QTP

quicktest professional

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About the Tutorial

HP **Q**uick**T**est **P**rofessional **(QTP)**, an automated functional testing tool that helps testers to perform automated regression testing in order to identify any gaps, errors/defects in contrary to the actual/desired results of the application under test.

This tutorial will give you an in-depth understanding on HP QuickTest Professional, its way of usage, record and play back of tests, object repository, actions, checkpoints, sync points, debugging, test results etc. and other related terminologies.

Audience

This tutorial is designed for Software Testing Professionals with a need to understand the QTP in detail along with its simple overview, and practical examples. This tutorial will give you enough ingredients to start with QTP from where you can take yourself at higher level of expertise.

Prerequisites

Before proceeding with this tutorial, you should have a basic understanding of software development life cycle (SDLC). A basic understanding of VBScript is also required. You can also go through the basics of VBScript here.

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1. QTP – Introduction

QTP stands for **Q**uick**T**est **P**rofessional, a product of **H**ewlett **P**ackard **(HP)**. This tool helps testers to perform an automated functional testing seamlessly, without monitoring, once script development is complete.

HP QTP uses **Visual Basic Scripting (VBScript)** for automating the applications. The Scripting Engine need not be installed exclusively, as it is available as a part of the Windows OS. The Current version of VBScript is 5.8, which is available as a part of Win 7. VBScript is NOT an object-oriented language but an object-based language.

Testing Tools

Tools from a software testing context, can be defined as a product that supports one or more test activities right from planning, requirements, creating a build, test execution, defect logging and test analysis.

Classification of Tools

Tools can be classified based on several parameters. It includes-

- The purpose of the tool
- The activities that are supported within the tool
- The type/level of testing it supports.
- The kind of licensing (open source, freeware, commercial)
- The technology used

Types of Tools

S. No.	Tool Type	Used for	Used by
1.	Test Management Tool	Test Managing, scheduling, defect logging, tracking and analysis.	Testers
2.	Configuration management tool	For Implementation, execution, tracking changes	All Team members
3.	Static Analysis Tools	Static Testing	Developers
4.	Test data Preperation Tools	Analysis and Design, Test data generation	Testers
5.	Test Execution Tools	Implementation, Execution	Testers

6.	Test Comparators	Comparing expected and actual results	All Team members
7.	Coverage measurement tools	Provides structural coverage	Developers
8.	Performance Testing tools	Monitoring the performance, response time	Testers
9.	Project planning and Tracking Tools	For Planning	Project Managers
10.	Incident Management Tools	For managing the tests	Testers

Where QTP Fits in?

QTP is a Functional testing tool, which is best suited for regression testing of the applications. QTP is a licensed/commercial tool owned by HP, which is one of the most popular tools available in the market. It compares the actual and the expected result and reports the results in the execution summary.

QTP – History and Evolution

HP Quick Test Professional was originally owned by Mercury Interactive and it was acquired by HP. Its original name was Astra Quick Test and later named as Quick Test Professional but the latest version is known as Unified Functional Tester (UFT).

Version History

Now let us take a look at the version history of QTP.

Versions	Timelines
Astra Quick Test v1.0 to v5.5 - Mercury Interactive	May 1998 to Aug 2001
QuickTest Professional v6.5 to v9.0 - Mercury Interactive	Sep 2003 to Apr 2006
Hp-QuickTest Professional v9.1 to v11.0 - Acquired and Released by HP	Feb 2007 to Sep 2010
Hp-Unified Functional Testing v11.5 to v11.53	2012 to Nov 2013

Advantages

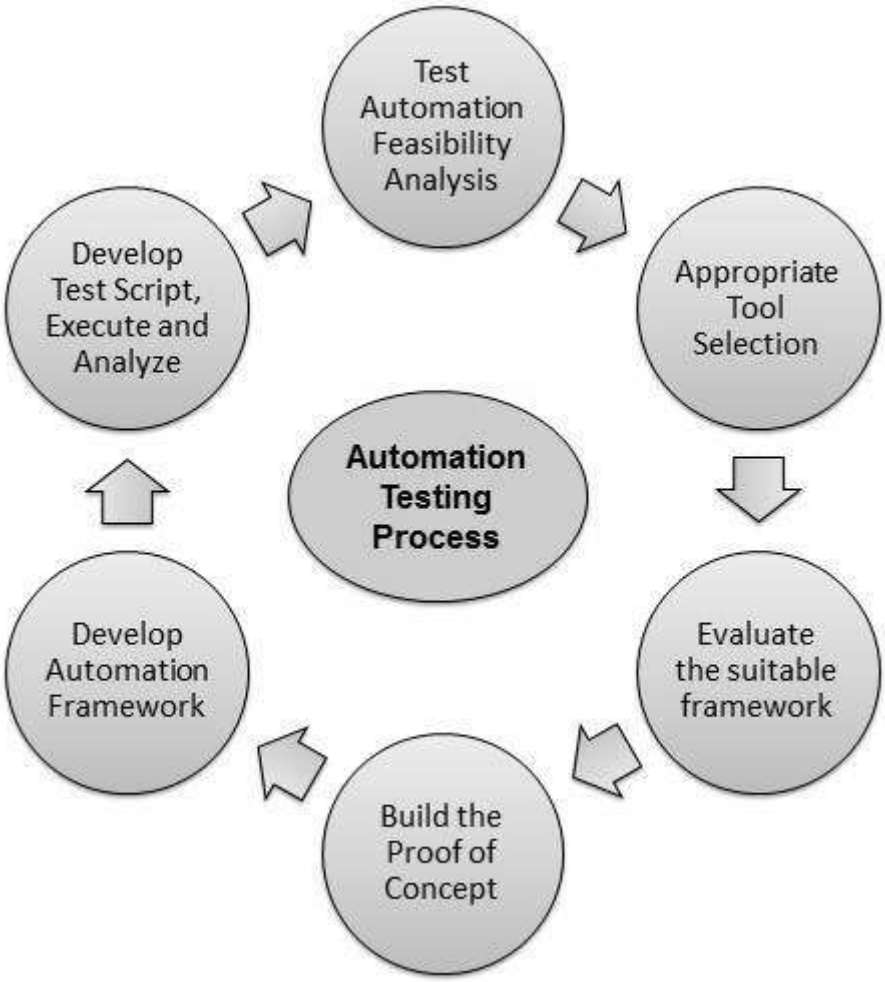
- Developing automated tests using VBScript does not require a highly skilled coder and is relatively easy when compared to other object oriented programming languages.
- Easy to use, ease of navigation, results validation, and Report generation.
- Readily Integrated with Test Management Tool (Hp-Quality Center) which enables easy scheduling and monitoring.
- Can also be used for Mobile Application Testing.
- Since it is an HP product, full support is provided by HP and by its forums for addressing technical issues.

Disadvantages

- Unlike Selenium, QTP works in Windows operating system only.
- Not all versions of Browsers are supported and the testers need to wait for the patch to be released for each one of the major versions.
- Having said, that it is a commercial tool, the licensing cost is very high.
- Even though scripting time is less, the execution time is relatively higher as it puts load on the CPU & RAM.

2. QTP – Automated Testing Process

For any automated tool implementation, the following are the phases/stages of it. Each one of the stages corresponds to a particular activity and each phase has a definite outcome.



- **Test Automation Feasibility Analysis** - First step is to check if the application can be automated or not. Not all applications can be automated due to its limitations.

- **Appropriate Tool Selection** - The next most important step is the selection of tools. It depends on the technology in which the application is built, its features and usage.

- **Evaluate the suitable framework** - Upon selecting the tool, the next activity is to select a suitable framework. There are various kinds of frameworks and each framework has its own significance. We will deal with frameworks in detail later in this tutorial.

- **Build Proof of Concept** - Proof of Concept (POC) is developed with an end-to-end scenario to evaluate if the tool can support the automation of the application. It is performed with an end-to-end scenario, which ensures that the major functionalities can be automated.

- **Develop Automation Framework** - After building the POC, framework development is carried out, which is a crucial step for the success of any test automation project. Framework should be built after diligent analysis of the technology used by the application and also its key features.

- **Develop Test Script, Execute, and Analyze** - Once Script development is completed, the scripts are executed, results are analyzed and defects are logged, if any. The Test Scripts are usually version controlled.

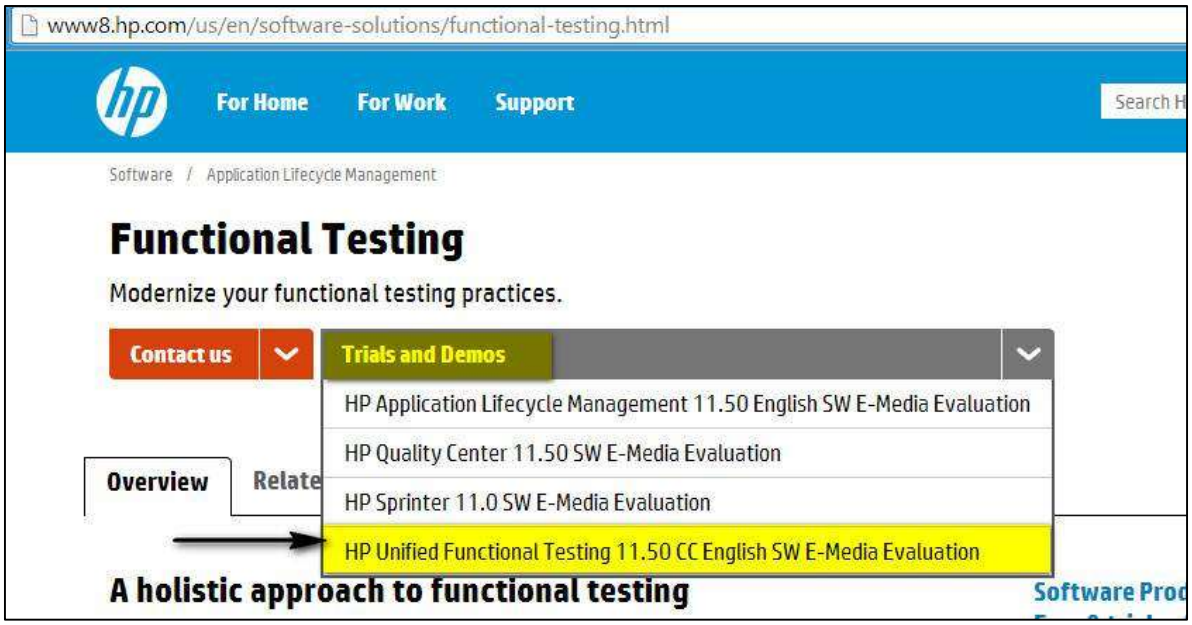
3. QTP – Environment Setup

QTP is a commercial tool and the trial version can be downloaded from HP site directly. Only the current version, which is Unified functional testing (11.5x) is available for download. Following is the URL from where the trial version can be downloaded.

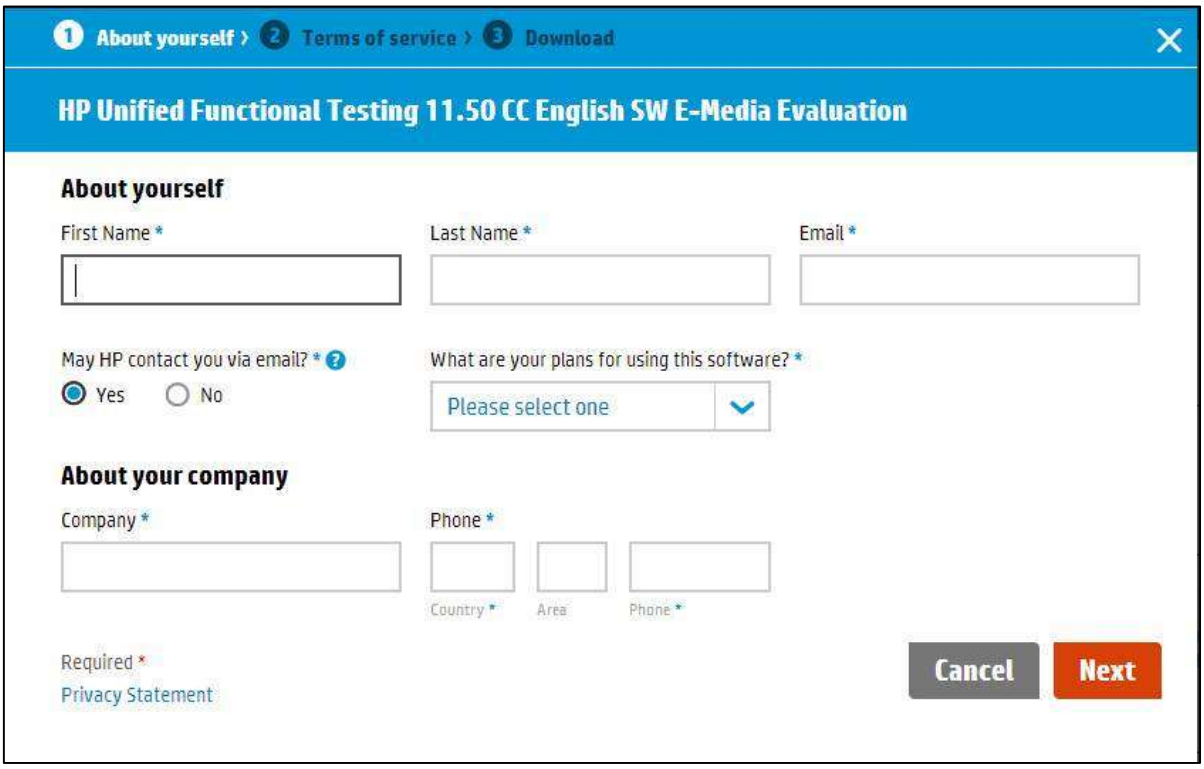
The Download URL : http://www8.hp.com/us/en/software-solutions/functional-testing.html

Installation Procedure

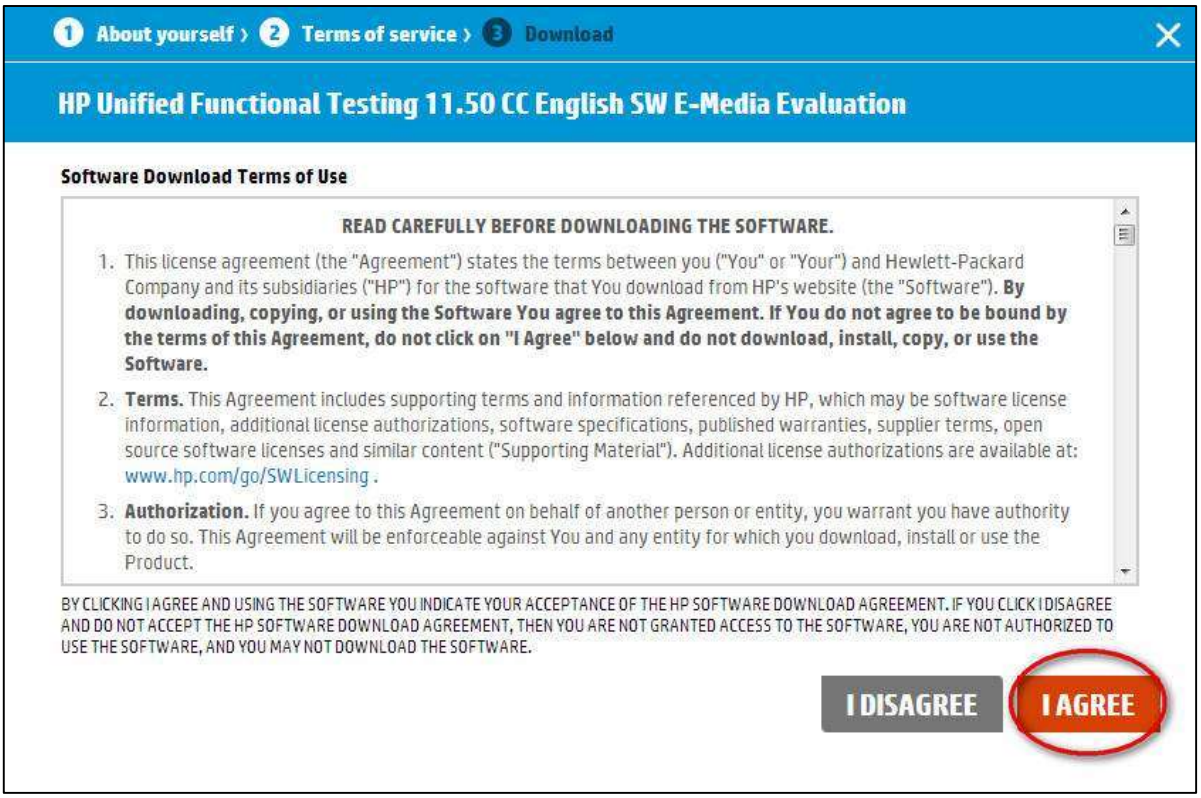
Step 1 – Click the "Trials and Demos" link and select "HP Unified Functional Testing 11.50 CC English SW E-Media Evaluation" as shown below:



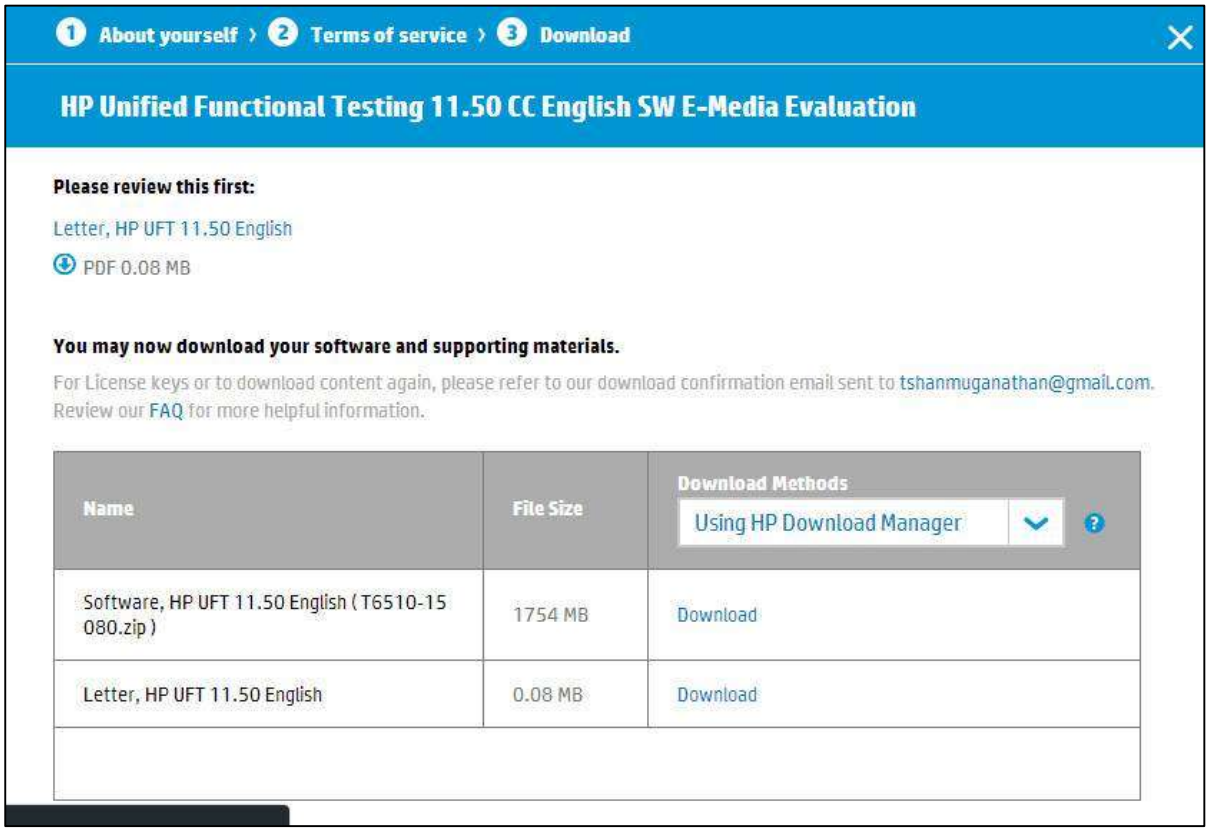
Step 2 - After Selecting "HP Unified Functional Testing 11.50", the download wizard opens. Fill in the Personal details and click Next.



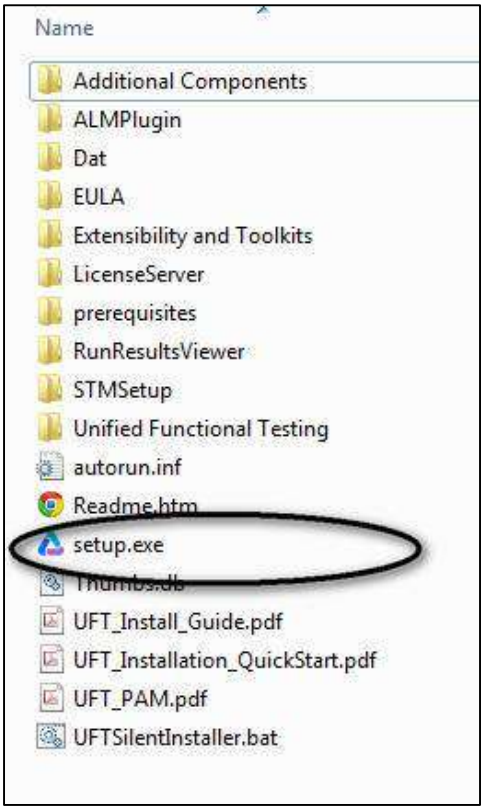
Step 3 - Read the 'Terms of Use' and click "NEXT".



Step 4 – The Download window opens. Now, click the "Download" button.

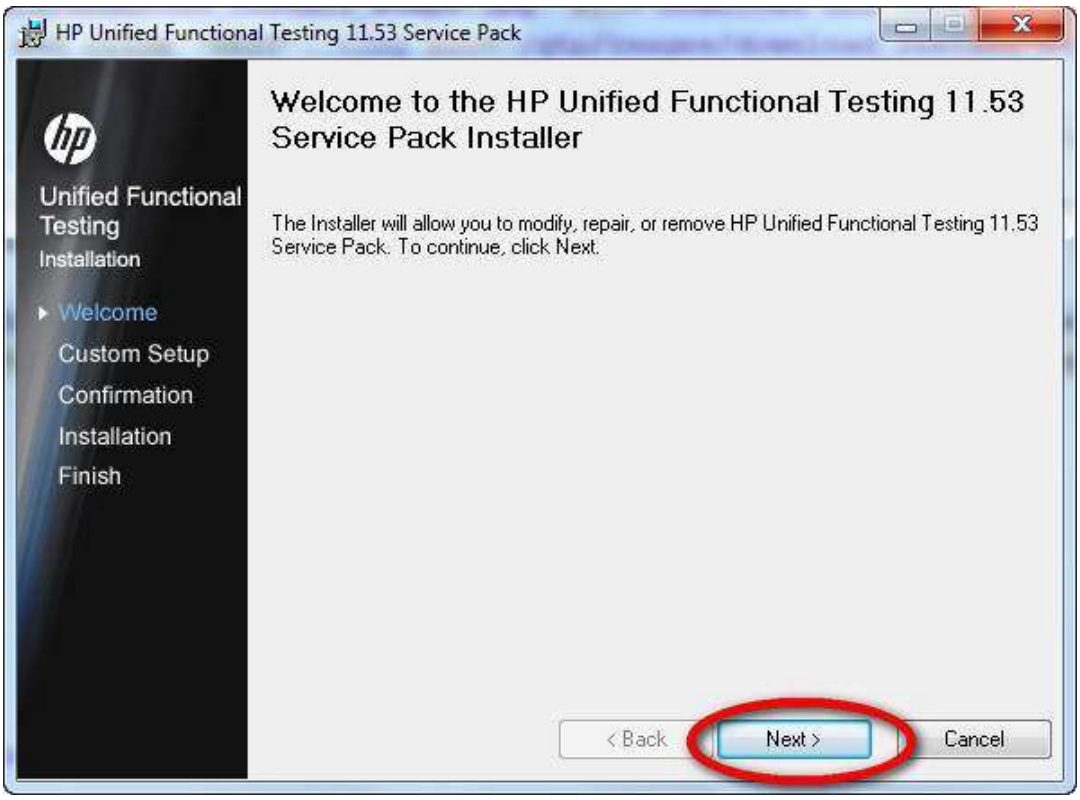


Step 5 - The downloaded file will be of the format .RAR. Now you need to unzip the archive and the folder contents would be as shown below and execute the Setup.exe.

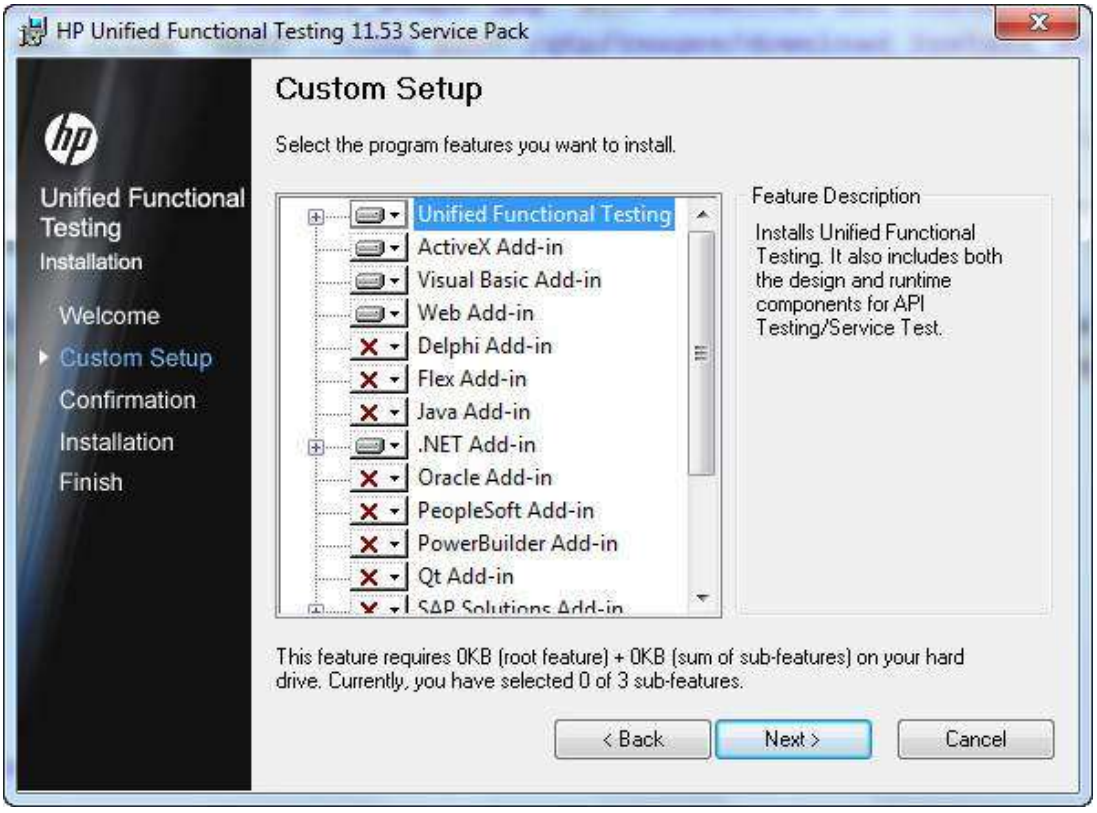


Step 6 - Upon Executing the Setup File, in order to install, select "Unified Functional Testing Set up" from the list as shown below:

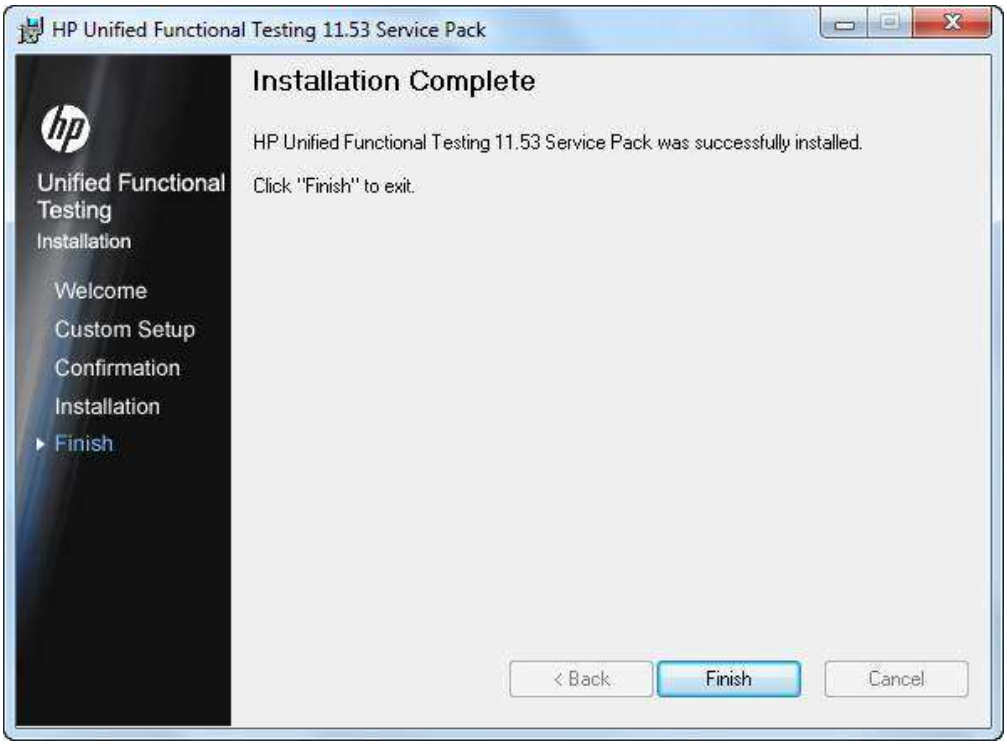
Step 7 - Then click Next to continue.



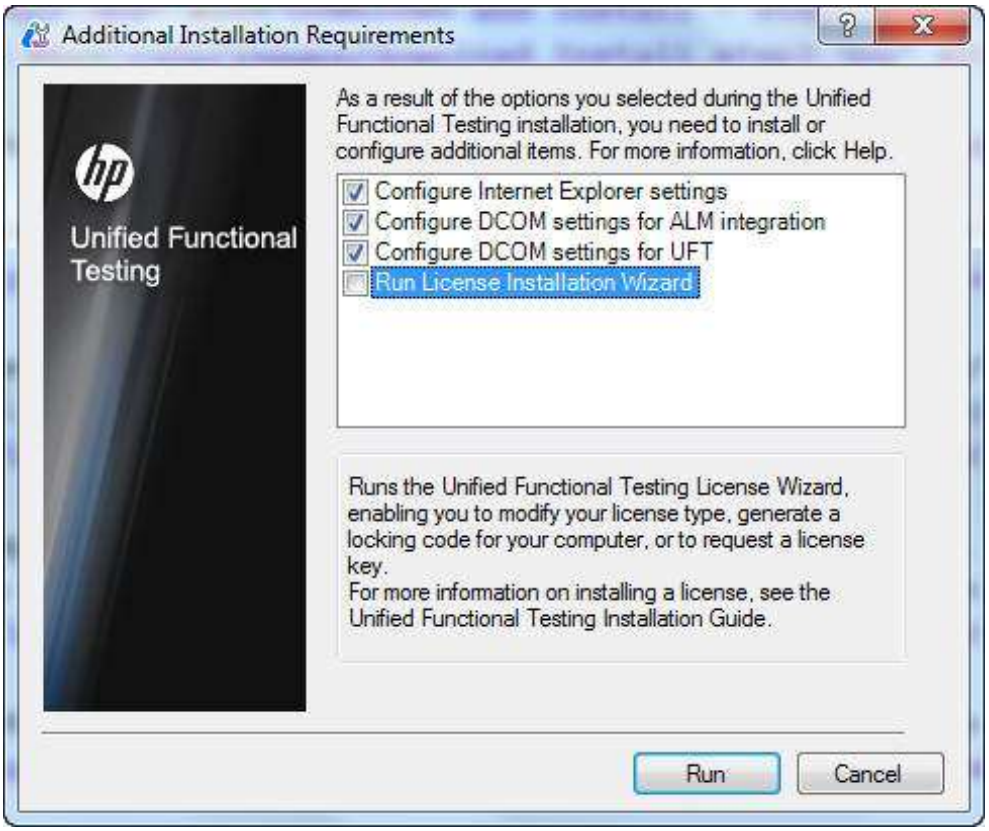
Step 8 - In the Custom Set up Window, select the plugins that are required for your automation i.e. you should select the plugins based on the technology of your application under test. For Example, if your application is based on .NET then you should ensure that you select .NET.



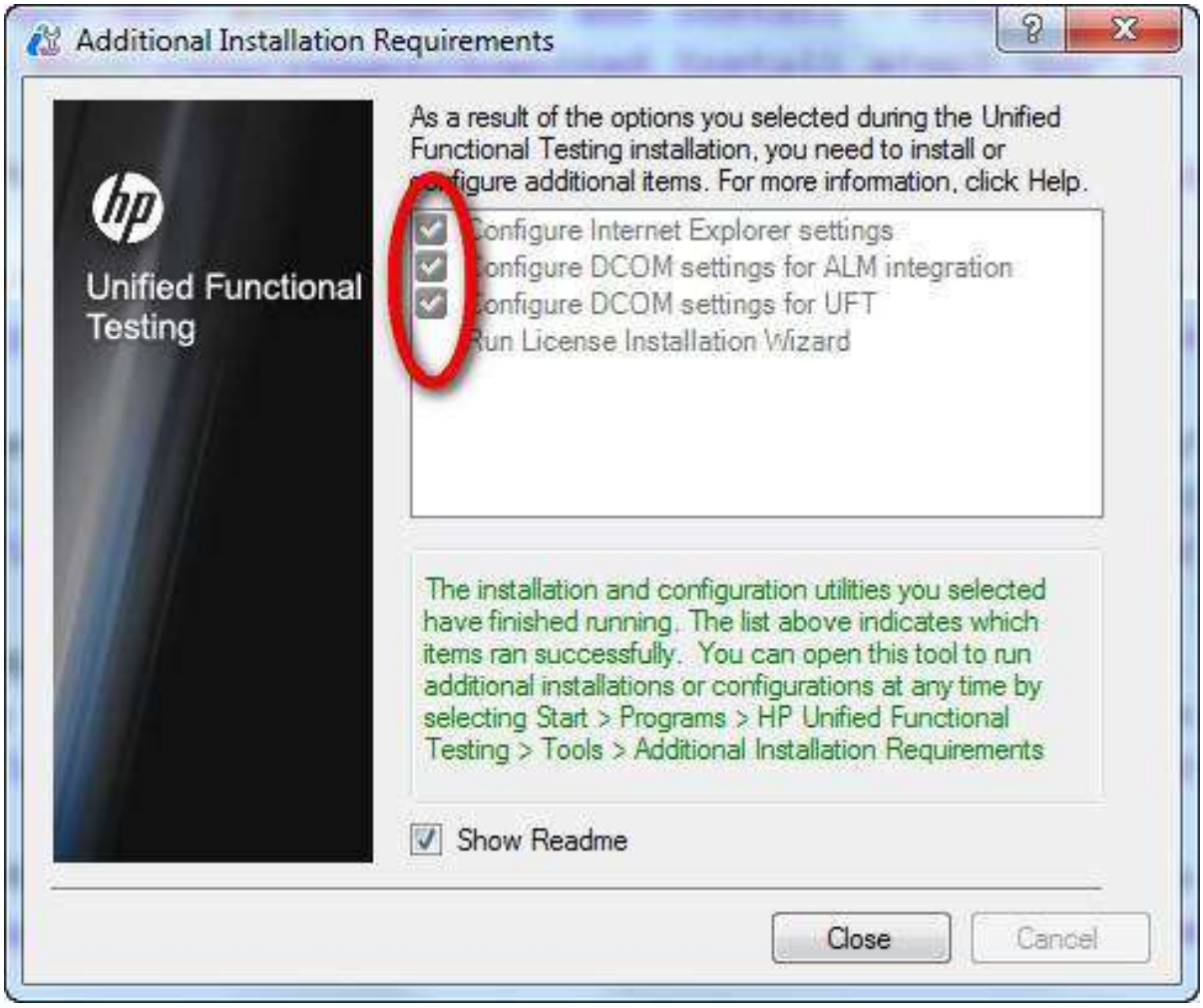
Step 9 - After selecting the required plugins for installation, click Next. After the completion of installation, you will end up with a Finish button Window.



Step 10 - Once you complete your installation, the "Additional Installation Requirements" Dialog box opens. Select everything in the list other than "Run License Installation Wizard" and click "RUN". We Need NOT select "Run License Installation Wizard" because we are installing the trial version, which, by default, gives a license for 30 days.

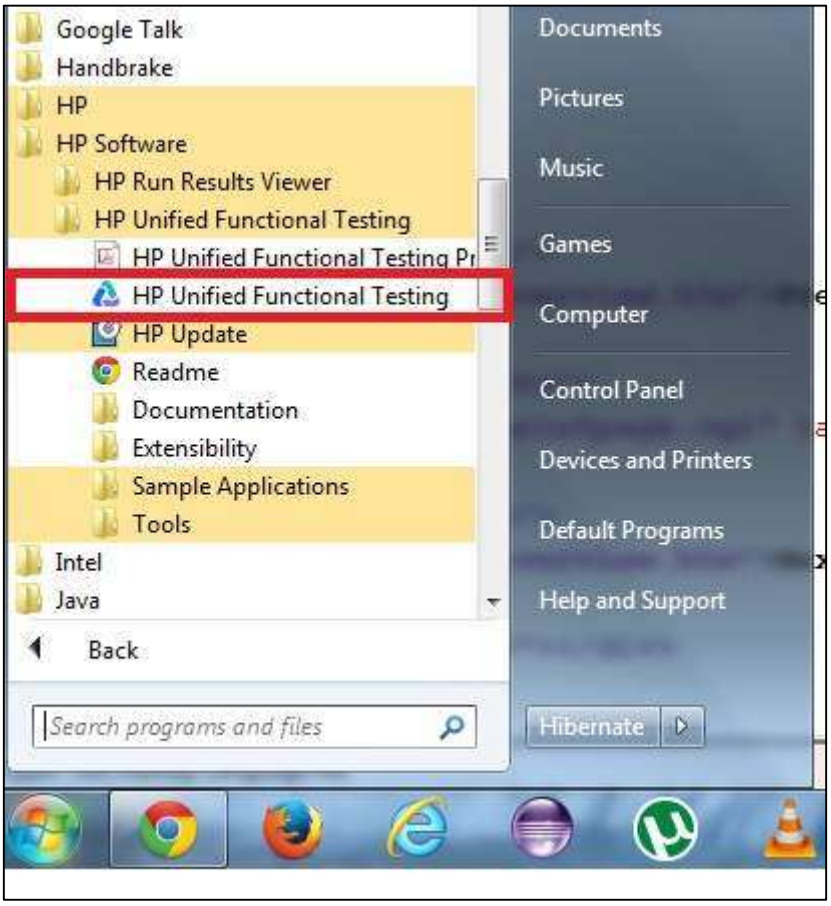


Step 11 – After the completion of Additional Installation Requirements, a tick mark is shown, which in turn states that the components are installed successfully. Now, click Close.



Launching UFT and Add ins Page

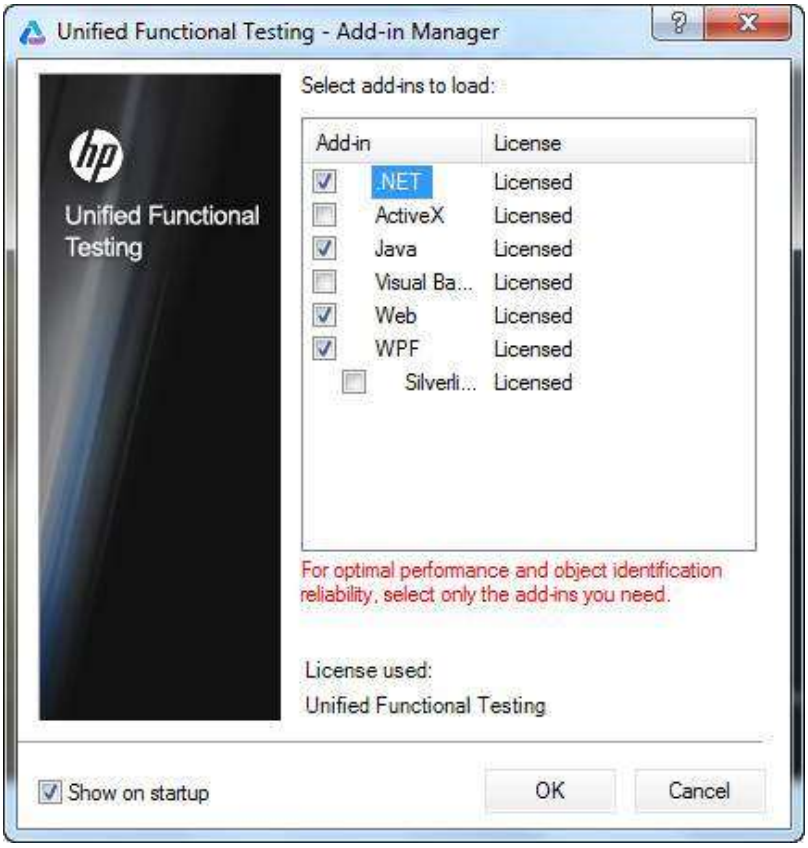
Step 1 - After Installation, application can be launched from the Start Menu as shown in the figure.



Step 2 - The license page appears. You can click Continue as we have installed the trial license.

Step 3 - The Add-ins dialog box opens for the user to select the required add-ins.

Note: Do not load all the add-ins but just the required add-ins and click OK.



