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Selenium – A Trending Automation Testing Tool

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ABSTRACT

Selenium is an important testing tool for software quality assurance. In recent days number of websites are increasing rapidly and it becomes essential to test the websites against various quality factors to make sure it meets the expected quality goals.

Several companies are spending a lot of bucks for the testing tool while Selenium is available completely free for the performance test. The open source tool is well known for its unlimited capabilities and unlimited reach. Selenium stands out from the crowd in this aspect. Anyone could visit the Selenium website and download the latest version and use it. It is not only an open source but also highly modifiable. Testers could make changes based upon their needs and requirements.

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***KEYWORDS:** Selenium, Automation Testing Tools, Automated testing, Test Automation, Selenium IDE, Web Driver*

I. INTRODUCTION

1.1. Software Testing

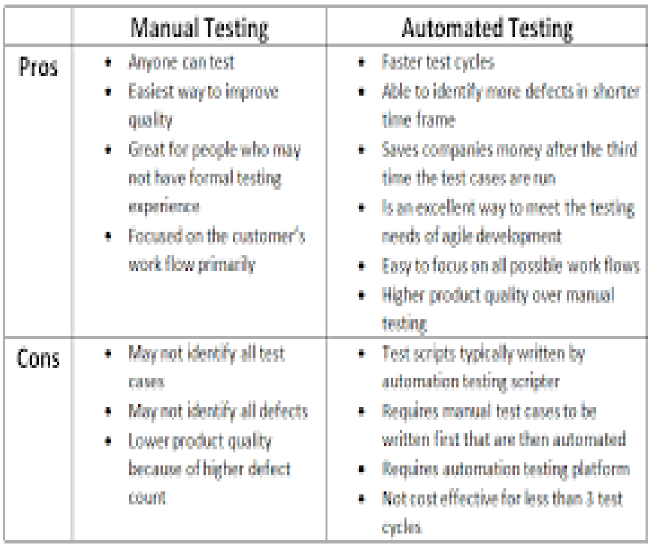
Software Testing is defined as an activity to check whether the actual results match the expected results and to ensure that the software system is Defect free. It involves execution of a software component or system component to evaluate one or more properties of interest. Software testing also helps to identify errors, gaps or missing requirements in contrary to the actual requirements. It can be either done manually or using automated tools.

1.2. Testing Approaches

1. **Manual testing: -** Manual testing is the process of testing software by hand to learn more about it, to find what is and isn't working. This usually includes verifying all the features specified in requirements documents, but often also includes the testers trying the software with the perspective of their end user's in mind. Manual test plans vary from fully scripted test cases, giving testers detailed steps and expected results, through to high-level guides that steer exploratory testing sessions. There are lots of sophisticated tools on the market to help with manual testing, but if you want a simple and flexible place to start, take a look at Test pad.
2. **Automation Testing:** Automation testing is the process of testing the software using an automation tool to find the defects. In this process, testers execute the test scripts and generate the test results automatically by using automation tools. Some of the famous automation testing tools for functional testing are QTP/UFT and Selenium.

1.3. Comparative study of Manual and Automation Testing

Table1.1: Comparison between manual and automation testing



	Manual Testing	Automated Testing
Pros	• Anyone can test • Easiest way to improve quality • Great for people who may not have formal testing experience • Focused on the customer's work flow primarily	• Faster test cycles • Able to identify more defects in shorter time frame • Saves companies money after the third time the test cases are run • Is an excellent way to meet the testing needs of agile development • Easy to focus on all possible work flows • Higher product quality over manual testing
Cons	• May not identify all test cases • May not identify all defects • Lower product quality because of higher defect count	• Test scripts typically written by automation testing scripter • Requires manual test cases to be written first that are then automated • Requires automation testing platform • Not cost effective for less than 3 test cycles

II. ANALYSIS

2.1. Merits of Automation

Increase in accuracy and repeatability – when an automated machine is programmed to perform a task over and over again, the accuracy and repeatability compared to an employee is far greater.

Less human error – no one is perfect, and we are all prone to making mistakes. Which is why a machine that performs repeated tasks is less likely to make mistakes than an employee.

Less employee costs – by adding automated machines to an operation, means less employees are needed to get the job done. It also indicates less safety issues, which leads to financial savings. With having less employees, there are numerous costs that are diminished or reduced such as payroll, benefits, sick days, etcetera.

Increased safety – having automated machines means having less employees who perform tasks that can be dangerous and prone to injury, which can make the work environment safer.

