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Review on Automation Tools in Software Testing

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Abstract*: *Testing is major component of any software engineering process meant to produce high quality applications. Software Testing can be conducted manually as well as automated. Manual Testing has many drawbacks such as consuming time and cost, require experience, complex reusing, less efficiency and not provide scripting facility for code. Automation Testing is the use of testing tools and reduce the need of human involvement, repetitive or redundant tasks. There is wide variety of software automated testing tools available in market. But it is important to a user to select a best suitable tool for testing. This research paper provides a feasibility study based on different parameters for commercial tools such as the Selenium, Robotium, SoapUI, Watir, QTP and Test Complete.

Keywords— Selenium, Robotium , SoapUI, Watir, QTP, TC.

I. INTRODUCTION

Fig.1 Software Testing

The aim of software testing process is to identify the defects existing in a software product. Software testing is necessary because we all make mistakes. Some of those mistakes are unimportant, but some of them are expensive or dangerous.[6]
Since we assume that our work may have many mistakes, hence we all need to check our own work. But some mistakes come from bad assumptions and blind spots, so we might make the same mistakes when we check our own work as we made when we did it. So that we may not notice the flaws in what we have done.[14] In manual testing, testing is done without any tool. If we humans are made to do the same repetitive task over and over again, we soon become bored and start making mistakes. Besides tools improve reliability, reduce turnaround time and increase ROI. They are various types of tools that assist in diverse testing activities ranging from requirements capturing to test management [1].

II. AUTOMATED SOFTWARE TESTING

Fig.2 Automated Software Testing Tools

In automation testing, testing is done with the help of automated testing tools. These automated testing tools enable developers and

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testers to easily automate the entire process of testing in software development. According to the daily use, Mobile and Web applications take the first place in development and testing. Testing automation enables developers and testers to easily automate the entire process of testing in software development saving time and cost[7].

III. SELENIUM

Selenium is a software-testing framework for web applications which can be used portably. Selenium provides a record/playback tool for authoring tests without the need of learning its scripting language called Selenium IDE. It also provides a test domain-specific language known as Selenese which helps to write tests in a number of programming languages like C#, Groovy, Java, Perl, PHP, Python, Ruby and Scala. The tests can then run against most modern web browsers. Selenium can be suitably used in Windows, Linux, and OS X platforms. It is open-source software developed by Apache 2.0 license.

Fig 3 Selenium-An Open Source Automation Test Tool

A. Selenium IDE

Selenium IDE is a complete integrated development environment. It allows recording, editing, and debugging tests.

B. Selenium client API

Instead of writing tests in Selenese, tests can also be written in various programming languages. These tests communicates with Selenium by calling methods in the Selenium Client API. Selenium currently provides client APIs for Java, C#, Ruby, JavaScript and Python.

C. Selenium Remote Control

Selenium Remote Control (RC) is a server, written in Java,which accepts commands for the browser via HTTP as an intermediator. RC helps in writing automated tests for a web application. Selenium project currently provides client drivers for PHP, Python, Ruby, .NET, Perl and Java for making test easier.

D. Selenium WebDriver

Selenium WebDriver is the successor to Selenium RC. Selenium WebDriver accepts commands that wa sent in Selenese, or via a Client API and sends them to a browser. Selenium-Webdriver (Selenium 2.0) is fully implemented and supported in Python, Ruby, Java, and C#.

Fig.4 Selenium Webdriver Architecture

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E. Selenium Grid

Selenium Grid is a server that allows tests to use web browser instances running on remote machines. With Selenium Grid, one server acts as the hub. Tests communicate with the hub to obtain access to browser instances. The hub has a list of servers that provide access to browser instances (WebDriver nodes), and lets tests use these instances.