Step 4 - After loading the required add-ins, the UFT 11.5 tool opens for the user and the first glimpse of the UFT looks, as shown below:

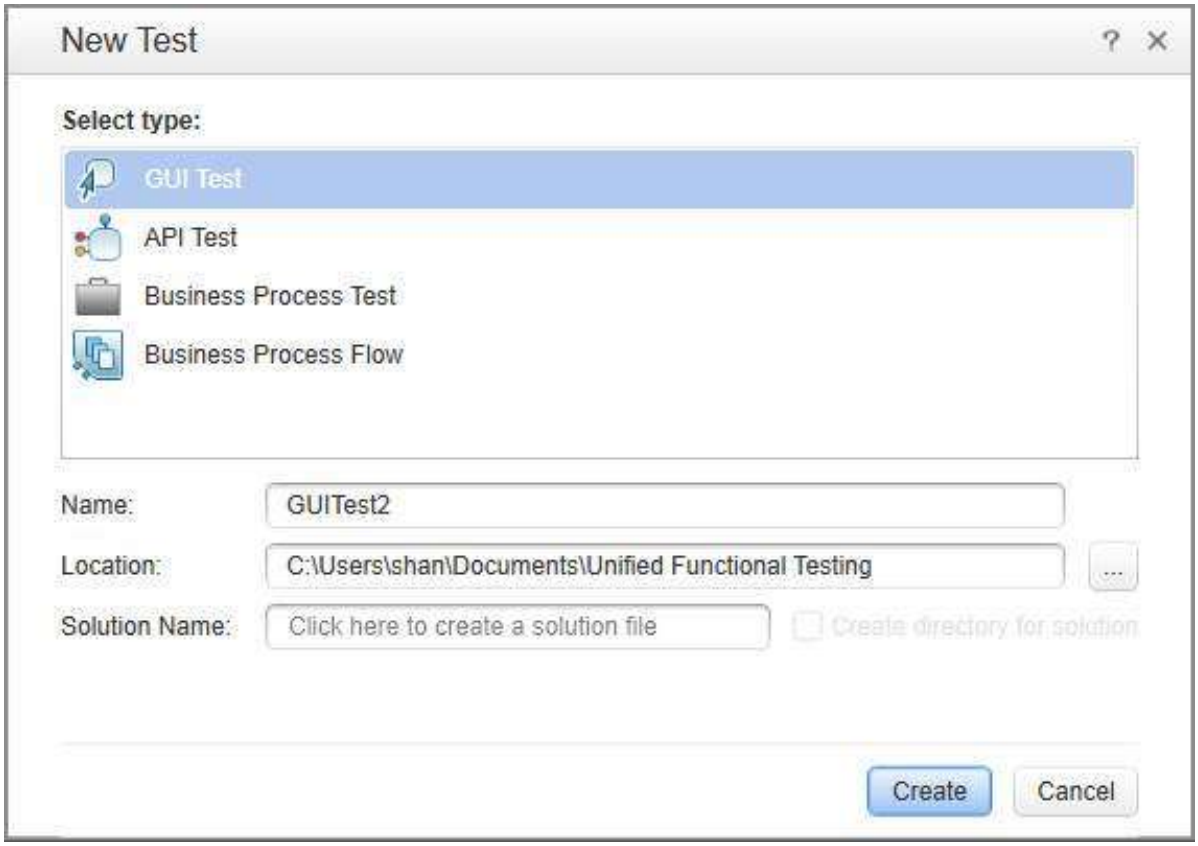
4. QTP – Record and Playback

Recording a test corresponds to recording the user actions of the application under test so that UFT automatically generates the scripts that can be played back. Record and Playback can give us the first impression of the tool, whether it can support the technology or not, if the initial settings are done correctly.

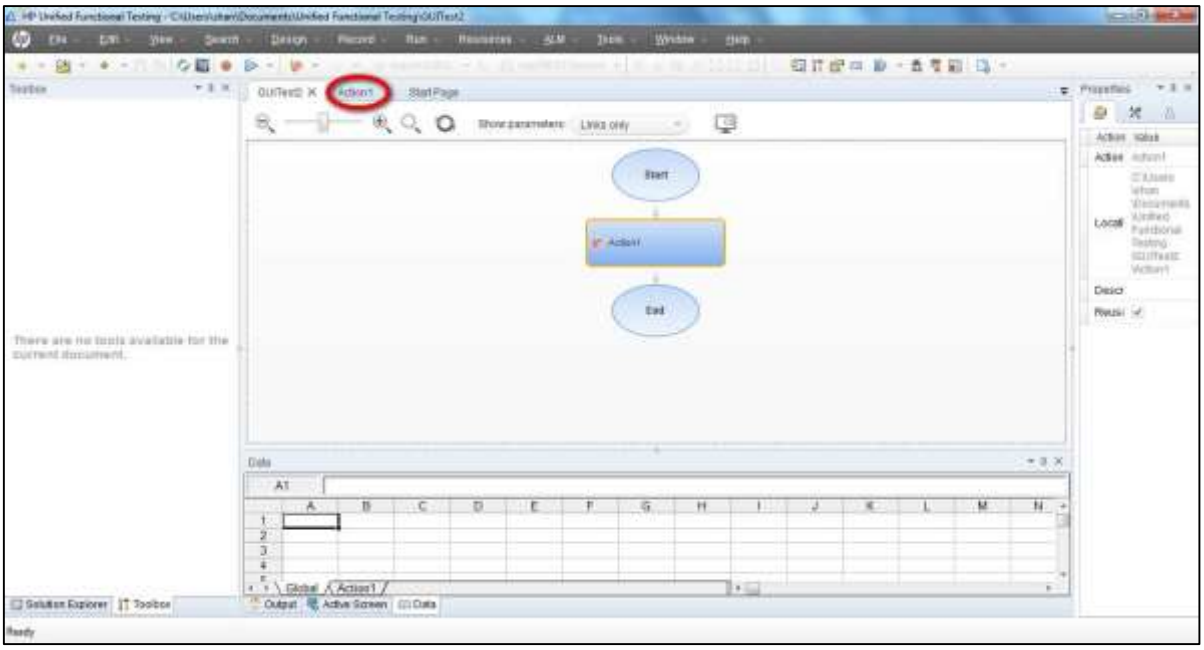
Steps for Record and Playback are as follows:

Step 1 : Click "New" test from the Start Page as shown below:

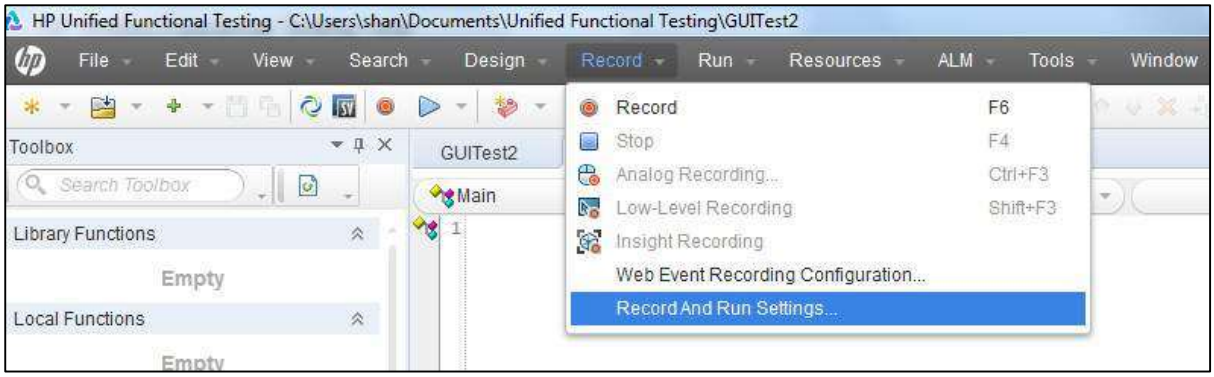
Step 2 : Clicking "New" Link, a new test window opens and the user needs to select the test type. Select "GUI Test", give a name for the test and the location where it needs to be saved.



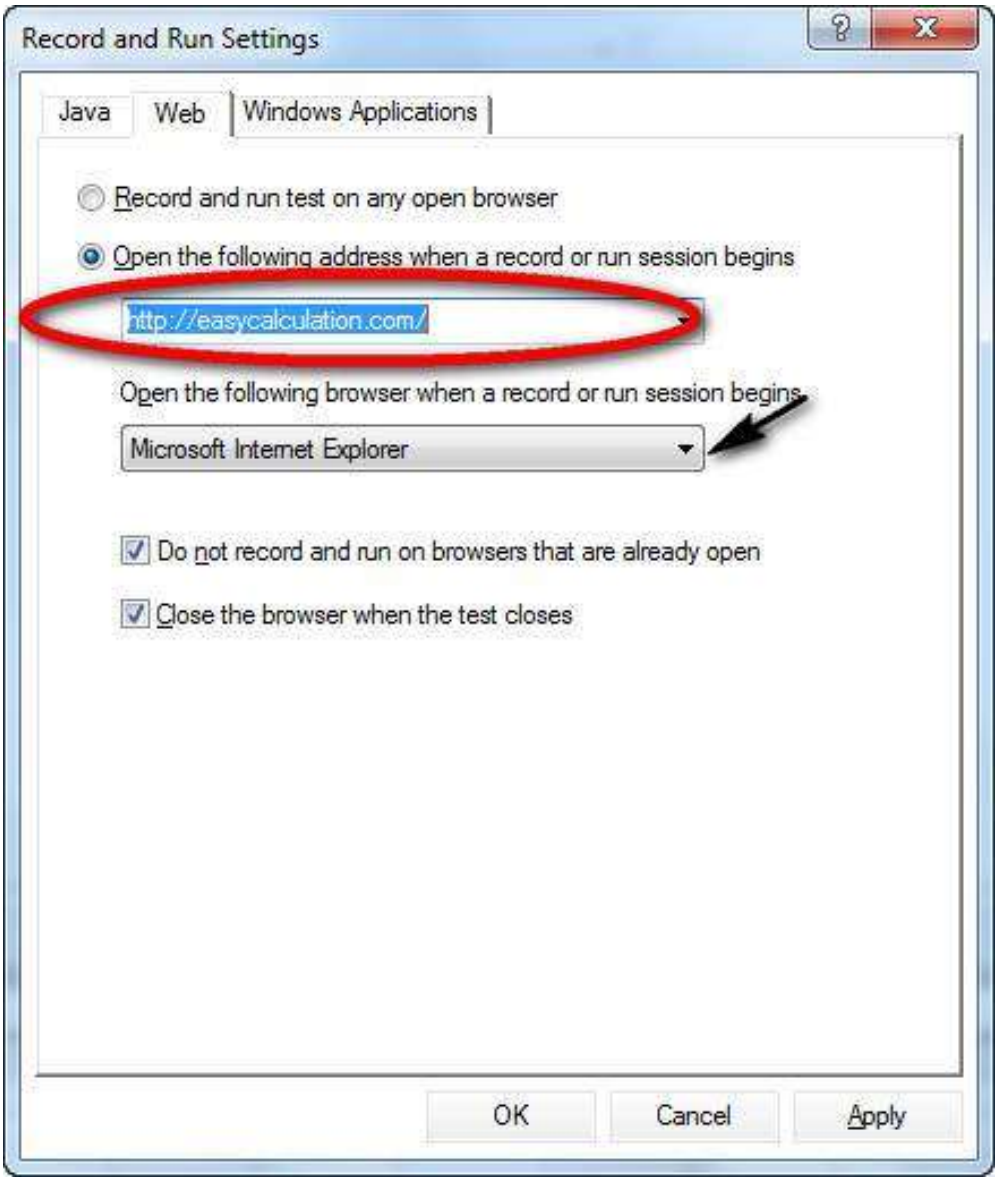
Step 3 : Once a New test is created, the new test screen opens as shown below. Now, click the "Action1" tab, which is created with 1 action by default.



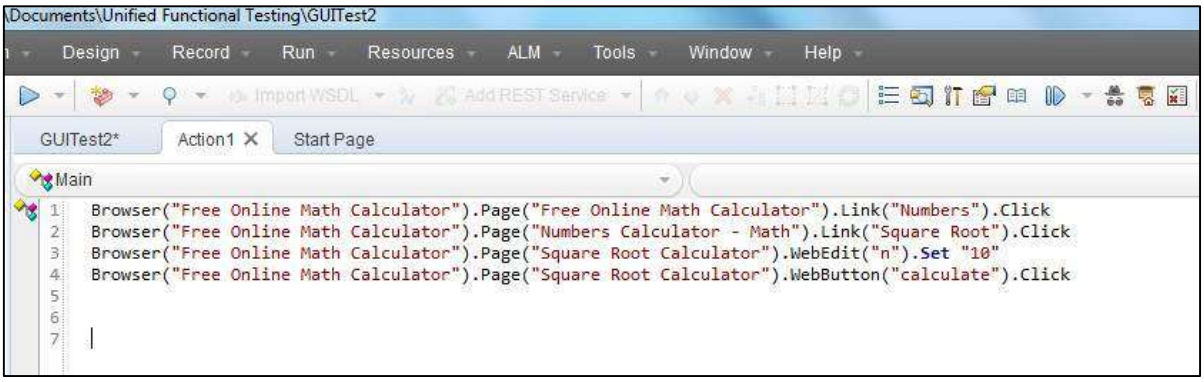
Step 4 : Click the "Record" Menu and select "Record and Run Settings" as shown below:



Step 5 : The Record and Run Settings dialog box opens and based on the type of application, one can select Web, Java, or Windows Applications. For Example, here, we will record a Web Based Application (http://easycalculation.com/).

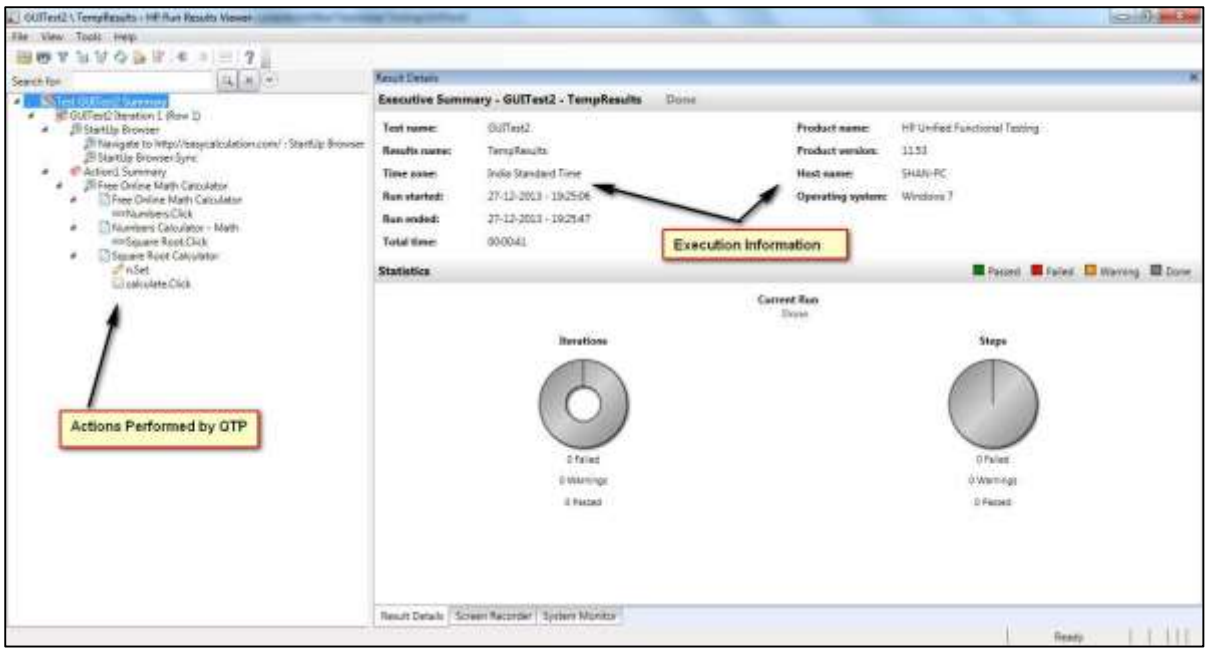


Step 6 : Click Record. The Internet Explorer opens automatically with the web address http://easycalculation.com/ as per the settings. Click the "Numbers" link under "Algebra" and key in a number and hit "Calculate". After completion of the action, click the "Stop" button in the record panel. You will notice that the script is generated as shown below:



Step 7 : Now playback the script by clicking the playback button. The Script replays and the result is displayed.

Step 8 : The result window is opened, by default, which exactly shows the timestamp of execution, pass and failed steps.



Significance of Record and Playback:

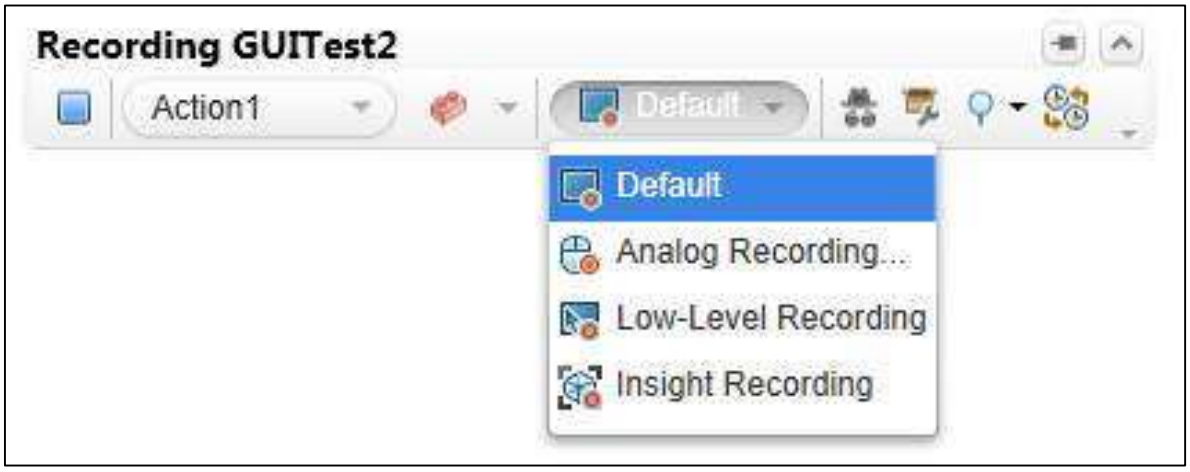
- It is used as the preliminary investigation method to verify if UFT can support the technology/application.
- Used to create a test a basic functionality of an application or feature that does not require long-term maintenance.
- It can be used for recording both mouse movements and keyboard inputs.

Modes of Recording

- **Normal Recording** : This is the default Recording mode that records the objects and the operations performed on the application under test.
- **Analog Recording** : This records not only the keyboard actions but also the mouse movements relative to the screen or the application window.
- **Low-Level Recording** : This records the exact co-ordinates of the objects independent of the fact whether UFT recognizes the object or NOT. It just records the co-ordinates, hence does NOT record mouse movements.
- **Insight Recording** : UFT records operations, based on its appearance and not based on its native properties.

How to Choose Recording Modes

After clicking the Recording button, the user can choose the recording mode from the recording pane that appears on the screen, once the recording starts. The selection can be made from any the ones that has been discussed above.



You will see that the following scenario is recorded in all the modes and the same action has been recorded under various circumstances.

- Launch IE - http://easycalculation.com/
- Click "Numbers" under "Algebra"
- Click "Square Root" link

- Enter a value to calculate the square root. Let us say 10
- Hit Calculate

Script Recorded under Default, Analog and Low Level recording mode is given below-

```
' DEFAULT RECORDING MODE

Browser("Free Online Math Calculator").Page("Free Online Math
Calculator").Link("Numbers").Click

Browser("Free Online Math Calculator").Page("Numbers Calculator -
Math").Link("Square Root").Click

Browser("Free Online Math Calculator").Page("Square Root
Calculator").WebEdit("n").Set "10"

Browser("Free Online Math Calculator").Page("Square Root
Calculator").WebButton("calculate").Click

' ANALOG RECORDING MODE

Desktop.RunAnalog "Track1"

' LOW LEVEL RECORDING MODE

Window("Windows Internet Explorer").WinObject("Internet Explorer_Server").Click
235,395

Window("Windows Internet Explorer").WinObject("Internet Explorer_Server").Click
509,391

Window("Windows Internet Explorer").WinObject("Internet Explorer_Server").Click
780,631

Window("Windows Internet Explorer").WinObject("Internet Explorer_Server").Type
"10"

Window("Windows Internet Explorer").WinObject("Internet Explorer_Server").Click
757,666
```

The recordings using insight recording mode will be as shown below:

```
' INSIGHT RECORDING MODE

Browser("Free Online Math Calculator").InsightObject(  ).Click

Browser("Free Online Math Calculator").InsightObject(  ).Click

Browser("Free Online Math Calculator").InsightObject(  ).Click
Browser("Free Online Math Calculator").InsightObject(  ).Click
Window("Windows Internet Explorer").WinObject("Internet Explorer_Server").Type "10"

Browser("Free Online Math Calculator").InsightObject(  ).Click

Browser("Free Online Math Calculator").InsightObject(  ).Click
```

5. QTP – Object Repository

Object Repository

Object Repository is a collection of object and properties with which QTP will be able to recognize the objects and act on it. When a user records a test, the objects and its properties are captured by default. Without understanding objects and its properties, QTP will NOT be able to play back the scripts.

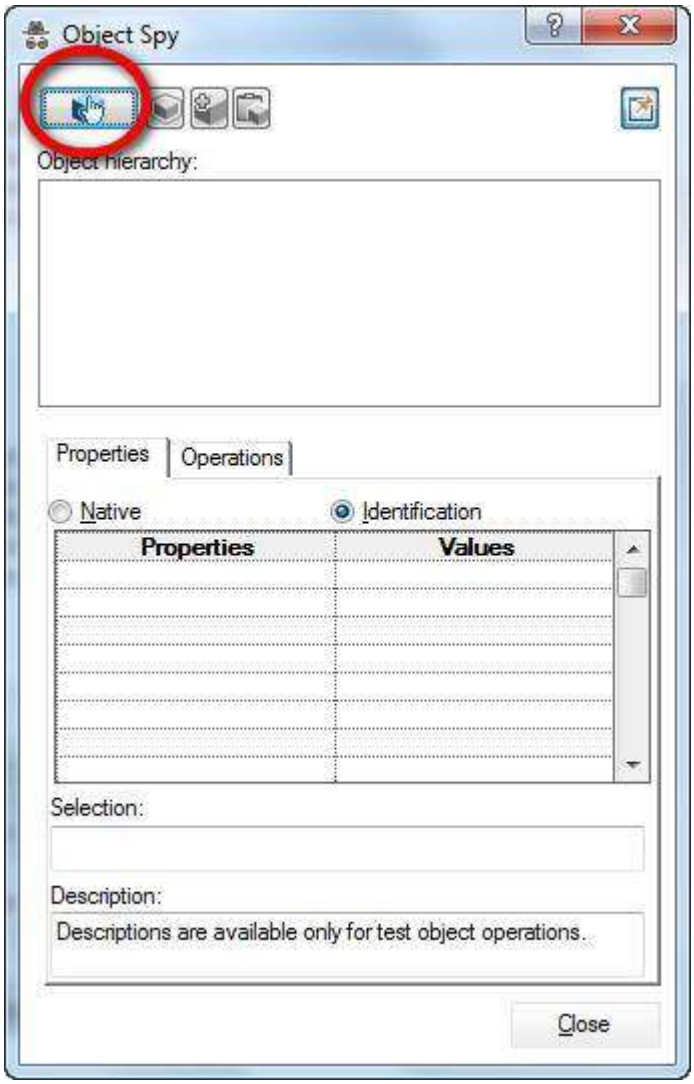
Click on each one of the following topics to know more about Object Repository and its associated features.

Topic	Description
Object Spy and its Features	To understand the usage of object spy and its associated functionalities.
Working with Object Repository	Adding, editing, deleting objects from an Object Repository and its associated functionalities.
Types of Object Repository	Deals with shared Object and local Object Repository and their context with respect to scripting.
User-defined Objects	Deals with the circumstances to use the User-Defined Objects.
Object Repository in XML	Deals with converting OR's to XML and using the object Repository as XML.
Comparing and Merging OR	Operations such as Compare OR', Merge OR's to effectively work with Object Repository.
Ordinal Identifiers	Circumstances where the ordinal identifiers are used and its advantages.
Child Objects	Using Child Objects for effective scripting

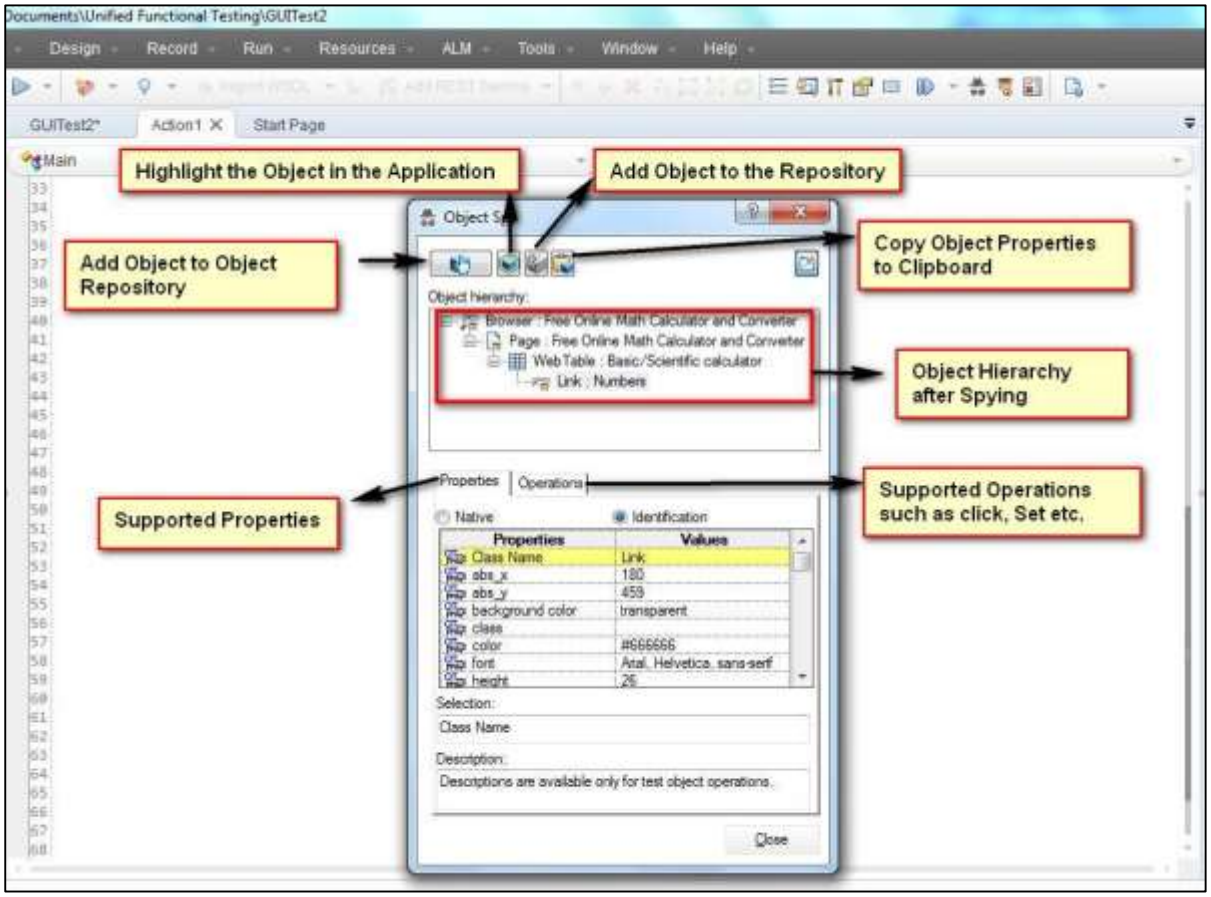
QTP – Object Spy

Object Spy is a utility/option within QTP to add objects to the Object Repository. Object Spy can be accessed from the tool bar as shown below:

Step 1 : Clicking the Object Spy icon, the Object Spy Dialog box opens. The Objects can be added to the repository on clicking the pointing hand.



Step 2 : After Spying the object, the object hierarchy will be shown. Let us say, we are spying the "Numbers" link at "http://easycalculation.com/". The Object properties will be as shown below.

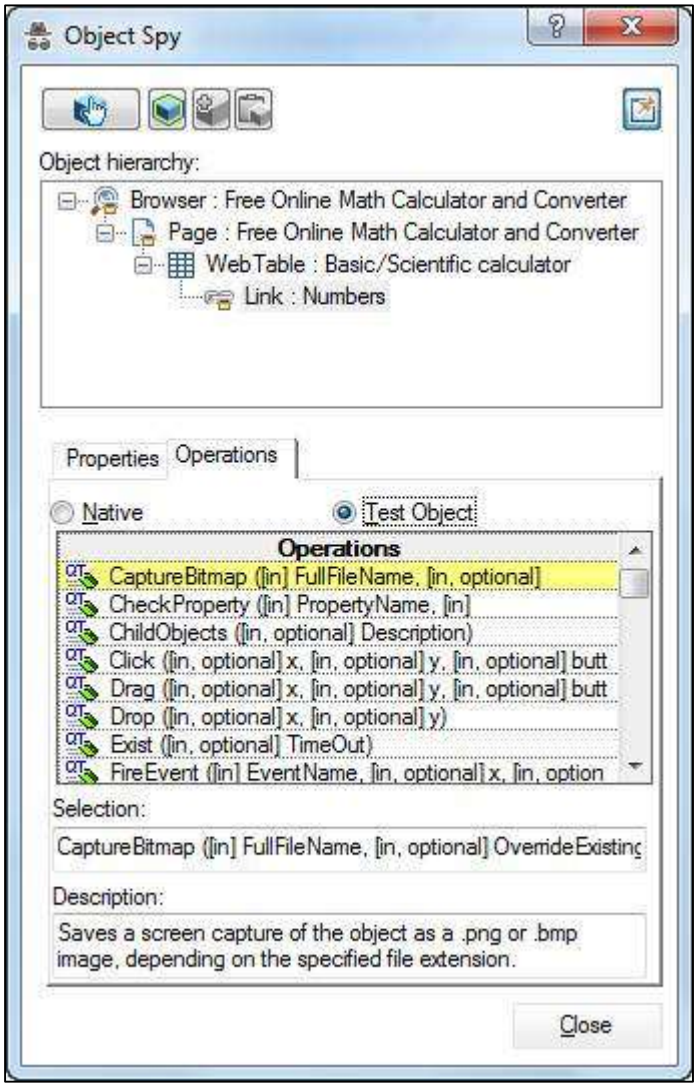


Step 3 : After Spying an object, click the "Highlight" option to highlight the object in the application.

Step 4 : For adding the object into the Object Repository, click the "Add objects" button in the Object spy dialog.

Step 5 : The properties and its values are displayed for the selected object in the dialog box, which should be unique for QTP, to recognize the objects while the script executes.

Step 6 : The supported operations on the object can be retrieved by clicking the operation tab. Operations such as "click" for a button, "Set" for a text box are retrieved from the "operations" tab as shown below:



QTP – Working with Object Repository

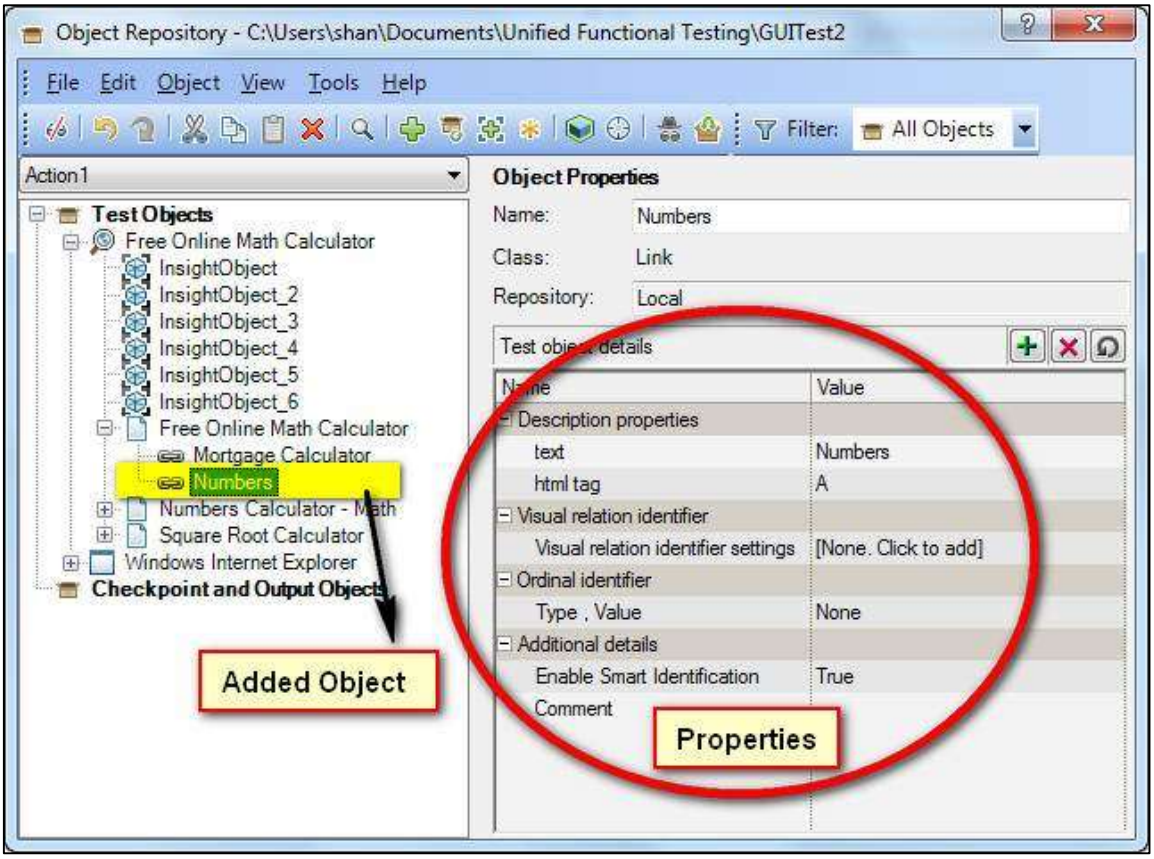
Adding Objects into OR

After Spying the object, adding the objects into Repository is the first step. The script can execute successfully if and only if the objects are added into the Object Repository. Upon Clicking "Add Objects to OR", the objects are added into Object repository.

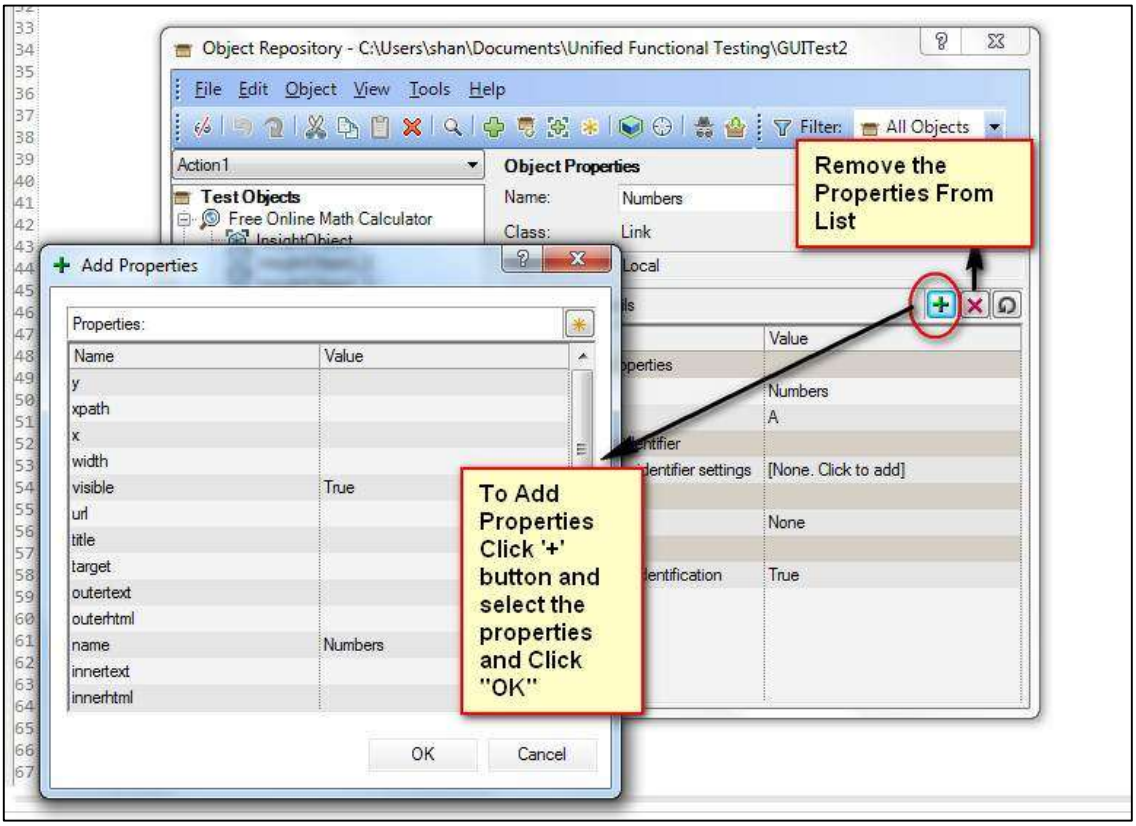
Even when a user does a recording, the objects and its properties are captured automatically. Hence, we are able to replay the script successfully.

Object Repository – Features

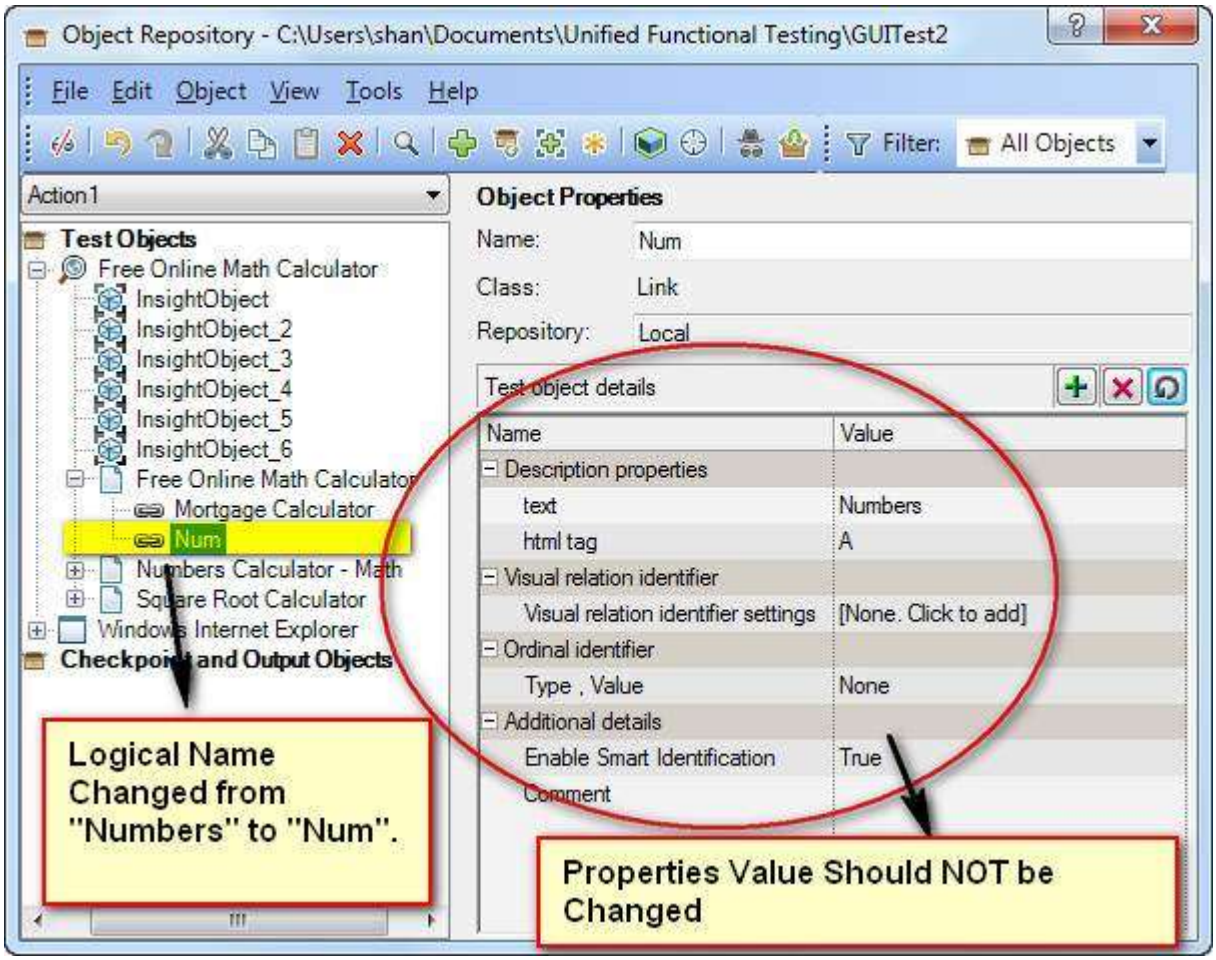
Step 1: After adding objects to the OR, we can verify by navigating to "Resources" -> "Object Repository". The Object Repository Window opens and we can locate the added object in the Repository as shown below:



Step 2: One can add the properties additionally apart from the default ones by clicking the "+" button and remove it using the "x" button. If we want to restore the defaults, we can click on the "circular arrow" button.

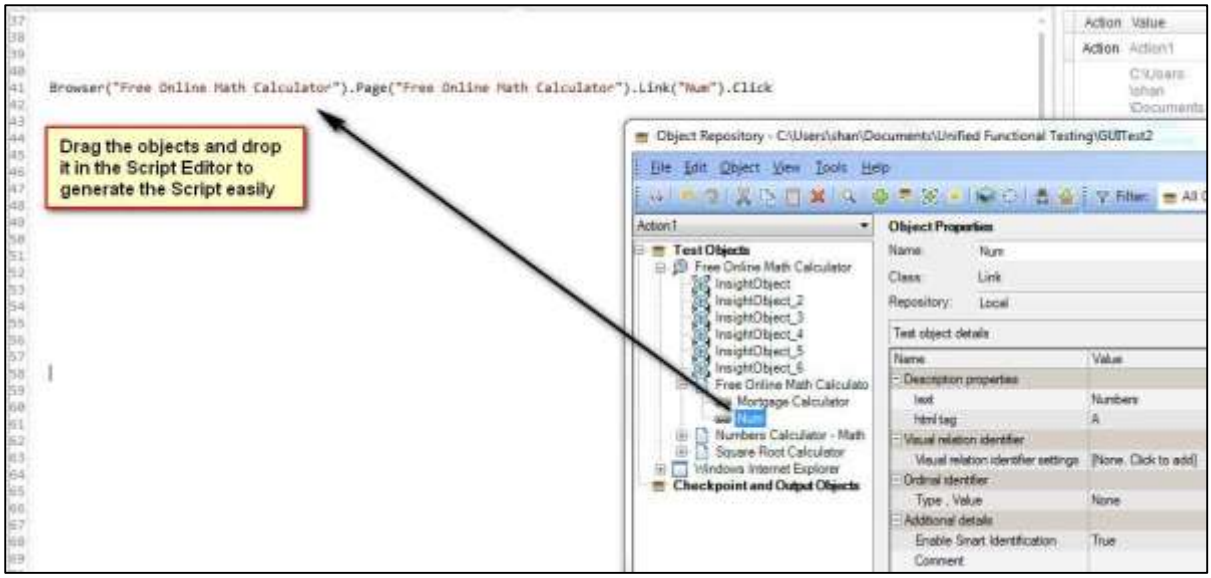


Step 3: One can change the object's name. Here the name of the object is "Numbers" that can be renamed to "num", which will not have any effect on identifying the object uniquely. If there is a change in logical name, the same name should be used while scripting. Only the Object's Name can be changed and not its properties.



