always enabled. This add-in is therefore not listed in the Add-in Manager.
Add-in Dependencies	None

Configuration	
Options Dialog Box	Use the **Windows Applications** pane (**Tools > Options > GUI Testing** tab > **Windows Applications** node). (Make sure that a GUI test is open and select **Tools > Options > GUI Testing** tab **> Web > General** node.)
Record and Run Settings Dialog Box (tests only)	Use the Windows Applications tab. (**Record > Record and Run Settings**) • The **Applications opened by UFT** and **Applications opened via the Desktop (by the Windows shell)** options are not supported for the Windows Runtime Add-in. • For the Applications specified below option, you enter the information differently, depending on the type of application being tested: • **For WPF and XAML-based applications:** the name of the `.exe` process of the application **Note:** You do not need to enter the location of the working folder for the application. • **For HTML and Javascript-based applications:** `WWAHOST.exe` • Analog recording and Low level recording are not supported for the Windows Runtime add-in.
Custom Active Screen Capture Settings Dialog Box (tests only)	Use the **Windows applications** section (**Tools > Options > GUI Testing** tab **> Active Screen** node > **Custom Level**). See the section on the Custom Active Screen Capture Settings dialog box in the *HP Unified Functional Testing User Guide*.
Application Area Additional Settings pane (business components only)	Use the **Applications** pane. In the application area, select **Additional Settings > Applications** in the sidebar. See the section on defining Application Settings for your application area in the *HP Unified Functional Testing User Guide*.

Using the Windows Runtime Add-in in UFT - Overview

The Windows Runtime Add-in enables you to test applications running in a Windows Runtime environment. A **Windows Runtime environment** describes the area in Windows 8.x or higher or Windows Server 2012 that runs applications from the Windows Store.

> **Note:** On Windows 8.x or higher or Windows Server 2012, UFT uses the Standard Windows Add-in to test applications that run on the desktop.

You can test different types of Windows Runtime applications using UFT:

- WPF or XAML-based Windows applications

  For details on WPF or XAML-based applications, see http://msdn.microsoft.com/en-us/magazine/jj651571.aspx.

- HTML or JavaScript-based Windows applications

  For details on HTML-based Windows Runtime application, see http://msdn.microsoft.com/en-us/library/windows/apps/hh770842.aspx. For details on Javascript-based Windows Runtime applications, see http://msdn.microsoft.com/en-us/library/hh710230(v=vs.94).aspx.

  > **Note:** If you are testing an HTML or JavaScript-based Windows application, you must also load the Web add-in when starting UFT.

For basic configuration details for the Windows Runtime Add-in, see "Windows Runtime Add-in - Quick Reference" on page 375.

How to Use UFT in a Windows Runtime Environment

This task describes how to perform common UFT tasks in a Windows Runtime environment.

This task includes the following steps:

- "Prerequisites " below
- "Display UFT and the Windows Runtime application together" on the next page
- "Use UFT tools with a Windows Runtime application " on the next page

Prerequisites

You must meet the following requirements before using the Windows Runtime add-in:

- UFT must be installed on a computer running Windows 8.x or higher or Windows Server 2012
- The `UFT4WinRT` service must be running. For details on the service, see the description of the service.

Display UFT and the Windows Runtime application together

UFT runs on the desktop in Windows 8.x or higher or Windows Server 2012. Therefore, direct interaction between UFT dialog boxes, panes, and windows is difficult. To enable UFT to work with Windows Runtime applications available on the **Start** screen, you can resize the open window:

- Dock the desktop window containing UFT on an edge of the screen:
  a. On the Desktop window, move the mouse to the upper edge of the window. The mouse cursor changes to a hand.
  b. Drag the desktop window toward the bottom of the screen.
  c. Move the dragged window to either edge of the screen.
  d. Resize the window as needed.

  > **Note:** The window can be resized to use 1/3 or 2/3 of the screen.

- Use UFT in full screen view.

