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## A Comparative Study of QTP and Load Runner Automated Testing Tools and their Contributions to Software Project Scenario

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**ABSTRACT:** Automated software testing becoming more and more important for many software projects in order to automatically verify key functionality, test for regression and help teams run a large number of tests in a short period of time. The aim of this research paper is to evaluate and compare automated software testing tools such as Quick Test professional and Load Runner to determine their usability and effectiveness. There are various tools available that help software teams build and execute automated tests. But the major part is to select the effective tool among various categories of tools. The main objective is to compare the features supported by these tools that determine their usability and effectiveness.

**KEYWORDS:** Test Automation Tools, QTP, Load Runner, Software Testing, Automated software Testing.

### I. INTRODUCTION

Before going to software automation tools for testing our primary responsibility to introduced testing. What is the idea behind testing, what are the different phases of testing? First testing is explained more generally and how it is connected to actual work. Software Testing plays an effective role in software development life cycle (SDLC).

Software testing is a process of executing a program or application with the intent of finding the software bugs.

- It can also be stated as the process of validating and verifying that a software program or application or product.
- Meets the business and technical requirements that guided it's design and development

Testing is the process of evaluating a system or its component(s) with the intent to find whether it satisfies the specified requirements or not.

Testing is executing a system in order to identify any gaps, errors, or missing requirements in contrary to the actual requirements.

Software testing is an investigation conducted to provide stakeholders with information about the quality of the product or service under test. [1]

Software testing is any activity aimed at evaluating an attribute or capability of a program or system and determining that it meets its required results. [2]

“Testing is the process of demonstrating that errors are not present”. [3]

“The purpose of testing is to show that a program performs its intended functions correctly”. [3]

“Testing is the process of establishing confidence that a program does what it is supposed to do”. [3]

### II. MAIN STRATEGIES OF SOFTWARE TESTING

There are two ways of software Testing: Manual Testing and Automation testing

#### 2.1 Manual Testing

In Manual Testing software is tested manually i.e. without using any automated tool or any script. Manual testing is the process of manually testing software for defects. It requires a tester to play the role of an end user and use most of all

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features of the application to ensure correct behaviour. To ensure completeness of testing, the tester often follows a written test plan that leads them through a set of important test cases.

- Manual testing requires more time and more resources, some time both.
- Performance testing is impractical in manual testing.
- Executing same test again and again is time taking process as well as tedious.
- GUI objects Size difference and color Combinations etc ...are not easy to find in Manual Testing.
- Batch testing is not possible, for each and every test execution Human User interaction is mandatory.
- Manual Test Scope is limited.
- We cannot reuse manual test.
- Actual load and performance is not possible to cover in manual testing for large number of users.
- Certain tasks are difficult to do manually eg. Low Level interface regression testing.

## 2.2 Automated Testing

In software testing, test automation is the use of special software (separate from the software being tested) to control the execution of tests and the comparison of actual outcomes with predicted outcomes. [4]

Test automation can automate some repetitive but necessary tasks in a formalized testing process already in place, or add additional testing that would be difficult to perform manually. Test automation is critical for continuous delivery and testing. Automation Testing covers almost all the problems of manual testing.

The objective of automated testing is to simplify as much of the testing effort as possible with a minimum set of scripts. If unit testing consumes a large percentage of a quality assurance (QA) team's resources, for example, then this process might be a good candidate for automation. Automated testing tools are capable of executing tests, reporting outcomes and comparing results with earlier test runs.

## 2.3 The Automated Test Life Cycle

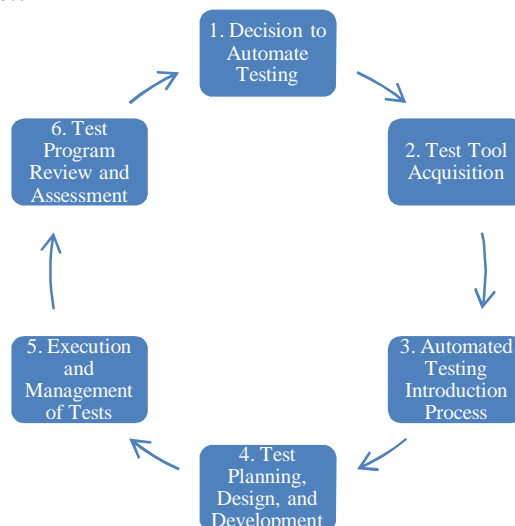


Figure 1 Automated Test Lifecycle Methodology (ATLM)

The first step, in the lifecycle, is making the decision to automate testing. In this stage the team outlines the potential benefits of automation and also creates a test tool proposal.