Note: Properties of any object must be unique so that QTP will be able to recognize the objects and act on it. If the object properties were same for two or more objects, then during execution an error would be thrown that "More than one object is matched for the specified properties".

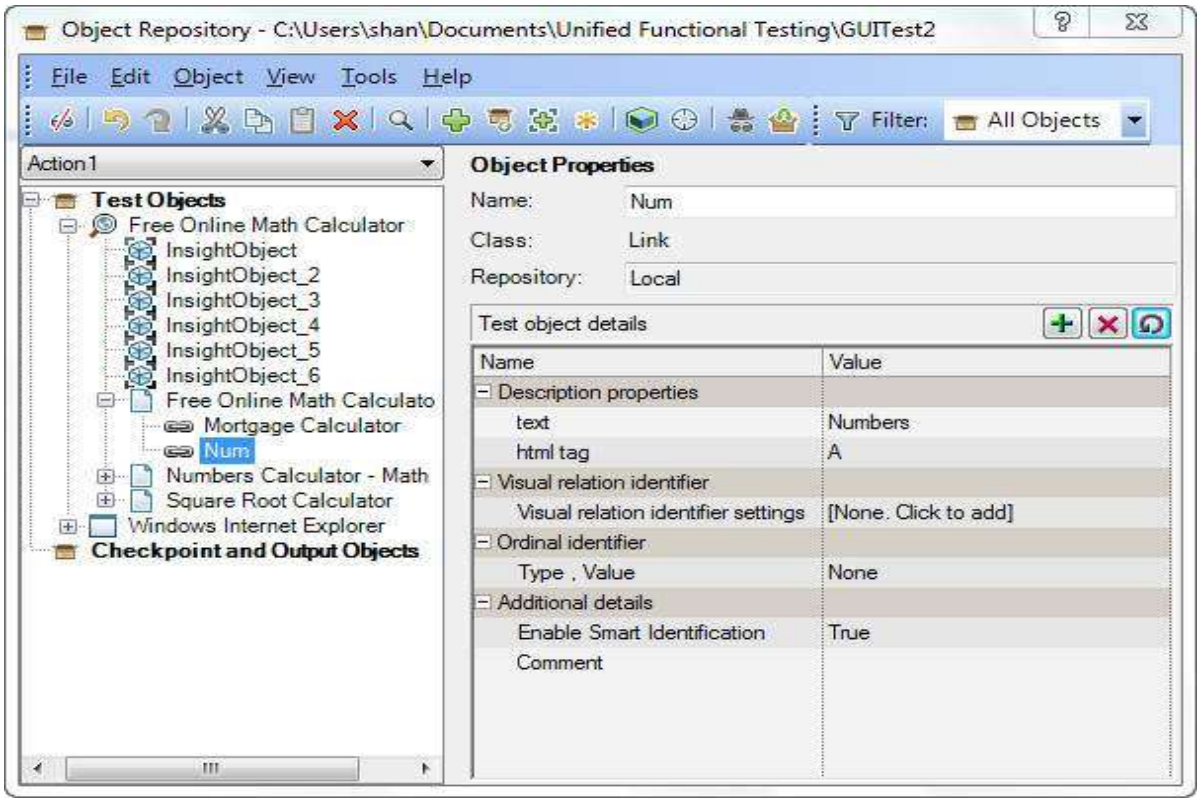
Step 4: After adding the objects, the same can be used in script by simple drag-drop as shown in the figure. When the object is dragged and dropped, the default operation is set. For example, click for a button, Set for a Text Box etc.



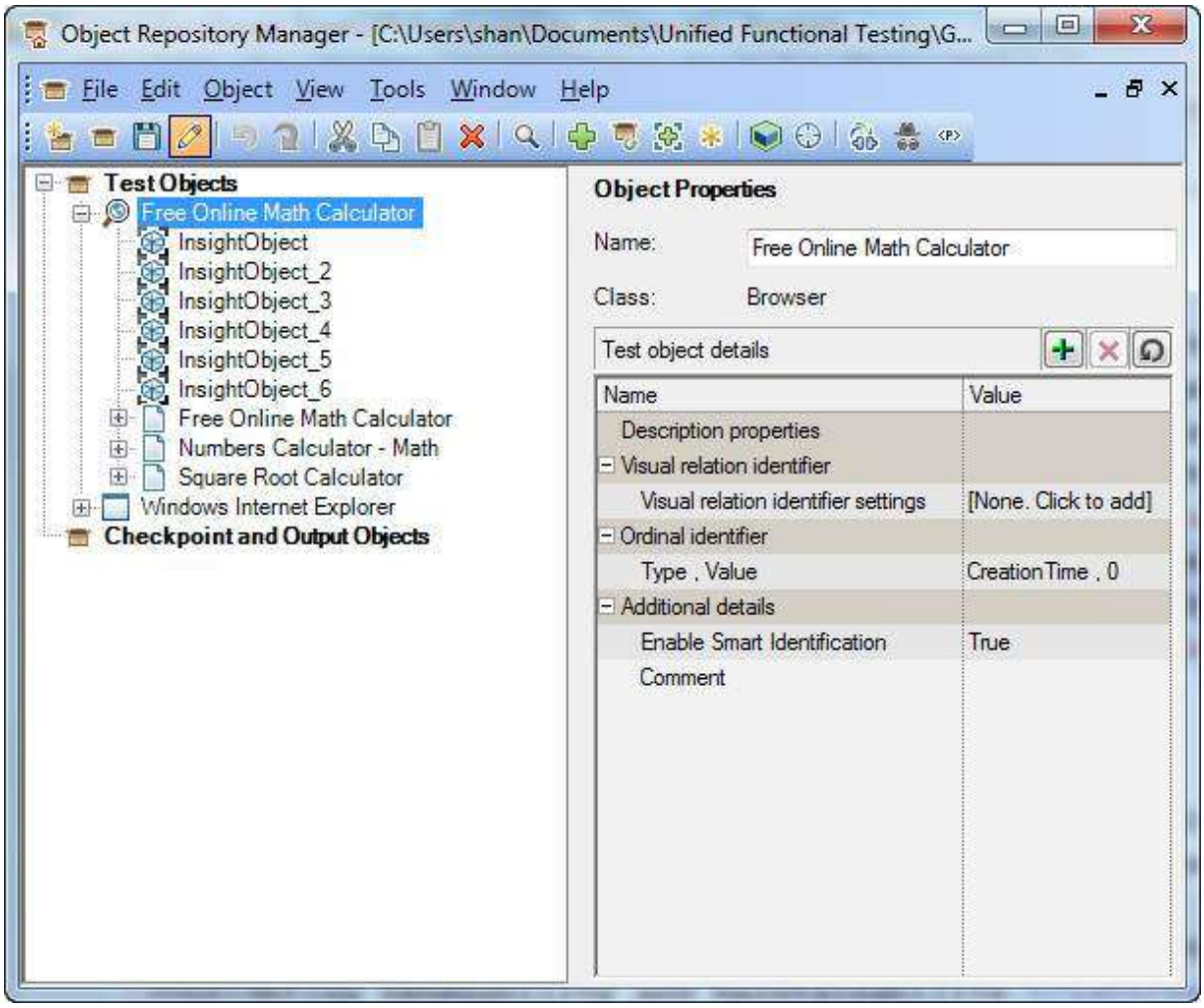
QTP – Object Repository Types

Based on Context, the Object Repository is of two types.

Local Object Repository - As the name suggests, the Object Repository is applicable only for that action. As we know, that QTP creates a New Test with 1 action by default. Local Object Repository can be opened by traversing to Resources → Object Repository. This is the default OR in QTP.



Shared Object Repository - The Object Repository is shared across actions/modules, which would be mapped for two or more actions. Local objects can be exported to be saved into Shared Object Repository by using the option "Export Local Objects" option. Shared Object Repository can be opened by traversing to Resource → Object Repository Manager



Following are the major difference between Local and shared ORs.

Local Object Repository (LOR)	Shared Object Repository (SOR)
This Object Repository is available; one for each action.	This type of OR is available for multiple tests and for multiple actions.
This is the OR that is available for each tests, by default.	This type of OR is usually used in frameworks considering reusability and maintainability.
Local Object Repository is editable in Object Repository.	Shared Object Repository is read-only by default but can be edited in Object Repository Manager.
It is NOT a standalone file that can edited.	SOR is a standalone file that can be edited easily.

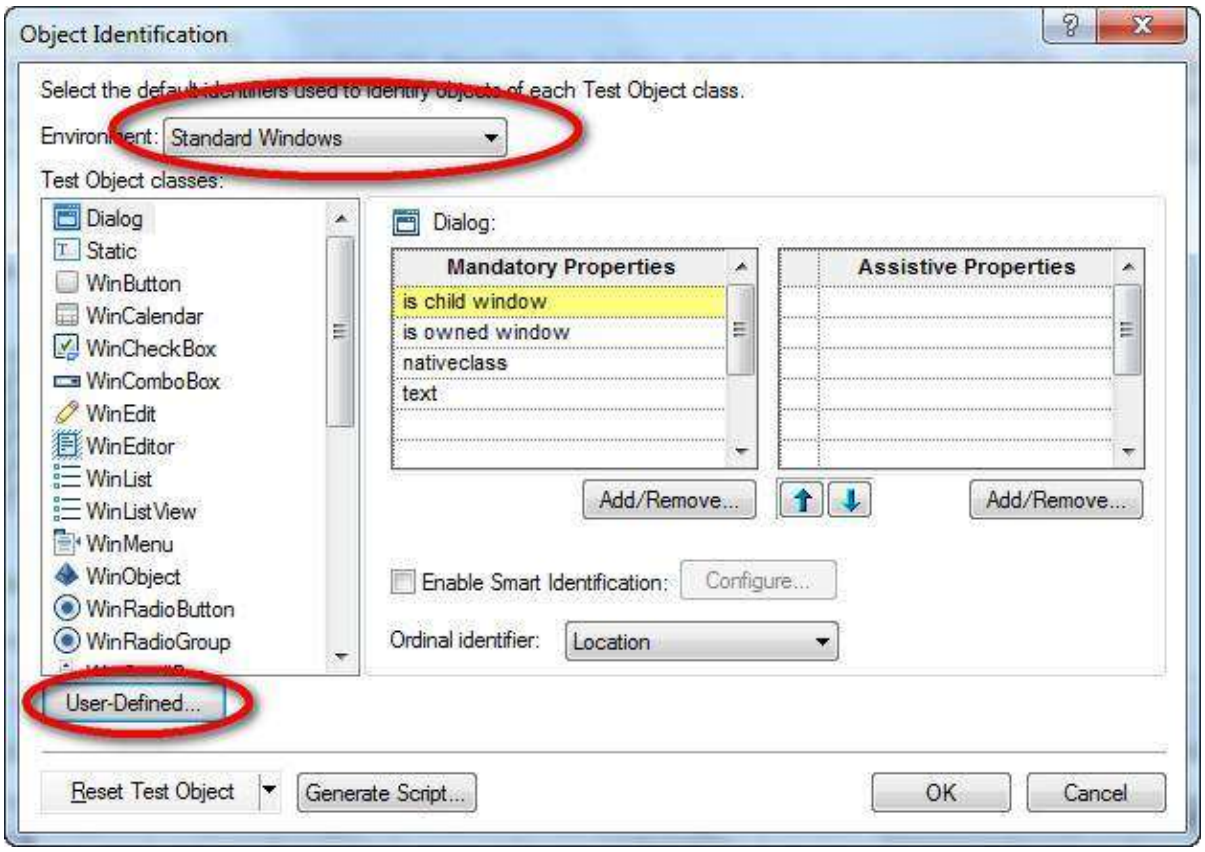
It is saved with an Extension .bdb	SOR is saved with an extension .tsr
It should be used when not many tests are working on the same screens of the application under test.	SOR Should be used when there are different scripts interacting with the same type of the object.

QTP – User Defined Objects

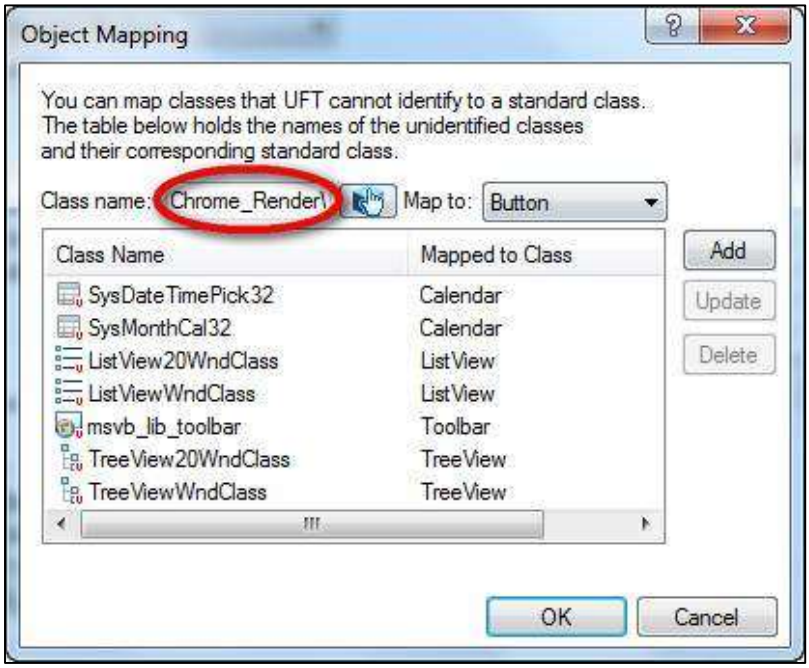
Sometimes, not all objects are recognized by QTP, in case the application does not use Standard Windows Classes. QTP uses Class Name to find the type of Object. Sometimes, the object is expected to behave like a button or a Combo Box etc.

When we try to add such kind of button, it might recognize as Winobject.

Hence, we can map that WinObject to behave like "CheckBox" Object type by Navigating to Tools -> Object Identification, and select Environment as "Standard Windows" and click "User Defined" button. Please Note this option will not work in any other environment.



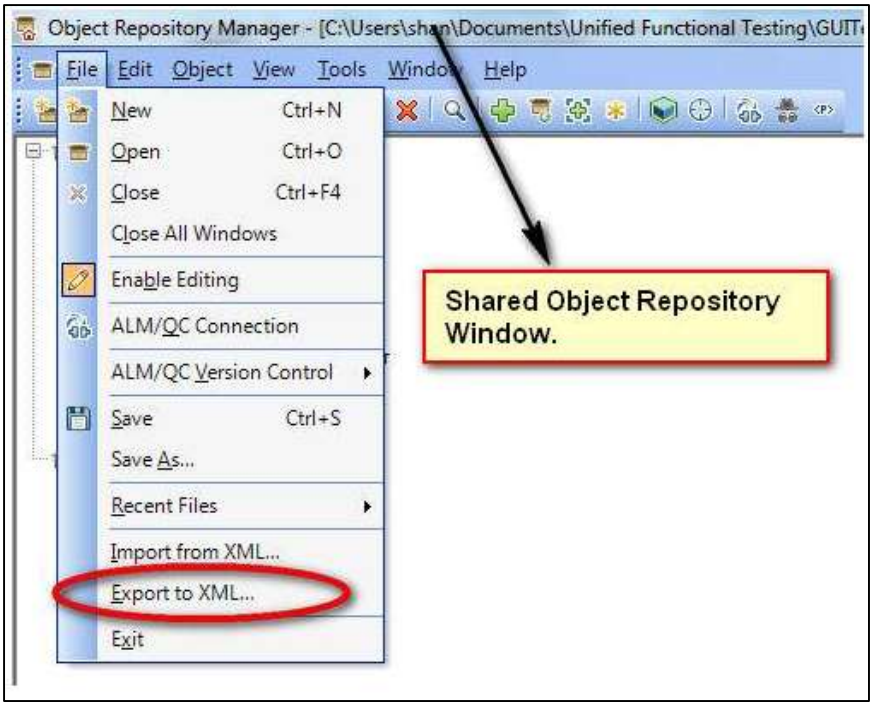
In the following example, an object of a specific class is made to recognize as an object of Type "button". Hence, this object inherits all properties of a button and we can use the objects that are supported by button.



QTP – Object Repository as XML

Object Repository can be saved in XML format so that the size of the Object repository is reduced. The OR can be saved as XML by "Exporting as XML" from Shared Object Repository Window as shown below :

The Same object repository can be imported from XML, can be edited/deleted, and exported back to XML.



QTP – Comparing and Merging ORs

Comparing Object Repositories

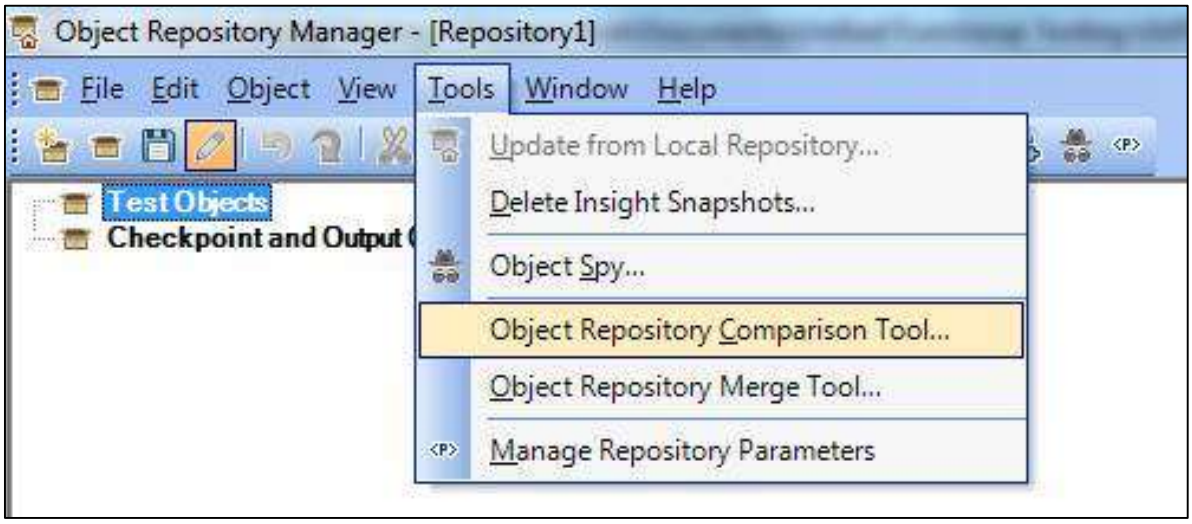
Many a times, we might be in a position to compare two object repositories to spot the difference and merge it, if in case, some objects are missing in the main repository.

These tools help us largely to spot the differences in the Object Repository

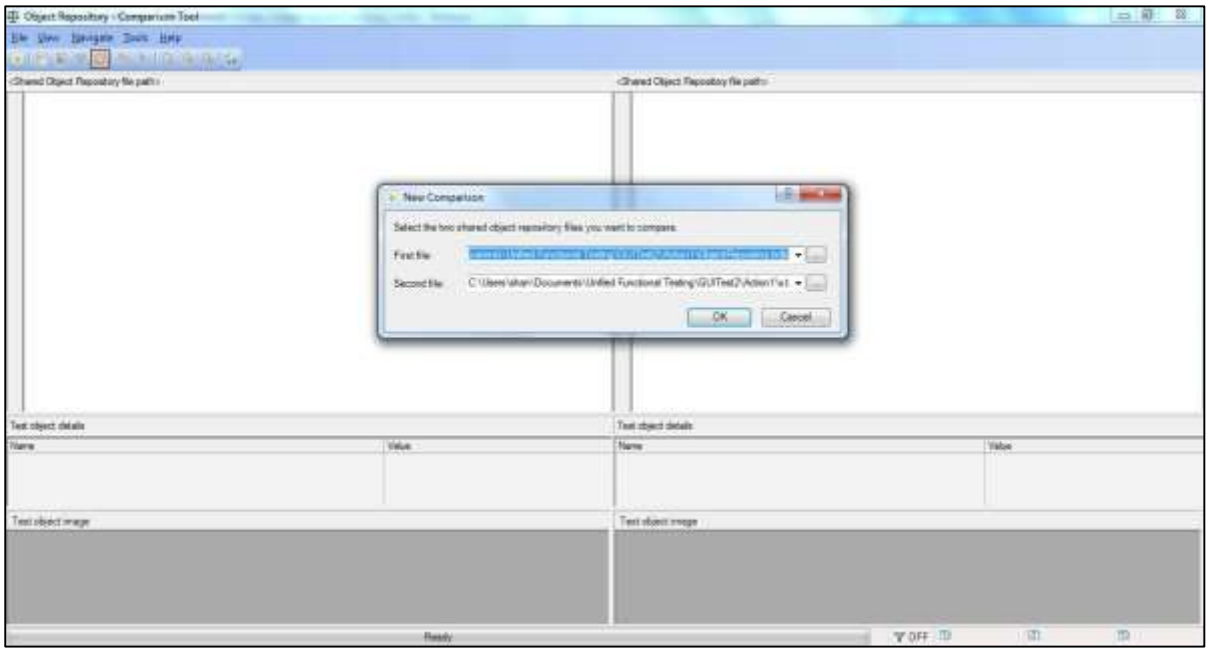
Steps to Compare OR's

Step 1 : Navigate to "Resources" >> "Object Repository Manager"

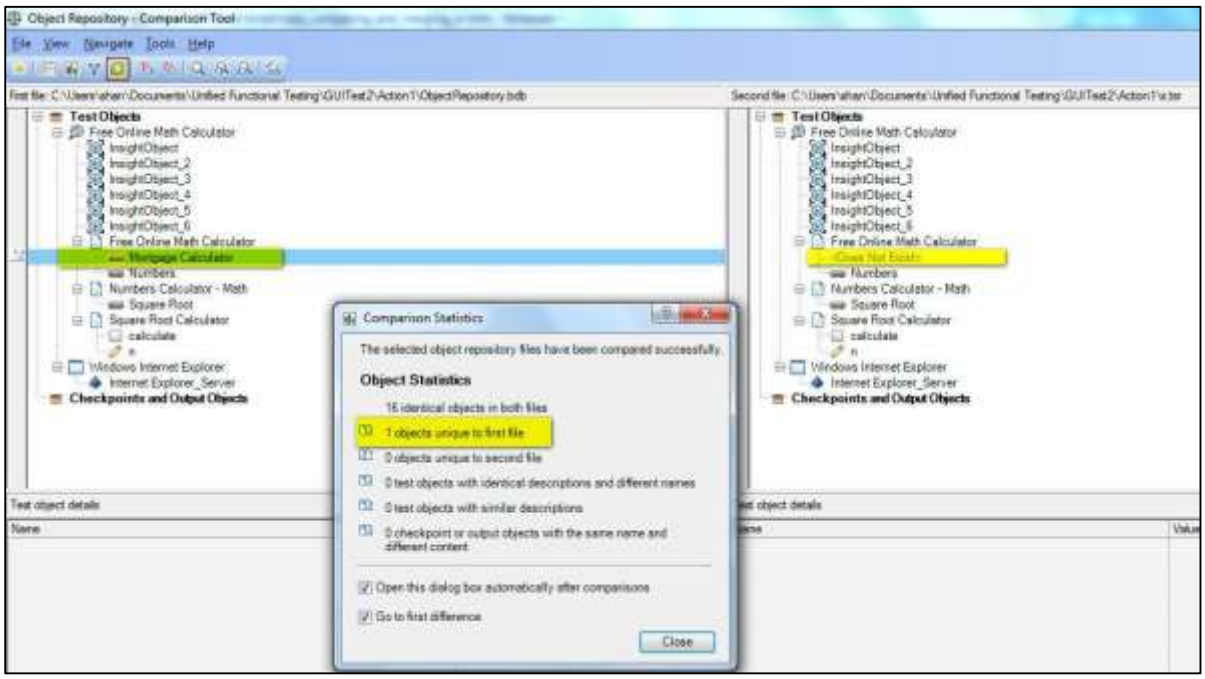
Step 2 : Go to "Tools" >> "Object Repository Merge Tool"



Step 3 : The Object Repository comparison Window opens and the user needs to select the two Object Repository files to be compared.



Step 4 : It performs the comparison and displays the differences one by one as shown below:



Step 5 : It can be filtered based on three parameters viz - unique objects, identical objects, partial match objects.

Merging Object Repositories

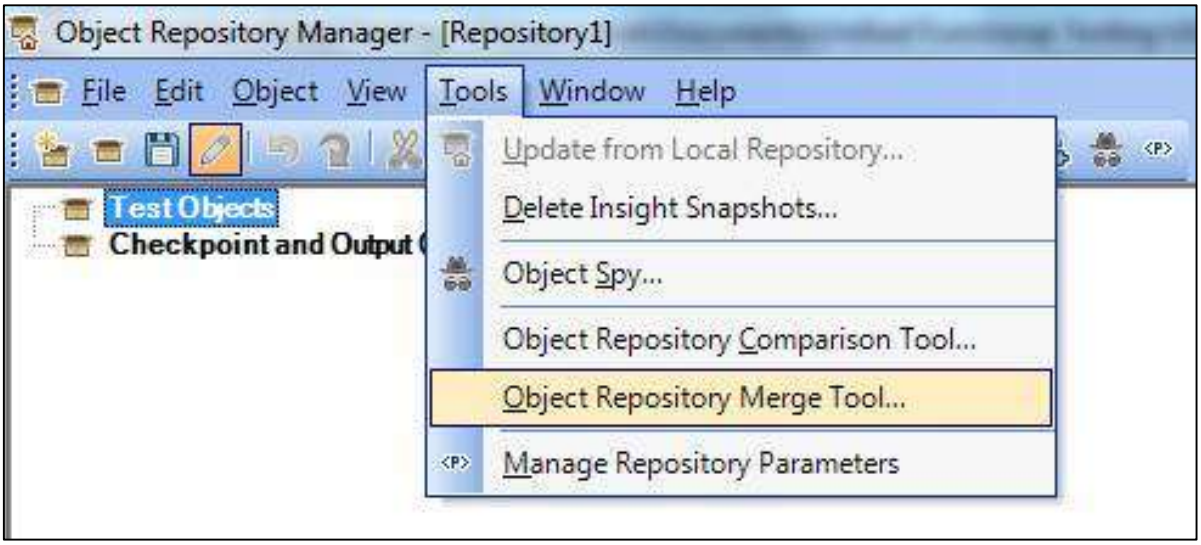
Sometimes, there are circumstances when Object repository needs to be merged, as maintaining two or more object repositories become additional overheads.

Merging Option is a great boon for testers who need to merge two-object repository without losing the object hierarchy.

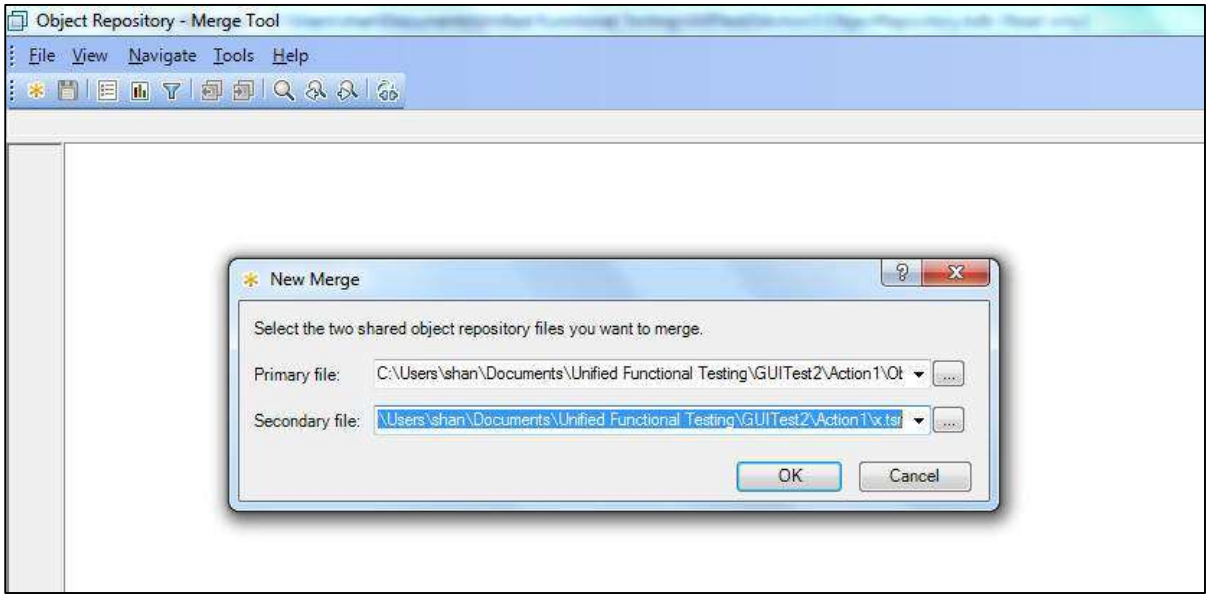
Steps to Merge OR's

Step 1 : Navigate to "Resources" >> "Object Repository Manager"

Step 2 : Go to "Tools" >> "Object Repository Comparison Tool"



Step 3 : The Object Repository Merge window opens and the user needs to select the two Object Repository files to be merged.



Step 4 : After merging, the statistics are shown to the user.

Step 5 : It can be filtered based on two parameters viz - show all objects, show only conflicting objects.

QTP – Ordinal Identifiers

Sometimes, there are series of objects with same class name and properties. Let us say, in a window, there are series of checkboxes with the same set of properties. If we want to act on those objects, we need to uniquely identify them so that QTP will be able to act on it.

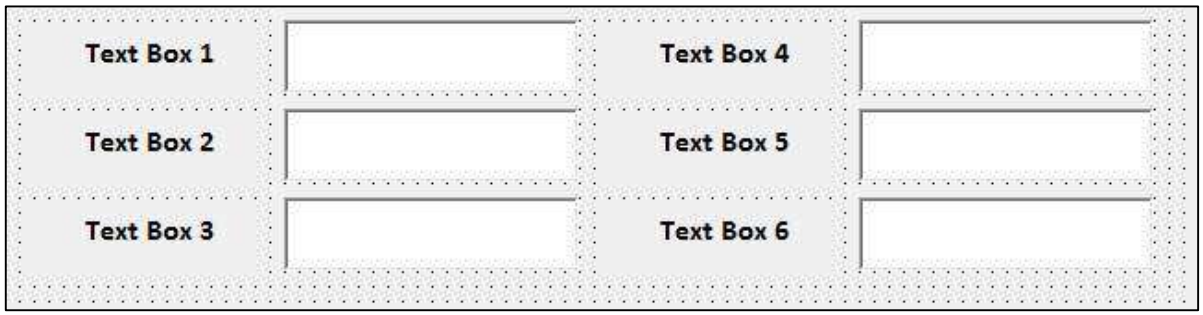
An Ordinal Identifier assigns a numerical value to the test objects, which indicates its location or order relative to its group. The Ordered value enables QTP to recognize it uniquely when the inbuilt properties are NOT sufficient to do so.

There are three Ordinal Identifiers in QTP that can be used in different context:

- Index
- Location
- Creation Time

Index

An object appearing first in the page/Window will have a smaller Index value when compared to another object that comes later in the same page/Window.



The value of index for the group of text boxes will be as follows:

Object Name	Index Value
TextBox 1	0
TextBox 4	1
TextBox 2	2
TextBox 5	3
TextBox 3	4
TextBox 6	5

Location

The Location property works vertically from top to bottom and from left to right. Hence, for the same case, the value of location for the group of text boxes will be as follows:

Object Name	Index Value
TextBox 1	0
TextBox 2	1
TextBox 3	2
TextBox 4	3
TextBox 5	4
TextBox 6	5

Creation Time

The Creation Time property holds good only for web based application. When we open two browser sessions of the same website, QTP will not be able to recognize the window, as both the windows will have the same set of properties. Hence, we can use creation time with which QTP will be able to act on the window.

```
'Will have CreationTime value = 0
SystemUtil.Run "iexplore.exe", "http://www.google.com"

'Will have CreationTime value = 1
SystemUtil.Run "iexplore.exe", "http://www.yahoo.com"

'Will have CreationTime value = 2
SystemUtil.Run "iexplore.exe", "http://www.microsoft.com"
'Will have CreationTime value = 3
SystemUtil.Run "iexplore.exe", "http://www.facebook.com"
```

Hence, to work on a specific browser, we need to explicitly mention the Creation time in OR or we can use the description of objects, which we will see in detail in descriptive programming section.

```
'Sync's www.google.com
Browser("creationtime:=" ).Sync

'Gets the RO text property of www.yahoo.com
Browser("creationtime:=1").GetROProperty("text")

'Highlights microsoft.com
Browser("creationtime:=2").Highlight
```

QTP – Child Objects

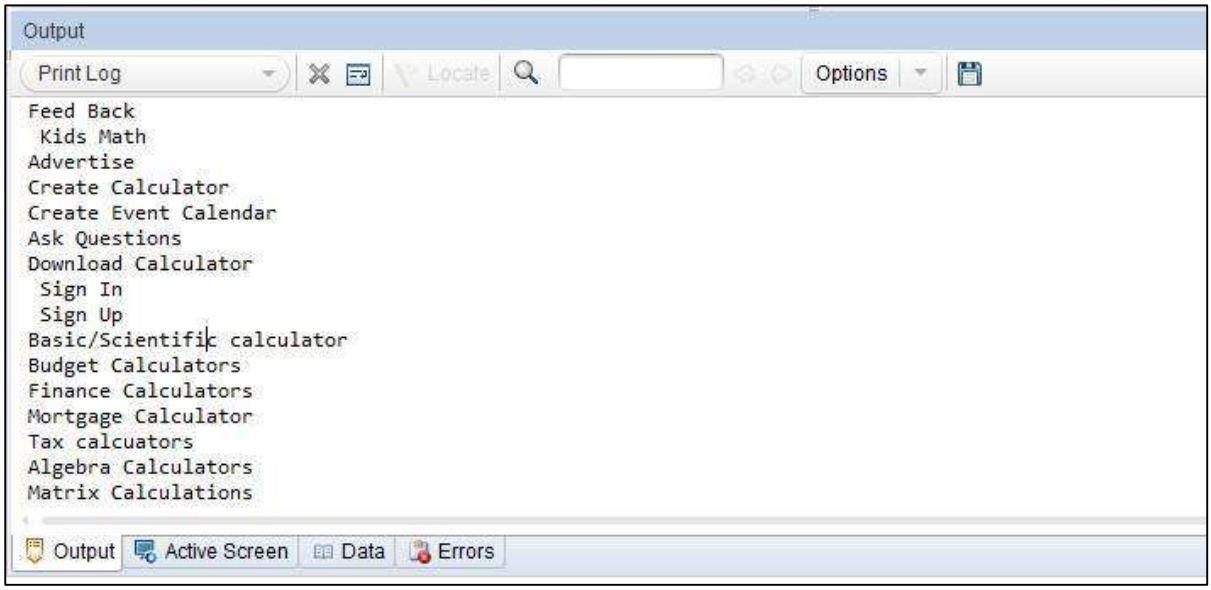
The objects (text box, combo box, links) contained in the frame or window is known as child objects. Sometimes, we would be in a situation to get the properties of all the links in a webpage or to get the values of all radio buttons in a window.

In these circumstances, if we want to work on the child objects, we need to use description of objects using which we will be able to work on all the objects in a particular window/page. Descriptive programming will be dealt in detail in the upcoming chapter but the significance of this chapter is to understand child objects and its usage.

The following Script gets the name of the links from the website "www.easycalculation.com"

```
Dim oDesc
Set oDesc = Description.Create
oDesc("micclass").value = "Link"

'Find all the Links
Set obj = Browser("Math Calculator").Page("Math Calculator").ChildObjects(oDesc)

Dim i
'obj.Count value has the number of links in the page
For i = 0 to obj.Count - 1
  'get the name of all the links in the page
  x = obj(i).GetROProperty("innerhtml")
  print x
Next
```

The Result is printed in the output window as shown below:

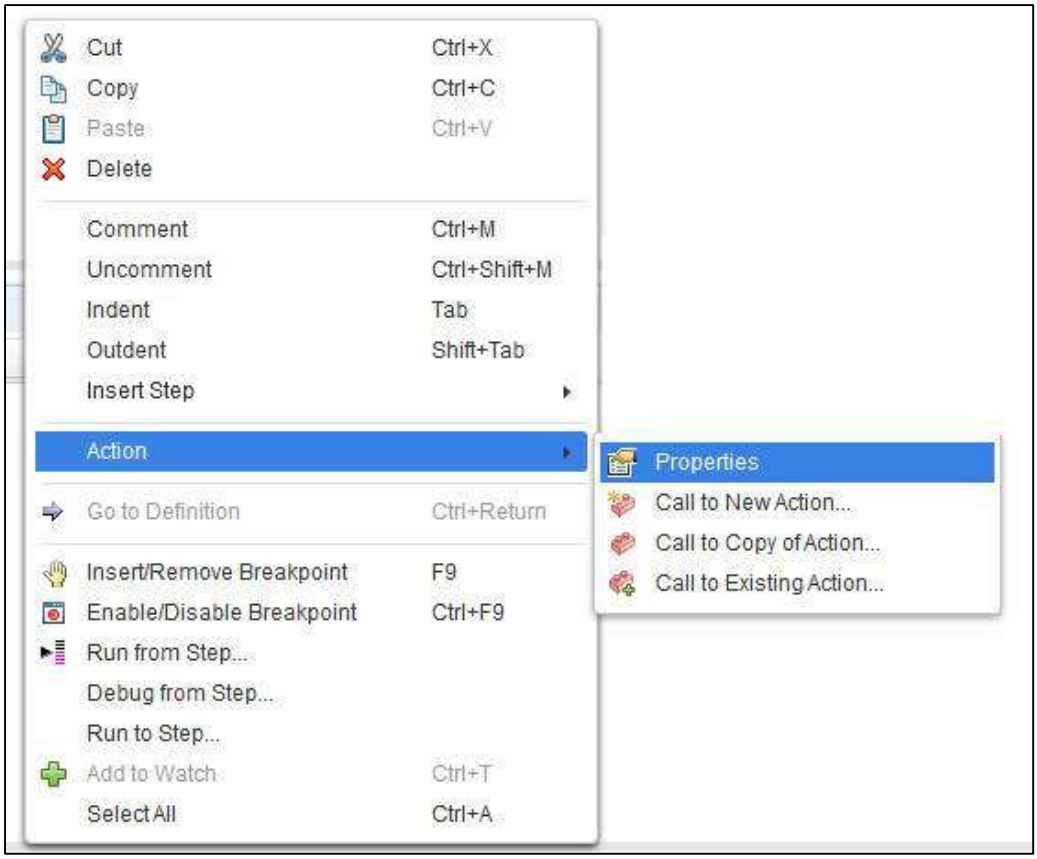


6. QTP – Actions

Actions helps testers to divide scripts into groups of QTP statements. Actions are similar to functions in VBScript; however, there are a few differences. By default, QTP creates a test with one action.

Actions	Functions
Action is an in-built feature of QTP.	VBScript Functions are supported by both VBScript and QTP.
Actions parameters are passed by value only.	Function parameters are passed either by by value or by ref.
Actions have extension .mts	Functions are saved as .vbs or .qfl
Actions may or may not be reusable.	Functions are always reusable.

The properties of the action can be accessed by right clicking on the Script Editor Window and selecting "Properties".



Action properties contains the following information-

- Action Name
- Location
- Reusable Flag
- Input Parameters
- Output Parameters

Types of Actions

There are three types of actions:

- **Non-reusable action** - An action that can be called only in that specific test in which it has been designed and can be called only once.

- **Reusable action** - An action that can be called multiple times, any test in which it resides, and can also be used by any other tests.

- **External Reusable action** - It is a reusable action stored in another test. External actions are read-only in the calling test, but it can be used locally with the editable copy of the Data Table information for the external action

Working with Actions

There are three options to insert an action. Click on each one of those to know more about the selected type of action.