F. Pros

1) Low Cost
2) Compatible
3) Choice of Language
4) Multiple Testing Frameworks
5) Easy to Integrate
6) Open source
7) Test Driven Development
8) Useful for Comprehensive Testing

G. Cons

1) Issues with finding Locators
2) Limitation in Browser Support
3) Manual Scripts Not Allowed
4) Slow Performance

IV. ROBOTIUM

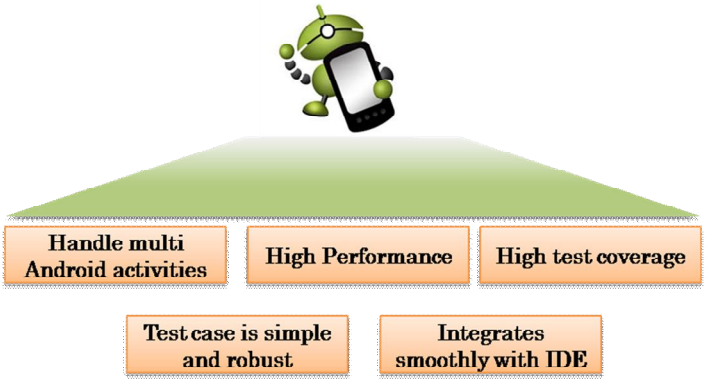

Fig.5 Working of Robotium

It is a framework for writing automatic grey box testing for Android applications.. Developers can write function with the support of Robotium. Robotium can be used for both testing applications where the source code is available and applications where only the APK file is available.It has support for Android features such as activities, toasts, menus and context menus[9][10].
Robotium is created to make it easy to write powerful and robust automatic UI test cases for Android applications. With the support of Robotium, test case developers can write function, system and acceptance test scenarios, spanning multiple Android activities.Robotium tests can be run on both emulator and device[8].

A. Pros

1) Handles multiple Android activities automatically
2) Automatic timing and delays
3) Automatically follows current Activity
4) Test execution is fast
5) Automatically makes own decisions, e.g. when to scrolls

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B. Cons

1) It cannot handle Flash or Web components.
2) Robotium cannot interact with Status Bar Notifications − that is, pull down the Notification area and click on a specified Notification.
3) Can be a bit slow, especially running on older devices.
4) It can't work with different Applications in on test – if your application calls another one (like Camera) – Robotium can't "see" it and press any buttons there.

V. SOAP UI

Fig.6 SOAP UI-Web Service Testing

SOAP UI is the leading open source cross-platform API Testing tool, allows testers to execute automated functional, regression, compliance, and load tests on different Web API. It supports all the standard protocols and technologies to test all kinds of API's .It also helps us to perform non-functional testing such as performance and security test. It is not used for UI Testing. It is only used for Web API or Web Service Testing. It is PROTOCOL Dependent and NOT browser dependent.

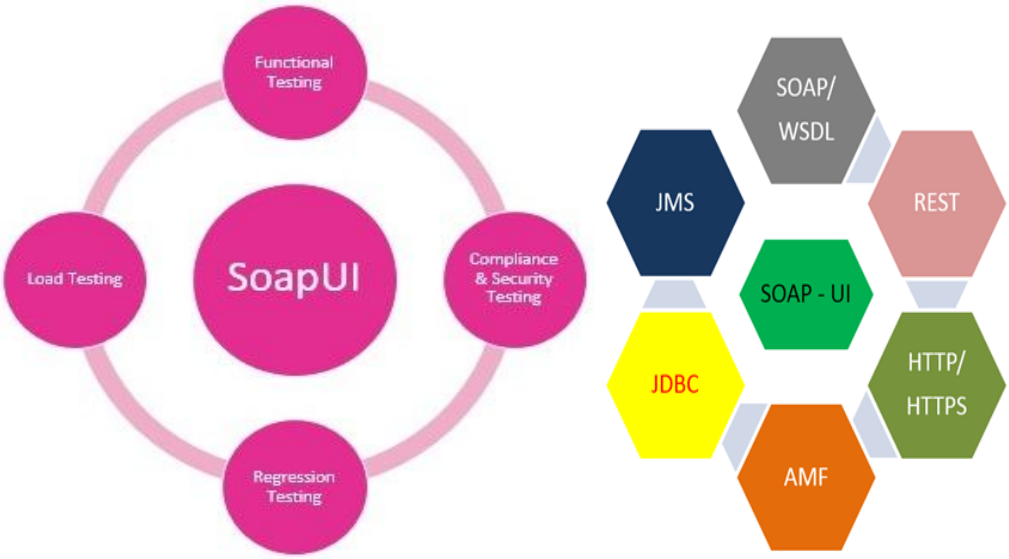

Fig.7 Architecture of Soap-UI

A Cross-platform free open source functional testing tool for service-oriented architectures (SOA) and representational state transfers (REST), written in Java language. Its user-friendly interface acquires various features, mainly used for API testing facilitates to easily and quickly perform functional/regression and load testing, supports all protocols and technologies related to the particular application[11].

