SIGNIFICANCE OF TESTING THROUGH TESTING TOOLS: COST ANALYSIS

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Abstract
Software testing is decisive factor for achieving reliability and more correctness in any program, application or in whole system. The system would become more adaptable by proper testing. In this process testing tools play an important role to help the developers. The first objective of this paper is to focus of significance of testing and its categories as per the testing performed by the particular entities. Secondly it represents the different vendors and their associated software testing tools with their key features. It also analyzes testing tools which work differently to check different types of application. Further the cost effectiveness for various testing tools has been shown by different charts. The ten high cost, ten low cost, open source and various free testing tools are shown to focus the effectiveness of cost factor.

Keywords : Testing , Testing Tools, Automation, Cost.

1. Introduction

Software Testing : It is the route of executing a program, application or system with the purpose of finding errors [1]. This process also involves any activity intended at evaluating competence of a program, application or system and seminal that it meets its required objectivity or not [2].
Software testing is the process of checking whole program, application or system by various way. The prime goal of testing is to find bugs, failure in software but testing is not focus only to the errors occurred at system but also focus the objective derived from the system. Program, application or system is not like as solid procedure where given input produce expected output all the time. They can be differs in the manner in which they fail. Most physical systems fail in a monotonous set of ways. While software can fail in many uncanny ways. To find out all of the unusual failure modes for software is generally infeasible [3].

2. Testing & it's categorized by entities

Software testing involves many types of testing which all have their specific goal to achieve. Module test can be apply to smallest compliable unit of source code as module. Black-box test can be applied ton modules or groups of modules which characterize assured functionality. Further collaboration of modules or classes can be tested more properly by integration testing. This part gives never by hundred testing types which are alphabetically in order.

Tester's testing
➢ Vigorous Testing, Era Testing, Informal Testing, Allegation Testing, All-pairs testing, Automatic Testing, Backward Compatibility Testing, Benchmark Testing, Boundary Value Testing, Bottom up Integration Testing, Compatibility Testing, Provision Coverage Testing, Context Driven Testing, Decision Coverage Testing,

Dependency Testing, Dynamic Testing, Domain Testing, Error-Handling Testing, Functional Testing, Fuzz Testing, Gray Box Testing, GUI software Testing, Globalization Testing, Hybrid Integration Testing, Integration Testing, Internationalization Testing, Inter-Systems Testing, Keyword-driven Testing, Localization Testing, Manual-Support Testing, Mutation Testing, Modularity-driven Testing, Negative Testing, Operational Testing, Orthogonal array Testing, Passive Testing, Parallel Testing, Performance Testing, Decay Testing, Recovery Testing, Security Testing, Smoke Testing, User Interface Testing.

End user/Customer
➢ Acceptance Testing, Accessibility Testing, Alpha Testing, Beta Testing, Comparison Testing, Prerequisite Testing.

QA
➢ Agile Testing, Black box Testing, Adaptation Testing, Critical Testing, End-to-end Testing, Equivalence Partitioning Testing, Fault injection Testing, Formal verification Testing, Requirements Testing.

Developer
➢ Branch Testing, Extent Testing, Code-driven Testing, Comparison Testing, Component Testing, Static Testing, Glass box Testing, Interface Testing, Loop Testing, Path Testing, Statement Testing, Structural Testing, System Testing, Unit Testing, Configuration Testing, Install/uninstall Testing,

Performance Engineer
➢ Concurrency Testing, Fortitude Testing, Load Testing, Stress Testing,

External Company
➢ Compliance Testing

3. Significance of testing tools

Software test tools help software developer to examine software bugs, verify functionality, and ensure the reliability of the software which is developed by them and required by the user. A wide range of Tools are available to assist software development process. Some software testing tool vendors offer an integrated suite that will support testing and development throughout the life of a project, from gathering requirements to gathering post implementing review. Few vendors concentrate on a single part of the application development life cycle as checking code, functionality, objectivities etc. As market grows very speedily that the automation of the testing is not required but it is necessity.

The techniques and mechanism for testing the program, application or software automatically can be known as automated testing techniques. We can say the program to check the program is a part of automated testing. Automated testing means computer programs used in the testing of a system, a component of the system, or its documentation [5,6]. In support to automated testing we have various Testing tools which work differently to check different types of application. The main groups of testing tools as below.