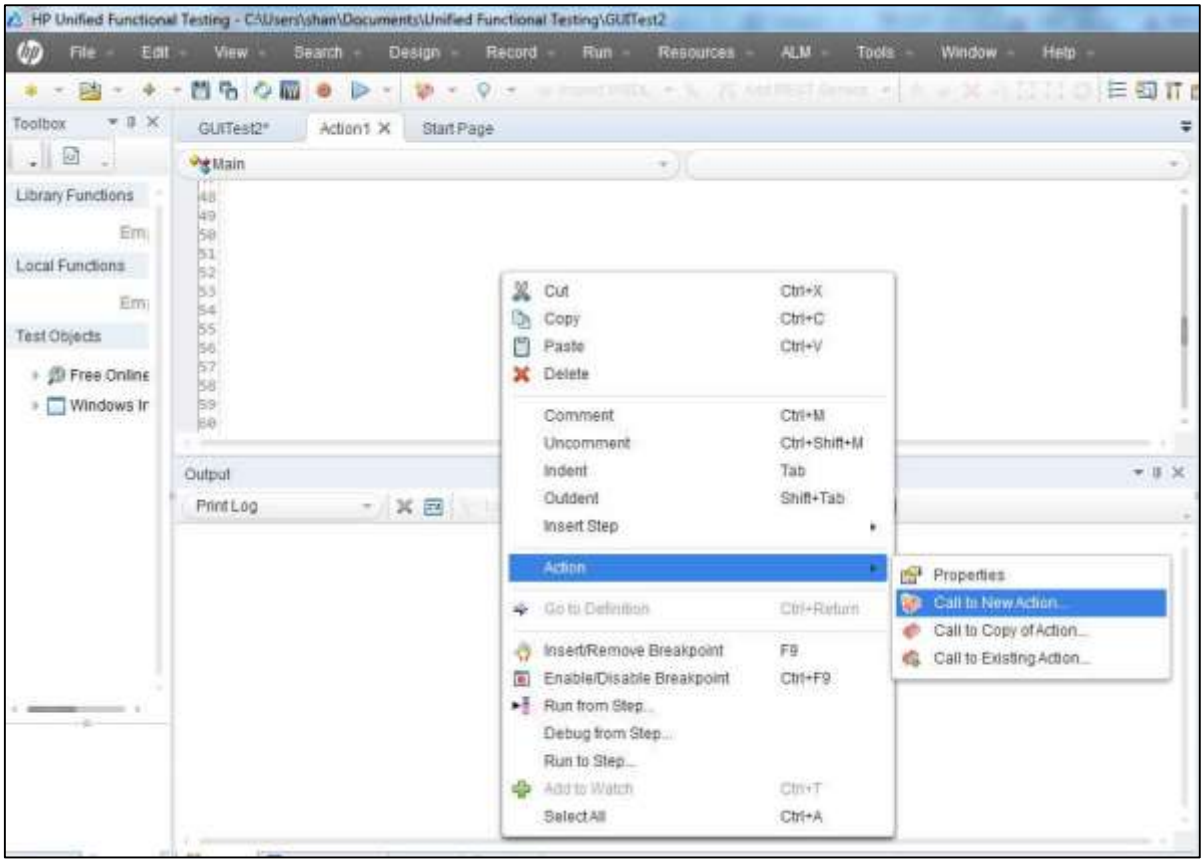
Action Type	Description
Insert Call to New Action	Inserts a New Action from the existing action
Insert Call to Copy of Action	Inserts a copy of an existing action
Insert Call to Existing Action	Inserts a call to existing re-usable action

QTP – Call to New Action

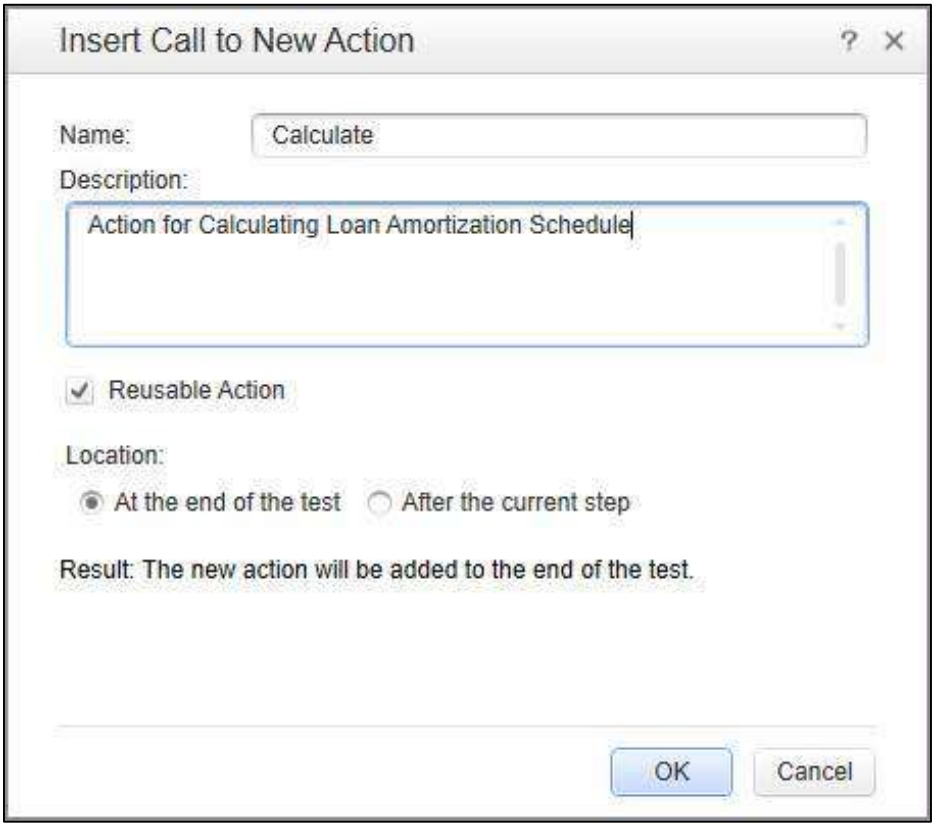
Inserting Call to New Action

Testers can insert a new action at any point of the script by performing the following steps:

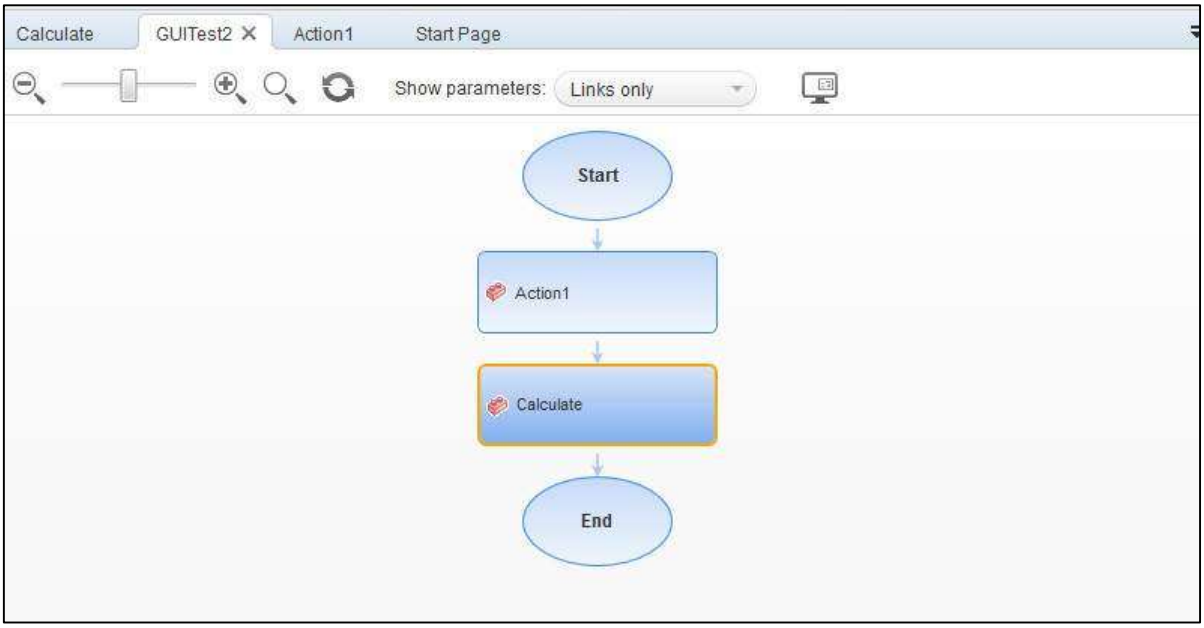
Step: 1 - Right click on the scripting area and select "Call to New Action".



Step: 2 - In the "Insert Call to New Action" Window, give the test name, description, and also specify if it is a reusable action or not. Most importantly, select the location of the action to be inserted.



Step: 3 - You can check the changes, graphically, in the test Name Tab as shown below:



You can also use QTP commands to call the Action at any point in the script.

```
RunAction "Calculate", oneIteration   'Executes  Calculate Action for one
iteration.
```

Action can be called with Parameters as shown below:

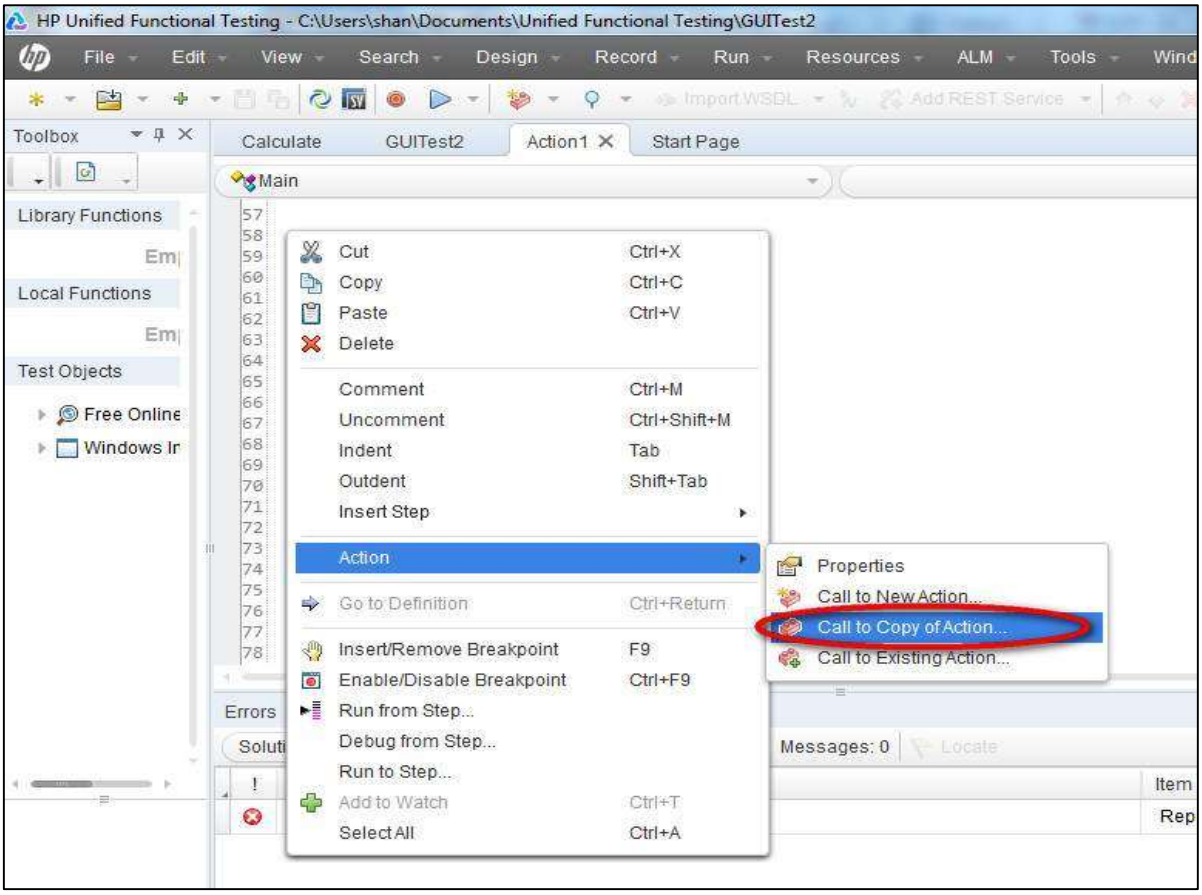
```
'Input to the action
num1 = 5
num2 = 10
Dim value1
'Run the action with parameters
OutputValue = RunAction("Calculate", oneIteration, num1, num2, value1)

'Display the output
print OutputValue
```

QTP – Call to Copy of Action

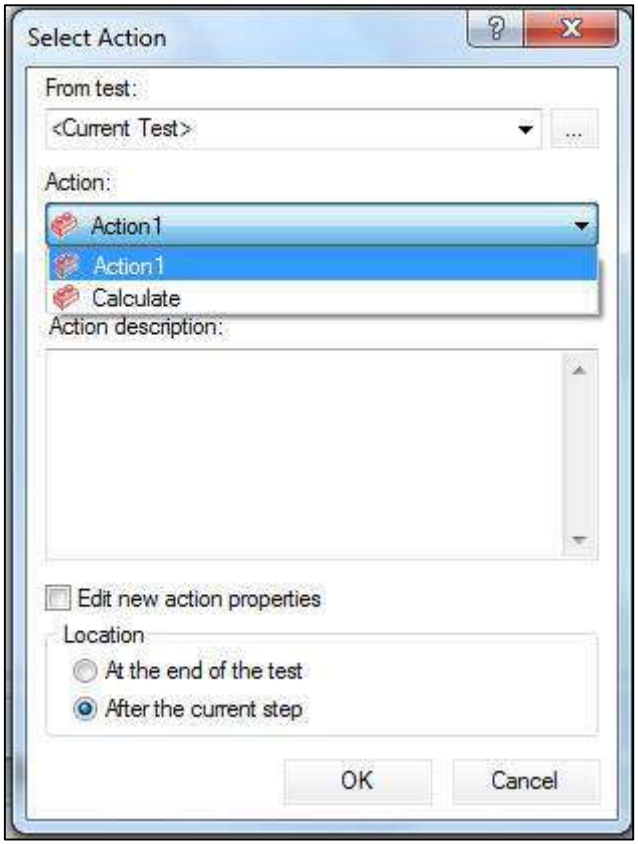
Inserting Call to Copy of Action

Testers can insert a copy of an existing action at any point of the script by performing the following steps:

Step 1 - Right click on the scripting area and select "Call to Copy of Action"



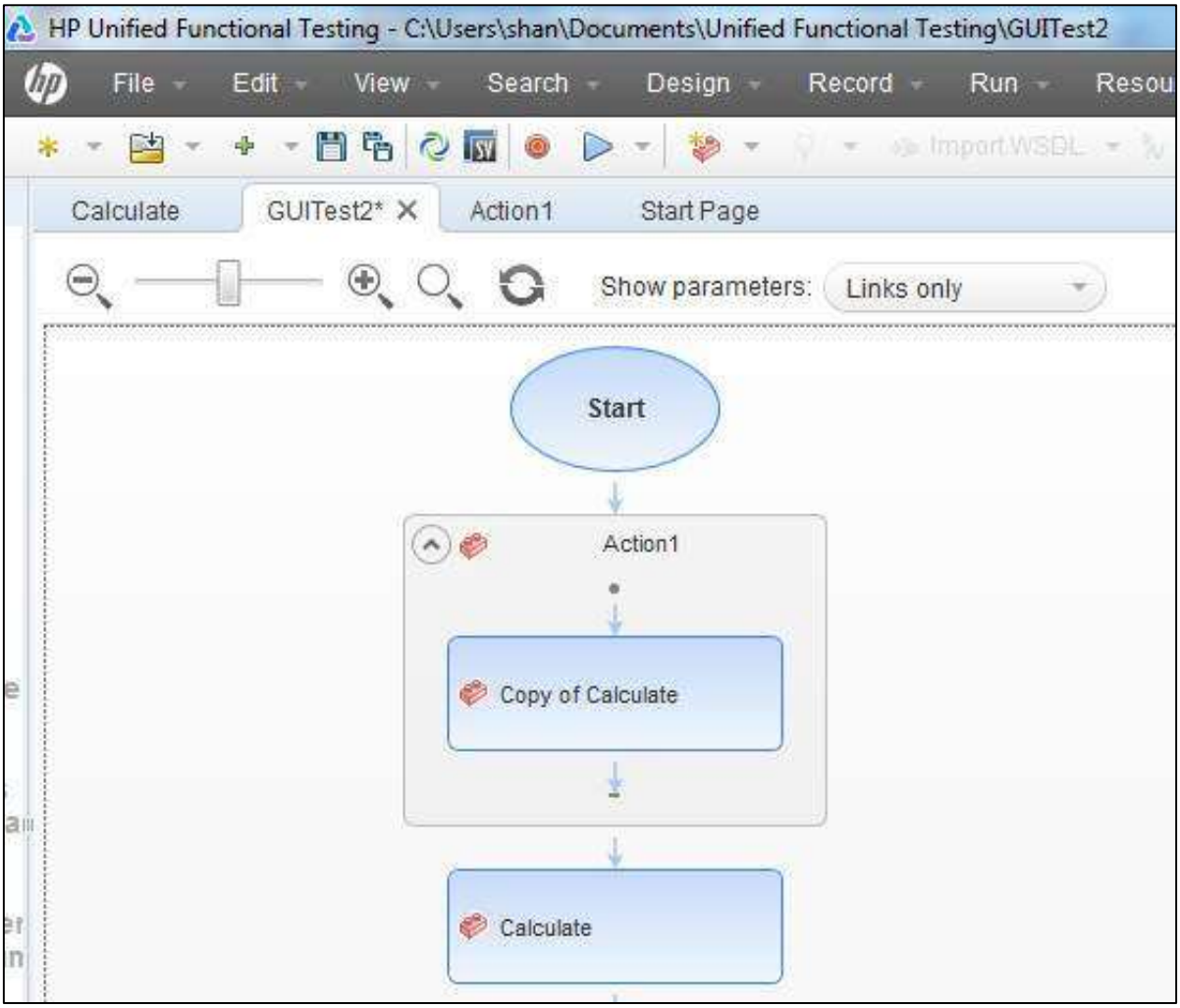
Step 2 - In the "Insert Call to Copy of Action" Window, Select "Test Name", "Action Name" and also select the location of the action to be inserted.



Step 3 – Immediately, the script is auto-generated to show that the copy of an action is inserted.

```
RunAction "Copy of Calculate", oneIteration
```

Step 4 - You can check the changes graphically in the test Name Tab as shown below:

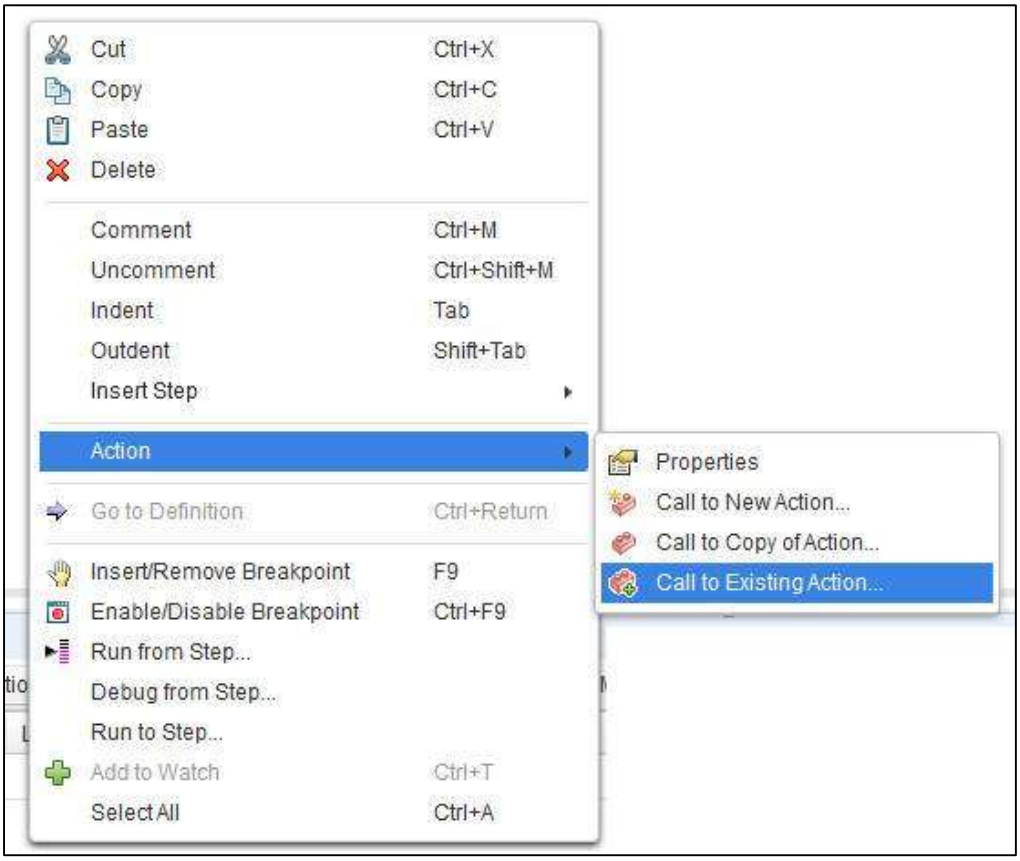


QTP – Call to Existing Action

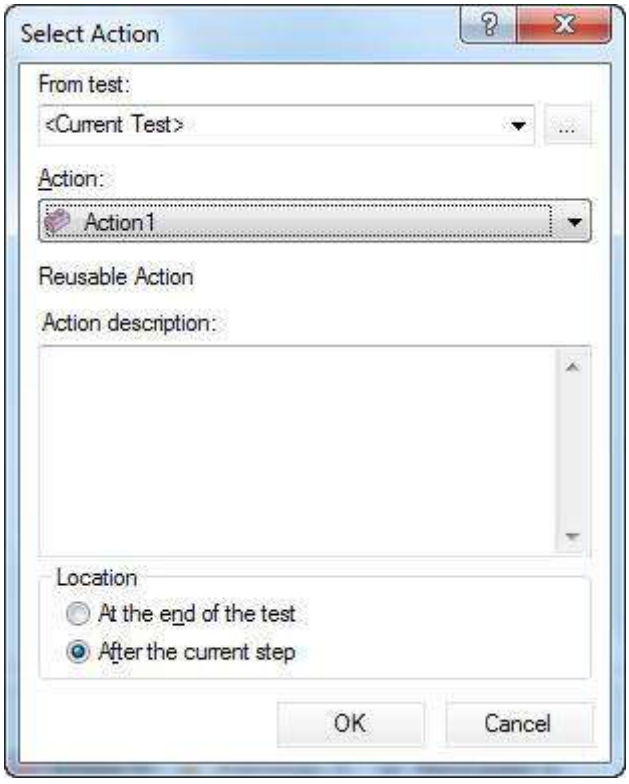
Inserting call to Existing Action

Testers can insert an Existing action at any point of the script by performing the following steps-

Step 1 - Right click on the Scripting area and select "Call to Existing Action"



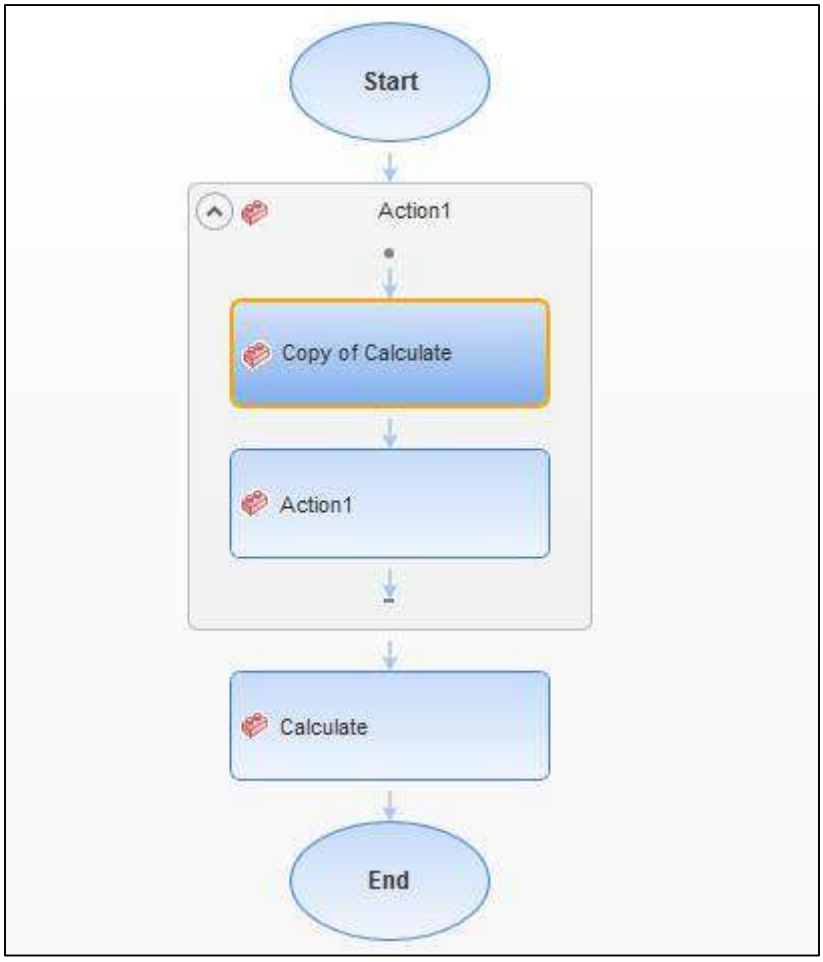
Step 2 - In the "Select Action" Window, give the test name, Action name, description and also specify the location of the action to be inserted.



Step 3 - Once inserted, the following script is generated exactly at the location where the action was inserted.

```
RunAction "Action1", oneIteration
```

Step 4 – You can check the changes graphically in the test Name Tab as shown below:



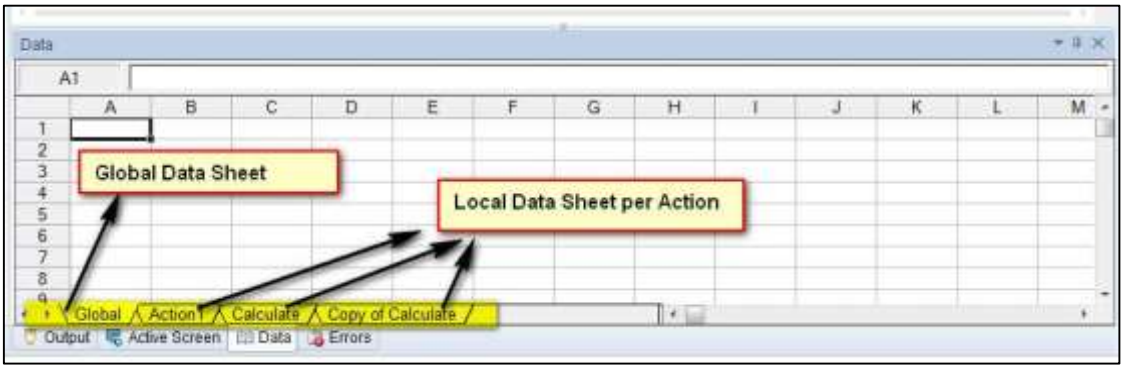
7. QTP – Datatables

A DataTable, similar to Microsoft Excel, helps the testers to create data-driven test cases that can be used to run an Action multiple times. There are two types of Datatables-

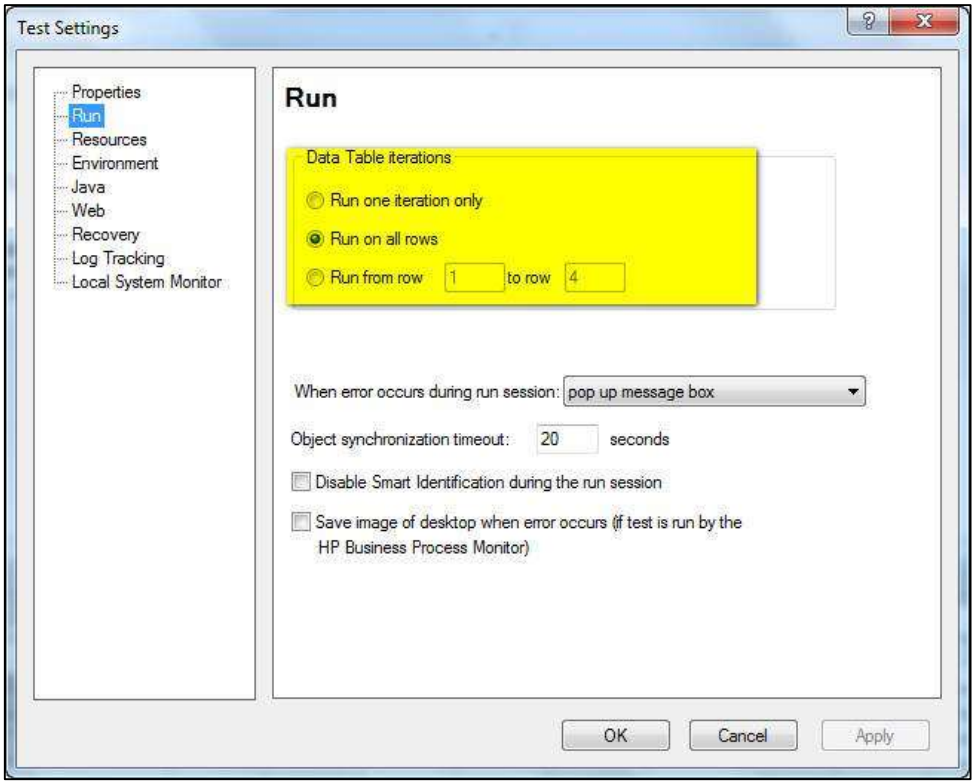
- **Local DataTable** - Each action has its own private datatable, also known as local datatable, which is can also be accessed across actions.

- **Global DataTable** - Each test has one global data sheet that is accessible across actions.

The data sheet can be accessed from the "Data" Tab of QTP as shown below:

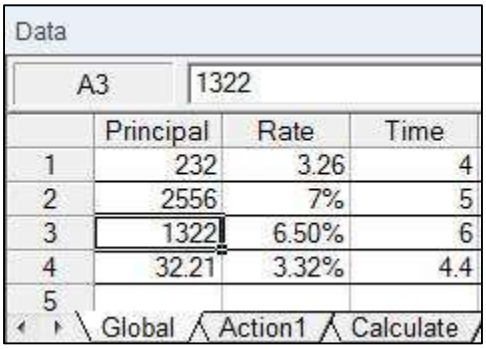


To execute a test case for some specified number of iterations, one can set the iterations of global datatable in the Test Settings dialog, that can be accessed using File -> Settings -> Run(Tab) as shown below:



Example

For example, if a user wants to parameterize "compound Interest" of "http://easycalculation.com/" that can be accessed using "http://easycalculation.com/compound-interest.php". The Parameters can be created as shown below. Most of the functionalities of Excel can be used in Data table as well.



DataTable Operations

There are three types of objects to access DataTable. DataTable operations can be well understood by traversing through the following-

Object Type	Description
Data Table Methods	Gives detailed information about the data table methods.
DTParameter Object Methods	Gives detailed information about the DTParameter methods.
DTSheet Object Methods	Gives detailed information about the DTSheet methods.

QTP – DataTable Object Methods

Method Name	Description	Syntax
AddSheet	Adds the specified sheet to the run-time data table	DataTable.AddSheet(SheetName)
DeleteSheet	Deletes the specified sheet from the run-time data table	DataTable.DeleteSheet SheetID
Export	Exports the Datatable to a new file in the specified location	DataTable.Export(FileName)
ExportSheet	Exports a Specific Sheet of the Datatable in run-time	DataTable.ExportSheet(FileName, SheetName)
GetCurrentRow	Returns the active row of the run-time data table of global sheet	DataTable.GetCurrentRow

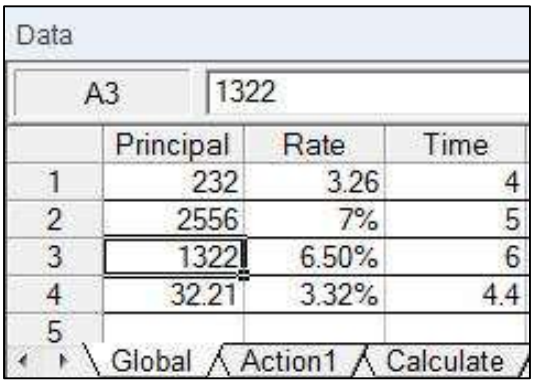
GetParameterCount	Returns the number of columns in the run-time data Table of Global Sheet	DataTable.GetParameterCount
GetRowCount	Returns the number of rows in the run-time data table of Global Sheet	DataTable.GetRowCount
GetSheet	Returns the specified sheet from the run-time data table.	DataTable.GetSheet(SheetID)
GetSheetCount	Returns the total number of sheets in the run-time data table.	DataTable.GetSheetCount
Import	Imports a specific external Excel file to the run-time data table.	DataTable.Import(FileName)
ImportSheet	Imports the specified sheet of the specific excel file to the destination sheet.	DataTable. ImportSheet(FileName, SheetSource, SheetDest)
SetCurrentRow	Sets the Focus of the Current row to the Specified Row Number	DataTable.SetCurrentRow(RowNumber)
SetNextRow	Sets the focus of the next row in the run-time data table	DataTable.SetNextRow
SetPreviousRow	Sets the focus of the previous row in the run-time data Table	DataTable.SetPrevRow

DataTable Object Properties

Property Name	Description	Syntax
GlobalSheet	Returns the first sheet of the run-time data table.	DataTable.GlobalSheet
LocalSheet	Returns the Active local sheet of the run-time data table.	DataTable.LocalSheet
RawValue	Retrieves the raw value of the cell	DataTable.RawValue ParameterID, [SheetID]
Value	Retrieves the value of the cell in the specified parameter.	DataTable.Value(ParameterID, [SheetID])

Example

Consider the following DataTable:




```
'Accessing Datatable to get Row Count and Column Count
rowcount = DataTable.GetSheet("Global").GetRowCount
msgbox rowcount      ' Displays 4

colcount = DataTable.GetSheet("Global").GetParameterCount
msgbox colcount      ' Displays 3

DataTable.SetCurrentRow(2)
val_rate = DataTable.Value("Rate","Global")
print val_rate    ' Displays 7%

val_ppl = DataTable.Value("Principal","Global")
print val_ppl   ' Displays 2556

val_Time = DataTable.Value("Time","Global")
print val_Time  ' Displays 5
```

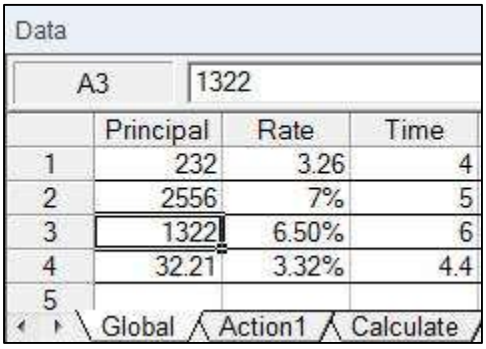
QTP – DTParameter Object Properties

Method Name	Description	Syntax
Name	Returns the name of the parameter in the run-time datatable.	DTParameter.Name
RawValue	Returns the raw value of the cell in the current row of the run-time datatable.	DTParameter.RawValue
Value	Retrieves or sets the value of the cell in the Active row of the parameter in the run-time datatable.	DTParameter.Value
ValueByRow	Retrieves the value of the cell in the specified row of the	DTParameter.ValueByRow(RowNum)

	parameter in the run-time datatable.	

Example

Consider the following DataTable:




```
Val = DataTable.GetSheet("Global").GetParameter("Principal").ValueByRow(2)
print Val' Val Displays 2556

DataTable.SetCurrentRow(1)
Val1 = DataTable.GetSheet("Global").GetParameter("Principal").Value
print Val1  ' Val1 displays 232
```

QTP – DTSheet Methods

Method Name	Description	Syntax
AddParameter	Adds the specified column to the sheet in the run-time data table.	DTSheet.AddParameter(ParameterName, Value)
DeleteParameter	Deletes the specified parameter from the run-time data table.	DTSheet.DeleteParameter(ParameterID)
GetCurrentRow	Returns the row number of the active row in the run-time Data Table.	DTSheet.GetCurrentRow
GetParameter	Returns the specified parameter from the run-time Data Table.	DTSheet.GetParameter(ParameterID)
GetParameterCount	Returns the total number of Columns	DTSheet.GetParameterCount

	in the run-time Data Table.	
GetRowCount	Returns the total number of rows in the run-time Data Table.	DTSheet.GetRowCount
SetCurrentRow	Sets the Focus on the specified Row of the Data Table	DTSheet.SetCurrentRow(RowNumber)
SetNextRow	Shifts the Focus to the next Row of the Data Table.	DTSheet.SetNextRow
SetPrevRow	Shifts the Focus to the Previous Row of the Data Table.	DTSheet.SetPrevRow

Example

```
'Accessing Datatable to get Row Count and Column Count
rowcount = DataTable.GetSheet("Global").GetRowCount
msgbox rowcount      ' Displays 4

colcount = DataTable.GetSheet("Global").GetParameterCount
msgbox colcount     ' Displays 3

DataTable.SetCurrentRow(2)
val_rate = DataTable.Value("Rate","Global")
print val_rate   ' Displays 7%

val_ppl = DataTable.Value("Principal","Global")
print val_ppl   ' Displays 2556

val_Time = DataTable.Value("Time","Global")
print val_Time  ' Displays 5
```

8. QTP – CheckPoints

Checkpoints, as the name says it all, refer to a validation point that compares the current value of specified properties or current state of an object with the expected value, which can be inserted at any point of time in the script.

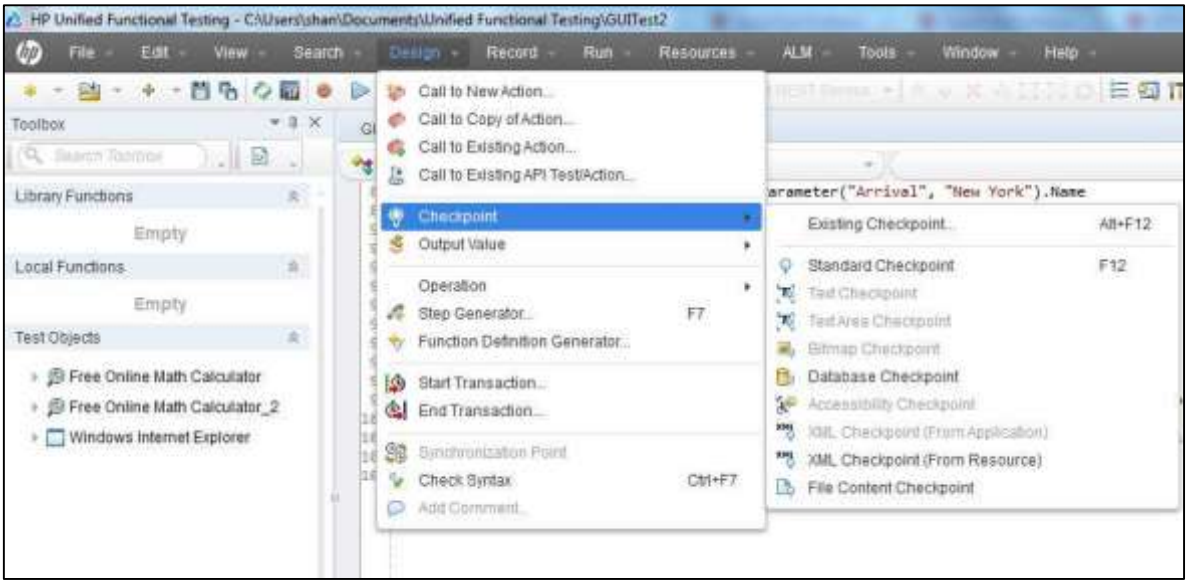
Types of Checkpoints

Type	Description
Standard Checkpoint	Verifies the property values of an object in application under test and supported by all add-in environments.
Bitmap Checkpoint	Verifies an area of your application as a bitmap
File Content Checkpoint	Verifies the text in a dynamically generated or accessed file such as .txt,.pdf
Table Checkpoint	Verifies the information within a table. Not all environments are supported.
Text Checkpoint	Verify if the text that is displayed within a defined area in a Windows-based application, according to specified criteria.
Text Area Checkpoint	Verifies if the text string is displayed within a defined area in a Windows-based application, according to specified criteria.
Accessibility Checkpoint	Verifies the page and reports the areas of the Web site that may not conform to the World Wide Web Consortium (W3C) Web Content Accessibility Guidelines
Page Checkpoint	Verifies the characteristics of a Web page. It can also check for broken links.
Database Checkpoint	Verifies the contents of a database accessed by the application under test.
XML Checkpoint	Verifies the content of the .xml documents or .xml documents in Web pages and frames.

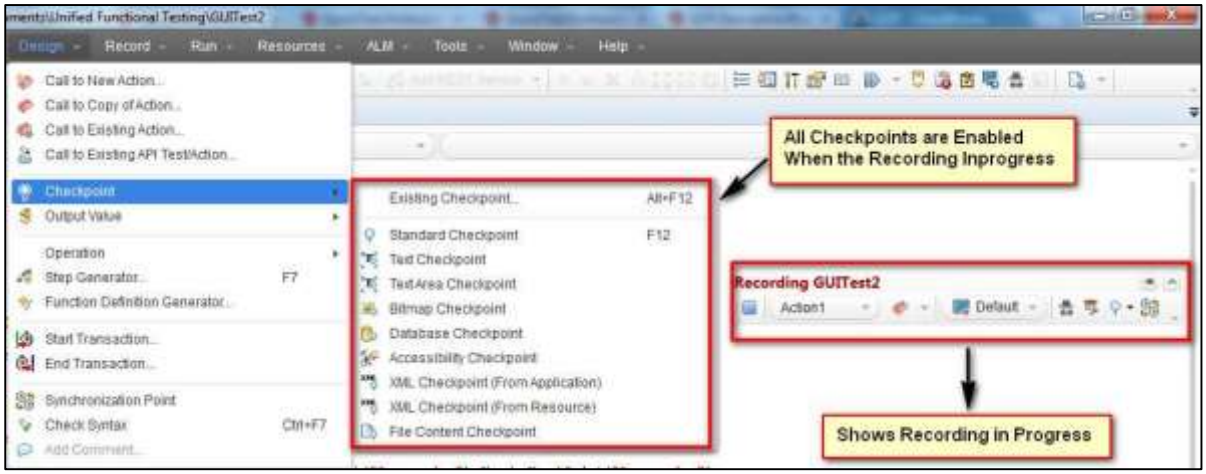
Inserting CheckPoint

When the user wants to insert a checkpoint, one has to ensure that most of the checkpoints are supported during the recording sessions only. Once the user stops recording, checkpoints are not enabled.

Given below is the checkpoint menu, when the user is NOT in the recording mode.



Given below is the checkpoint menu, when the user is in the recording mode.