Higher volume production – investing in automated equipment creates a valuable resource for large production volumes, which in turn, will increase profitability.

2.2. Demerits of Automation

More pollution – Different types of machines operate using motor which may require gases or chemicals in order to operate. This can cause an increase in pollution in the workplace.

Large initial investment – automated machines can be one of the costliest operating costs for a company. With automated machines running anywhere between thousands and millions of dollars depending on the type and degree of automation.

Increase in unemployment – by increasing the amount of automation, there are less employees required causing high unemployment rates.

Unpredictable costs – there can be several unpredictable costs that may exceed the actual cost saved by the automation itself. Some of these costs could include research and development costs of automating a process, preventative maintenance costs, and the cost of training employees to operate automated machines.

2.3. Requirements for Automated Software Testing

All the tests are not automated. There are certain requirements for a test to be automated. They may be financial restrictions or limited man power and many. There a few basic questions whose answers could give you an idea whether the test has to be automated or not.

They are as follows: -

- Can we define the actions of test sequence?
- Is that necessary to replicate the actions of sequence several times?
- Is it possible to automate the sequence of actions?
- Is the performance of the application under test similar with automation as well as manual?
- Is it necessary to execute the tests on different hardware configurations?

2.4. Test Automation Process Life Cycle Diagram

In automation testing life cycle methodology, test design is constructed to portray test efforts, to give project and test team a framework on the scope of the test program.

- **Determining the Scope of Test Automation: -**

It is the first stage of automation testing life cycle and it aims to identify the feasibility of automation. Every aspect should be considered while analysing the feasibility. Also, it is essential to perform a feasibility analysis on the manual test case pack that allows automation engineers to design the test scripts.

- **Selecting the Right Tool for Automation: -**

Automation testing is highly tool dependent. That is why finding the right automation testing tool is a critical phase for an automation testing life cycle. When you are looking for an automation tool you need to keep in mind the budget, technologies being used in the project, familiarity of the tool with resources on-board, intuitiveness, flexibility and more. Choose a tool that provides you with a support team who can take care of queries or issues.

- **Test Plan + Test Design + Test Strategy: -**

It is the most critical phase of automation testing life cycle methodology that defines how to approach and accomplish the goal of test automation. Selecting a test automation framework is the first and foremost thing to do in the Test Strategy phase of Automation Testing Life Cycle.

- **Setting Up the Test Environment: -**

As the name indicates, this stage of Automation Testing Life Cycle involves setting up a machine or remote machine where test cases will be executed. Why would we need remote machines? Because unless we live in an ideal world, your users would be using different machines to access your website or web-app on the internet.

- **Automation Test Script Development + Execution: -**

Once you install the test environment, it is the time to execute the test script. So, this phase of automation testing life cycle is dedicated to the execution of all test scripts.

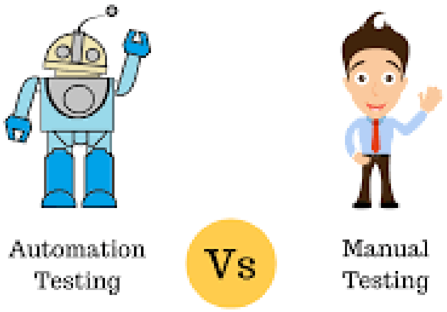


Figure 2.1: Automation lifecycle

2.6. Finalization of Test Automation and Making a Test Plan:

The tests that can be automated are decided in this phase. The test automation process is similar to the software development process. It takes similar effort to automate a test. It follows the same cycle as in the process of a software development product. The plan is made by taking into consideration amount of time required and total number of resources needed and who does it.

III. INTRODUCTION TO SELENIUM

Selenium Framework is an open-source test automation tool that is needed for automation testing. Selenium is a collection of various software Tools with a unique way to follow the test automation. It has capabilities to manage across operational systems and completely different browsers. It supports various programming languages, which incorporates most, however not restricted to solely, Groovy, Ruby, Perl, Python, Java, C and Ph. Selenium consist of numerous components which content three major tools. Everyone has a selected role in aiding the event of test automation for a web application.

- **Selenium IDE:** Selenium IDE (Integrated Development Environment) is an open source web automation testing tool under the Selenium Suite. Unlike Selenium WebDriver and RC, it does not require any programming logic to write its test scripts rather you can simply record your interactions with the browser to create test cases. Subsequently, you can use the playback option to re-run the test cases.

- **Selenium RC**: RC uses a JavaScript Program called Selenium core which controls the browser. It works by intimating the user action as commanded by the JavaScript commands but that does not enforce user to write automated test cases in the only JavaScript, let's see how does RC make that happen.