➢ Test Design Tools that help you decide what tests need to be executed. That focuses on data and test case generators.
➢ GUI Test Drivers Tools that automate execution of tests for products with graphical user interfaces.
➢ Client/server test automation tools, including load testers.

- ➢ Load and Performance Tools that specialize in putting a heavy load on systems.
- ➢ Test Management Tools that automate execution of tests for products without graphical user interfaces. Also tools that help you work with large test suites.
- ➢ Test Implementation Tools Miscellaneous tools that help to implement tests.
- ➢ Test Evaluation Tools that help to evaluate the quality of your tests.
- ➢ Static Analysis Tools that analyze programs without running them.

Here is the list of testing tools with Vendor Name-Tool Name-Price
- ➢ MICROSOFT-Web App Stress Tool (WAS)-Free[7]
- ➢ APPPERFECT-LoadTester-Free[8]
- ➢ PUSHTOTEST-Performance Kit-Free[9]
- ➢ PILOT SOFTWARE LTD (TURKEY)-SiteTester-$29.00[10]
- ➢ SOFTLOGICA LLC (Russia)-WAPT-$299[11]
- ➢ LOADTESTING.COM-Portent Supreme-$279.95 [12]
- ➢ PAESSLER (Germany)-Webserver Stress Tool 7-$624.95 [13
- ➢ SIS –Florida Tech-Holodeck-$1,500[14
- ➢ MERCURY INTERACTIVE-LoadRunner-$5,000[15]
- ➢ IBM RATIONAL-Performance Tester-$5,000 [16]
- ➢ COMPUWARE-QALoad-$5,000 [17]
- ➢ SEGUE-SilkPerformer-$5,000 [18]
- ➢ EMPIRIX-e-TEST suite-$5,000 [19]
- ➢ RADVIEW-WebLoad-$5,000 [20]
- ➢ MICROSOFT-Application Center Test-$2,999 [21]
- ➢ REDGATE SOFTWARE-ANTS Load Professional Edition -$2,490 [22]
- ➢ OPENDEMAND-OpenLoad-$2,195 [23]
- ➢ TEVRON-CitraTest-$5,000 [24]
- ➢ HOSTEDLABS-HostedToolBox$20 [25]
- ➢ AUTOMATEDQA-Aqtime-$599 [26]
- ➢ WEBPARTNER -Stress Testing-$500[27]
- ➢ PARASOFT-SOAPtest and Parasoft WebKing-$895 [28]
- ➢ POWERPROXY-PowerProxy-$50 [29]
- ➢ NEOTYS-NeoLoad-$2,395 [30]
- ➢ APPPERFECT.COM AppPerfect DevSuite – LoadTester-Free edition and $499 edition[31]
- ➢ MONIFORCE-WebStress[32]
- ➢ QUOTIUM-QuotiumPRO[33]
- ➢ OPTIMYZ-WebServiceTester[34]
- ➢ STEPHEN GENUSA -WebHammer 2.0-$49 [35]
- ➢ WEBSERVICES.ORG (UK)-DieselTest-Open Source[36,37]
- ➢ A DEVELOPER GROUP-The Grinder-Open Source[38]
- ➢ THE APACHE JAKARTA PROJECT-Apache JMeter-Open Source[39]
- ➢ A GROUP OF DEVELOPERS-Opensource Test Suite (DOTS)-Open Source[40]
- ➢ D B MONSTER-DBMonster-Open Source[41]
- ➢ DELUGE-Deluge-Open Source[42]
- ➢ DIESELTEST-Dieseltest-Open Source[43]
- ➢ HAMMERHEAD-Hammerhead 2 - Web Testing Tool-[FREE - Open Source[44]