Example

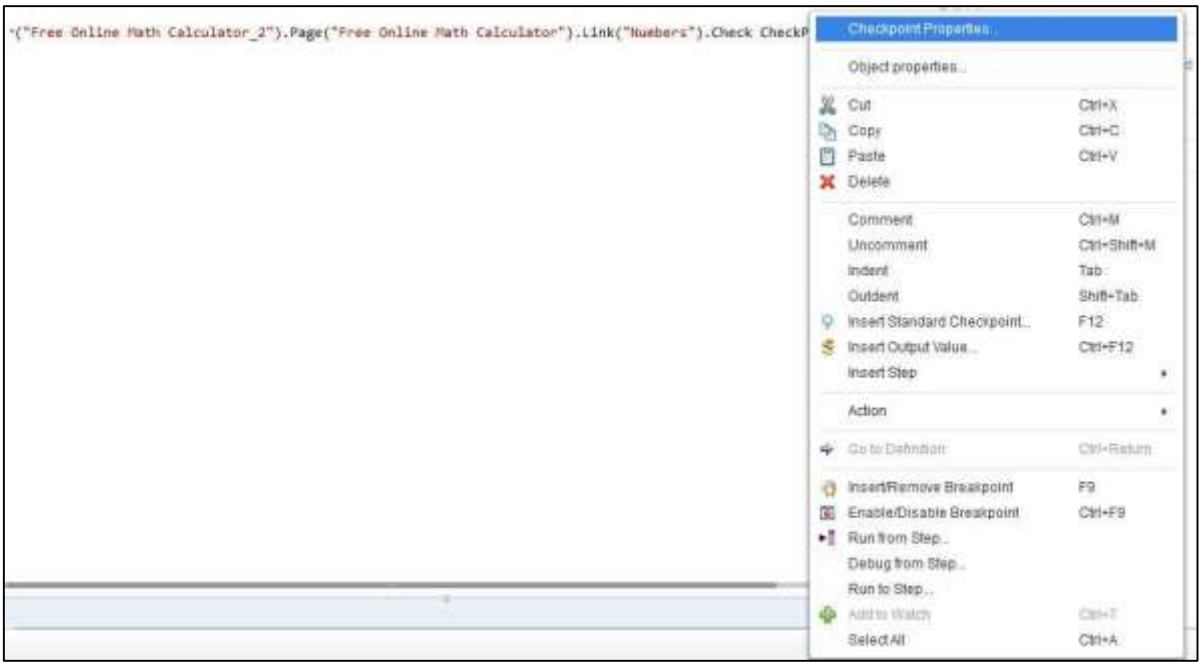
The checkpoints are added for the application under test - "http://easycalculation.com/"

```
' 1. Inserted Standard Checkpoint
Status = Browser("Math Calculator").Page("Math
Calculator").Link("Numbers").Check CheckPoint("Numbers")

If Status Then
   print "Checkpoint Passed"
Else
   Print "Checkpoint Failed"
End if
' 2. Inserted BitMap Checkpoint
```

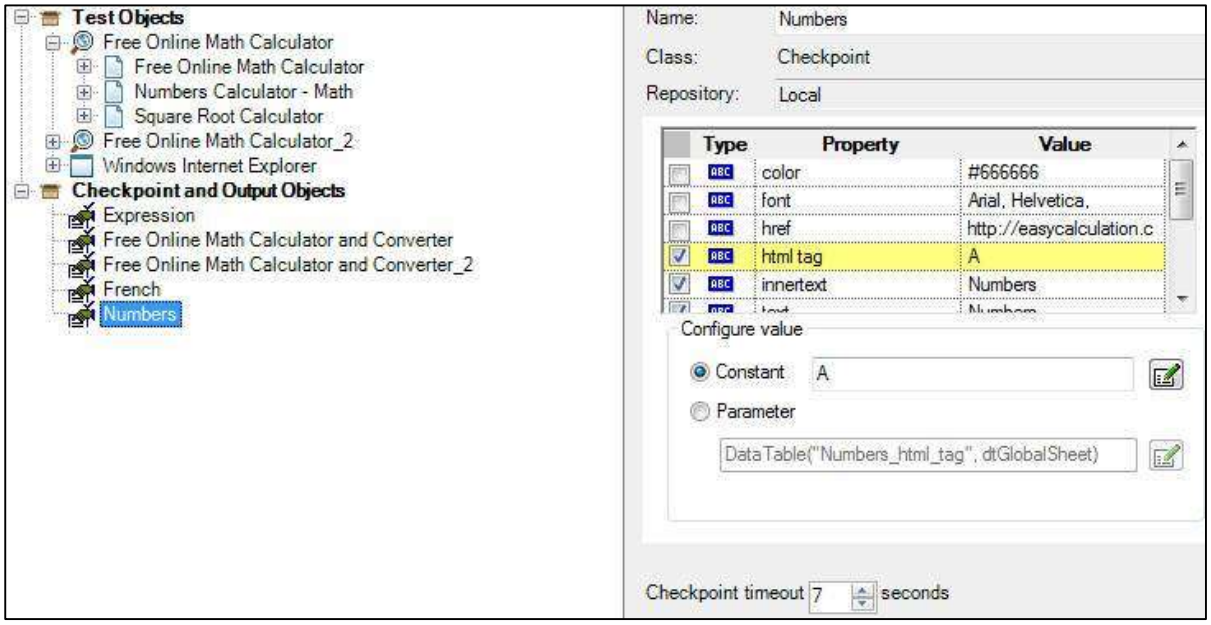
```
imgchkpoint = Browser("Math Calculator").Page("Math
Calculator").Image("French").Check CheckPoint("French")
If imgchkpoint Then
   print "Checkpoint Passed"
Else
   Print "Checkpoint Failed"
End if
```

Viewing Checkpoint Properties

After inserting, in case a tester want to change the values, we can do so by right clicking on the keyword 'checkpoint' of the script and navigating to "Checkpoint Properties" as shown below:



You can locate the same checkpoints in object repository, as well, as shown below. It exactly shows what type of checkpoint is used and what are the expected values, and time out values.



9. QTP – Synchronization

Synchronization point is the time interface between Tool and Application under test. Synchronization point is a feature to specify the delay time between two steps of the test script.

For example, clicking on a link may load the page is 1 second, sometimes 5 seconds or even it may take 10 seconds to load it completely. It depends on various factors such as the application-server response time, network bandwidth, and client system capabilities.

If the time is varying then the script will fail, unless the tester handles these time differences intelligently.

Ways to Insert Sync Point

- WaitProperty
- Exist
- Wait
- Sync(only for web based apps)
- Inserting QTP Inbuilt Synchronization points.

Let us say, we need to insert a sync point between clicking on "numbers" link and clicking on "simple Interest" calculator in "www.easycalculation.com". We will now take a look at all the five ways to insert sync point for the above scenario.

Method 1: WaitProperty

WaitProperty is a method that takes the property name, Value and Timeout value as input to perform the sync. It is a dynamic wait and hence, this option is encouraged.

```
' Method 1 - WaitProperty with 25 seconds
Dim obj
Set obj = Browser("Math Calculator").Page("Math Calculator")
obj.Link("Numbers").Click

obj.Link("Simple Interest").WaitProperty "text", "Simple Interest",25000
obj.Link("Simple Interest").Click
```

Method 2: Exist

Exist is a method that takes the Timeout value as input to perform the sync. Again, it is a dynamic wait and hence this option is encouraged.

```
' Method 2 : Exist Timeout - 30 Seconds
Dim obj
Set obj = Browser("Math Calculator").Page("Math Calculator")
obj.Link("Numbers").Click

If obj.Link("Simple Interest").Exist(30) Then
 obj.Link("Simple Interest").Click
Else
 Print "Link NOT Available"
End IF
```

Method 3: Wait

Wait is a hardcoded sync point, which waits independent of the event happened or NOT. Hence, usage of Wait is discouraged and can be used for shorter wait time such as 1 or 2 seconds.

```
' Method 3 : Wait Timeout - 30 Seconds
Dim obj
Set obj = Browser("Math Calculator").Page("Math Calculator")
obj.Link("Numbers").Click
wait(30)
Browser("Math Calculator").Page("Math Calculator").Link("Simple Interest").Click
```

Method 4: Sync Method

Sync Method can be used only for web applications where there is always a lag between page loads.

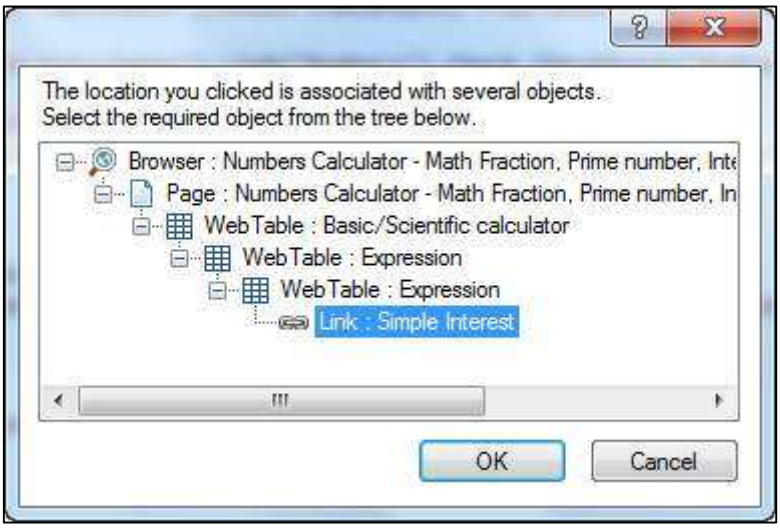
```
' Method 4 :
Dim obj
Set obj = Browser("Math Calculator").Page("Math Calculator")
obj.Link("Numbers").Click

Browser("Math Calculator").Sync
Browser("Math Calculator").Page("Math Calculator").Link("Simple Interest").Click
```

Method 5 : Inserting QTP Inbuilt Synchronization points:

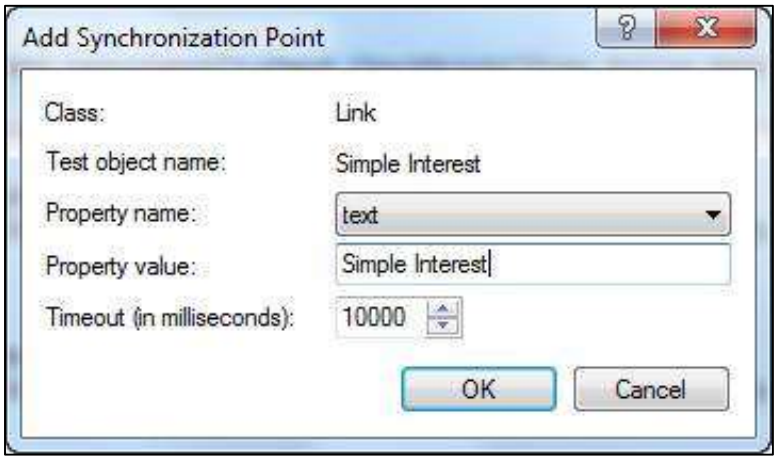
Step 1 : Get into Recording Mode. This option would be disabled if the user is NOT in Recording Mode.

Step 2 : Go to "Design" → "Synchronization Point" .

Step 3 : We need to select the object, which we want to be the Sync Point. After selecting the object, object window opens as shown below:



Step 4 : Click OK; the "Add Synchronization Window" opens. Select the Property, Value and Time out value and click OK as shown below:



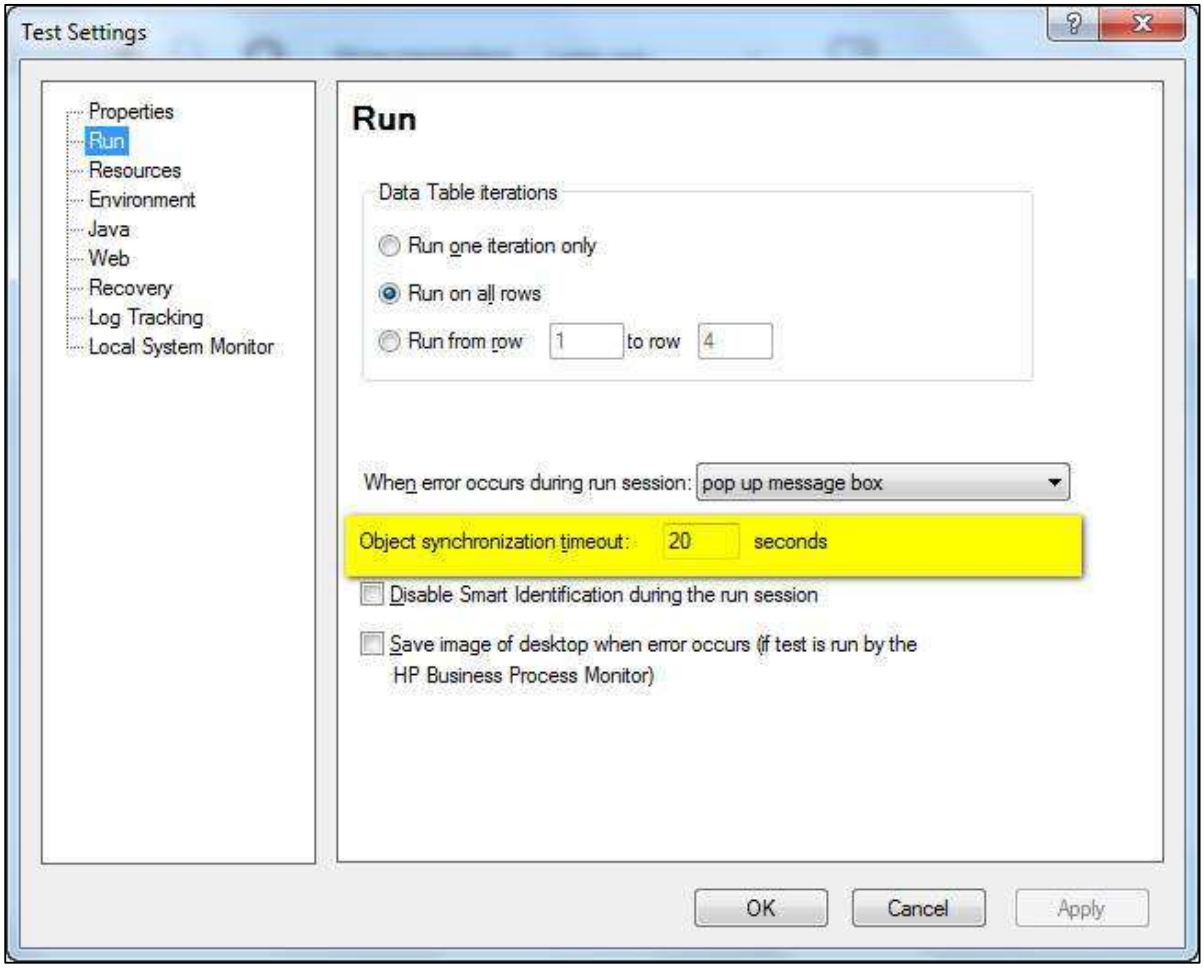
Step 5 : The script would be generated as shown below, which is the same as that of the WaitProperty(Method 1) that we had already discussed:

```
Browser("Math Calculator").Page("Math Calculator").Link("Numbers").Click

Browser("Math Calculator").Page("Math Calculator").Link("Simple
Interest").WaitProperty "text", "Simple Interest", 10000
```

Default Synchronization

When the user has not used any of the above sync methods, still QTP has an in-built Object synchronization timeout which can be adjusted by the user.

Navigate to "File" >> "Settings" >> Run Tab >> Object Synchronization Time out as shown below.



10. QTP – Smart Identification

Sometimes, QTP is unable to find any object that matches the recognized object description or it may find more than one object that fits the description, then QTP ignores the recognized description and uses the Smart Identification mechanism to recognize the object.

QTP's Smart Identification uses two types of properties:

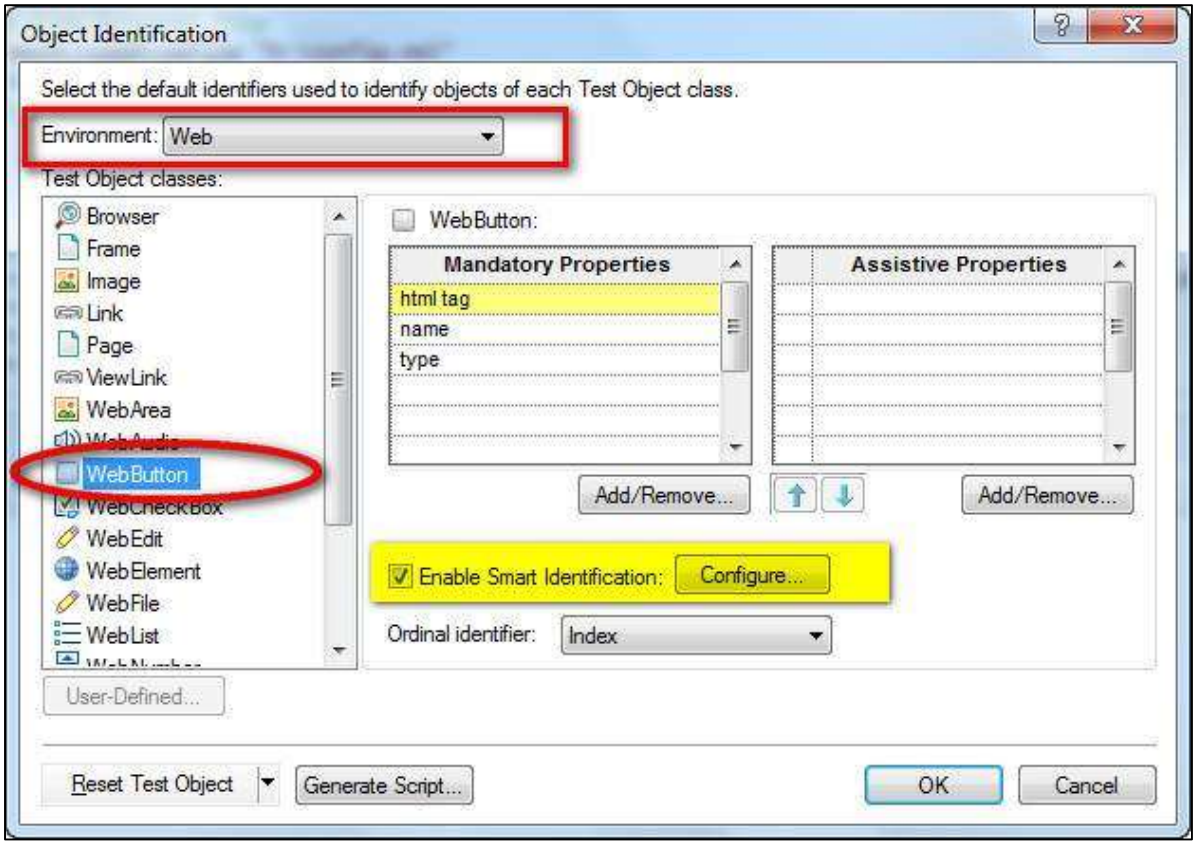
- **Base Filter Properties** - The basic properties of a particular test object class whose values cannot be changed without changing the essence of the original object.

- **Optional Filter Properties** - Other properties also assist in identifying the objects of a particular class whose properties are unlikely to change often but can be ignored if they are no longer applicable.

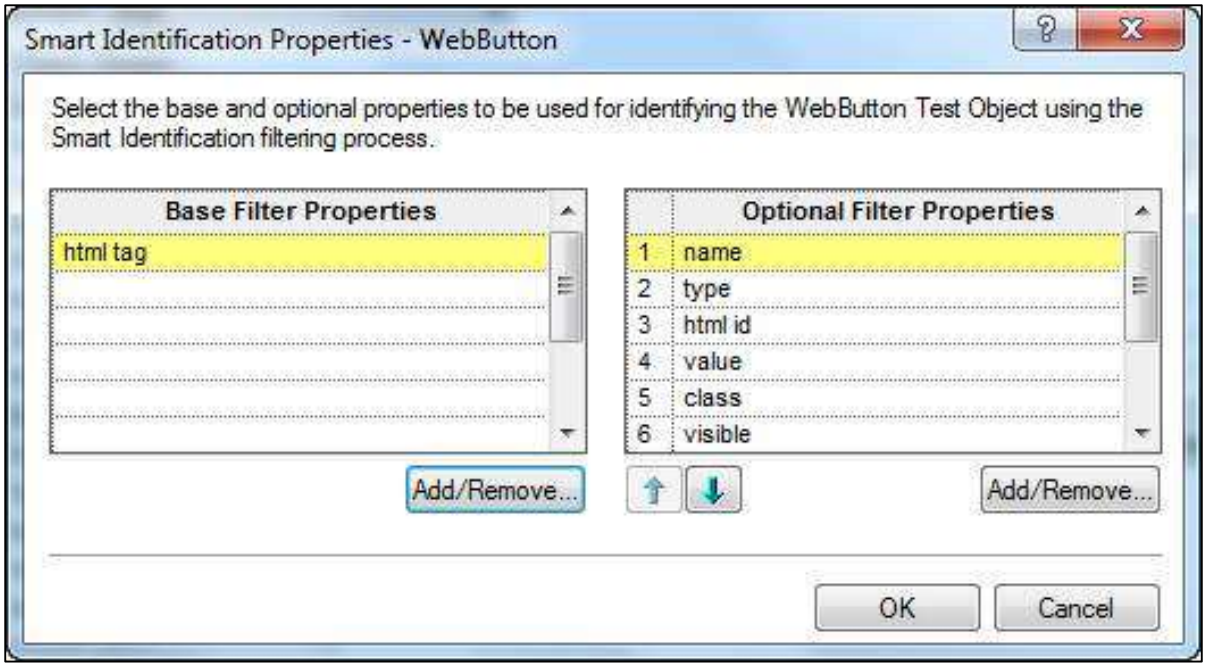
Enabling Smart Identification for an Object

Step 1 : Navigate to "Tools" → "Object Identification". Object Identification dialog opens.

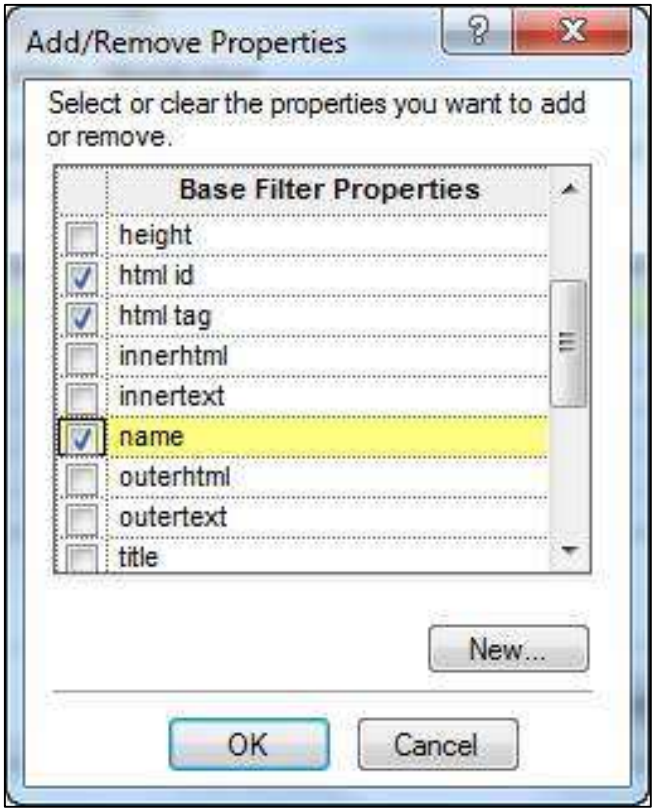
Step 2 : Choose the Environment, Object Class and Turn ON "Enable Smart Identification" as shown below:



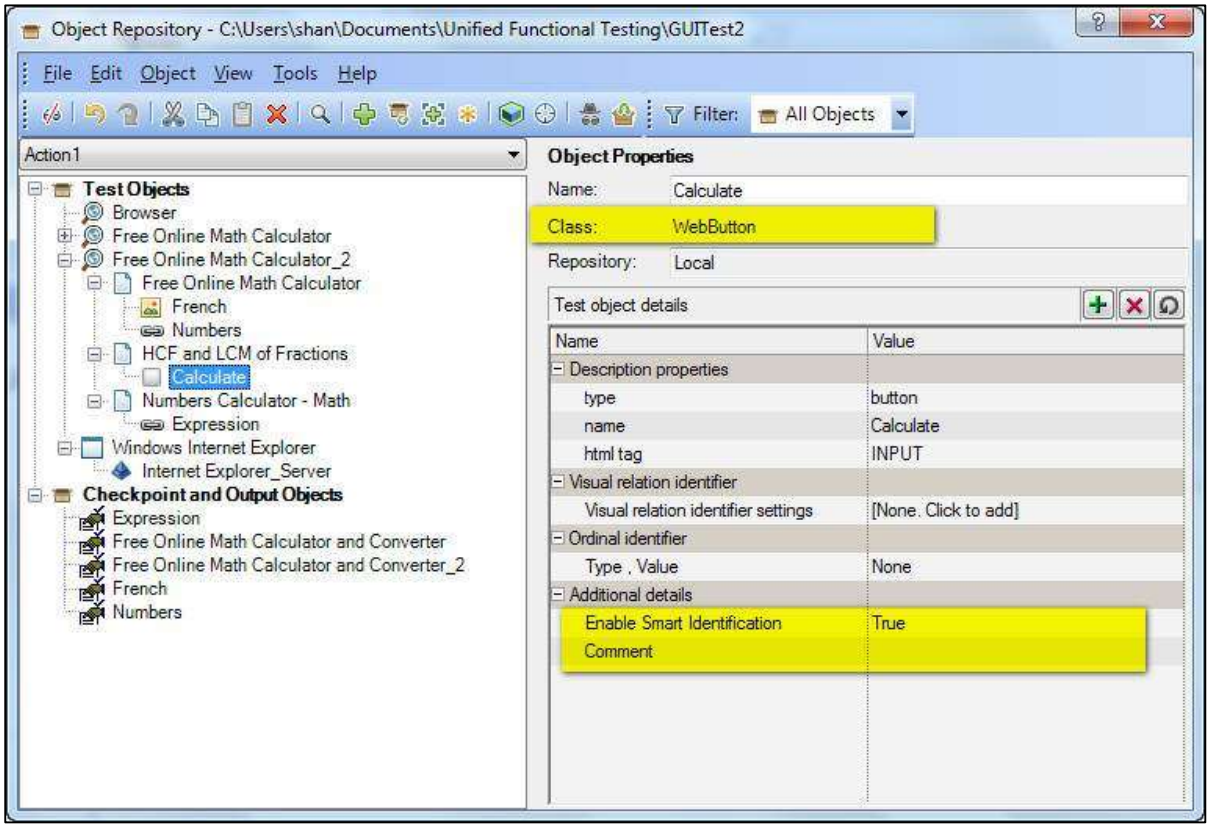
Step 3 : Click Configure and choose the base and Optional Filter Properties.



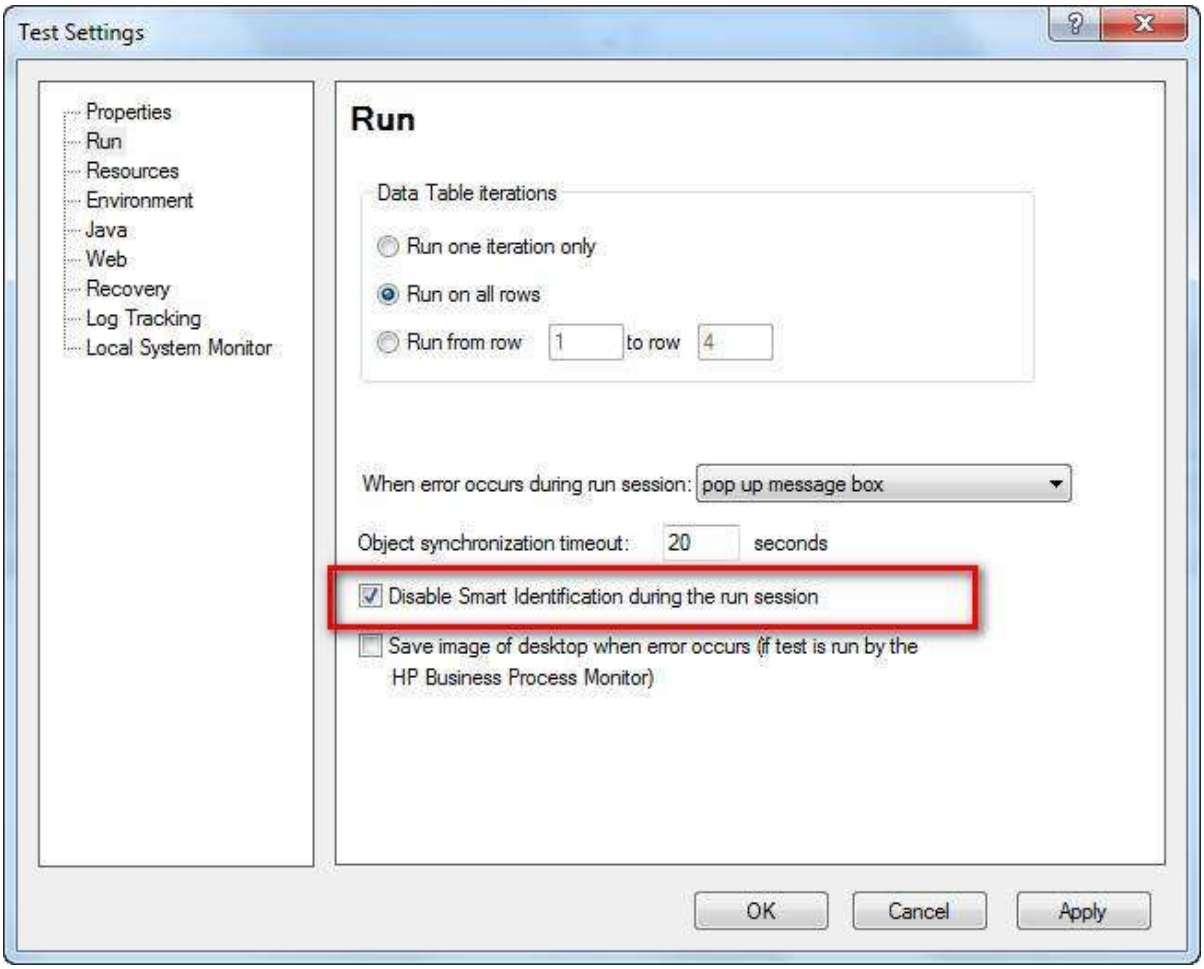
Step 4 : Add Properties in Base Properties apart from the default one and also add/remove Optional Filter Properties. Please note that same properties cannot be a part of both Mandatory and Assistive Properties and click "OK".



Step 5 : Verify if the Smart Identification is enabled after adding object of that type in the Object Repository. Smart Identification is set to TRUE. We can also make it False in case we do not want to enable Smart Identification.



Step 6 : We can even disable a test Level by applying at test script level under "Settings" of "File" Menu as shown below:



Step 7 : If the Smart Identification is disabled as per Step# 6 then it will not apply smart identification for any object during the script execution.

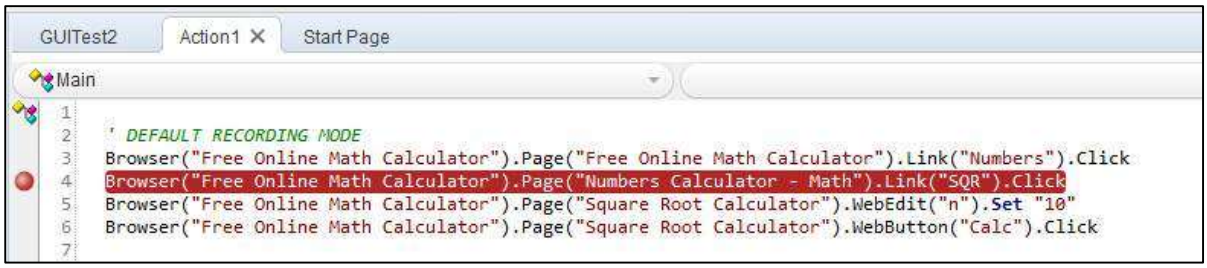
Step 8 : In case the objects are added with Smart Identification as Off, QTP will not use Smart Identification for recognizing in future, even though we have enabled it later.

11. QTP – Debugging

Debugging, in automation testing context, is a systematic process of spotting and fixing the coding issues in the automation script so that the script will be more robust and can spot the defects in the application.

There are various ways to perform debugging using break points in QTP. Break points can be inserted just by pressing "F9" or by using the Menu option "Run" → "Inserting/Removing Break Point".

After Inserting the Break point, the "Red Colored" Dot and the line will be highlighted in RED as shown below:



Method	ShortCut	Description
Step Into	F11	Used to execute each and every Step. Steps into the Function/Action and executes line by line. It pauses on each line after execution.
Step Over	F10	Used to Step over the Function. Step Over runs only the current step in the active document.
Step Out	Shift+F11	After Step Into the function, you can use the Step Out command. Step Out continues the run to the end of the function and then pauses the run session at the next line.

Options in Break Point

Various Options in Break Point can be accessed by Navigating through the 'Run' Menu.

ShortCut	Description
F9	Insert/Remove BreakPoint
Ctrl+F9	Enable/Disable BreakPoint
Ctrl+Shift+F9	Clear All BreakPoint
Use Only Menu	Enable/Disable All BreakPoints

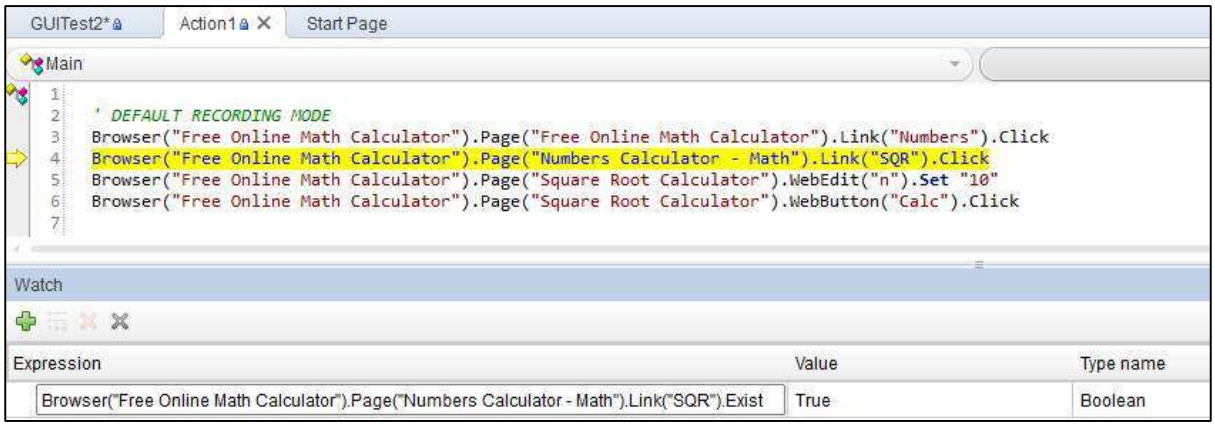
Debugging Pane

The following are the panes in the debugging window:

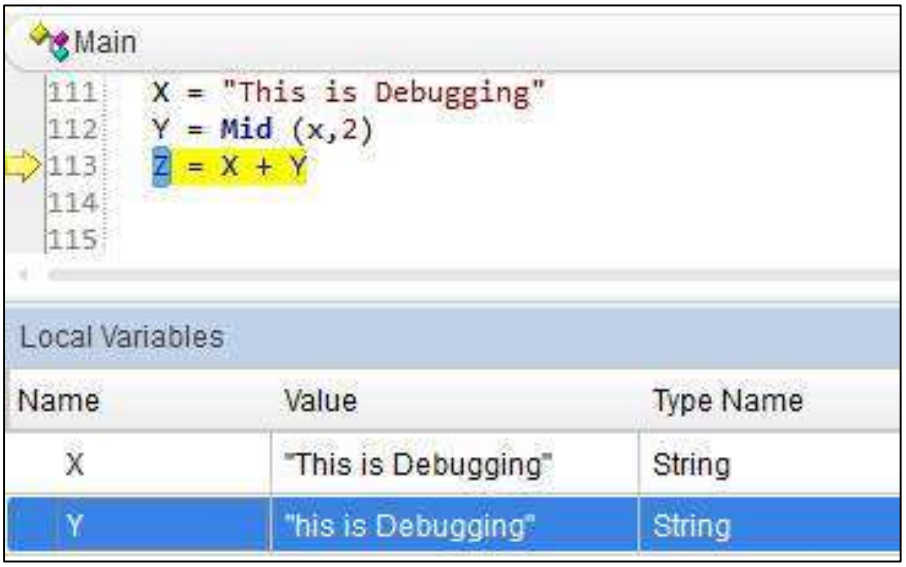
- **Output** - This Tab displays all the Output of the Print Statements.
- **Watch** - This Tab displays the Boolean output of the Given Expression.
- **LocalVariables** - This Tab displays the Output of the Local Variables.

Example

The Watch Pane shows the output expression as shown below:



The Local Variables Pane shows the values held by the local variables as shown below:



12. QTP – Error Handling

There are various ways of handling errors in QTP. There are three possible types of errors, one would encounter, while working with QTP. They are-

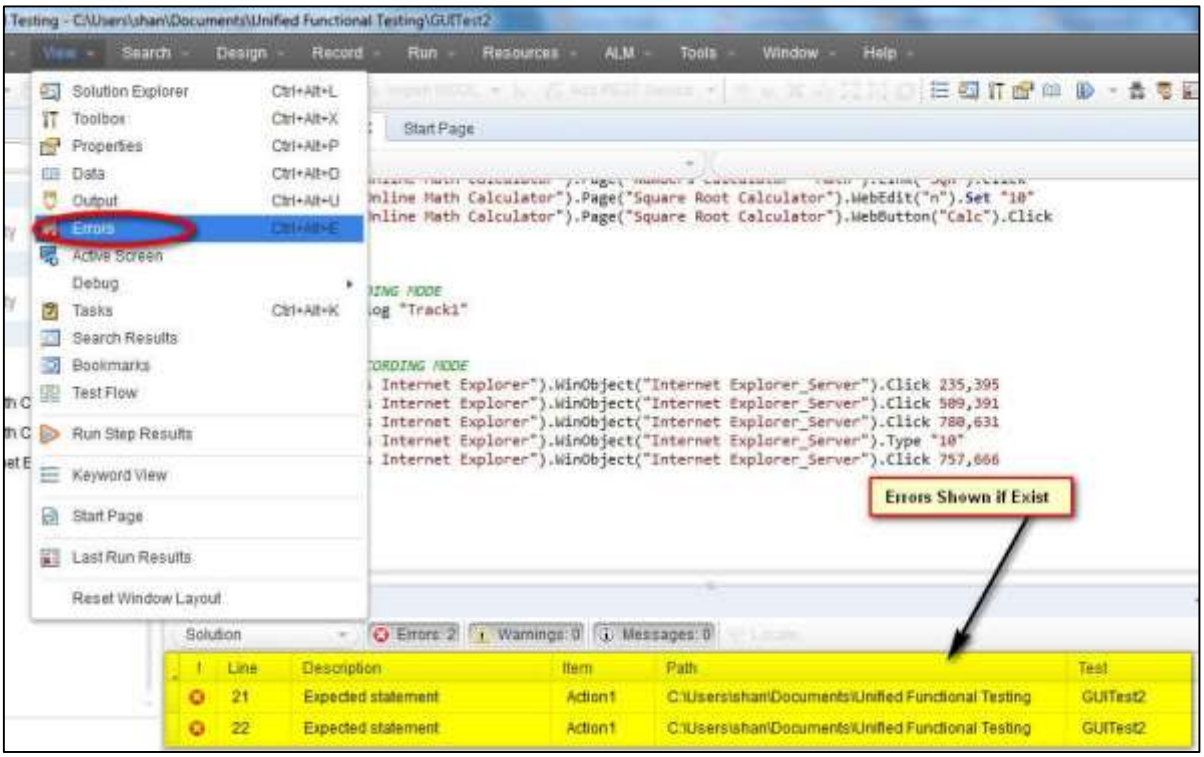
- Syntax Errors
- Logical Errors
- Run Time Errors

Error Types

Syntax Errors

Syntax errors are the typos or a piece of the code that does not confirm with the VBscripting language grammar. Syntax errors occur at the time of compilation of code and cannot be executed until the errors are fixed.

To verify the syntax, use the keyboard shortcut Ctrl+F7 and the result is displayed as shown below. If the window is not displayed one can navigate to "View" → "Errors".



Logical Errors

If the script is syntactically correct but it produces unexpected results, then it is known as a Logical error. Logical error usually does not interrupt the execution but produces incorrect results. Logical errors could occur due to variety of reasons, viz- wrong assumptions or misunderstandings of the requirement and sometimes incorrect program logics (using do-while instead of do-Until) or Infinite Loops.

One of the ways to detect a logical error is to perform peer reviews and also verify the QTP output file/result file to ensure that the tool has performed the way it was supposed to do.

RunTime Errors

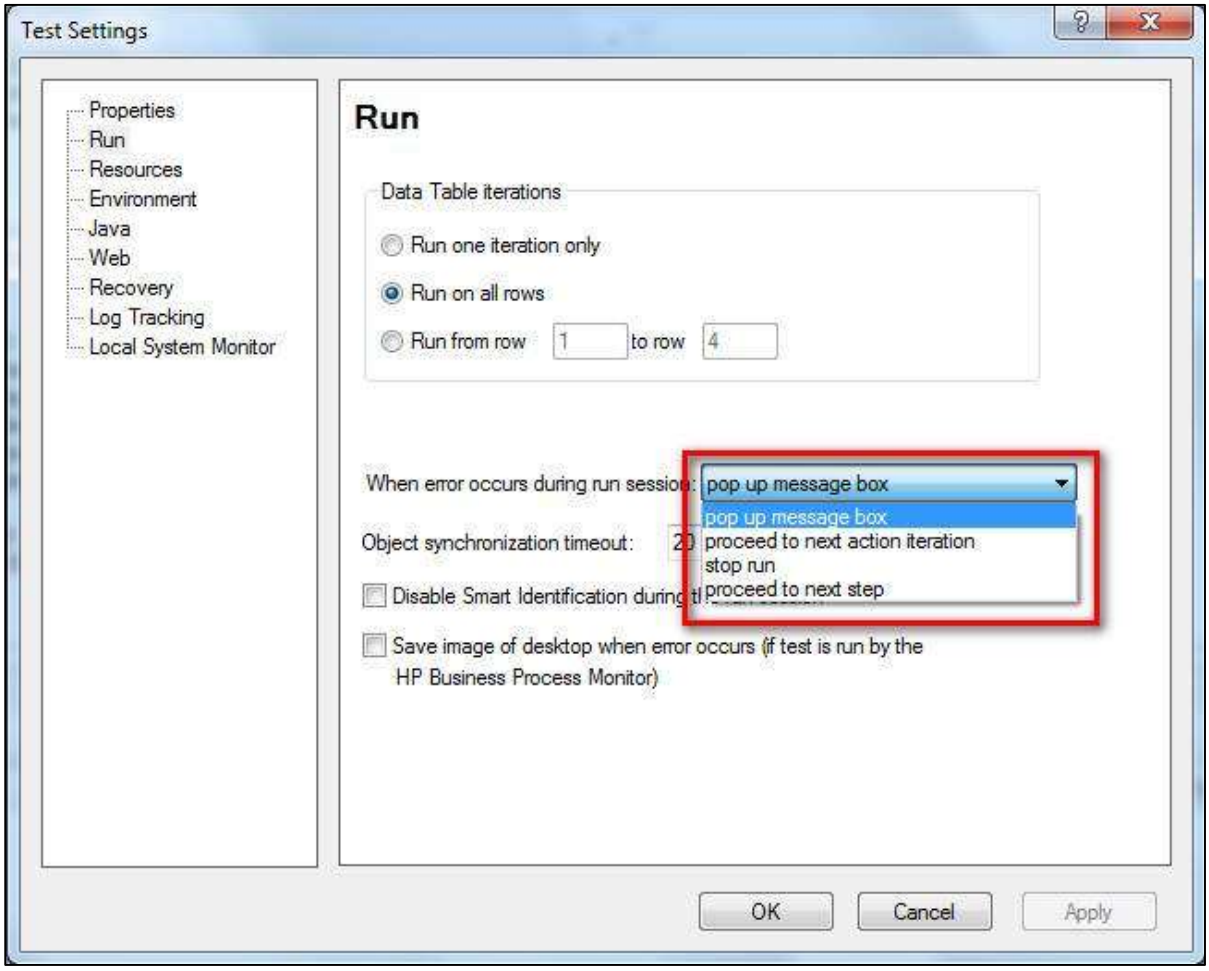
As the name states, this kind of error happens during Run Time. The reason for such kind of errors is that the script trying to perform something is unable to do so and the script usually stops, as it is unable to continue with the execution. Classic examples for Run Time Errors are-

- File NOT found but the script trying to read the file
- Object NOT found but the script is trying to act on that particular object
- Dividing a number by Zero
- Array Index out of bounds while accessing array elements

Handling Run-Time Errors

There are various ways to handle errors in the code.