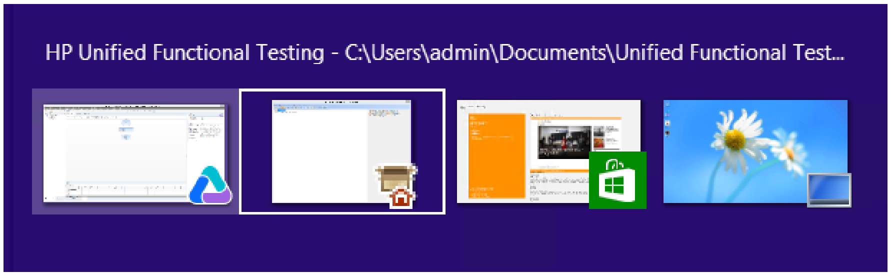
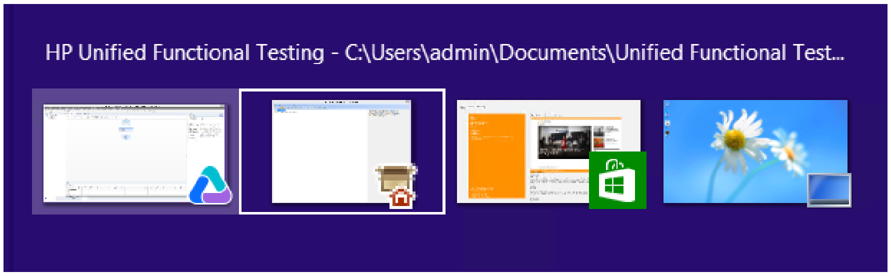
  By default, the desktop window containing your UFT session is displayed at full screen view. To navigate to your Windows Runtime application, use the keyboard shortcuts described in the following steps.

Use UFT tools with a Windows Runtime application

Because UFT runs on the Desktop screen in Windows 8.x or higher, direct navigation between the Object Spy dialog box, Navigate and Learn toolbar, and the Record Toolbar is difficult. Use the following steps to enable UFT to access your Windows Runtime application:

1. Open the relevant UFT tool.
2. Do one of the following:

Object Spy	Press the **Windows + SHIFT** key. Windows cycles through all open Windows Runtime applications. After selecting your application, the Object Spy dialog box is displayed on top of the open application. **Note:** If you use this option to switch to your application, the **Keep on Top option** in the Object Spy dialog box does not work.
Navigate and Learn toolbar	a. Press **ALT + TAB**. Windows displays a window displaying the list of open applications:

	 HP Unified Functional Testing - C:\Users\admin\Documents\Unified Functional Test... b. Using the arrow keys, select your application. When the Windows Runtime application is displayed in the main window, the Navigate and Learn toolbar is displayed on top of the open application.
Record Toolbar	a. Press **ALT + TAB**. Windows displays a list of open applications.  HP Unified Functional Testing - C:\Users\admin\Documents\Unified Functional Test... b. Using the arrow keys, select your application. When the Windows Runtime application is displayed in the main window, the Record toolbar is displayed on top of the open application.

> **Note:** If you close your application using **ALT + F4** while recording or spying on an object, the application automatically reopens when continuing to record or spy.

3. Continue spying on objects, adding objects to the object repository, or recording actions as necessary.

Known Issues - Windows Runtime

- You cannot use the **.Object** property to invoke native methods for a Windows Runtime object.
- Analog recording and Low level recording are not supported for the Windows Runtime add-in.
- If you modify the mandatory and assistive identification properties of a Windows Runtime object in the Object Identification dialog, UFT does not recognize the modified properties when spying on or adding the same object in the same UFT session.

  Workaround: Restart UFT and spy on or add the object again.
- If you close a Windows Runtime application using **ALT + F4** while recording, UFT does not record the application close.

  Workaround: Manually add a **WindowsApp.Close** statement step after recording.
- UFT cannot record or spy on a Windows Runtime application that is in a suspended state.

  Workaround: Restart the Windows Runtime application.

- UFT cannot record over applications that have a higher integrity level, such as setup programs or programs that are run as administrator.

  Workaround: Run UFT as administrator if you need to record over an application with a higher integrity level.

Part 22: Appendix

This section includes:

Appendix A: GUI Checkpoints and Output Values Per Add-in

The tables in this chapter show the categories of checkpoints and output values that are supported by UFT for each add-in.

For details about using checkpoints and output values in a specific add-in, see the relevant add-in section.

This chapter includes:

Supported Checkpoints

The following table shows the categories of checkpoints that are supported by UFT for each add-in.

Table Legend

- S: Supported
- NS: Not Supported
- NA: Not Applicable

Note: Only standard and bitmap checkpoints are supported for keyword components.

For additional information, see "Footnotes" on the next page.