- THE DEVELOPMENT GATEWAY FOUNDATION-JCrawler-Open Source[46]
- ADAM SLOSARSKI (Poland)-Ntime-Open Source[47,48]
- OPEN LOAD-OpenLoad-Open Source[49]
- WEB POLYGRAPH-Web Polygraph-Open Source[50]
- OPEN SYSTEM TESTING ARCHITECTURE-OpenSTA-Open Source[51]
- SIEGE-Siege-Open Source[52]
- STRESS DRIVER-stress_driver-Open Source[53]
- TP TEST (Sweden)-TPTEST -Open Source[54]
- VINCENT SHEFFER-LoadSim -Open Source[55]
- KEYNOTE-Test Perspective Load Test –Free[56]
- OPENLOAD-OpenLoad -Open Source[57]
- HEWLETT-PACKARD-Free[58]
- AGILENT TECHNOLOGIES-NetworkTester-Open Source[59]
- SIEGE -Stress Tester- Open Source[60]
- CLAN PRODUCTIONS (Wales)-JBLITZ -$99-$599[61]
- THE MEASUREMENT FACTORY, INC (U of CA)-Web Polygraph-Free[62]
- ACME LABS SOFTWARE-Http_Load-Free[63]
- TCNOW.COM-Open System Testing Architecture-Free Open Source[64]

In this section tools are mentioned with their price respectably. The following chart represent the top ten price vice testing tools. Where LoadRunner, Performance Tester, QALoad, SilkPerformer, e-TEST suite, WebLoad, CitraTest all have higher price compare to another tools.

Mercury's LoadRunner (load/stress) testing tool for web and other applications; supports variety of application environments, platforms, and databases. Large suite of network/app/server monitors to enable performance measurement [15]. IBM Rational Performance Tester is a load and performance testing solution for teams concerned about the scalability of their Web-based applications. Rational Performance Tester simplifies the test creation, load generation and data collection processes to ensure the ability of their applications to scale to thousands of concurrent users[16]. Compuware's QALoad for load/stress testing of web, database, and char based systems and monitoring its operating system, database and network components[17].
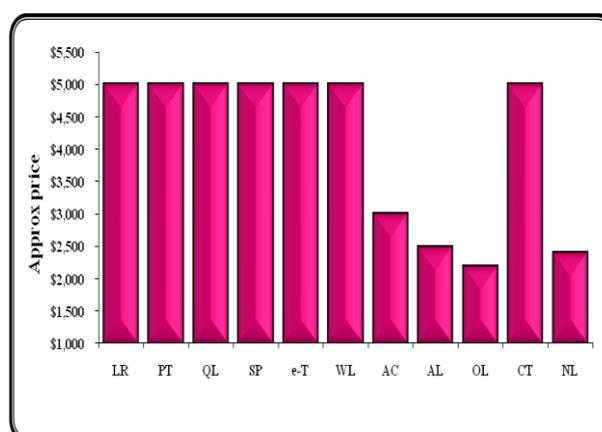

Figure 1: Price vice Top 10 Testing tools

Table 1: Price vice Top 10 Testing Tools

Vendor Name	Tool Name	Tool Code	Approximate Price
MERCURY INTERACTIVE	LoadRunner	LR	$5,000
IBM RATIONAL	Performance Tester	PT	$5,000
COMPUWARE	QALoad	QL	$5,000
SEGUE	SilkPerformer	SP	$5,000
EMPIRIX	e-TEST suite	e-T	$5,000
RADVIEW	WebLoad	WL	$5,000
MICROSOFT	Application Center Test	AC	$2,999
REDGATE SOFTWARE	ANTS Load Professional Edition	AL	$2,490
OPENDEMAND	OpenLoad	OL	$2,195
TEVRON	CitraTest	CT	$5,000
NEOTYS	NeoLoad	NL	$2,395