1. Using Test Settings - Error handling can be defined the Test Settings by Navigating to "File" >> "Settings" >> "Run" Tab as shown below. We can select any of the specified settings and click "OK".



2. Using On Error Statement – The 'On Error' statement is used to notify the VBScript engine of intentions to handle the run-time errors by a tester, rather than allowing the VBScript engine to display error messages that are not user-friendly.

- **On Error Resume Next** - On Error Resume Next informs the VBScript engine to process executing the next line of code when an error is encountered.

- **On error Goto 0** - This helps the testers to turn off the error handling.

3. Using Err Object - Error object is an in-built object within VBScript that captures the run-time error number and error description with which we are able to debug the code easily.

- **Err.Number** - The the Number property returns or sets a numeric value specifying an error. If Err.Number value is 0 then No error has occurred.

- **Err.Description** - The Description property returns or sets a brief description about an error.

- **Err.Clear -** The Clear method resets the Err object and clears all the previous values associated with it.

Example

```
'Call  the function to Add two Numbers
Call Addition(num1,num2)

Function Addition(a,b)

  On error resume next

 If NOT IsNumeric(a) or IsNumeric(b) Then

   Print "Error number is   " &   err.number & " and description is : " &
err.description

   Err.Clear

   Exit Function

 End If

  Addition = a+b

   'disables error handling

 On Error Goto 0

  End function
```

4. Using Exit Statement - Exit Statements can be used along with Err object to exit from a test or action or iteration based on the Err.Number value. Let us see each one of those Exit statements in detail.

- **ExitTest -** Exits from the entire QTP test, no matter what the run-time iteration settings are.
- **ExitAction -** Exits the current action.
- **ExitActionIteration** - Exits the current iteration of the action.
- **ExitTestIteration -** Exits the current iteration of the QTP test and proceeds to the next iteration.

5. Recovery Scenarios - Upon encountering an error, recovery scenarios are triggered based on certain conditions and it is dealt in detail in a separate chapter.

6. Reporter Object - Reporter Object helps us to report an event to the run results. It helps us to identify if the concerned action/step is pass/fail.

```
'Syntax: Reporter.ReportEventEventStatus, ReportStepName, Details,
[ImageFilePath]
'Example
Reporter.ReportEvent micFail, "Login", "User is unable to Login."
```

13. QTP – Recovery Scenarios

Recovery Scenarios

While executing the QTP scripts, we might get some unexpected errors. In order to recover the tests and continue executing the rest of the script from these unexpected errors, Recovery Scenarios are used. The Recovery Scenario Manager can be accessed by Navigating to "Resources" → Recovery Scenario Manager as shown below:

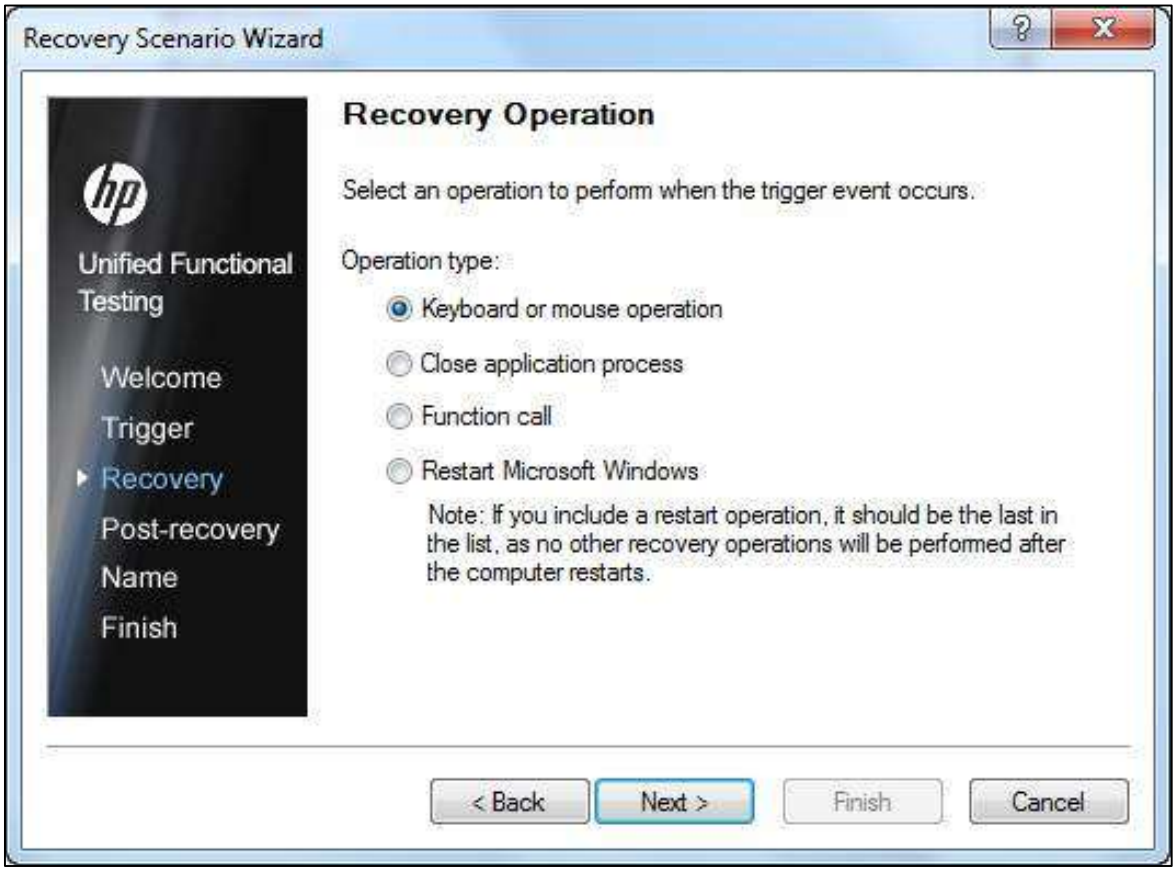
Steps to Create Recovery Scenario

Step 1 : Click "New" Recovery Scenario button; the Recovery Scenario Wizard opens as shown below:

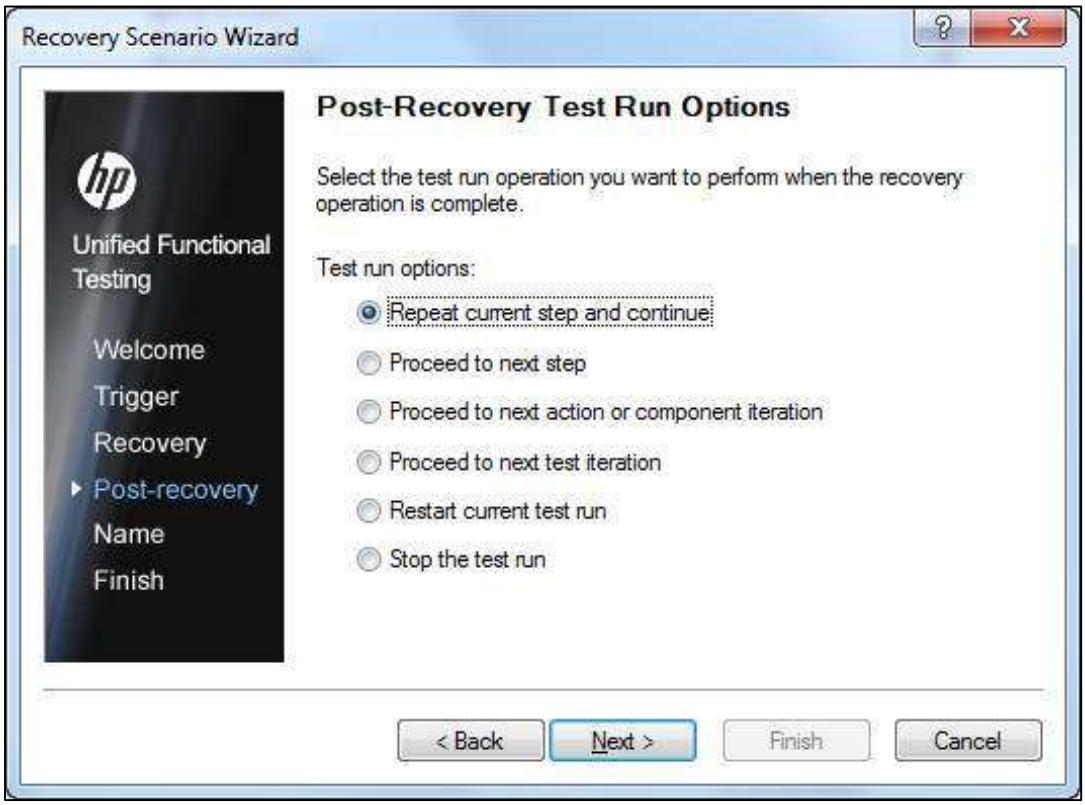
Step 2 : Choose the Trigger Event. It corresponds to event, which can arise in any of the following four events-

- Pop-Up Window
- Object State
- Test Run Error
- Application Crash

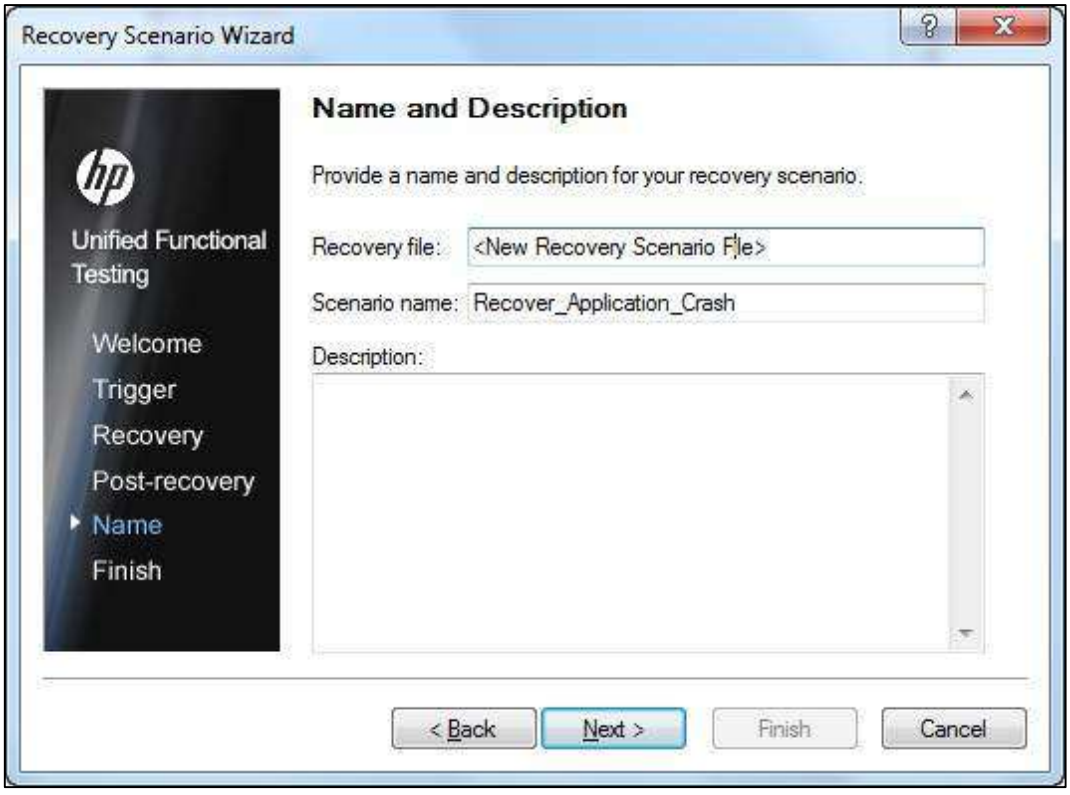
Step 3 : The Recovery Operations Window opens. Recovery Operation can perform any of the following Operation as shown in the screenshot below:



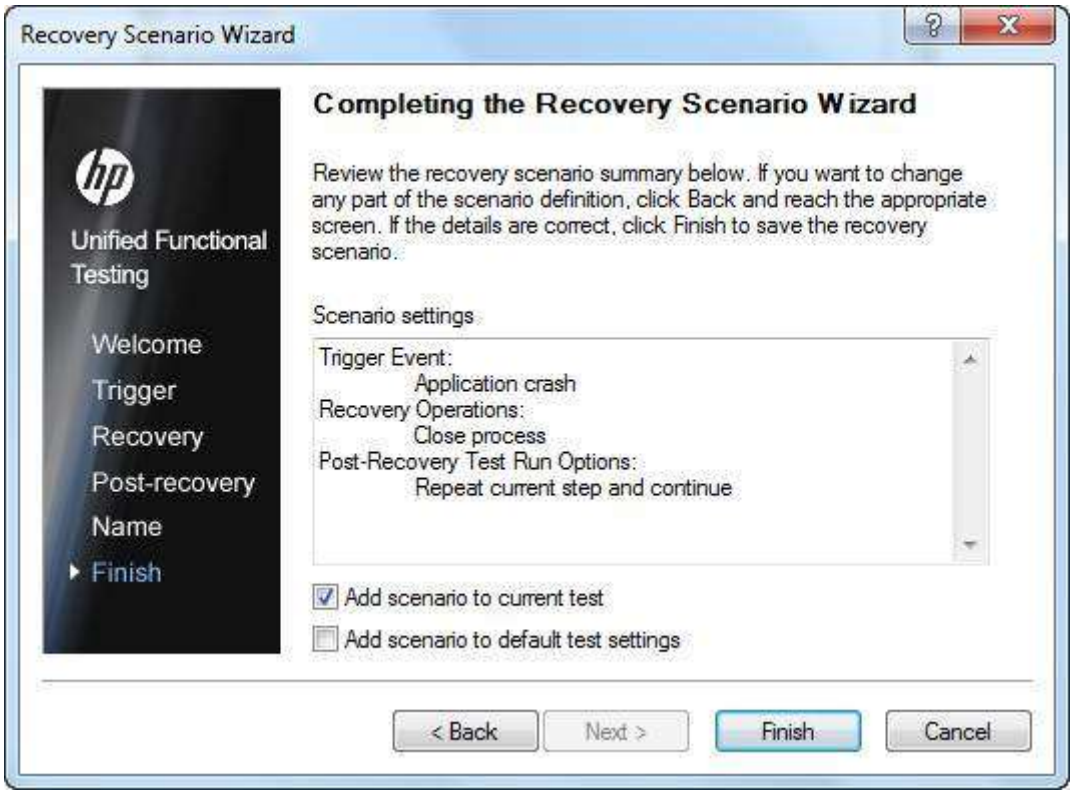
Step 4 : After specifying the appropriate Recovery Operation, we need to specify the Post Recovery Operation as well, as shown below:



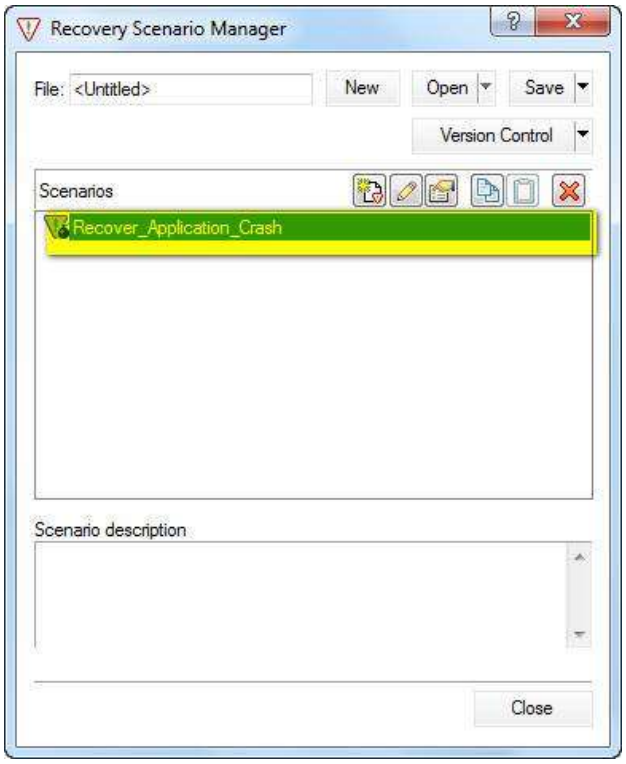
Step 5 : After specifying the Post Recovery Operation, the recovery scenario should be named and added to the Test so that it can be activated.



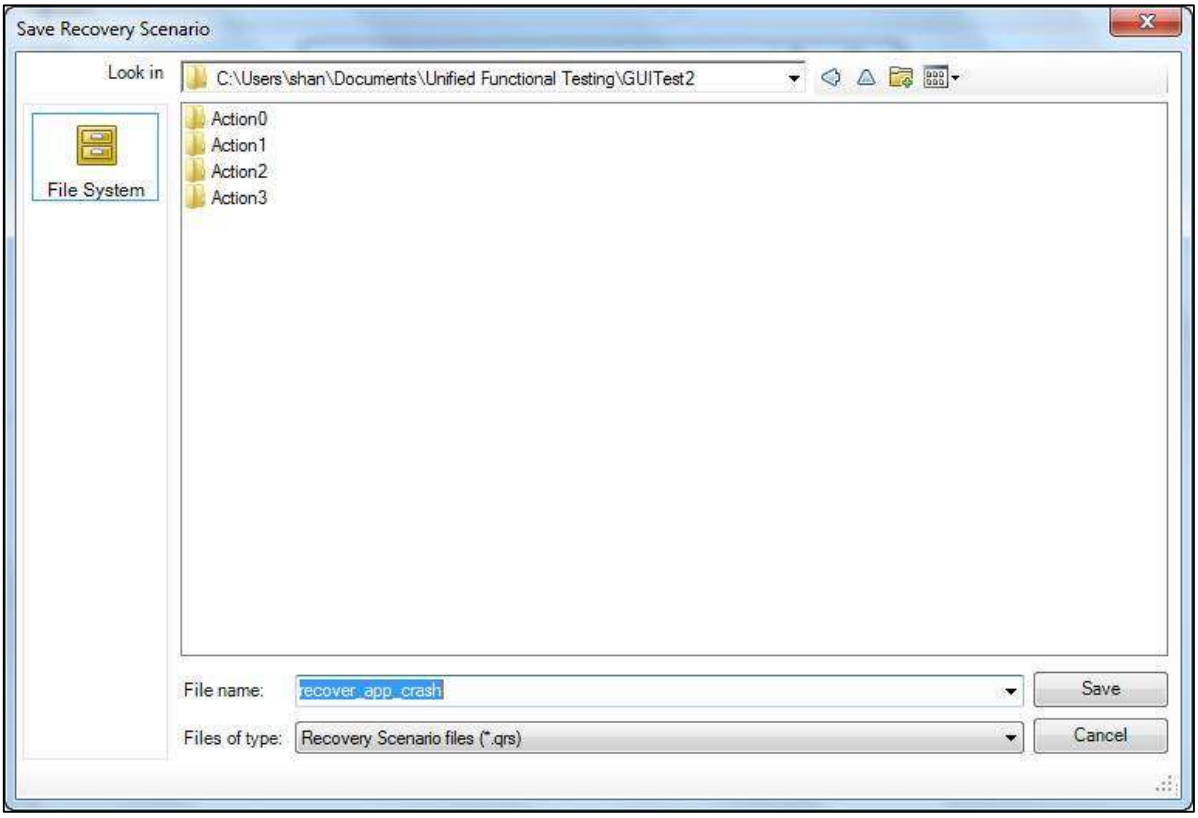
Step 6 : The Recovery Scenario creation is complete and needs to be mapped to the current Test by checking the option "Add Scenario to the current Test" and click "Finish".



Step 7 : The Added Recovery Scenario will be as shown below and click the "Close" Button to continue.

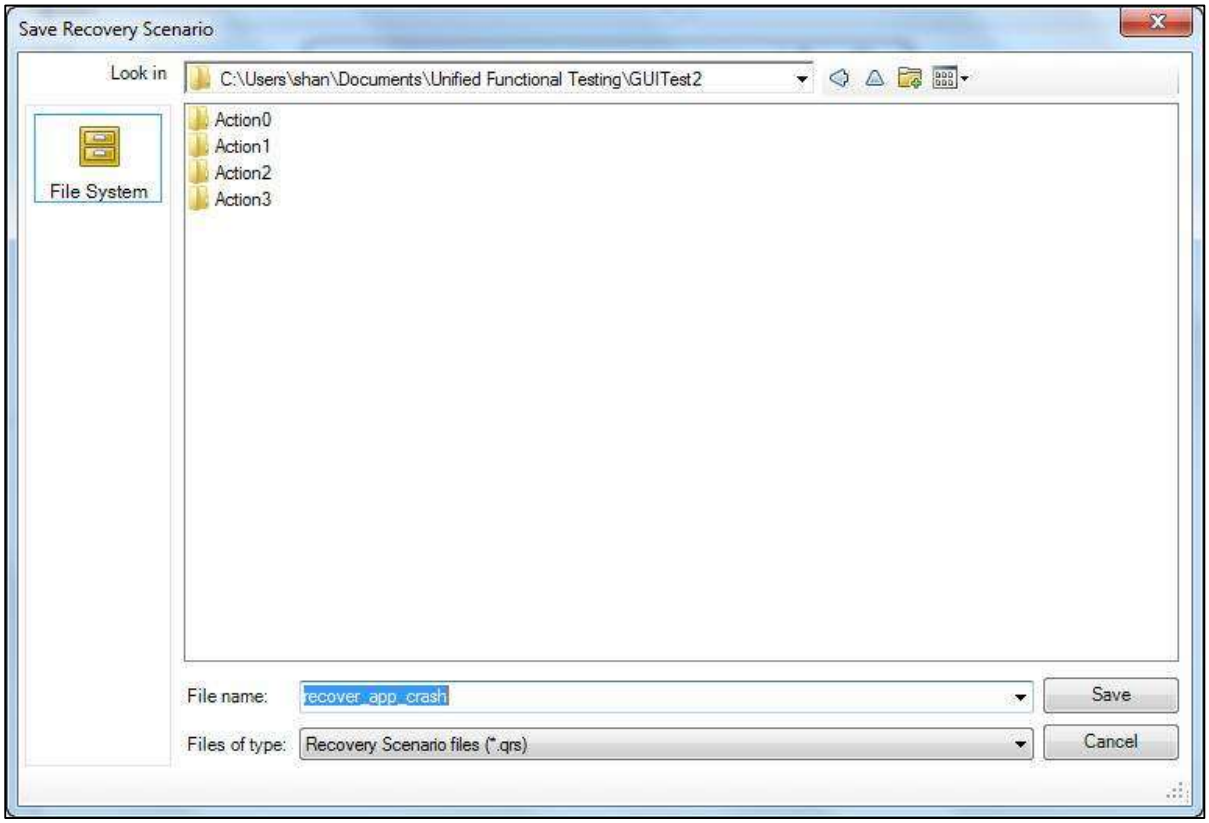


Step 8 : After clicking the Close button, QTP would prompt the user to save the created Recovery scenario. It will be saved with the extension .qrs and the wizard would close.



Verification

The Created Recovery Scenario should be a part of the test now and can be verified by navigating to "File" → "Settings" → "Recovery" Tab.

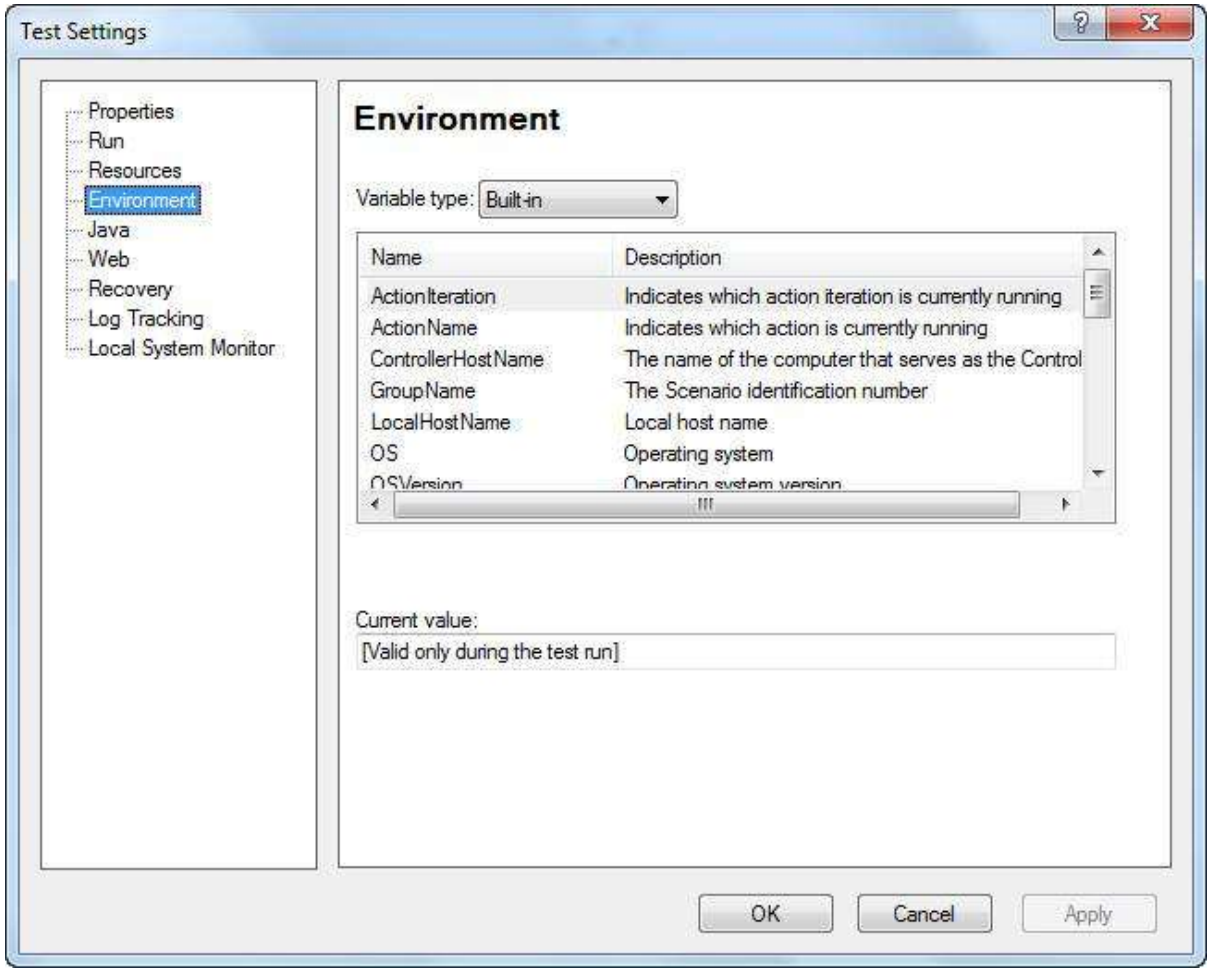


14. QTP – Environment Variables

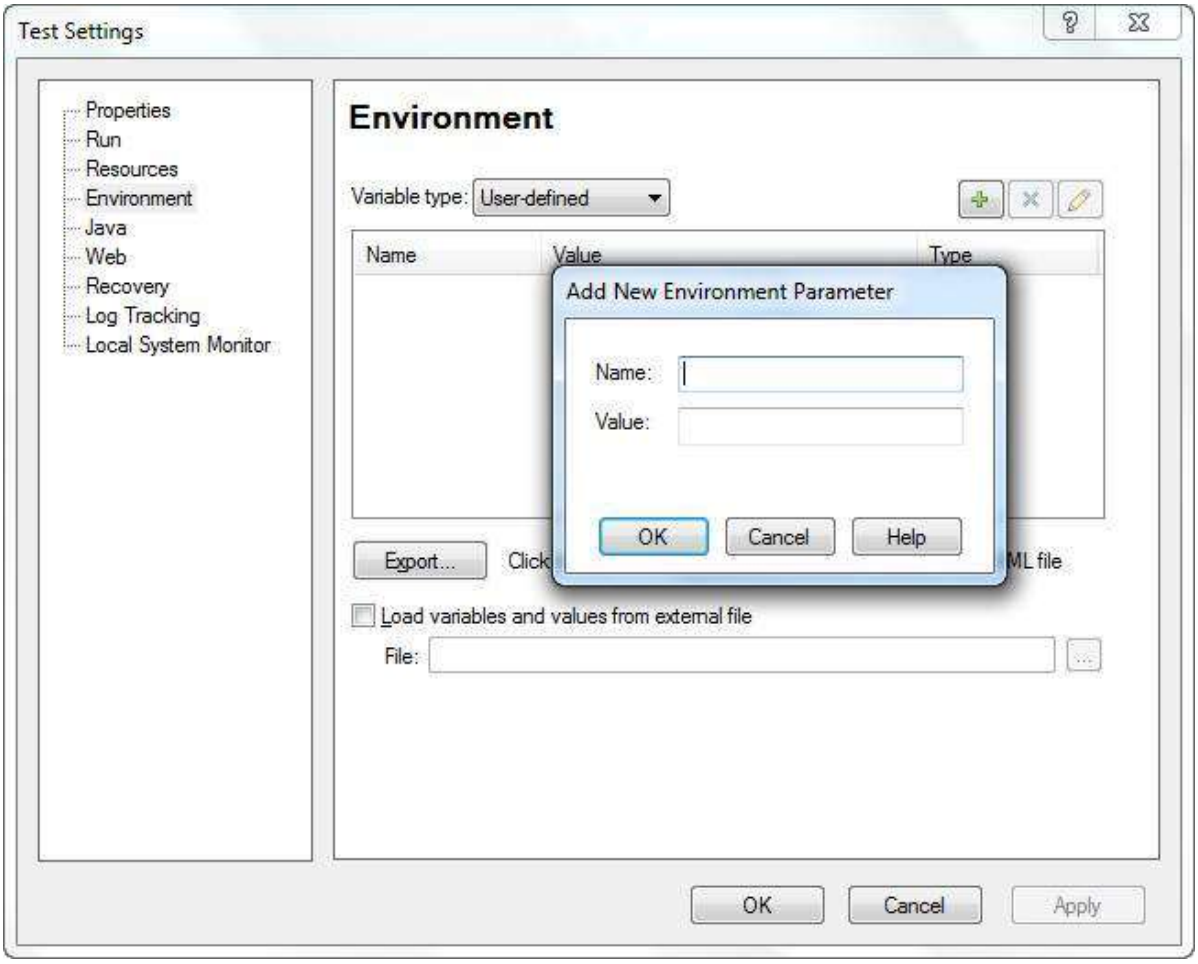
QTP environment variables are special types of variables that can be accessed by all actions, function libraries, and recovery scenarios. There are in-built environment variables for Windows that are available to all the applications running on that particular system, but QTP environment variables are only available to that particular test script during run-time.

Types of Environment Variables

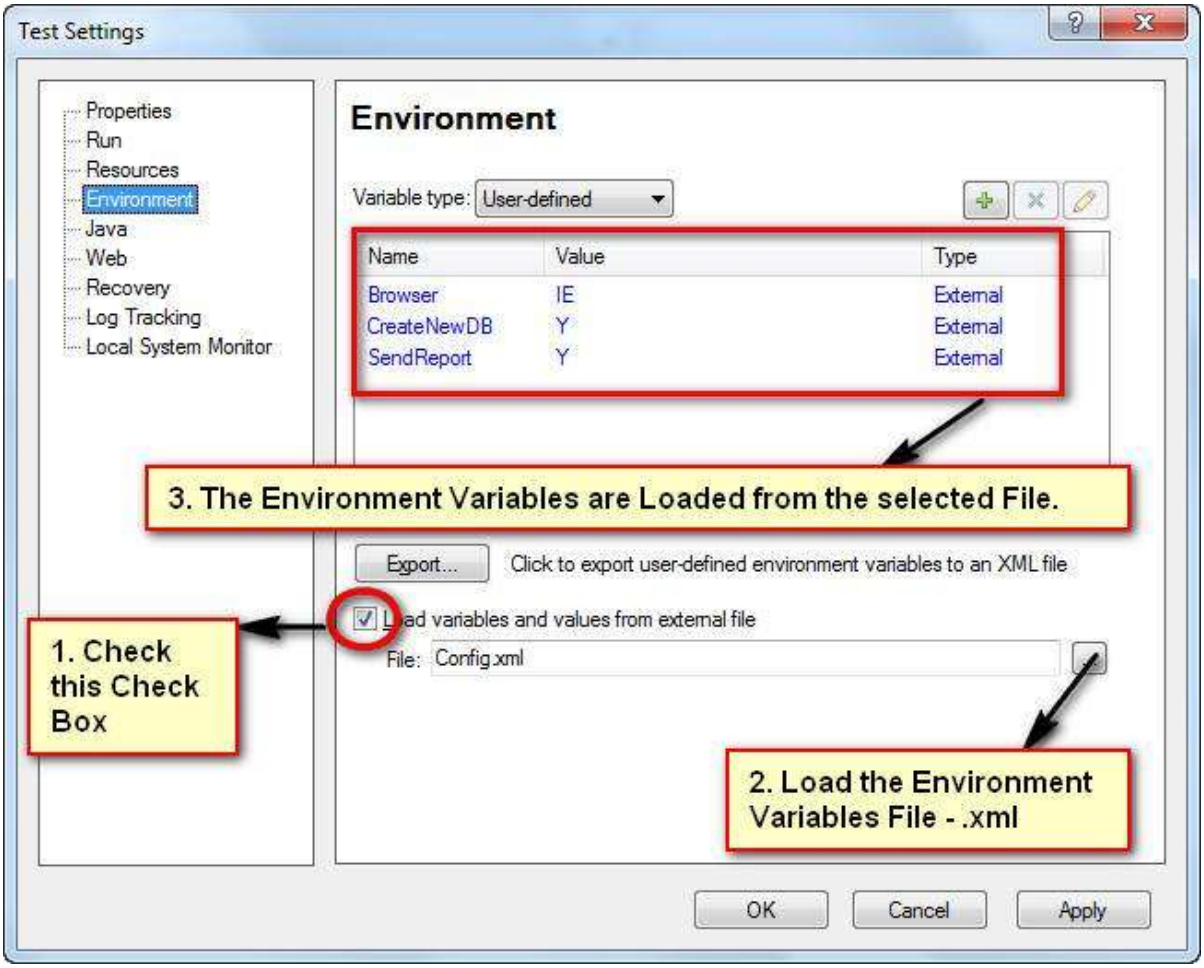
Built-in Environment Variables - provides a range of environment parameters that can provide information such as test name, action name, the test path, local host name, the operating system name, type and its version. The Environment Variable names can be accessed by navigating to "File" → "Test Settings" → "Environment" Tab.



User defined Internal - User defined variables can be saved by selecting "User Defined" in the Environment Tab Window. The "+" button is clicked to enter Parameter Name and Value as shown below:



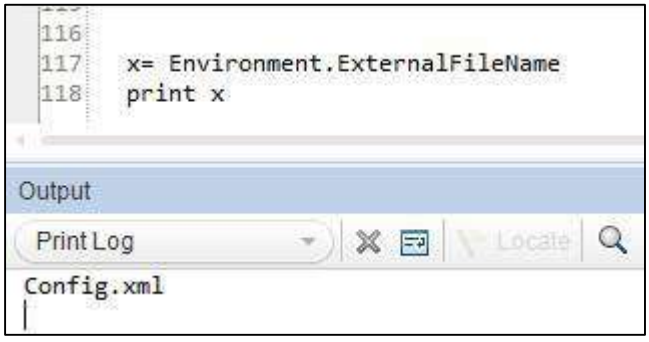
User Defined External - User Defined Variables can be stored in an external file as a .xml file and can be loaded into the test as shown in the figure given below. It can also be loaded dynamically during run-time as explained below in one of the examples.



Environment Variables – Supported Methods

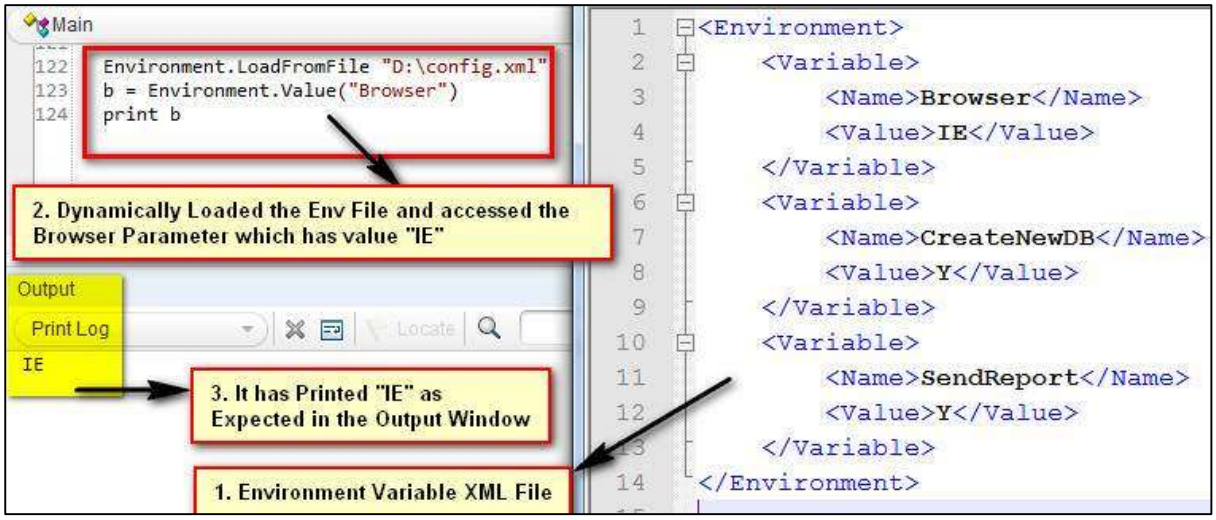
1. ExternalFileName Property - Returns the name of the loaded external environment variable file specified in the Environment tab of the Test Settings dialog box. If no external environment variable file is loaded, this property returns an empty string.

```
x= Environment.ExternalFileName
print x
```



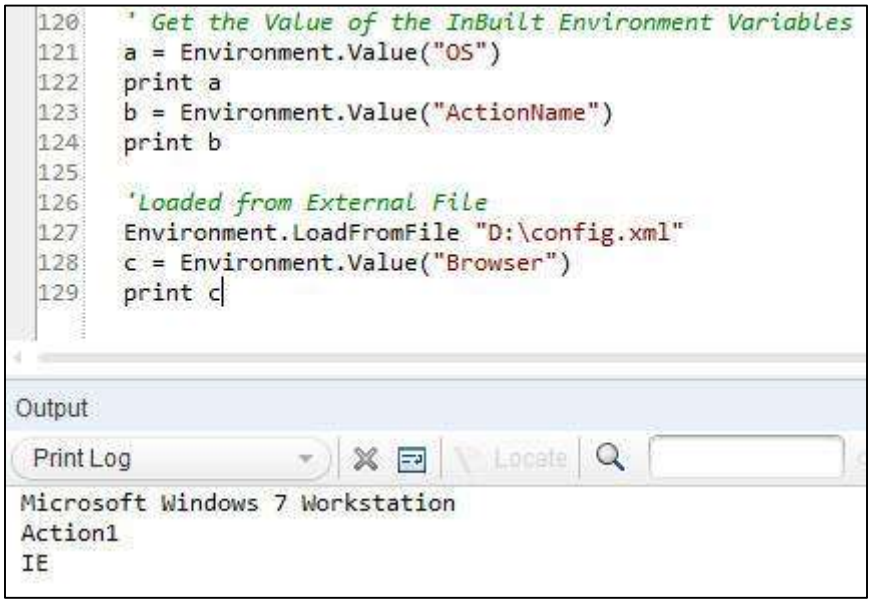
2. LoadFromFile Method - Loads the specified environment variable file (.xml) dynamically during run time. When using this method, the environment variables need not be added manually into the Environment Tab.

```
Environment.LoadFromFile "D:\config.xml"
b = Environment.Value("Browser")
print b
```



3. Value Property - Retrieves the value of environment variables. We can also set the value of user-defined internal environment variables using this property.

```
' Get the Value of the InBuilt Environment Variables
a = Environment.Value("OS")
print a
b = Environment.Value("ActionName")
print b

'Loaded from External File
Environment.LoadFromFile "D:\config.xml"
c = Environment.Value("Browser")
print c
```



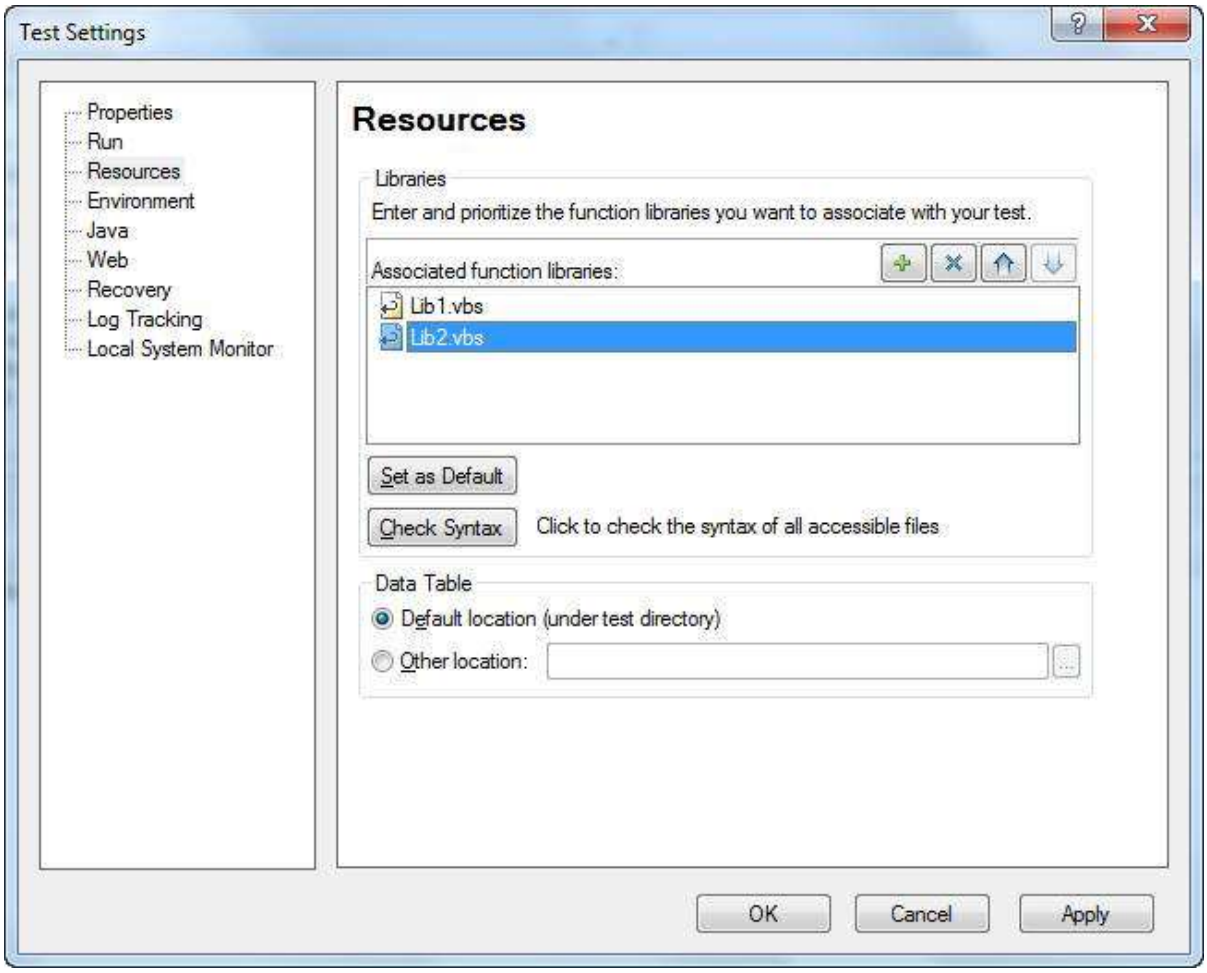
15. QTP – Library Files

In order to modularize the script, library files are added to the QTP Script. It contains variable declaration, Functions, Classes etc. They enable reusability that can be shared across test scripts. They are saved with an extenstion .vbs or .qfl

A new Library file can be created by navigating to "File" >> "Function Library".