	Accessibility	Bitmap	Database	File Content	Image	Page	Standard	Table	Text	Text Area	XML (Application)	XML (Resource)
.NET Web Forms[3]	S	S	NA	NA	NA	NA	S	S	S[6]	S[6]	S	S
.NET Windows Forms	NA	S	NA	NA	NA	NA	S	S	S[6]	S[6]	NA	NA
ActiveX	NS	S	NA	NA	NS	NA	S	S	S	S	NA	NA
Delphi	NS	S	NA	NA	NS	NA	S	S	S	S	NA	NA
Flex	NA	S	NA	NA	NA	NA	S	S	S	S	NA	NA
Java	NA	S	NA	NA	NA	NA	S	S	S	S[4]	NA	NA
Mobile	NA	S	NA	NA	NA	NA	S	NA	S	NS	NA	NA
Oracle	NA	S	NA	NA	NA	NA	S	S	NS	NS	NA	NA
PeopleSoft	S	S	NA	NA	S	S	S	S	S[1]	NS	S	S
PowerBuilder[2]	NS	S	NA	NA	NS	NA	S	S	S	S	NA	NA
Qt	NS	S	NA	NA	NS	NA	S	S	S	S	NA	NA
SAP Web-based	S	S	NA	NA	S	S	S	S	S	NS	S	S
SAP Windows-based	S[5]	S	NA	NA	S[5]	S[5]	S	S	S[5]	NS	S[5]	NA

	Accessibility	Bitmap	Database	File Content	Image	Page	Standard	Table	Text	Text Area	XML (Application)	XML (Resource)
Siebel	S	S	NA	NA	S	S	S	S	S	NS	S	S
Silverlight	NA	S	NA	NA	NA	NA	S	S	S	S	NA	NA
Standard Windows	NS	S	NA	NA	NS	NA	S	S	S	S	NA	NA
Stingray	NA	S	NA	NA	NA	NA	S	S	S	S	NA	NA
Terminal Emulator	NA	S	NA	NA	NA	NA	S	NA	NA	NA	NA	NA
VisualAge for Smalltalk	NA	S	NA	NA	NA	NA	S	S	S	S	NA	NA
Visual Basic	NS	S	NA	NA	NS	NA	S	S	S	S	NA	NA
Web	S	S	NA	NA	S	S	S	S	S[1]	S	S[7]	NA
Windows Runtime	NA	S	NA	NA	NA	NA	S	S	S	S	NA	NA
WPF	NA	S	NA	NA	NA	NA	S	S	S	S	NA	NA

Footnotes

[1] Text checkpoints are supported only for Page, Frame, and ViewLink objects.

[2] When you insert a checkpoint on a PowerBuilder DataWindow control, UFT treats it as a table and opens the Table Checkpoint Properties dialog box.

[3] For NET Web Forms, text checkpoints for WbfTreeView, WbfToolbar, and WbfTabStrip objects are not supported.

[4] The text area checkpoint mechanism for Java Applet objects is disabled by default. You can enable it in the Advanced Java Options dialog box.

[5] This is supported only when UFT records HTML elements using the Web infrastructure, but not when it records using the SAPGui Scripting Interface (as selected in the SAP pane of the Options dialog box).

[6] This is supported only when UFT is configured to use the OCR (optical character recognition) mechanism.

[7] XML checkpoints are not supported on Internet Explorer 9 or later running in standard mode, on Google Chrome, on Mozilla Firefox, or on Apple Safari because the WebXML test object is not supported for these browsers.

[8] - Checkpoints on Mobile object are supported only when recording your test.

Supported Output Values

The following table shows the categories of output values that are supported by UFT for each add-in.

Table Legend

- **S:** Supported
- **NS:** Not Supported
- **NA:** Not Applicable

> **Note:** Only standard and bitmap output values are supported for keyword components.

For additional information, see "Footnotes" on the next page.