SEGUE's SilkPerformer can simulate thousands of users working with multiple protocols and computing environments and allows prediction of behavior of e-business environment before it is deployed regardless of size and complexity [18]. EMPIRIX's e-TEST suite a managed, hosted load testing service from Empirix with unlimited load generation capacity utilizing multiple points-of-presence[19]. RADVIEW's WebLoad available as part of their TestView web testing suite. Capabilities include over 75 Performance Metrics can view global or detailed account of transaction successes/failures on individual Virtual Client level, assisting in capturing intermittent errors; allows comparing of running test vs. past test metrics. Test scripting via visual tool or JavaScript. Wizard for automating non-GUI-based services testing[20]. TEVRON's CitraTest is the ideal software test automation solution for conducting performance benchmarking, application monitoring, functional and latency testing for ANY Windows based application, including all Web browsers.
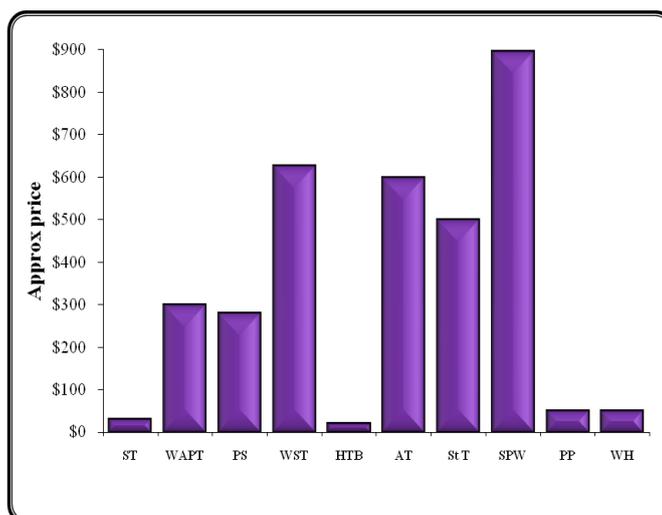

Figure 2: Price vice Bottom 10 Testing Tools

The following chart represents the bottom ten price vice testing tools. Here w filtered six lowest prices among bottom ten prices vice testing tools. PILOT SOFTWARE LTD's SiteTester is a load-testing utility servers and web application. SiteTester simulates concurrent access of various users from different hosts to a web/application server[10]. SOFTLOGICA LLC 's WAPT is Web load and stress testing tool which Handles dynamic content and HTTPS/SSL[11]. LOADTESTING.COM's Portent Supreme is web load testing tool[12].

Table 2: Price vice Bottom 10 Testing Tools

Vendor Name	Tool Name	Tool Code	Approx Price
PILOT SOFTWARE LTD (TURKEY)	SiteTester	ST	$29.00
SOFTLOGICA LLC (Russia)	WAPT	WAPT	$299
LOADTESTING.COM	Portent Supreme	PS	$279.95
PAESSLER (Germany)	Webserver Stress Tool 6	WST	$624.95
HOSTEDLABS	HostedToolBox	HTB	$20
AUTOMATEDQA	Aqtime	AT	$599
WEBPARTNER	Stress Testing	St T	$500
PARASOFT	SOAPtest and ParasoftWebKing	SPW	$895
POWERPROXY	PowerProxy	PP	$50
STEPHEN GENUSA	WebHammer 2.0	WH	$49

HOSTEDLABS's HostedToolBox provides a complete systems management framework and toolset for your mission-critical infrastructure per month $20[25]. POWERPROXY 's PowerProxy is a low cost HTTP/HTTPs proxy, from Orderly Software Ltd., has a range of basic load-testing features to test web servers and show debugging[29]. STEPHEN GENUSA's WebHammer is Low-cost utility by Stephen Genusa designed to test Web applications and servers [35].

Polygraph is used for benchmarking tool for caching proxies, origin server accelerators, L4/7 switches, and other Web intermediaries [62].
The following chart represents the price vice, open source and free software testing tools. Here we discuss free tools along with their key features. MICROSOFT'S Web App Stress is designed to realistically simulate multiple browsers requesting pages from a web site this tool to gather performance and stability information about your web application[7]. APPPERFECT'S LoadTester is a highly scalable load simulation that helps you test your application's behavior under conditions of heavy usage. It is used primarily for load testing and capacity planning[8]. PUSHTOTEST's Test Perspective is used for software developers, QA technicians, and IT managers use to check Web-enabled applications for functionality, scalability, and performance[9]. KEYNOTE's Load Test used for load-generating infrastructure on the Internet realistic outside-the-firewall load and stress tests to validate performance [56]. HEWLET's –PACKARDis used for Web server performance/benchmarking tool from HP Research Labs[58]. THE MEASUREMENT FACTORY's Web

The following chart represent the price vice list of above mentioned testing tools.