A. Pros

1) User friendly interface
2) Soap UI NG pro comes loaded with powerful and easy to use reporting functionality.
3) Multi-Environment support

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4) Test debugging is easy.

B. Cons

1) Cost is of License and maintenance is high.

VI. WATIR

Fig.8 Web Application Testing in Ruby

WATIR, it is pronounced as Water. The most important projects of watir are

- watir-classic
- watir-webdriver
- watirspec

A. Watir-classic

Watir-classic is different from HTTP based test tools which operates by simulating a browser. Whereas Watir-classic directly drives the browser through the Object Linking and Embedding protocol. It is implemented over the Component Object Model architecture.

B. Watir-webdrive

Watir-webdriver is a modern version of the Watir API based on Selenium. Watir-webdriver is not only derived from Selenium 2.0, but it is also built from the HTML specification. Watir-webdriver should always be compatible with existing w3c specifications.

C. Watirspec

Watirspec is an executable specification of the watir API and it combines the best features of watir, RSpec and Ruby for browser based functions.

D. Pros

1) It has rich API

2) No external server needed to run a test.

3) Tests any language-based web application

4) Cross-browser testing

5) Compatible with business-driven development tools like RSpec, Cucumber, and Test/Unit

E. Cons

1) Knowledge of Ruby is must.

2) Every Browser requires a different library.

3) It does not seem to be widely used as Selenium.

VII. QTP

Quick Test Professional is an automated functional testing tool. It helps testers to execute automated tests to identify the errors, defects or gaps contrary to the actual result expected of the application under test.

A. Features of QTP

QTP is the best testing tool because it is an icon based tool which automates the regression and functional testing of the application.

The scripting language used is VB script. It supports SAP, Oracle, etc. It allows Business Process Testing.

B. Pros

1) Excellent object identification process
2) Supports record and playback.
3) It has an inbuilt IDE
4) It can easily maintain suites like smokes, regression, sanity.
5) Allows testing desktop as well as webbing based application.
6) Used by both technical and non-technical testers.
7) Easily integrated with test management tools like QC, Test Director, win runner.

VIII. TEST COMPLETE

Fig.9 TC Representation

Test Complete is a functional automated testing platform developed by Smart Bear Software. It helps the testers to create automated tests for Microsoft windows, Web, Android OS, iOS, WPF, HTML5, Flash, Flex, Silverlight, NET, VCL and Java. It automates functional testing and backend testing like database testing.

A. Test Complete modules

Desktop, Web & Mobile

Each module has the functionality for creating automated tests on the particular platform. The tests can be recorded, scripted or manually created with keyword driven operations.

B. Features of Test Complete

1) Keyword Testing
2) Scripted Testing
3) Test record and Playback
4) Distributed testing
5) Access to methods and properties of internal object
6) Bug Tracking Integration
7) Data driven testing

Test Complete supports testing types such as Functional testing, Unit testing, Regression testing, Keyword testing, Web testing, data driven testing, load testing, etc. It supports scripting languages such as VB script, JScript, C++ script, C# script, Python, etc. Test Complete supports applications such as .NET, WPF, JAVA, Android, iOS, Visual C++,Visual Basic, HTML 5,Microsoft Silverlight, Adobe Flex, Adobe Flash, etc[12].

C. Pros

1) Supports for all 32 bit and 64 bit windows application.

2) Automates many software test types.

3) Recorded tests can be modified later by testers to create new tests or to enhance existing tests.