The second step is the test tool acquisition. In this stage the entire testing tool is evaluated and selected. The third step is the automated testing introduction process. This stage outlines the procedure needed to successfully introduce automated testing to a new project. Test process analysis is the first part of the procedure. The fourth step is the test planning, design and development. This, I believe, is the most important stage as it includes identifying the test procedures standards, defining the tests and the development standard. The test design step includes the number of tests to be performed, the ways the testing will be approached and the test conditions that will be used. Finally the test

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development step is carried out so that the automated tests can be reusable, repeatable & maintainable. The fifth stage is execution and management of tests. All test plans are now executed according to the standards discussed earlier in their plans.

The sixth stage is test program reviews and assessment. This stage is carried out throughout the lifecycle so that there is continuous improvement and less faults at the end. This would reduce the cost as faults found in earlier stages are cheaper to resolve than later stages. Automation testing is not the full replacement for manual testing. It is in fact a continuation of manual testing aimed to provide speed and accuracy to the testing efforts.

### III. AUTOMATED SOFTWARE 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.

Tests carried out with these tools can be run repeatedly, at any time of day. The method or process being used to implement automation is called a test automation framework. Several frameworks have been implemented over the years by commercial vendors and testing organizations. Automating tests with commercial off-the-shelf (COTS) or open source software can be complicated, however, because they almost always require customization. In many organizations, automation is only implemented when it has been determined that the manual testing program is not meeting expectations and it is not possible to bring in more human testers.

As James Bach (creator of Rapid Software Testing) said a wonderful quote:

*“Tools don’t test. Only people test. Tools only perform actions that “help” people test. “*

*Automated testing primarily uses automation tools, which are assistance to the test engineers.*

Now days we can get lots of Software Testing Tools in the market. Some tools are open sources and some are licensed or proprietary tools. Open source tools can be downloaded from the internet or can be obtained by the vendor without any charges. The tools are divided into different categories as follows:

- Test Management tools
- Functional Testing Tools
- Load Testing Tools

This purpose of this research paper highlights comparison between QTP and Load Runner testing tools and their contribution to software project scenario.

#### 3.1 Quick Test Professional (QTP)

HP Quick Test Professional (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. HP QTP uses Visual Basic Scripting (VBScript) for automating the applications. The Scripting Engine need not be installed exclusively as it is available part of the Windows OS.

QTP testing consists of following steps.

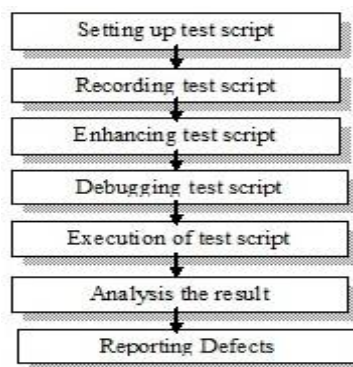


Figure 2 phases of QTP testing

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## 3.2 Load Runner

HP Load Runner is a software testing tool from Hewlett-Packard. It is used to test applications, measuring system behavior and performance under load. HP acquired Load Runner as part of its acquisition of Mercury Interactive in November 2006. [6]

Load Runner is a performance and load testing product.

HP Load Runner can simulate thousands of users concurrently using application software, recording and later analyzing the performance of key components of the application.

The key components of HP Load Runner are:

- **Load Generator** generates the load against the application by following scripts
- **VuGen** (Virtual User Generator) for generating and editing scripts
- **Controller** controls, launches and sequences instances of Load Generator - specifying which script to use, for how long etc. During runs the Controller receives real-time monitoring data and displays status.
- **Agent process** manages connection between Controller and Load Generator instances.
- **Analysis** assembles logs from various load generators and formats reports for visualization of run result data and monitoring data.

Load Runner testing consists of following steps.