	Accessibility	Bitmap	Database	File Content	Image	Page	Standard	Table	Text	Text Area	XML (Application)	XML (Resource)
.NET Web Forms	NA	NA	NA	NA	NA	S	S	S	S[5]	S[5]	NA	NA
.NET Windows Forms	NA	NA	NA	NA	NA	NA	S	S	S[5]	S[5]	NA	NA
ActiveX	NS	NA	NA	NA	NA	NA	S	S	S	S	NA	NA
Delphi	NS	NA	NA	NA	NA	NA	S	S	S	S	NA	NA
Java	NA	NA	NA	NA	NA	NA	S	NA	S	S[3]	NA	NA
Mobile	NA	NA	NA	NA	NA	NA	S	NA	S	NS	NA	NA
Oracle	NA	NA	NA	NA	NA	NA	S	S	NA	NA	NA	NA
PeopleSoft	NA	NA	NA	NA	NA	S	S	S	S[1]	NS	S	S
PowerBuilder[2]	NA	NA	NA	NA	NA	NA	S	NA	S	S	NA	NA
Qt	NA	NA	NA	NA	NA	NA	S	S	S	S	NA	NA
SAP Web-based	NA	NA	NA	NA	NA	S	S	S	S	NS	S	S
SAP Windows-based	NA	NA	NA	NA	NA	S[4]	S	S	S[4]	NS	S[4]	S

	Accessibility	Bitmap	Database	File Content	Image	Page	Standard	Table	Text	Text Area	XML (Application)	XML (Resource)
Siebel	NA	NA	NA	NA	NA	S	S	S	S	NS	S	S
Silverlight	NA	NA	NA	NA	NA	NA	S	S	S	S	NA	NA
Standard Windows	NA	NA	NA	NA	NA	NA	S	S	S	S	NA	NA
Stingray	NA	NA	NA	NA	NA	NA	S	S	S	S	NA	NA
Terminal Emulator	NA	NA	NA	NA	NA	NA	S[8]	NA	S[7]	NA	NA	NA
VisualAge for Smalltalk	NA	NA	NA	NA	NA	NA	NA	S	S	S	NA	NA
Visual Basic	NA	NA	NA	NA	NA	NA	S	NA	S	S	NA	NA
Web	NA	NA	NA	NA	NA	S	S	S	S[1]	NS	S[6]	NA
Windows Runtime	NA	NA	NA	NA	NA	NA	S	S	S	S	NA	NA
WPF	NA	NA	NA	NA	NA	NA	S	S	S	S	NA	NA

Footnotes

[1] Text output values are supported only for Page, Frame, and ViewLink objects.

[2] When you insert an output value step on a PowerBuilder DataWindow control, UFT treats it as a table and opens the Table Output Value Properties dialog box.

[3] The text area output mechanism for Java Applet objects is disabled by default. You can enable it in the Advanced Java Options dialog box.

[4] This is supported only when UFT records HTML elements using the Web infrastructure, but not when it records using the SAPGui Scripting Interface (as selected in the SAP pane of the Options dialog box).

[5] This is supported only when UFT is configured to use the OCR (optical character recognition) mechanism.

[6] XML output values are not supported on Internet Explorer 9 or later running in standard mode, on Google Chrome, or on Mozilla Firefox, because the WebXML test object is not supported for these browsers.

[7] You can create text output values (tests only) only for TeScreen and TeTextScreen objects.

[8] In the terminal emulator window you can add text checkpoints or output values (tests only) and standard checkpoints and output values for the status bar and the dialog boxes that open from the menu options. UFT recognizes these as standard Windows objects.

Accessing UFT in Windows 8.X or Higher Operating Systems

By default, you can access UFT directly from the **Start** or **Apps** Screen in Windows 8.x or higher.

In addition, you can add UFT tools and files that were accessible from the **Start** menu in previous versions of Windows to the **Start** screen, including:

- **Applications (.exe files).** For example:
  - The Run Results Viewer
  - All UFT tools, such as the Password Encoder and the License Validation Utility
  - The API testing sample Flight applications
- **Non-program files.** You can access documentation and the link to the Mercury Tours Website from the **Apps** screen.

Note: By default, the Start and Apps screens on Windows 8.x or higher are set to open Internet Explorer in Metro Mode. However, if User Account Control is turned off on your computer, Windows 8 will not open Internet Explorer in Metro mode. Therefore, if you try to open an HTML shortcut from the Start or Apps screen, such as the UFT Help or Readme file, an error will be displayed.

To solve this, you can change the default behavior of Internet Explorer so that it never opens in Metro mode. In the **Internet Properties** dialog box > **Programs** tab, select **Always in Internet Explorer on the desktop** for the **Choose how you open links** option. For more details, see http://support.microsoft.com/kb/2736601 and http://blogs.msdn.com/b/ie/archive/2012/03/26/launch-options-for-internet-explorer-10-on-windows-8.aspx.

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