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IX. COMPARISON

A. QTP Vs Selenium [3]

Selenium	QTP
Open Source	Paid tool
Works on all OS	Works on Windows only
Used to test only Web applications	Tests both web and desktop applications
Works on almost all browsers	Works on Firefox 3.5x and IE
No object repository.	Has got an object repository
IDE sometimes does not record some events	Recording is a little reliable
Core engine is JavaScript and is very strong	Core engine is not JavaScript based

B. Watir Vs Selenium [13]

Watir	Selenium
Opens browser as a normal way how the user opens it.	Create object for browser and works with that object in particular port.
Changing registry details is very easy.	Changing registry details is not easy work.
Watir waits until the page was fully loaded. We can use sleep commands.	If your net connection is very slow then Selenium may returns error because of wait For Page To Load exceeds and also sleep commands most of the times fails.
Watir is a Ruby library that wraps the COM interface to Internet Explorer. COM is a long-standing Windows-based technology for making libraries accessible to various languages. This allows access to the Document Object Model.So it doesn't matter where on the page an object exists, what matters is how you identify it (id, name, title, etc).	Selenium uses a unique mechanism for driving browsers. Selenium's automation engine is written in JavaScript and runs inside a browser. The engine, called a browser bot, is embedded in a page that accesses the application under test in a separate frame. Because of cross-site scripting, Selenium's browser bot has to be served from the same site as the application under test – requiring installation on the server.
Watir was designed to be easy to learn, it allows page elements to be identified by index, name, ID, value or adjacent text. Now Watir supports IE, Firefox, Chrome, Safari with the help of Firewatir, Safari Watir, chrome Watir. It is currently limited to IE browsers on Windows, Fire watir supports Firefox browsers. So we need to write separate code(or object) for each and every browsers. But Selenium does in Single attempt.	Selenium was designed for breadth of coverage- multiple browsers and platforms. It was expected to be used by the same developers who built the application. Drawback: Selenium requires a server-side installation.
Learning Watir –> Without Ruby knowledge it's not possible to write the watir script for one web application.	Learning Selenium –> Programming skill is not Major. But the QA should familiar with anyone of the language from Ruby/Java/perl/Python/c#/Groovy/PHP to implement the code for any web application.

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C. Test Complete Vs QTP [4]

Test Complete	QTP
It supports Windows 7, Windows Vista, major Win 64-bit apps.	It supports only Windows XP.
Web Browser supports - IE, Chrome 31, Opera, Firefox.	Web Browser supports - Google Chrome (up to v.23), Internet Explorer, Firefox (v.21).
Language supports - VB Script, JS Script, Delphi Script, C++, C#.	Language supports - VB Script and Java Script.
Mobile supports - Android and iOS platform support, Windows Desktop and Client/Server support.	Various commercial products - HP UFT Mobile – formerly Mobile Cloud for QTP.
AQtrace and AQtime integration.	Continuous integration is possible through Quality Center/ALM or Jenkins.
Execution speed of Test Complete is bigger than QTP.	QTP is more expensive than Test Complete which has two versions (Enterprise and Standard).
Test Complete provides results in a single pane.	QTP provides results in an executive summary.
It is easier to study Test Complete.	QTP has wider functionality.
In Test Complete, scripts can be called from one another and can be reused.	In QTP, scripts can be copied and reused. It is possible to pass the parameters from one action to another. QTP has an object repository concept.

X. CONCLUSION

One can select a testing tool based on the type of application need to be tested, budget, and the efficiency required. Our objective had not been to favour one at the cost of the second. It is a matter of convenience for the testers and programmers to select a tool that suits their requirements best[15].Selenium, Soap UI and TC are very good tools for test automation. Each tool has its own pros and cons. Selenium can reduce the cost as it is open source but the efforts involved in scripting for selenium increased by about 15% than other tools in initial stages. Test Complete has easy to use UI and efficient playback. Test Complete will be best to use for applications with lesser security needs. Soap UI is not just a functional API testing tool but also lets us perform non-functional testing such as performance and security test. Soap UI is also available as Soap UI Pro, which includes several timesaving features aimed at making your testing faster and easier. If test automation requirements are getting fulfilled with Test Complete, there is no need to go for QTP at a higher cost. Both these tools solve the same purpose; it is just that QTP is a versatile tool for a critical and more risky Application Under Test (AUT). The complete Selenium test automation is designed specifically for web testing. It will not allow us to automate other technologies. The Selenium solution is highly complex, involving the integration of many components. The process for Selenium test automation necessitates a developer test skills set. When making a tool selection in this area, it is important to take into consideration much more than the cost. This comparative study will help users to select best one among these six tools according to their requirements [5].