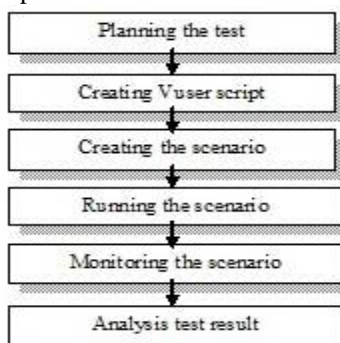


Figure 3 phases of Load Runner testing

## IV. EVALUATION STUDY

Comparisons between QTP and Load Runner are made on the basis of following parameters:

- Recording and Playback
- Script Generation capability
- Data Driven Testing(DDT)
- Test Result Report
- Execution Speed
- Easy to Learn
- Cost

### 4.1 Recording and Playback

Recording is the most commonly used method to create a test. The basic steps are typically recorded and the test later under goes improvements in order to suit the needs of the testing process. When we start the recording, application is started. It records all the action as performed by user. We cannot insert the check point during recording. We can only insert these after recording. QTP provides three modes of recording:

- Normal or context sensitive mode
- Low level mode
- Analog mode

Normal recording mode gets used most of the times because it only stores the action of application that is under test by ignoring system error message.

Load runner is also recording and playback type tool. Load Runner captures the application operations based on protocols. Unlike QTP scripts, Load Runner scripts are independent of GUI. This is because the code generated does not work based on UI objects; rather, it works on the principal of client's request to the server and expecting server

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response back to the client. This is why replaying Load Runner scripts are always browser independent. The VUser can communicate directly with a server by executing calls to the server API-without relying on client software (SUL) this means there will no impact on scripts if the changes are made to the UI of the System under Load. This tells; the performance testing is completely based on client/server communication (request and response) and not the GUI objects

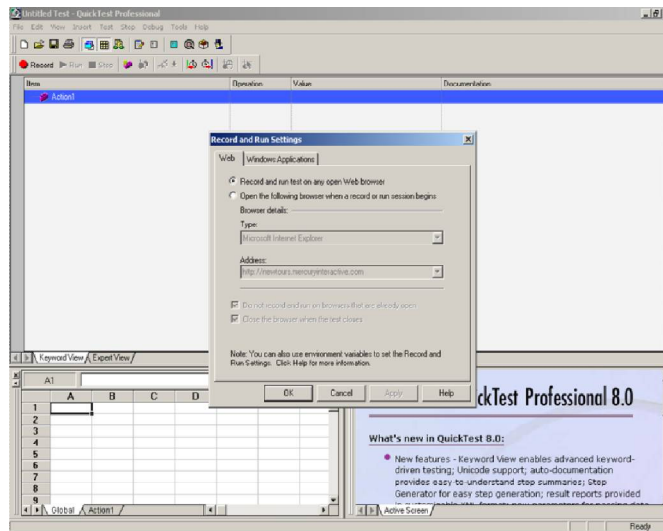


Figure 4 Recording in QTP

## 4.2 Script Generation Capability

HP Quick Test Professional uses VB Script as its scripting language. This is the only language that is fully supported by QTP's IDE. VBScript supports Object Oriented Programming concepts but not polymorphism and inheritance. QTP Support ".NET" application automation, and it also has "Data Table" to store scrip values and variables.

You can write your Quick Test automation programs in any language and development environment that supports automation. For example, you can use: VBScript, JavaScript, Visual Basic, Visual C++, or Visual Studio.NET. "

Load Runner is C based scripting but it's wrong to assume that VuGen scripts are always written in C. Some virtual user types are only available in other languages, and some give you an option of generating a recorded script in a variety of languages. At current count, Load Runner supports 8 languages (or 6, if you consider VBA, VBScript and VB to be the same language).

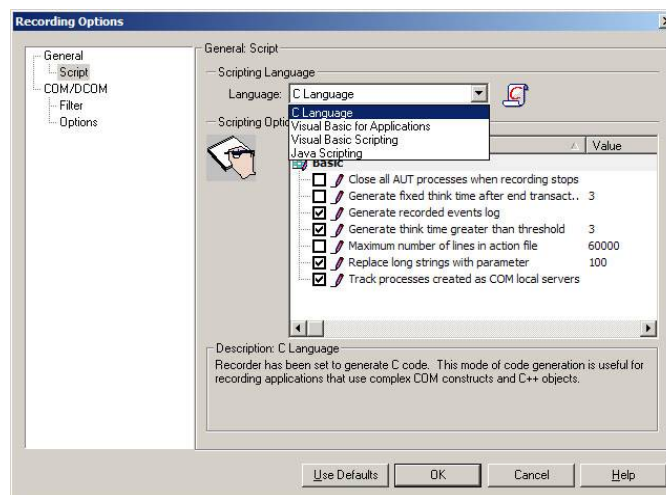


Figure 5 Generating Scripting Language in Load Runner

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To generate your script in a different language (if available), change the “scripting language” setting under Recording Options. It should be noted that not all Vuser types allow you to generate code from a recording of your application. Template scripts require you to hand-code API calls in your script. As QTP Load Runner does not have “Data table” and “.NET” application automation

### 4.3 Data Driven Testing (DDT)

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. These way testers can test how the application handles various inputs effectively. It can be any of the below data files.