Associating Function Libraries

Method 1 : By using "File" > "Settings" > Resources > Associate Function Library option. Click the "+" button to add Function Library file and add it using the actual path or relative path as shown below:



Method 2 : Using ExecuteFile method.

```
'Syntax : ExecuteFile(Filepath)
ExecuteFile "C:\lib1.vbs"
ExecuteFile "C:\lib2.vbs"
```

Method#3 : Using LoadFunctionLibrary Method.

```
'Syntax : LoadFunctionLibrary(Filepath)
LoadFunctionLibrary "C:\lib1.vbs"
LoadFunctionLibrary "C:\lib2.vbs"
```

Method#4 : Automation Object Model(AOM) - It is a mechanism, using which, we can control various QTP operations outside QTP. Using AOM, we can launch QTP, Open the Test, Associate Function Libraries etc. The following VbScript should be saved with Extension .vbs and upon executing the same, QTP will be launched and test would start executing. AOM will be discussed in detail in the later chapters.

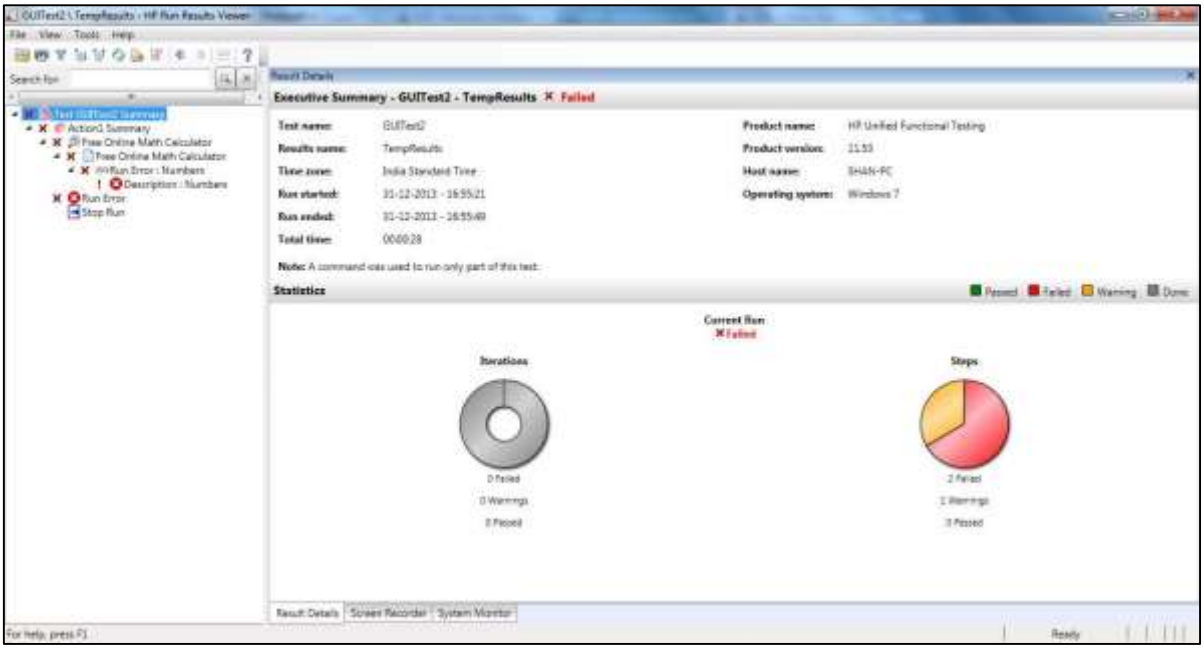
```
'Launch QTP
Set objQTP = CreateObject("QuickTest.Application")
objQTP.Launch
objQTP.Visible = True

'Open the test
objQTP.Open "D:\GUITest2", False, False
Set objLib = objQTP.Test.Settings.Resources.Libraries

'Associate Function Library if NOT associated already.
If objLib.Find("C:\lib1.vbs") = -1 Then
  objLib.Add "C:\lib1.vbs", 1
End
```

16. QTP – Automated Testing Process

Test Results

The Test Results Window gives us sufficient information to show the steps passed, failed etc. Results window opens automatically after the execution of the test (as per default settings). The following information is displayed-

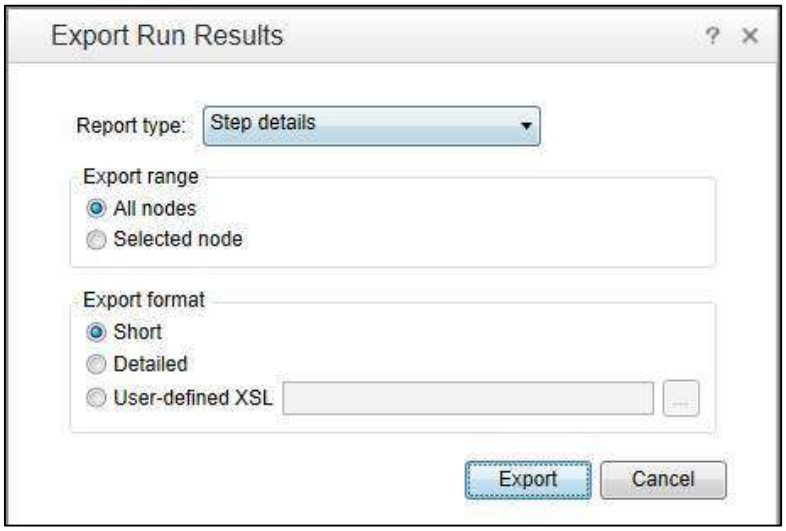
- Steps Passed
- Steps Failed
- Environment Parameters
- Graphical Statistics



Operations performed in Test Results

Converting Results to HTML

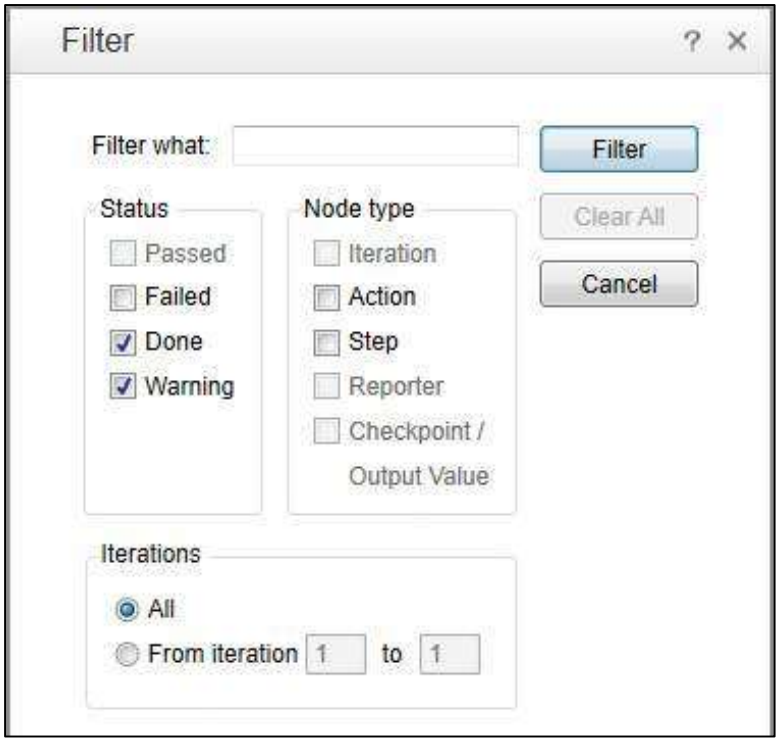
In the Results Viewer window, navigate to "File" → "Export to File". Export Run Results dialog box opens as shown below:



We can choose what type of report is to be exported. It can be short results, detailed results or even, we can select nodes. After selecting the File Name and exporting it, the file is saved as .HTML File

Filtering the Results

Results can be filtered based on Status, Node Type, and Iterations. It can be accessed by using the Filter button in the "Test Results Window".

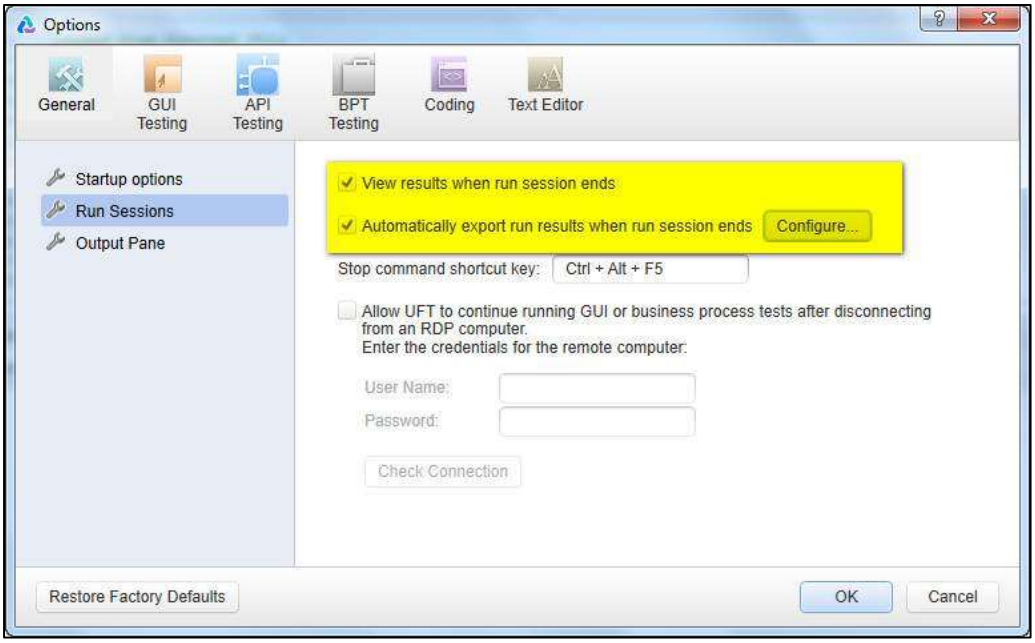


Raising Defects

Defects can be logged into QC directly from the Test Results Window pane by accessing "Tools" → "Add Defect" which open's the connection to ALM as shown below:

Test Results

The Automatic Test Results Window can be configured under "Tools" → "Options" → "Run Sessions" Tab. We can turn it OFF, if required, and also, we can switch ON "Automatically Export Results when session Ends"



The screenshot or the movie can be recorded based on the settings. The same can be configured under "Tools" → "Options" → "Screen Capture" Tab. We can save the screenshot or movies based on the following three conditions-

- For Errors
- Always
- For Errors and Warnings

17. QTP – Working with GUI Objects

There are various GUI objects, with which QTP interacts, during the script execution. Hence, it is important to know the basic methods for the key GUI objects using which we will be able to work on it effectively.

Working with Text Box

Following are the methods using which we access text box during Run Time-

- **Set -** Helps the tester to Set Values into the Text Box
- **Click -** Clicks on the Text Box
- **SetSecure -** Used to set the text in the password boxes securely
- **WaitProperty -** Waits Till the Property value becomes true
- **Exist -** Checks for the existence of the Text Box
- **GetROProperty("text") -** Gets the Value of the Text Box
- **GetROProperty("Visible") -** Returns a Boolean value if visible

Example

```
Browser("Math Calculator").Sync
Set Obj = Browser("Math Calculator").Page("SQR Calc").WebEdit("n")

'Clicks on the Text Box
Obj.Click

'Verify if the Object Exist - Returns Boolean value
a= obj.Exist
print a

'Set the value
obj.Set "10000" : wait(2)

'Get the Runtime Object Property - Value of the Text Box
val = obj.GetROProperty("value")
print val


'Get the Run Time Object Property - Visiblility - Returns Boolean Value
```

```
x= Obj.GetROProperty("visible")
print x
```

Working with Check Box

Following are some of the key methods with which one can work with Check Box-

- **Set -** Helps the tester to Set the checkbox value "ON" or "OFF"
- **Click -** Clicks on the check Box. Even checks ON or OFF but user will not be sure about the status
- **WaitProperty -** Waits Till the Property value becomes true
- **Exist -** Checks for the existence of the Check Box
- GetROProperty("name") **-** Gets the Name of the check Box
- **GetROProperty("Visible") -** Returns a Boolean value if visible

Example

```
'To Check the Check Box
Set Obj = Browser("Calculator").Page("Gmail").WebCheckBox("PersistentCookie")
Obj.Set "ON"

'To UnCheck the Check Box
Obj.Set "OFF"

'Verifies the Existance of the Check box and returns Boolean Value
val = Obj.Exist
print val

'Fetches the Name of the CheckBox
a= Obj.GetROProperty("name")
print a

'Verifies the visible property and returns the boolean value.
x = Obj.GetROProperty("visible")
print x
```

Working with Radio Button

Following are some of the key methods with which one can work with Radio Button-

- **Select(RadioButtonName) -** Helps the tester to Set the Radio Box "ON"
- **Click -** Clicks on the Radio Button. Even Radio Button ON or OFF but tester cannot get the status
- **WaitProperty -** Waits Till the Property value becomes true
- **Exist -** Checks for the existence of the Radio Button
- **GetROProperty("name") -** Gets the Name of the Radio Button
- **GetROProperty("Visible") -** Returns a Boolean value if visible

Example

```
'Select the Radio Button by name "YES"
Set Obj = Browser("Calculator").Page("Forms").WebRadioGroup("group1")
Obj.Select("Yes")

'Verifies the Existance of the Radio Button and returns Boolean Value
val = Obj.Exist
print val

'Returns the Outerhtml of the Radio Button
txt = Obj.GetROProperty("outerhtml")
print text

'Returns the boolean value if Radio button is Visible.
vis = Obj.GetROProperty("visible")
print vis
```

Working with Combo Box

Following are some of the key methods with which one can work with Combo Box-

- **Select(Value) -** Helps the tester to Select the value from the ComboBox
- **Click -** Clicks on the object
- **WaitProperty -** Waits Till the Property value becomes true
- **Exist -** Checks for the existence of the Combo Box
- **GetROProperty("Text") -** Gets the Selected Value of the Combo Box

- **GetROProperty("all items") -** Returns all the items in the combo Box
- **GetROProperty("items count") -** Returns the number of items in the combo Box

Example

```
'Get the List of all the Items from the ComboBox
Set ObjList = Browser("Math Calculator").Page("Statistics").WebList("class")
x = ObjList.GetROProperty("all items")
print x
'Get the Number of Items from the Combo Box
y = ObjList.GetROProperty("items count")
print y
'Get the text value of the Selected Item
z = ObjList.GetROProperty("text")
print z
```

Working with Buttons

Following are some of the key methods with which one can work with Buttons-

- **Click -** Clicks on the Button
- **WaitProperty -** Waits Till the Property value becomes true
- **Exist -** Checks for the existence of the Button
- **GetROProperty("Name") -** Gets the Name of the Button
- **GetROProperty("Disabled") -** Returns a Boolean value if enabled/disabled

Example

```
'To Perform a Click on the Button
Set obj_Button = Browser("Math Calculator").Page("SQR").WebButton("Calc")
obj_Button.Click

'To Perform a Middle Click on the Button
obj_Button.MiddleClick

'To check if the button is enabled or disabled.Returns Boolean Value
x = obj_Button.GetROProperty("disabled")
print x

'To fetch the Name of the Button
y = obj_Button.GetROProperty("name")
```

```
print y
```

Working with webTables

In Today's web based application, webTables have become very common and testers need to understand how WebTables work and how to perform an action on webTables. This topic will help you to work with the webTables effectively.

Statement	Description
if statement	An **if** statement consists of a boolean expression followed by one or more statements.
if..else statement	An **if else** statement consists of a boolean expression followed by one or more statements. If the condition is True, the statements under **If** statements are executed. If the condition is false, Else part of the script is Executed
if...elseif..else statement	An **if** statement followed by one or more **ElseIf** Statements, that consists of boolean expressions and then followed by an optional **else statement**, which executes when all the condition becomes false.
nested if statements	An **if** or **elseif** statement inside another **if** or **elseif** statement(s).
switch statement	A **switch** statement allows a variable to be tested for equality against a list of values.

- **html id -** If the table has an id tag then it is best to make use of this property.
- **innerText -** Heading of the Table.
- **sourceIndex -** Fetches the Source Index of the Table
- **ChildItemCount -** Gets the number of ChildItems present in specified Row
- **RowCount -** Gets the number of Rows in the Table
- **ColumnCount -** Gets the number of Columns in the Table
- **GetcellData -** Gets the Value of the Cell based on the column and Row Index

Example

```
Browser("Tutorials Point").Sync

' WebTable

Obj = Browser("Tutorials Point").Page("VBScript
Decisions").WebTable("Statement")

' Fetch RowCount

x = Obj.RowCount

print x



' Fetch ColumnCount
```

```
y = Obj.ColumnCount(1)
print y

' Print the Cell Data of the Table
For i = 1 To x Step 1
   For j = 1 To y Step 1
      z = Obj.GetCellData(i,j)
      print "Row ID : " & i & " Column ID : " & j & " Value : " & z
   Next
Next
'Fetch the Child Item count of Type Link in a particular Cell
z = Obj.ChildItemCount(2,1,"Link")
print z
```

18. QTP – Virtual Objects

What are Virtual Objects?

Sometimes, an application under test may contain standard window object but are not recognized by QTP. Under these circumstances, objects can be defined as virtual object(VO) of type button, link etc. so that user actions can be simulated on the virtual objects during execution.

Example

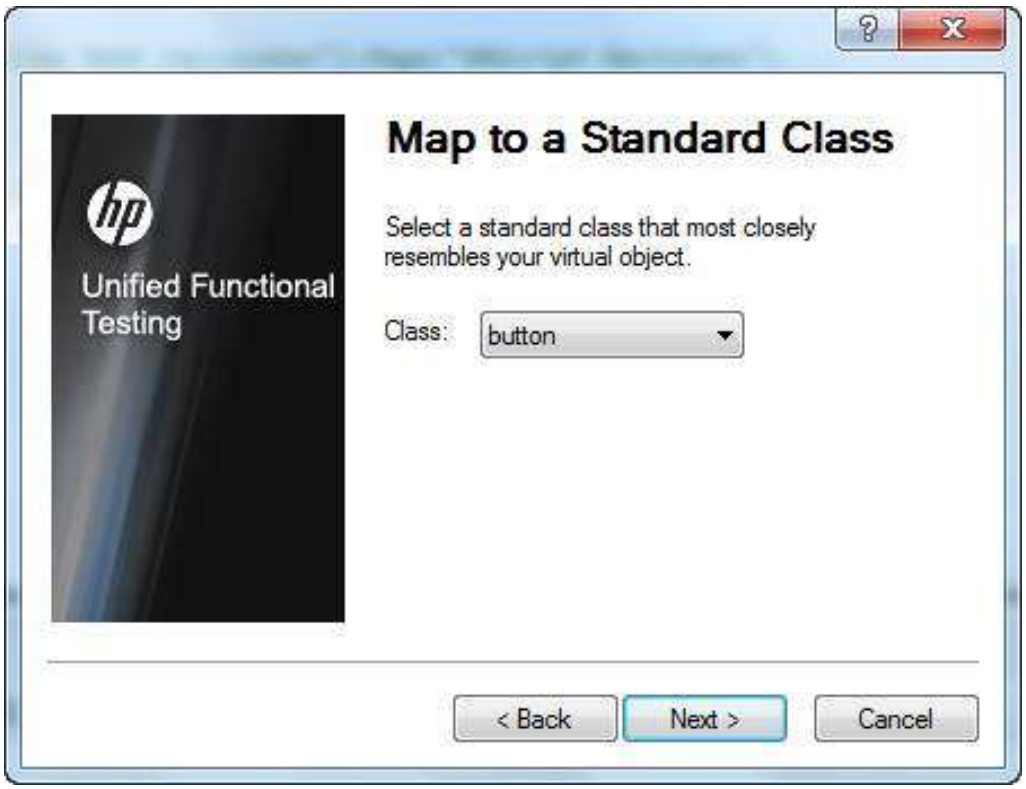
Let us say we are automating a scenario in Microsoft Word. I activated MS word application and I click on any icon in the ribbon. For example, on the Ribbon, Insert tab is clicked and then the user clicks the "Picture" button. A button is recognized as WinObject; hence, importance of virtual objects is pronounced.

```
Window("Microsoft Word").WinObject("Ribbon").Click 145,45
Window("Microsoft Word").WinObject("Ribbon").WinObject("Picture...").Click
170,104
```

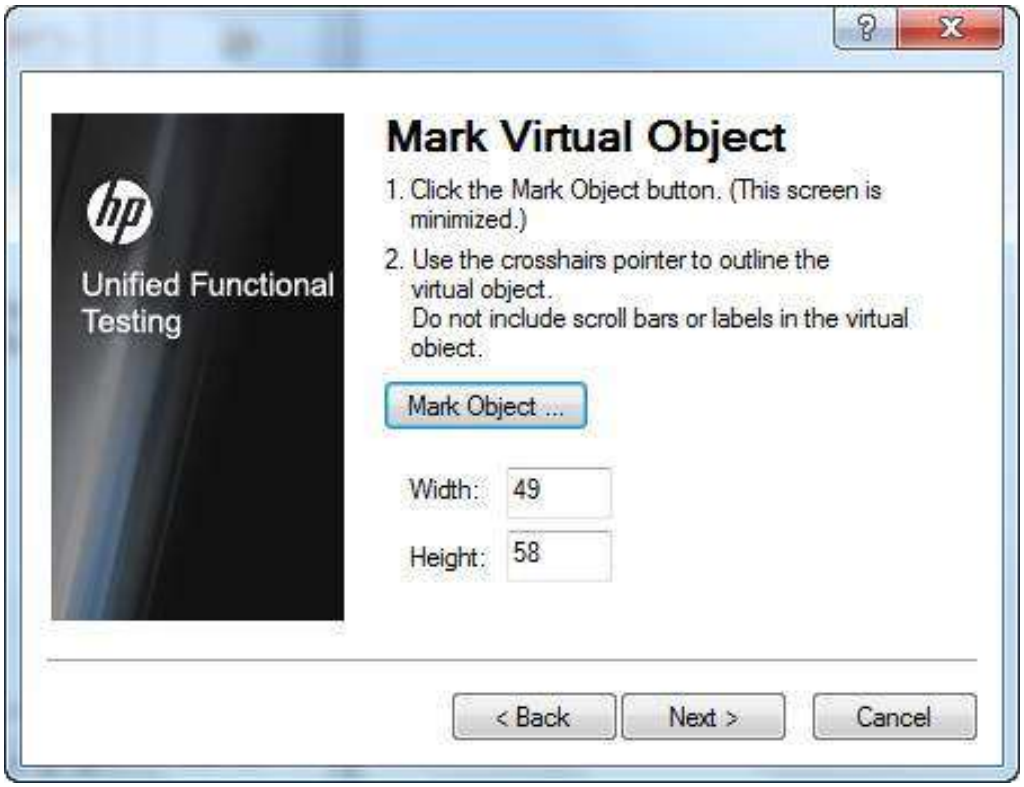
Creating a Virtual Object

Step 1 : In such scenarios, virtual Objects are created using Virtual Object Manager or New Virtual Object from "Tools" >>"Virtual Object" >> "New Virtual Object" and click the "Next" button.

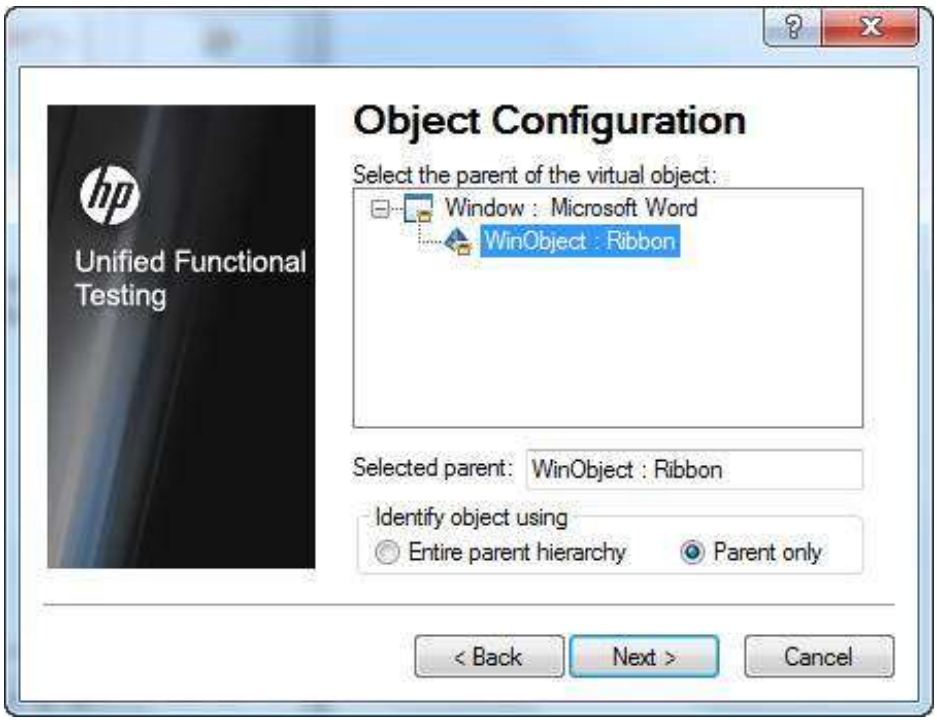
Step 2 : Map the Object against the Class Type and click "Next".



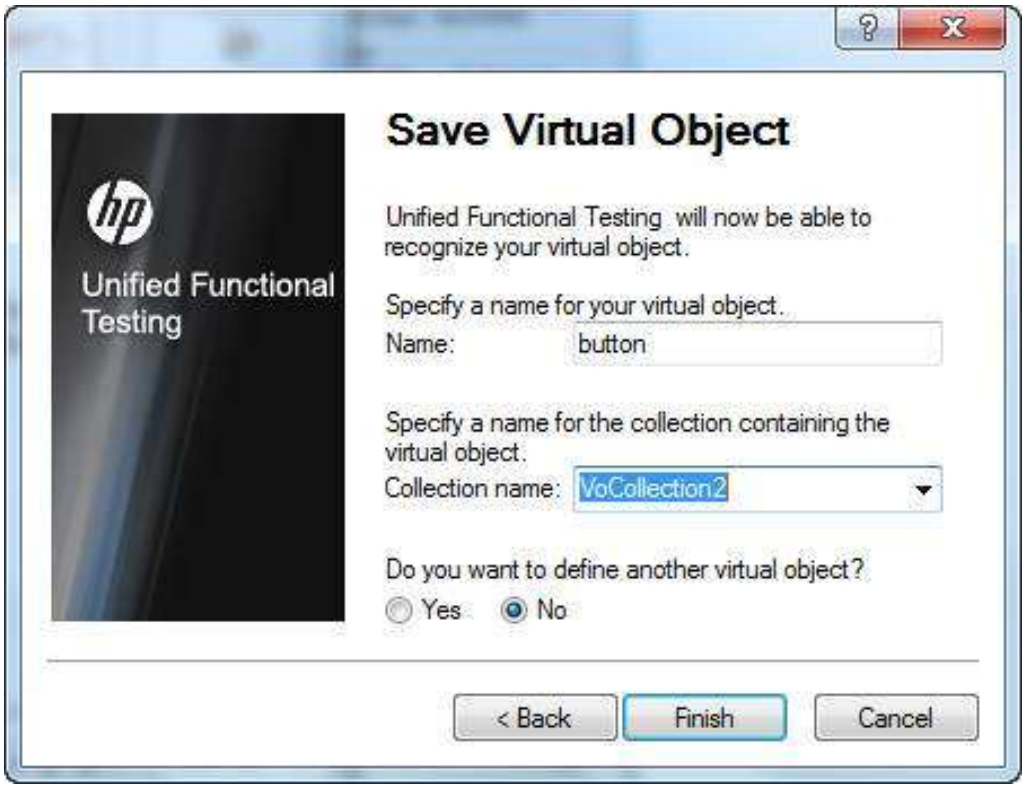
Step 3 : Click "Mark Object" Button. A cross hair cursor would appear and mark the object that you would like to map and click "Next".



Step 4 : Select the parent of the Virtual object and click "Next".



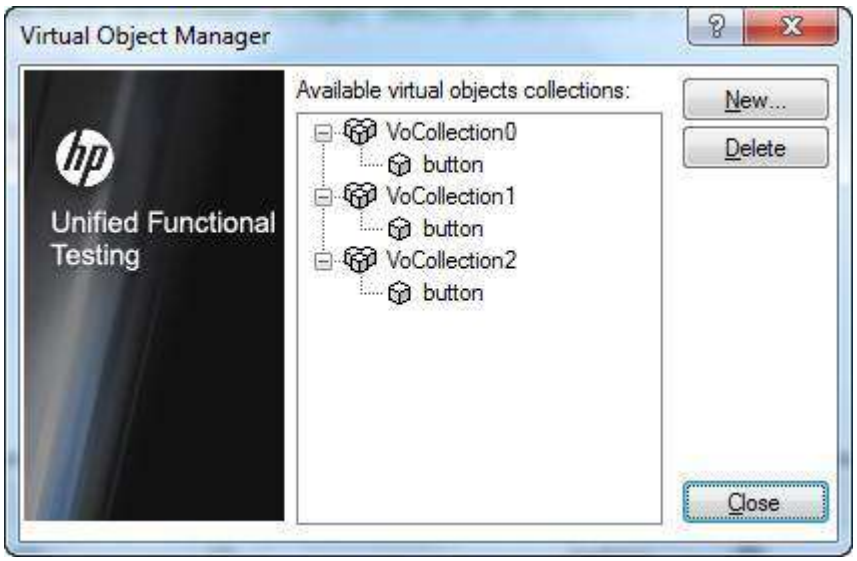
Step 5 : Name the collection in which you would like to store the virtual object and click "Finish".



Virtual Object Manager

Virtual object Manager manages the collections of Virtual objects. Testers can add or Delete the Virtual Objects from the Virtual Object manager.

Navigation to Virtual object Manager : "Tools" >> "Virtual Object Manager" as shown below:



Using Virtual Objects

After creating the Virtual Objects, the created object can be used as shown below:

```
Window("Microsoft Word").WinObject("Ribbon").VirtualButton("button").Click
```

Virtual Object Limitations

- QTP does not support virtual objects for analog or low-level recording.
- Checkpoints cannot be added on Virtual Objects.
- Virtual Objects are not controlled by Object Repository.
- Though we map an object to a particular class (button or List), all the methods of the native objects are not supported by Virtual objects.
- Object Spy cannot be used on Virtual Object.
- The test execution will fail if the screen resolution changes as the co-ordinates change.
- Application Window should be of same screen size so that Virtual objects are captured correctly.

19. QTP – Accessing Databases

As such, QTP does not provide any built-in support to connect to database, however using VBScript testers will be able to connect and interact with databases using ADODB objects.

ADODB has 4 properties or methods with which we will be able to work with the databases. They are-

- **ADODB.Connection** - Used to establish a connection to the Database
- **ADODB.Command** - Used to execute a SQL command(Queries or Stored Procedures)
- **ADODB.Fields** - Used to fetch a particular column from a record set after executing a query/stored proc
- **ADODB.Recordset** - Used to fetch data from a database

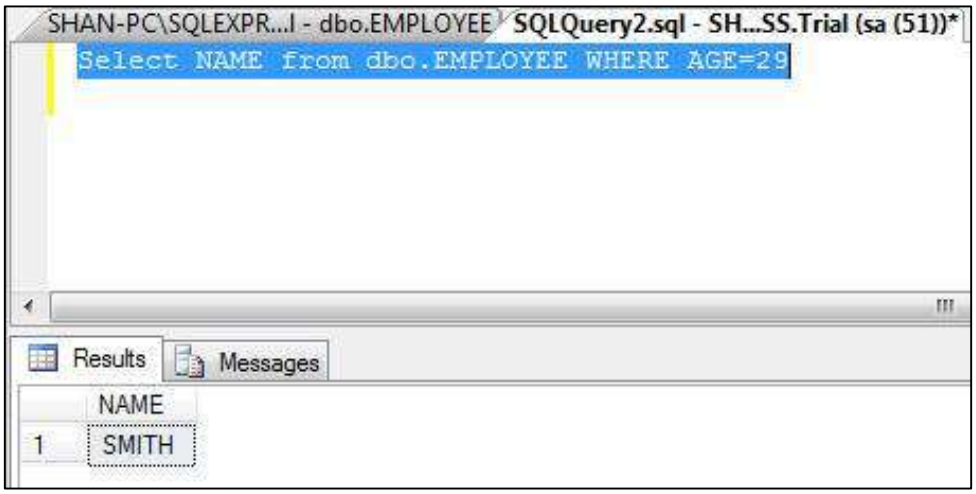
How to connect to Database?

Databases can be connected using Connection strings. Each database differs in the way we connect to them. However, the connection strings can be built with the help of www.connectionstrings.com

Let us see how to connect to the database with the following parameters-

- **Database Type** - MSSQL SERVER
- **Server Name** - SQLEXPRESS
- **Database Name** - Trial
- **User Id** - sa
- **password** - Password123

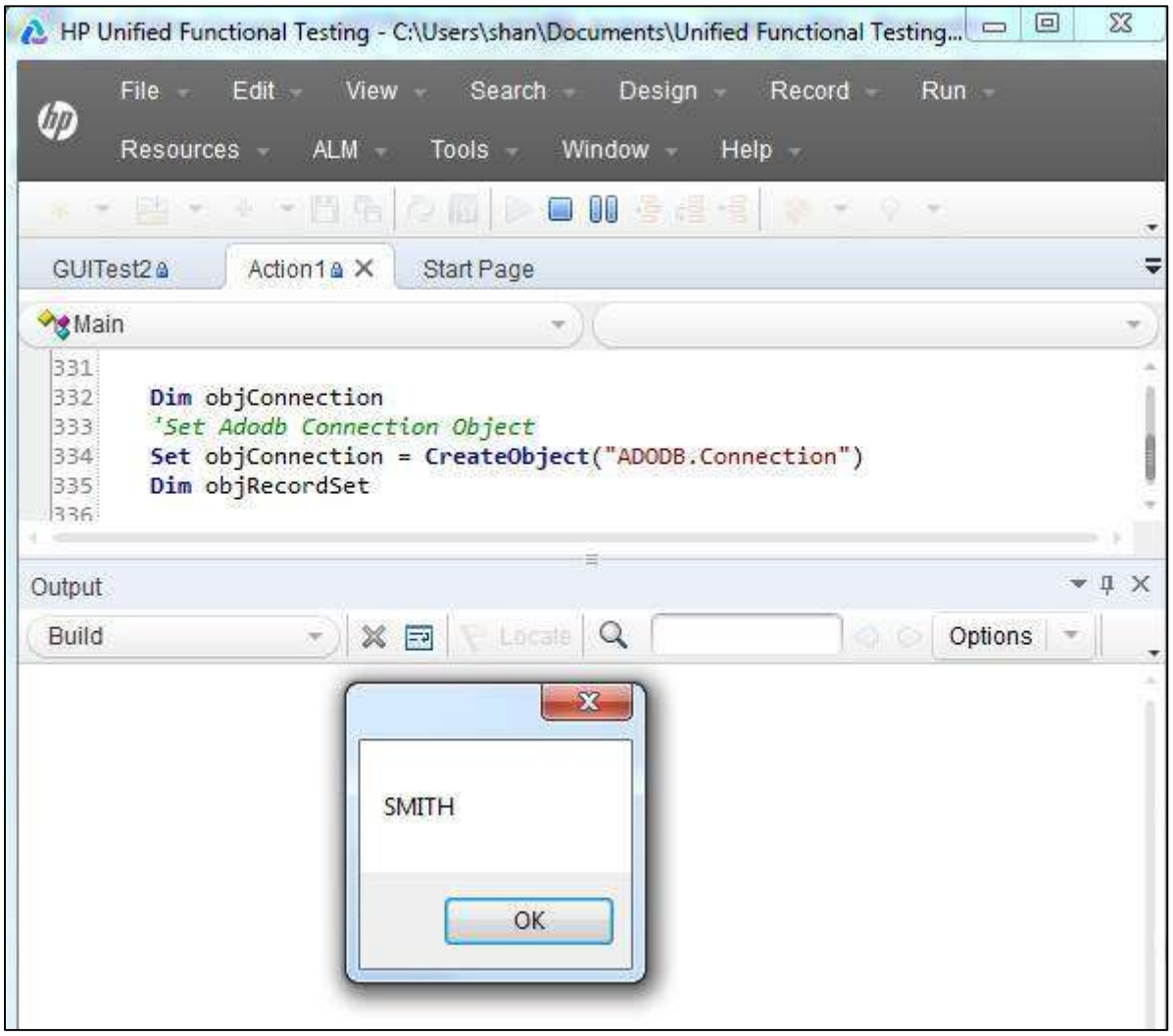
The output of the Query is shown in the SQL Server Management Studio as follows:



```
Dim objConnection

'Set Adodb Connection Object

Set objConnection = CreateObject("ADODB.Connection")

Dim objRecordSet

'Create RecordSet Object
Set objRecordSet = CreateObject("ADODB.Recordset")

Dim DBQuery 'Query to be Executed
DBQuery = "Select NAME from dbo.EMPLOYEE where AGE = 29"

'Connecting using SQL OLEDB Driver
objConnection.Open                "Provider=sqloledb.1;Server=.\SQLEXPRESS;User
Id=sa;Password=Password123;Database=Trial"

'Execute the Query
objRecordSet.Open DBQuery,objConnection

'Return the Result Set
Value = objRecordSet.fields.item(0)
msgbox Value

' Release the Resources
objRecordSet.Close
objConnection.Close

Set objConnection = Nothing

Set objRecordSet = Nothing
```

Result

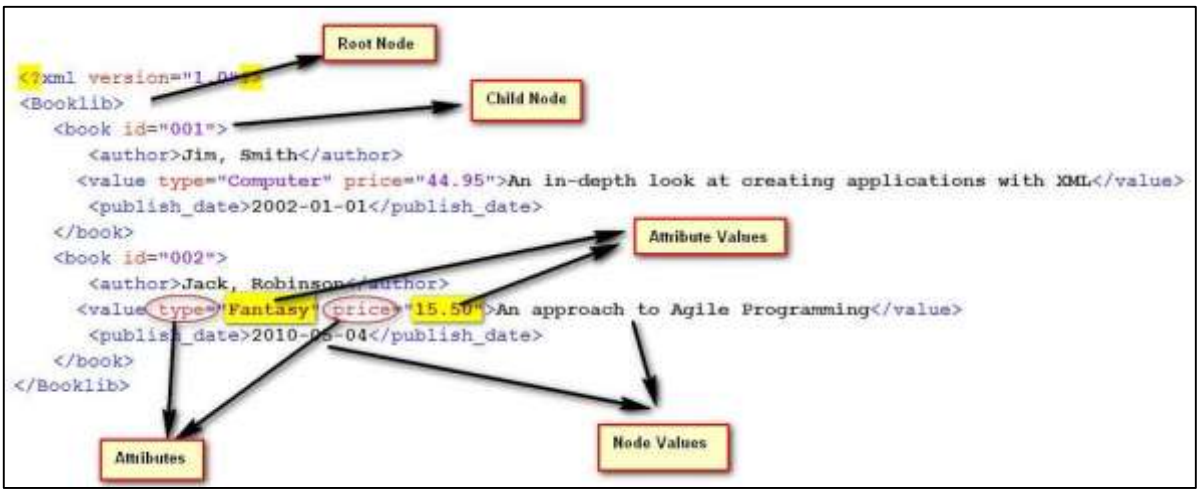
On executing the above script, the output is shown in the message box as shown below:



20. QTP – Working with XML

XML is a markup language designed to store data in a format that can be both readable by human and machine. Using XML, data can also be easily exchanged between computer and database systems.

Sample XML and their key elements are represented below-



Accessing XML

```
Const XMLDataFile = "C:\TestData.xml"
Set xmlDoc = CreateObject("Microsoft.XMLDOM")
xmlDoc.Async = False
xmlDoc.Load(XMLDataFile)
' Getting the number of Nodes (books)
Set nodes = xmlDoc.SelectNodes("/bookstore/book")
Print "Total books: " & nodes.Length    ' Displays 2
' get all titles
Set nodes = xmlDoc.SelectNodes("/Booklib/book/value/text()")
' get their values
For i = 0 To (nodes.Length - 1)
    Title = nodes(i).NodeValue
    Print "Title is" & (i + 1) & ": " & Title
Next
```

Comparing XML

We can compare two given XMLs-

```
Dim xmlDoc1
Dim xmlDoc2

' Load the XML Files
Set xmlDoc1 = XMLUtil.CreateXMLFromFile ("C:\File1.xml")
Set xmlDoc2 = XMLUtil.CreateXMLFromFile ("C:\File2.xml")

'Use the compare method of the XML to check if they are equivalent
Comp = xmlDoc1.Compare (xmlDoc1, xmlDoc2)

'Returns 1 if the two files are the same
If Comp = 1 Then
   Msgbox "XML Files are the Same"
Else
   Msgbox "XML Files are Different"
End if
```

21. QTP – Descriptive Programming

QTP scripts can execute only if the objects are present in the Object Repository. The descriptions of the Objects are created using Descriptive programming-

- When the testers want to perform an operation on an object that is not present in the object repository
- When objects in the application are very dynamic in nature.
- When the Object Repository grows big, it results in poor Performance as the size of the Object Repository increases.
- When the framework is built, such that it has been decided not to use Object Repository at all.
- When testers want to perform an action on the application at run-time without having the knowledge of object's unique properties.