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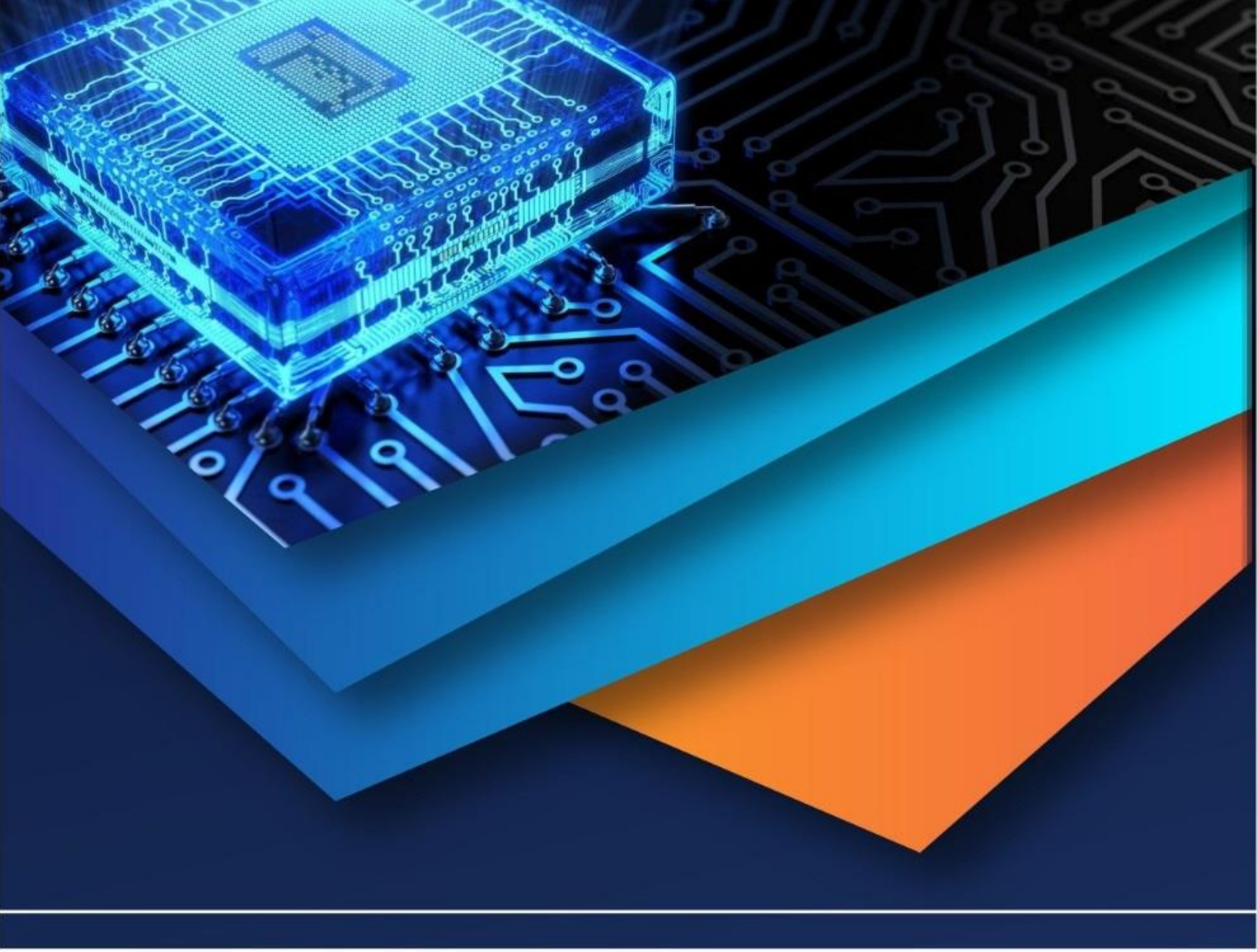

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