- Data pools
- Excel files
- ADO objects
- CSV files
- ODBC sources

Excel files are the ones that get used most often. The very fact that each action in QTP comes integrated with a data sheet of its own explains why that’s so. Basically a data sheet can be any relevant external file.



Figure 6 QTP Data Driven Framework

QTP supports DDT by using inbuilt data tables which have functionality like excel sheet and easy to edit and update. Using the data tables reduces efforts of maintaining excel sheets and easy mapping of columns to the input elements by user. We can insert data table parameters into our test so that it will run several times on different sets of data. Each test run on different set of data is called iteration. There are two types of Data tables.

#### 4.3.1 Local Data Table

It is available to only one action in our test.

#### 4.3.2 Global Data Table

When we want a data table to be available to all the action in our test, then it is called a global data table.

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

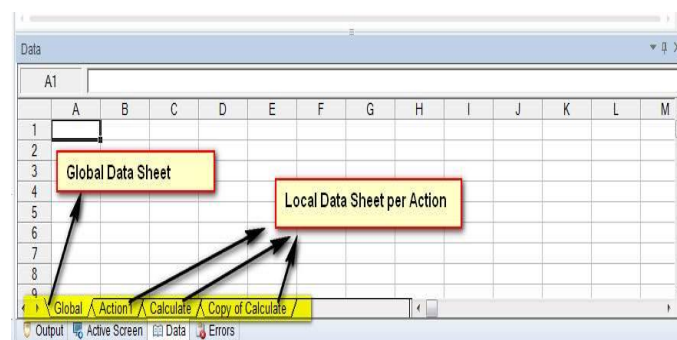


Figure 7 Accessing data Sheet

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QTP can also access the external sources by using data tables. Since the data is kept separate from the test script, the same script can be run multiple times for different sets of data (which can be kept in multiple rows in the data sheet). Changes made in the test data don't affect the test scripts in any way and vice versa.

### 4.3.3 VUGen in Load Runner

VUGen is one of the four core components of Load Runner. It is the first component we interact with when getting started with Performance Testing using HP Load Runner. The purpose of VUGen is to create VUScripts that are used to simulate a real-like virtual-user. VUGen lets the user record and script a test to be performed against an AUT, and playback and make modifications to the script as required, such as defining Parameterization.

### 4.4 Test Result Report

The test result window in QTP gives us sufficient information to show steps passed, steps failed. Result window opens automatically after execution of the test. It also provides information about checkpoints that applied during testing. QTP gives statistics about the previous run and current run in the form of pie charts. These results are very useful and easy to understand.

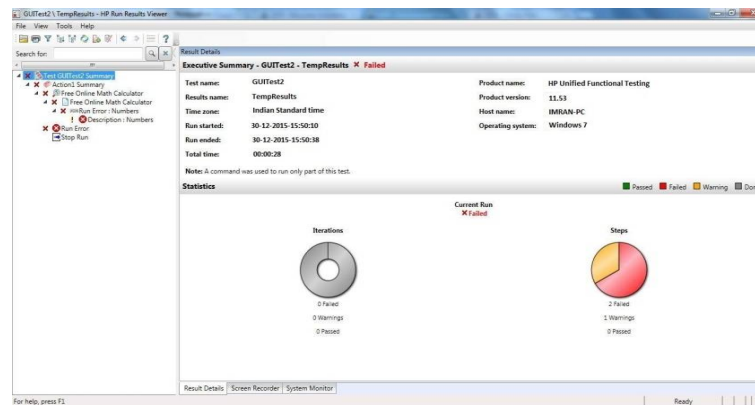


Figure 8 QTP Test Results

### 4.4.1 Controller in Load Runner

Controller is a program to "control" overall load test. It is responsible for helping you run your performance test design using the VUGen scripts you've already created. It lets you over-ride run-time settings, enable or disable think time, rendezvous points, add load generators and control the number of users each generator can simulate. It automatically creates a dump of execution results, gives you a live view of "current state" of load test running. In the scenario group pane you can see as Vusers gradually start to run and generate load on the system.