- **Selenium Web Driver**: Selenium WebDriver is a collection of open source APIs which are used to automate the testing of a web application.
  Selenium WebDriver does not handle window component, but this limitation can be overcome by using external tools such as AUTO IT tool, Sikuli etc.

- **Selenium Grid:** Selenium Grid is a tool use to run parallel tests across totally different machines and different browsers at the equal time which ends in decreased execution time.

Web applications require changes more as compared to desktop systems making updates in features of system, security attacks, and preferred changes for users. Applying the regression testing overall for a system is expensive because companies cannot afford this as expected turnaround time for the patches is short. They provided a solution of this problem when companies face the challenges of security breaches. Regression testing approach in such situation applies only on the code, which has been modified.

Selenium is a browser automation tool, commonly used for writing end-to-end tests of web applications. A browser automation tool does expect exactly and automate the control of a browser so that repetitive tasks can be automated. It has different features which are useful for developer. Selenium IDE is use for record and playback as well as for those developers who are new in developing side can also use easily for their work.

For developers who are good in programming language can use selenium RC or Web Driver. To run selenium tests parallel one can, use selenium grid. By choosing proper framework one can save time as well as money and can improve software quality.

Selenium Testing Process consists of following phases:

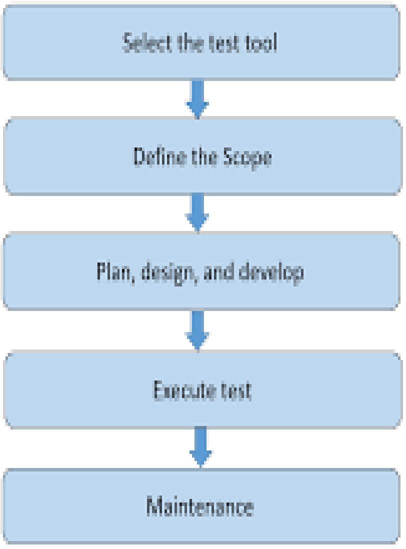


Figure 3.1: Selenium Testing Process

IV. ARCHITECTURE OF THE SELENIUM

The architecture of the Selenium web tool. It has two basic components: Selenium Client and Server. The client includes the WebDriver API, which is used to create test scripts to make interaction with web page and other application elements. It also includes the remote Web Driver class, which communicates with a remote Selenium server.

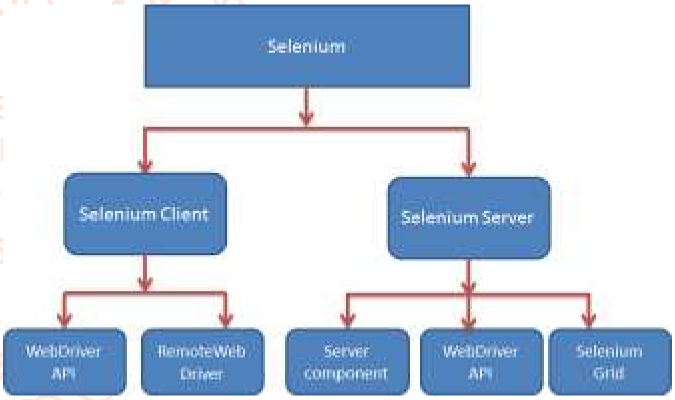


Figure 4.1: Overview of framework architecture

The Selenium server comprises of a server component which is used to accept requests from Selenium Client's Remote Web Driver class. It also comprises of the Web Driver API which is used to execute tests for web browsers on a server machine. The last component is the Selenium Grid which is implemented by Selenium Server in command-line options for grid characteristics, containing a central hub and nodes for numerous situations and preferred browser capabilities. Grid is a tool expended to run parallel tests through dissimilar machines and dissimilar browsers concurrently which effects the minimized execution time.

V. CONCLUSION

This paper proposed the concept of testing and various testing approaches. It will help to understand test automation and its importance. An Automation testing process is to help testing the software program application. It defines properly that Selenium is Trending Automation Tool in the Industry. Apart from that Selenium testing tool has both advantages and shortcomings in comparison to other automation testing tools. But Selenium overshadows other testing tools in areas of –

- Cost – Selenium comes at free of cost as it is an open-source testing tool.
- Parallel Testing – Tester can execute test scripts on multiple machines simultaneously.
- Flexibility – Selenium supports test scripts in multiple languages, execution on multiple browsers and operating systems.

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