Syntax

There are two ways to scripting using Descriptive Programming technique. They are-

- Description Objects
- Description Strings

Description Objects

Script is developed using Description Objects that depend upon the properties used and their corresponding values. Then, these descriptions are used to build the script.

```
'Creating a description object
Set btncalc = Description.Create()

'Add descriptions and properties
btncalc("type").value = "Button"
btncalc("name").value = "calculate"
btncalc("html tag").value = "INPUT"

' Use the same to script it
Browser("Math Calc").Page("Num Calculator").WebButton(btncalc).Click
```

Description Strings

The description of the objects is developed using the properties and values as strings as shown below.

```
Browser("Math Calc").Page("Num Calculator").WebButton("html
tag:=INPUT","type:=Button","name:=calculate").Click
```

Child Objects

QTP provides the ChildObjects method, which enables us to create a collection of objects. The parent objects precedes ChildObjects.

```
Dim oDesc
Set oDesc = Description.Create
oDesc("micclass").value = "Link"

'Find all the Links
Set obj = Browser("Math Calc").Page("Math Calc").ChildObjects(oDesc)

Dim i
'obj.Count value has the number of links in the page
For i = 0 to obj.Count - 1
   'get the name of all the links in the page
   x = obj(i).GetROProperty("innerhtml")
   print x
Next
```

Ordinal Identifiers

Descriptive programming is used to write the script based on ordinal identifiers, which will enable QTP to act on those objects when two or more objects have the same properties.

```
' Using Location
Dim Obj
Set Obj = Browser("title:=.*google.*").Page("micclass:=Page")
Obj.WebEdit("name:=Test","location:=0").Set "ABC"
Obj.WebEdit("name:=Test","location:=1").Set "123"

' Index
Obj.WebEdit("name:=Test","index:=0").Set "1123"
Obj.WebEdit("name:=Test","index:=1").Set "2222"

' Creation Time
Browser("creationtime:=0").Sync
Browser("creationtime:=1").Sync
Browser("creationtime:=2").Sync
```

22. QTP – Automation Object Model

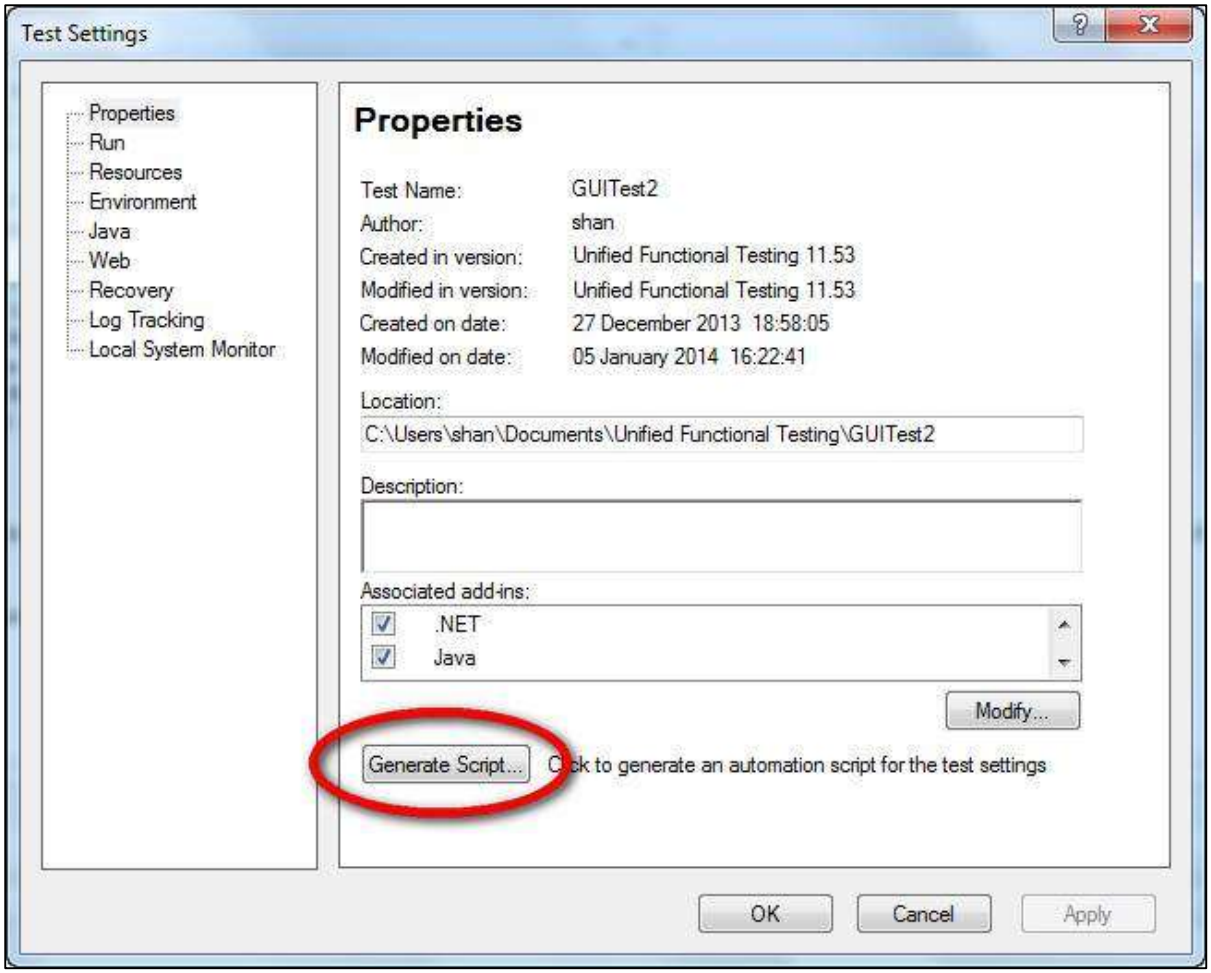
QTP itself can be automated using the COM interface that is provided by HP-QTP. Automation object model is a set of objects, methods, and properties that helps the testers to control the configuration settings and execute the scripts using the QTP interface. The Key Configurations/actions that can be controlled (but not limited to) are listed below-

- Loads all the required add-ins for a test
- Makes QTP visible while execution
- Opens the Test using the specified location
- Associates Function Libraries
- Specifies the Common Object Sync Time out
- Start and End Iteration
- Enable/Disable Smart Identification
- On Error Settings
- Data Table Path
- Recovery Scenario Settings
- Log Tracking Settings

QTP 11.5x provides an exclusive documentation on Automation Object model that can be referred by navigating to "Start" >> "All Programs" >> "HP Software" >> "HP Unified Functional Testing" >> "Documentation" >> "Unified Functional Testing Automation Reference"

Generate AOM Script

A tester can generate AOM script from QTP itself, using the "Generate Script" option. Navigate to "Run" >> "Settings" >> "Properties" Tab >> "Generate Script" as shown below:



Example

```
' A Sample Script to Demostrate AOM
Dim App 'As Application
Set App = CreateObject("QuickTest.Application")
App.Launch
App.Visible = True

App.Test.Settings.Launchers("Web").Active = False
App.Test.Settings.Launchers("Web").Browser = "IE"
App.Test.Settings.Launchers("Web").Address = "http://easycalculation.com/"
App.Test.Settings.Launchers("Web").CloseOnExit = True

App.Test.Settings.Launchers("Windows Applications").Active = False
App.Test.Settings.Launchers("Windows Applications").Applications.RemoveAll
App.Test.Settings.Launchers("Windows Applications").RecordOnQTDescendants = True
App.Test.Settings.Launchers("Windows  Applications").RecordOnExplorerDescendants
= False
App.Test.Settings.Launchers("Windows
Applications").RecordOnSpecifiedApplications = True

App.Test.Settings.Run.IterationMode = "rngAll"
App.Test.Settings.Run.StartIteration = 1
App.Test.Settings.Run.EndIteration = 1
```

```
App.Test.Settings.Run.ObjectSyncTimeOut = 20000
App.Test.Settings.Run.DisableSmartIdentification = False
App.Test.Settings.Run.OnError = "Dialog"


App.Test.Settings.Resources.DataTablePath = ""
App.Test.Settings.Resources.Libraries.RemoveAll


App.Test.Settings.Web.BrowserNavigationTimeout = 60000
App.Test.Settings.Web.ActiveScreenAccess.UserName = ""
App.Test.Settings.Web.ActiveScreenAccess.Password = ""


App.Test.Settings.Recovery.Enabled = True
App.Test.Settings.Recovery.SetActivationMode "OnError"
App.Test.Settings.Recovery.Add "D:\GUITest2\recover_app_crash.qrs",
"Recover_Application_Crash", 1
App.Test.Settings.Recovery.Item(1).Enabled = True

'''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
' System Local Monitoring settings
'''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
App.Test.Settings.LocalSystemMonitor.Enable = false
'''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
' Log Tracking settings
'''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
With App.Test.Settings.LogTracking
   .IncludeInResults = False
   .Port = 18081
   .IP = "127.0.0.1"
   .MinTriggerLevel = "ERROR"
   .EnableAutoConfig = False
   .RecoverConfigAfterRun = False
   .ConfigFile = ""
   .MinConfigLevel = "WARN"
End With
```

23. QTP – Frameworks

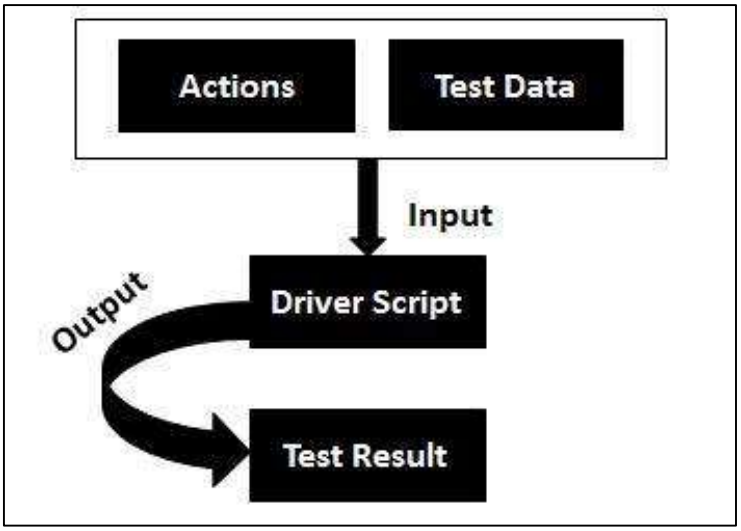
A Framework defines a set of guidelines/best practices that enforces a set of standards, which makes it easy to use for the end users to work with. There are different types of automation frameworks and the most common ones are listed below-

- Keyword-Driven Framework
- Data-Driven Framework
- Hybrid Framework

Keyword-Driven Framework

Keyword driven testing is a type of functional automation testing framework which is also known as table-driven testing or action word based testing.

In Keyword-driven testing, we use a table format, usually a spreadsheet, to define keywords or action words for each function that we would like to execute.



Advantages

- It is best suited for novice or a non-technical tester.
- Enables writing tests in a more abstract manner using this approach.
- Keyword driven testing allows automation to be started earlier in the SDLC even before a stable build is delivered for testing.
- There is a high degree of reusability.

Disadvantages

- Initial investment in developing the keywords and its related functionalities might take longer.
- It might act as a restriction to the technically abled testers.

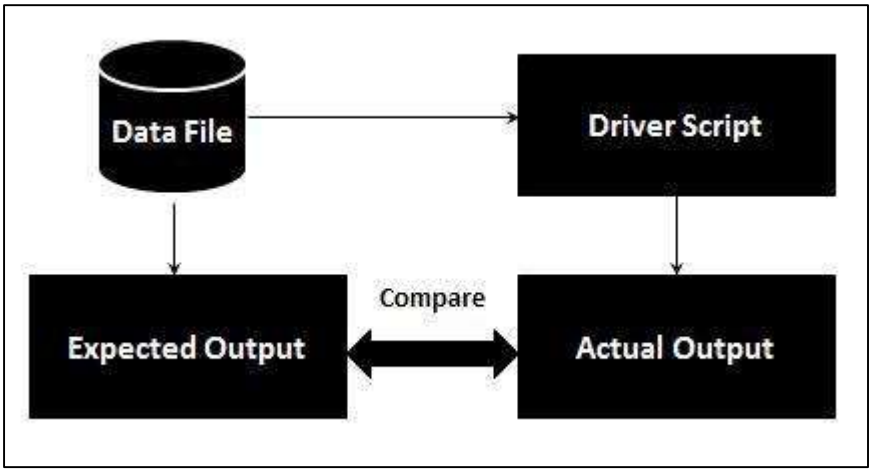
Data Driven Framework

Data-driven testing is creation of test scripts where test data and/or output values are read from data files instead of using the same hard-coded values each time the test runs. This way, the testers can test how the application handles various inputs effectively. It can be any of the following data files-

- datapools
- Excel files
- ADO objects
- CSV files
- ODBC sources

Flow Diagram

Data Driven Testing can be best understood by the following diagram-



Advantages

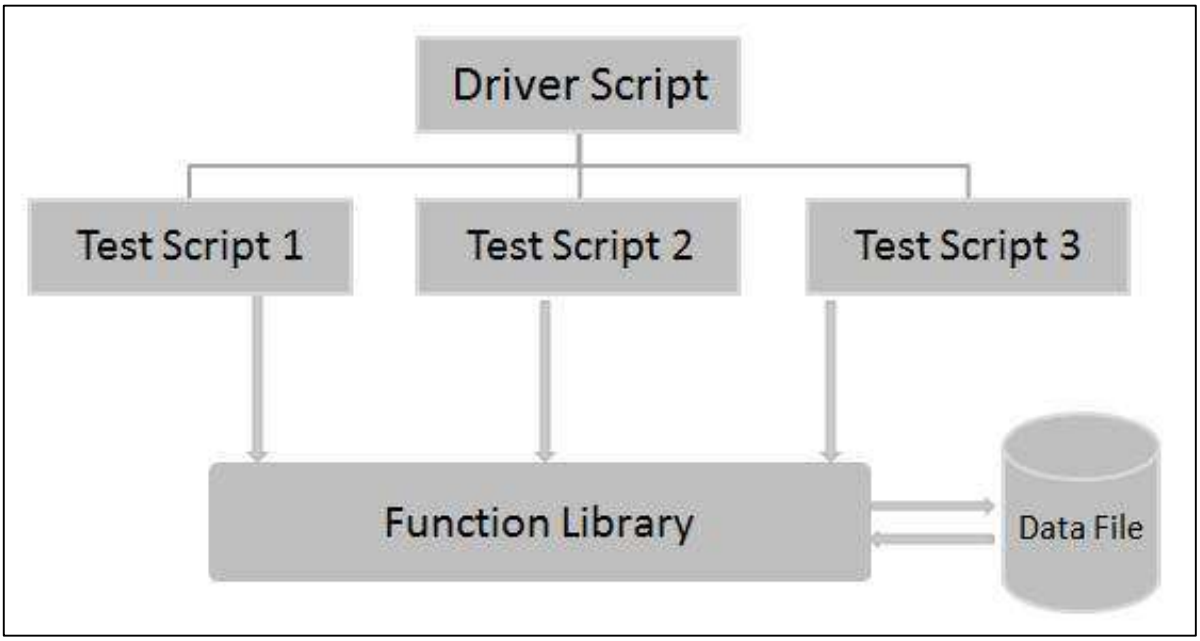
- Data driven framework results in less amount of code
- Offers greater flexibility for maintaining and fixing the scripting issues
- Test Data can be developed

Disadvantages

- Each script needs to be different to understand different sets of data.

Hybrid Framework

Hybrid Framework is a combination of Keyword driven and data Driven framework that can be best described using the following flow diagram.



Affecting Factors

Following are the parameters one should take into account while developing the framework. The affects factors are listed below-

- Framework files should support versioning controlling software such as SVN, CVS, MS Source Control
- Framework should support executing the scripts in different environments viz- QA, SAT, DEV
- Upon Object changes, scripts should execute with minimal changes.
- Framework should configure itself and take care of prerequisite such as creating folders/databases.
- Framework should have robust reporting structure so that issues in the script/application can be easily spotted
- Framework should have greater flexibility so that it should be easy to use
- Framework should follow coding standards so that files, functions, and history of changes are maintained correctly.

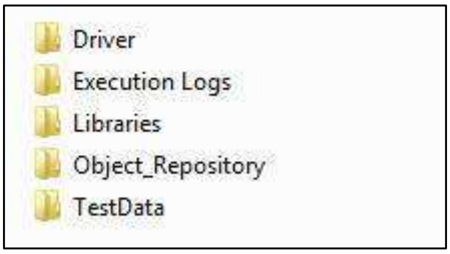
In the next chapter, we will learn how to design a simple framework.

24. QTP – Designing a Framework

Let us design a simple framework by taking a sample application. We will automate a few scenarios of the application under test and write reusable functions.

The sample application under test is **"Calculator"**, a default application that is available as a part of Windows. Let us now create different components of a framework. Here, we will develop a hybrid framework and use Object Repository as it is fairly a simple application. However, this framework can be scaled to support a complex application as well.

The folder structure of the Framework is as shown below-



Explanation of the folder structure-

- **Master Driver Script -** The Script that drives the entire execution. It performs prerequisite and initial settings that are required for the execution.

- **Library Files -** The Associated Functions that forms the Function Library.

- **Data Table -** The Test Data that is required for the Execution.

- **Object Repository -** The Objects and its properties that enable QTP to recognize the objects seamlessly.

- **Execution Logs -** The Folder contains the execution log file with user functions and function execution history.

Master Driver Script

```
'= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
' MASTER DRIVER SCRIPT NAME    : Calculator
' DESCRIPTION                 : Drivers Script to Execute Automated Test for
the Calculator
' AUTHOR                      : Tutorials Point
' DATE CREATED                : 30-Dec-2013
' OBJECT REPOSITORY ASSOCIATED : Calc.tsr
' LIBRARY FILES ASSOCIATED    : calculator.qfl, Common.qfl
' MODIFICATION LOG
```

```
' ------------------------------------------------
' First Version       Tutorials point
'= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
Option Explicit

Public ExecDrive

' Get the Root folder of the Test  so that we can make use of relative paths.
Dim x : x=Instr(Environment.Value("TestDir"),"Driver")-2
ExecDrive = mid(Environment.Value("TestDir"),1,x)

' Get the path of Libraries using relative to the current Drive
Dim LibPath : LibPath = ExecDrive+"\Libraries\"

' Dynamically Load the Function Libraries
LoadFunctionLibrary LibPath + "Calculator.qfl", LibPath + "common_utils.qfl"

' Capturing the Start Time
' clscommon is the class object created in common.qfl library file
clscommon.StartTime = Time()

' Launching the Application
SystemUtil.Run "C:\Windows\System32\Calc.exe" : wait (2)

' Initialize the Data Table Path
Dim FileName : FileName  = ExecDrive+"\TestData\Calculator.xls"
Dim SheetSource : SheetSource  = "Calc_test"
Dim SheetDest : SheetDest = "Global"

' Import the DataTable into the QTP Script
DataTable.ImportSheet  FileName , SheetSource , SheetDest

' Object Repository Path
Dim RepPath : RepPath = ExecDrive+"\Object_Repository\Calc.tsr"
RepositoriesCollection.RemoveAll()
RepositoriesCollection.Add(RepPath)

 ' To Keep a Count on iteration
```

```
Dim InttestIteration
Dim InttestRows : InttestRows = datatable.GetRowCount

'  Fetching Date-TimeStamp which will be unique for Naming the Execution Log
File
clscommon.StrDateFormatted = day(date()) & "_" &  MonthName(Month(date()),true)
&
 "_" & YEAR(date())& "_"&hour(now)&"_"&minute(now)

' Name the LogFile
clscommon.StrLogFile = ExecDrive & "\Execution Logs\" &
clscommon.StrDateFormatted & ".txt"

' Create the Execution LogFile which captures the result
clscommon.Fn_FileCreate(clscommon.StrLogFile)

' Iniitialize the Parameters and all the relevant Test Details
Call Fn_InitializeLogFile()

' Kill all the previous calculator process
Call fn_Kill_Process("calc.exe")

For InttestIteration=1 to InttestRows
   datatable.SetCurrentRow InttestIteration
   Dim StrExecute : StrExecute = Ucase(Trim(datatable.Value("Run","Global")))
   If StrExecute = "Y" Then
      clscommon.Number1  = Trim(datatable.Value("Number_1","Global"))
      clscommon.Number2  = Trim(datatable.Value("Number_2","Global"))
      clscommon.Number3  = Trim(datatable.Value("Number_3","Global"))

      clscommon.Number4  = Trim(datatable.Value("Number_4","Global"))
      clscommon.Number5  = Trim(datatable.Value("Number_5","Global"))
      clscommon.Number6  = Trim(datatable.Value("Number_6","Global"))

      clscommon.Test_Case_ID   =
Trim(datatable.Value("Test_Case_ID","Global"))'
                     :  clscommon.LogWrite "The Test Case Data is Located at
:: " & tcDataPath
      clscommon.tcScenario  = Trim(datatable.Value("Scenario","Global"))'
                                                  :  clscommon.LogWrite "The
Test Case Data is Located at :: " & tcDataPath
```

```
      Dim  Expected_Val :   Expected_Val =
Trim(datatable.Value("Expected_Val","Global"))'
                        :  clscommon.LogWrite "The Test Case Data is Located at
:: " & tcDataPath


      Select case clscommon.tcScenario

         Case "Add"

            clscommon.LogWrite "=== Inside the Test Set :: " &
clscommon.tcScenario & " ==="

            Call fnCalculate("+",Expected_Val)


         Case "Subtract"

            clscommon.LogWrite "=== Inside the Test Set :: " &
clscommon.tcScenario & " ==="

            Call fnCalculate("-",Expected_Val)


         Case "Multiply"

          clscommon.LogWrite "=== Inside the Test Set :: " &
clscommon.tcScenario & " ==="

          Call fnCalculate("*",Expected_Val)


         Case "Divide"

          clscommon.LogWrite "=== Inside the Test Set :: " &
clscommon.tcScenario & " ==="

          Call fnCalculate("/",Expected_Val)


         Case "Sqrt"

          clscommon.LogWrite "=== Inside the Test Set :: " &
clscommon.tcScenario & " ==="

          Call fnCalculate("sqt",Expected_Val)

      End Select

   End If

Next


' Calling the End Test to Add the result Footer in exec log file.

Call fn_End_test()


'  ====================  End of Master Driver Script ====================
```

Library Files

The Calculator Functions are written in a separate function file saved with the extension .qfl or .vbs. These functions are reusable across actions.

```
'  Calculator. Qfl File :: Associated Function Library for Calculator Master
Driver


'= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
' FUNCTION NAME     : Fn_InitializeLogFile
' DESCRIPTION       : Function to Write the Initial Values in the Log File
' INPUT PARAMETERS  : varExecDrive,StrDB,StrUId,Strpwd,StrNewDB
' OUTPUT PARAMETERS : NIL
' RETURN VALUE      : Pass or Fail message
' DATE CREATED      : 30-Dec-2013
'= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
Public Function Fn_InitializeLogFile()
   clscommon.LogWrite "*****************************************"
   clscommon.LogWrite "Calc Automation Started"
End Function
'= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
' FUNCTION NAME     : fnCalculate
' DESCRIPTION       : Function to perform Arithmetic Calculations
' INPUT PARAMETERS  : operator,Expected_Val
' OUTPUT PARAMETERS : NIL
' RETURN VALUE      : Pass or Fail message
' DATE CREATED      : 30-Dec-2013
'= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
Function fnCalculate(operator,Expected_Val)
   clscommon.LogWrite "Executing the Function 'fnCalculate' "


   Window("Calculator").Activate


   If Trim(clscommon.Number1) <> ""  Then
Window("Calculator").WinButton(clscommon.Number1).Click
   If Trim(clscommon.Number2) <> ""  Then
Window("Calculator").WinButton(clscommon.Number2).Click
   If Trim(clscommon.Number3) <> ""  Then
Window("Calculator").WinButton(clscommon.Number3).Click


   Window("Calculator").WinButton(operator).Click
```

```
   If Trim(clscommon.Number4) <> ""  Then
Window("Calculator").WinButton(clscommon.Number4).Click
   If Trim(clscommon.Number5) <> ""  Then
Window("Calculator").WinButton(clscommon.Number5).Click
   If Trim(clscommon.Number6) <> ""  Then
Window("Calculator").WinButton(clscommon.Number6).Click


   Window("Calculator").WinButton("=").Click
   Dim ActualVal : ActualVal  =
Window("Calculator").WinEdit("Edit").GetROProperty("text")
   clscommon.LogWrite "The Actual Value after the Math Operation is "&
ActualVal


   If Trim(ActualVal) = Trim(Expected_Val)  Then
      clscommon.WriteResult "Pass",  clscommon.Test_Case_ID ,
clscommon.tcScenario , " Expected Value matches with Actual Value :: " &
ActualVal


   Else
      clscommon.WriteResult "Fail",  clscommon.Test_Case_ID ,
clscommon.tcScenario , " Expected Value - " & Expected_Val & " Does NOT matches
with Actual Value :: " & ActualVal
   End If


   Window("Calculator").WinButton("C").Click


   If Err.Number <> 0  Then
      clscommon.LogWrite  "Execution Error : The Error Number is ::  " &
Err.Number & " The Error Description is " & Err.Description
      Err.Clear
   End If


   clscommon.LogWrite "Exiting the Function 'fnCalculate' "
End Function


'= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
' FUNCTION NAME     : fn_Kill_Process
' DESCRIPTION       : Function to Kill the process by name
' INPUT PARAMETERS  : Application name to be killed
' OUTPUT PARAMETERS : NIL
' RETURN VALUE      : NIL
```

```
' DATE CREATED      : 30-Dec-2013
'= = = = = = = = = = = = = = = = = = = = = = = = = = =
Function fn_Kill_Process(process)
   Dim strComputer ,  strProcessToKill , objWMIService , colProcessstrComputer
= "."
   strProcessToKill = process

   Set objWMIService = GetObject("winmgmts:" _&
"{impersonationLevel=impersonate}!\\" _& strComputer & "\root\cimv2")

   Set colProcess = objWMIService.ExecQuery _("Select * from Win32_Process
Where Name = '" & strProcessToKill & "'")

   count = 0
   For Each objProcess in colProcess
      objProcess.Terminate()
      count = count + 1
   Next
End Function

'= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
' FUNCTION NAME     : fn_End_test
' DESCRIPTION       : Function to finish the test Execution process
' INPUT PARAMETERS  : Application name to be killed
' OUTPUT PARAMETERS : NIL
' RETURN VALUE      : NIL
' DATE CREATED      : 20/Dec/2013
'= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
Function fn_End_test()
   clscommon.LogWrite "Status Message - Executing the Function 'fn_End_test' "

   Window("Calculator").Close
   On Error Resume Next

   clscommon.StopTime = Time()
   clscommon.ElapsedTime = DateDiff("n",clscommon.StartTime,clscommon.StopTime)
   Dim Totaltests
   Totaltests = clscommon.gintPassCount+ clscommon.gintFailCount
```

```
   clscommon.LogWrite "## # # # # # # # # # # # # # # # # # # # # # # # # # # # #
# # # #
   clscommon.LogWrite "##  The Execution Start Time  ::  " &
clscommon.StartTime
   clscommon.LogWrite "##  The Execution End Time   ::  " & clscommon.StopTime
   clscommon.LogWrite "##  The Time Elapsed ::   " & clscommon.ElapsedTime & "
Minutes "
   clscommon.LogWrite "##  The OS ::  " & Environment.Value("OS")
   clscommon.LogWrite "##  The Total No of Test Cases Executed  ::  " &
Totaltests
   clscommon.LogWrite "##  The No. of Test Case Passed ::  " &
clscommon.gintPassCount
   clscommon.LogWrite "##  The No. of Test Case Failed ::  " &
clscommon.gintFailCount
   clscommon.LogWrite "## # # # # # # # # # # # # # # # # # # # # # # # # # # # #
# # # #
   SystemUtil.CloseDescendentProcesses
End Function


'  ===============     End of Calculator. Qfl   ============================== '
```

The other library file, which is 'common_utils.qfl' that contains the functions, which enables us to write the output to a text file.

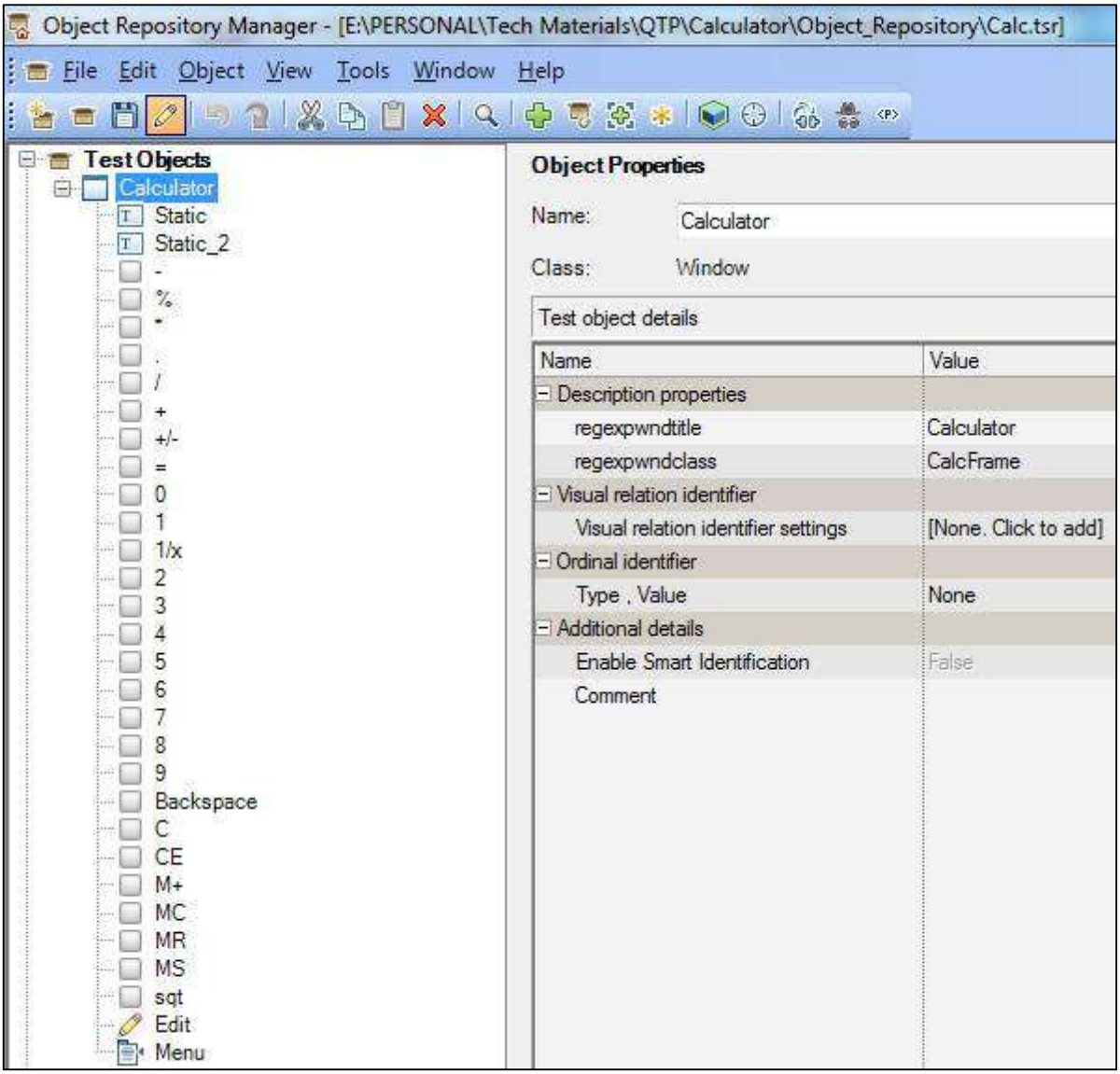
```
Set clscommon=New OS_clsUtils


'Creating a class file to handle global variables.
Class OS_clsUtils
   Dim StrLogFile
   Dim StrDateFormatted
   Dim Result


   Dim  Number1, Number2 , Number3
   Dim  Number4, Number5 , Number6
   Dim Test_Case_ID , tcScenario
   Dim StartTime, StopTime, ElapsedTime


   Dim gintPassCount , gintFailCount , gintWarningCount ,  gintdoneCount,
gintinfoCount


   Function Fn_FileCreate(strFileName)
      Dim objFSO:  Set objFSO = CreateObject("Scripting.FileSystemObject")
      On Error Resume Next
```

```
      Dim objTextFile : Set objTextFile = objFSO.CreateTextFile(strFileName)
      objTextFile.Close

      Set objTextFile = Nothing
      Set objFSO = Nothing
   End Function

   Function LogWrite(sMsg)
      Const ForAppending = 8

      Dim objFSO : Set objFSO = CreateObject("scripting.FileSystemObject")
      Dim objTextFile : Set objTextFile = objFSO.OpenTextFile
(clscommon.StrLogFile, ForAppending, True)

      objTextFile.WriteLine day(date()) & "/" &  MonthName(Month(date()),true)
&  "/" & YEAR(date()) & " " & time & ": " & sMsg
      objTextFile.Close

      Set objTextFile = Nothing
      Set objFSO = Nothing
   End Function

   Function WriteResult(strStatus,functionName,functionDescription,Result)
      Const ForAppending = 8
      Dim objFSO : Set objFSO = CreateObject("scripting.FileSystemObject")
      Dim objTextFile : Set objTextFile = objFSO.OpenTextFile
(clscommon.StrLogFile, ForAppending, True)

      objTextFile.WriteLine day(date()) & "/" &  MonthName(Month(date()),true)
&  "/" & YEAR(date()) & " " & time & ": " & "  * * * * * * Test Case Exec
Details  * * * * * "
      objTextFile.WriteLine day(date()) & "/" &  MonthName(Month(date()),true)
&  "/" & YEAR(date()) & " " & time & ": " & " Test staus :: " & strStatus
      objTextFile.WriteLine day(date()) & "/" &  MonthName(Month(date()),true)
&  "/" & YEAR(date()) & " " & time & ": " & " Tese ID ::  " & functionName
      objTextFile.WriteLine day(date()) & "/" &  MonthName(Month(date()),true)
&  "/" & YEAR(date()) & " " & time & ": " & " Test Description :: " &
functionDescription
      objTextFile.WriteLine day(date()) & "/" &  MonthName(Month(date()),true)
&  "/" & YEAR(date()) & " " & time & ": " & " Test Result Details :: " & Result
```

```
      objTextFile.WriteLine day(date()) & "/" &  MonthName(Month(date()),true)
&  "/" & YEAR(date()) & " " & time & ": " & "  * * * * * * * * * * * * * * * * *
* * * * * * * *  * * * * * * * * * * * * "

      objTextFile.Close


      Set objTextFile = Nothing
      Set objFSO = Nothing


      Select Case Lcase(strStatus)
         Case "pass"
         gintPassCount = gintPassCount + 1


         Case "fail"
         gintFailCount = gintFailCount+1
            End Select
   End Function
End Class
'    ====================   End of common_Utils.qfl ====================
```

Object Repository

Object Repository has got all the objects that the user would be acting upon. The image given below shows the list of all objects added into the repository with the name calc.tsr



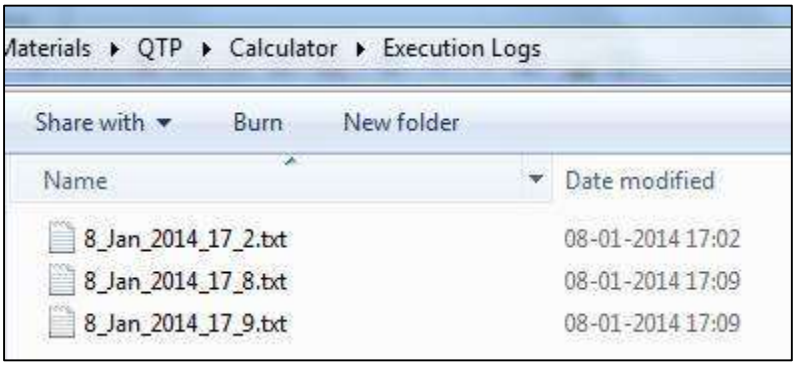
DataTable

DataTable contains the keywords, which drive the tests and also Test the data with which QTP will act on the objects.

	A	B	C	D	E	F	G	H	I	J
1	Run	Test_Case_ID	Scenario	Number_1	Number_2	Number_3	Number_4	Number_5	Number_6	Expected_Val
2	Y	TC_001	Add	5	9	5	3	5	4	949.
3	Y	TC_002	Subtract	5	9	6	1	8	1	415.
4	Y	TC_003	Multiply	3	1	3	8	9	1	278883.
5	Y	TC_004	Divide	9	9		3	3		3.
6	Y	TC_005	Sqrt	1	0	0				10.

The Execution Log

The Execution log file or output file contains user actions and function log, which will enable the testers to debug upon script failures.




```
8/Jan/2014 5:09:16 PM: ***********************************************
8/Jan/2014 5:09:16 PM: Calc Automation Started
8/Jan/2014 5:09:16 PM: === Inside the Test Set  ::   Add  ===
8/Jan/2014 5:09:16 PM: Executing the Function 'fnCalculate'
8/Jan/2014 5:09:17 PM: The Actual Value after the Math Operation is 949.
8/Jan/2014 5:09:17 PM:  * * * * * * Test Case Exec Details  * * * * *
8/Jan/2014 5:09:17 PM: Test staus :: Pass
8/Jan/2014 5:09:17 PM: Tese ID ::  TC_001
8/Jan/2014 5:09:17 PM: Test Description :: Add
8/Jan/2014 5:09:17 PM: Test Result Details ::  Expected Value matches with Actual
Value :: 949.
8/Jan/2014 5:09:17 PM: * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * *


8/Jan/2014 5:09:17 PM: Exiting the Function 'fnCalculate'
8/Jan/2014 5:09:17 PM: === Inside the Test Set  ::   Subtract  ===
8/Jan/2014 5:09:17 PM: Executing the Function 'fnCalculate'
8/Jan/2014 5:09:17 PM: The Actual Value after the Math Operation is 415.
8/Jan/2014 5:09:17 PM: * * * * * * Test Case Exec Details  * * * * *
8/Jan/2014 5:09:17 PM: Test staus :: Pass
8/Jan/2014 5:09:17 PM: Tese ID ::  TC_002
8/Jan/2014 5:09:17 PM: Test Description :: Subtract
8/Jan/2014 5:09:17 PM: Test Result Details ::  Expected Value matches with Actual
Value :: 415.
8/Jan/2014 5:09:17 PM: * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * *
```

```
8/Jan/2014 5:09:17 PM: Exiting the Function 'fnCalculate'

8/Jan/2014 5:09:17 PM: === Inside the Test Set  ::   Multiply  ===

8/Jan/2014 5:09:17 PM: Executing the Function 'fnCalculate'

8/Jan/2014 5:09:18 PM: The Actual Value after the Math Operation is 278883.

8/Jan/2014 5:09:18 PM: * * * * * * Test Case Exec Details  * * * * *

8/Jan/2014 5:09:18 PM: Test staus :: Pass

8/Jan/2014 5:09:18 PM: Tese ID ::  TC_003

8/Jan/2014 5:09:18 PM: Test Description :: Multiply

8/Jan/2014 5:09:18 PM:  Test Result Details ::  Expected Value matches with
Actual Value :: 278883.

8/Jan/2014 5:09:18 PM: * * * * * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * *


8/Jan/2014 5:09:18 PM: Exiting the Function 'fnCalculate'

8/Jan/2014 5:09:18 PM: === Inside the Test Set  ::   Divide  ===

8/Jan/2014 5:09:18 PM: Executing the Function 'fnCalculate'

8/Jan/2014 5:09:19 PM: The Actual Value after the Math Operation is 3.

8/Jan/2014 5:09:19 PM: * * * * * * Test Case Exec Details  * * * * *

8/Jan/2014 5:09:19 PM: Test staus :: Pass

8/Jan/2014 5:09:19 PM: Tese ID ::  TC_004

8/Jan/2014 5:09:19 PM: Test Description :: Divide

8/Jan/2014 5:09:19 PM: Test Result Details ::  Expected Value matches with Actual
Value :: 3.

8/Jan/2014 5:09:19 PM: * * * * * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * *


8/Jan/2014 5:09:19 PM: Exiting the Function 'fnCalculate'

8/Jan/2014 5:09:19 PM: === Inside the Test Set  ::   Sqrt  ===

8/Jan/2014 5:09:19 PM: Executing the Function 'fnCalculate'

8/Jan/2014 5:09:20 PM: The Actual Value after the Math Operation is 10.

8/Jan/2014 5:09:20 PM: * * * * * * Test Case Exec Details  * * * * *

8/Jan/2014 5:09:20 PM: Test staus :: Pass

8/Jan/2014 5:09:20 PM: Tese ID ::  TC_005

8/Jan/2014 5:09:20 PM: Test Description :: Sqrt

8/Jan/2014 5:09:20 PM: Test Result Details ::  Expected Value matches with Actual
Value :: 10.

8/Jan/2014 5:09:20 PM: * * * * * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * *
```

```
8/Jan/2014 5:09:20 PM: Exiting the Function 'fnCalculate'
8/Jan/2014 5:09:20 PM: Status Message - Executing the Function 'fn_Finish_test'
8/Jan/2014 5:09:20 PM: ## # # # # # # # # # # # # # # # # # # # # # # # # # # #
# # # #
8/Jan/2014 5:09:20 PM: ##  The Execution Start Time  ::  5:09:14 PM
8/Jan/2014 5:09:20 PM: ##  The Execution End Time   ::  5:09:20 PM
8/Jan/2014 5:09:20 PM: ##  The Time Elapsed ::   0 Minutes
8/Jan/2014 5:09:20 PM: ##  The OS ::  Microsoft Windows Vista Server
8/Jan/2014 5:09:20 PM: ##  The Total No of Test Cases Executed  ::  25
8/Jan/2014 5:09:20 PM: ##  The No. of Test Case Passed ::  25
8/Jan/2014 5:09:20 PM: ##  The No. of Test Case Failed ::
8/Jan/2014 5:09:20 PM: ## # # # # # # # # # # # # # # # # # # # # # # # # # # #
# # # #
```