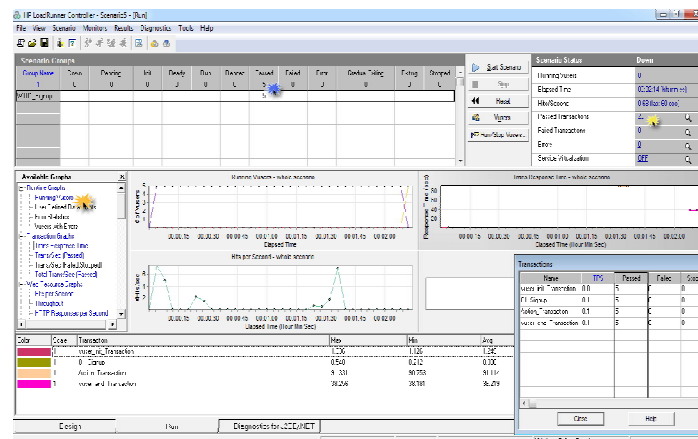


Figure 9 Load Runner Controller Scenarios



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#### 4.5 Execution Speed:

Execution speed of QTP is little faster than Load runner. We calculate the execution speed by taking total test run time of each user screen. Both QTP and Selenium result windows shows start test run time and end time and also total time taken.

#### 4.6 Easy To Learn:

Load runner has more features and more complicated as compared to QTP. Load Runner takes more time to learn than QTP. Load Runner provides only Load testing whereas QTP provides various testing such as Regression, Functional, Unit and Web testing.

#### 4.7 Cost:

Load Runner is cheaper than QTP. QTP is available through single-seat licenses, as well as floating or concurrent licenses. A trial version of the software is also available.

LoadRunner licensing seems to confuse some people (there are currently 2563 product numbers under the "Performance Center" centre in the HP pricelist). This Tech Tip attempts to clarify how it all works. LoadRunner licenses fall into one of the following categories:

- Perpetual license
- Term license
- Virtual User Days
- Software as a Service

When you purchase a Load Runner license, you will need to purchase a license for a *Load Runner Controller* and for a certain number of *Virtual Users* of a particular type. Virtual user days represent the number of users that can be used to test load on your application or website in a 24 hour period.

TABLE-1  
Virtual Users Vs Prices in \$

Virtual Users	Prices(\$)
1-999 VUDs	2.00
1000-4999	1.40
5000-9999	1.40
10,000-24,999	0.98
25,000-49999	0.69
50,000-99999	0.56

Quick Test Pro retails for \$9000 for each floating license, or \$6000 for a Node-lock license plus \$2000 for the Test Director. Maintenance fees are an additional 25% per year.



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## V. COMPARISON BETWEEN QTP AND LOAD RUNNER

TABLE-2

Features	QTP	Load Runner
Application Support	Client server applications only like built in TCL/TK and PowerBuilder	Support a range of applications including mobile, Ajax, Flex, HTML 5, .NET, Java, GWT, Silver light, SOAP, Citrix, ERP, legacy and more.
Reports	Quality Centre has in-built awesome dashboards and allows standard reporting format in HTML,XML etc.	Little Complex
Software Cost	License & Annual maintenance Fees	Less as compared to QTP.
Script Creation Time	Less	More as compared to QTP
Mobile (Phones & Tablets) support	Different commercial product i.e. UFT Mobile (formerly known as Mobile Cloud for QTP)	Measure full mobile performance device level, network and backend. Integrated with Mobile Centre and Network Virtualization.
Scripting Language	VB Script	HP Load Runner client emulation scripts are usually created using the ANSI C programming language. However, Java and .Net programs can also be run by HP Load Runner. Version 12.50 added the use of JavaScript for Web-HTTP/HTML scripts.
Environment Support	Window XP, Window 7, Window Vista, Window 8/8.1	Windows 8.1 and Linux only
Browser support	Google chrome, Internet Explorer, Firefox	IE, Mozilla, Opera, Netscape, Firefox

## VI. CONCLUSION

QTP and Load Runner both are effective tools for test automation. QTP simulates a user interaction with the GUI whereas Load Runner simulates heavy usage. QTP simulates a user by recording its actions on the GUI while Load Runner doesn't bother with the GUI but records the commands through a proxy. Load Runner will be best with the application of lesser security whereas QTP is best where data security is required.

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