Table 3: Price vice List of above Mentioned Testing Tools

Vendor Name	Tool Name	Tool Code	Approximate Price
PILOT SOFTWARE LTD (TURKEY)	SiteTester	ST	$29.00
SOFTLOGICA LLC (Russia)	WAPT	WAPT	$299
LOADTESTING.COM	Portent Supreme	PS	$279.95
PAESSLER (Germany)	Webserver Stress Tool 6	WST	$624.95
SIS –Florida Tech www.sisecure.com/ holodeck/what_is.shtml	Holodeck	HD	$1,500
MERCURY INTERACTIVE	LoadRunner	LR	$5,000
IBM RATIONAL	Performance Tester	PT	$5,000
COMPUWARE	QALoad	QL	$5,000
SEGUE	SilkPerformer	SP	$5,000
EMPIRIX	e-TEST suite	e-T	$5,000
RADVIEW	WebLoad	WL	$5,000
MICROSOFT	Application Center Test	AC	$2,999
REDGATE SOFTWARE	ANTS Load Professional Edition	AL	$2,490
OPENDEMAND	OpenLoad	OL	$2,195
TEVRON	CitraTest	CT	$5,000
HOSTEDLABS	HostedToolBox	HTB	$20
AUTOMATEDQA www.automatedqa.com/	Aqtime	AT	$599
WEBPARTNER www.webpartner.com/	Stress Testing	St T	$500
PARASOFT	SOAPtest and ParasoftWebKing	SPW	$895
POWERPROXY www.powerproxy.net/	PowerProxy	PP	$50
NEOTYS	NeoLoad	NL	$2,395
STEPHEN GENUSA	WebHammer 2.0	WH	$49

Conclusion

There are n numbers of testing is used to improve the system in effective working. Testing process is performed by various entities. Here such entity wise testing categorized. Testing is followed by various testing tools. Various testing tools are analyzed by their cost and features.

Table 4: Open Source Testing Tools

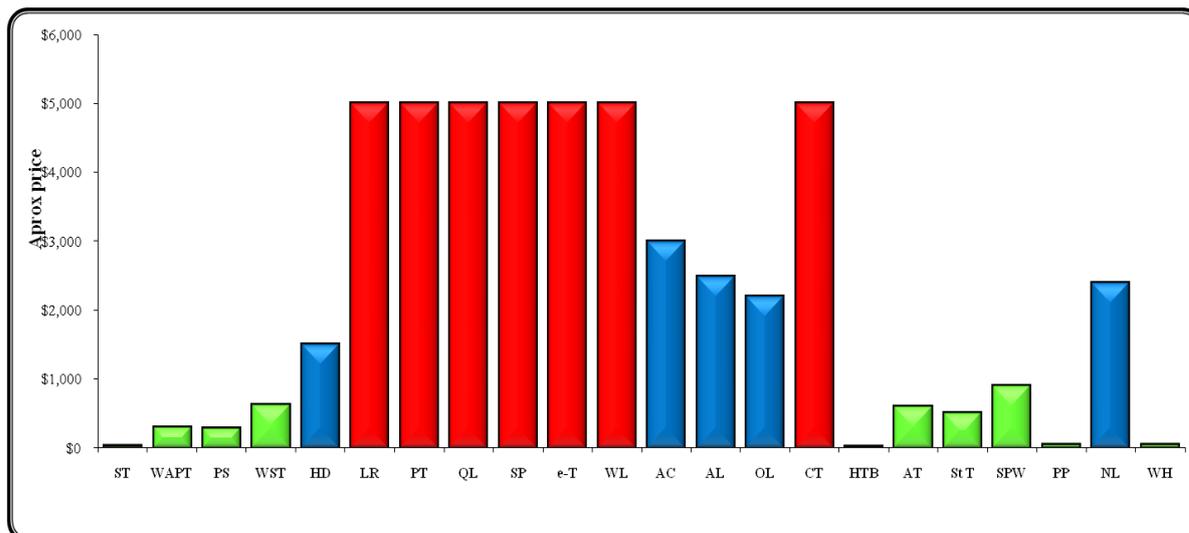| Vendor Name	Tool Name	Tool Code
MICROSOFT	Web App Stress Tool (WAS) [free]	WAST
APPPERFECT	LoadTester	LT
PUSHTOTEST	Performance Kit	PK
KEYNOTE	Test Perspective Load Test	TPL
HEWLETT-PACKARD	Httperf	HF
THE MEASUREMENT FACTORY, INC	Web Polygraph	WP
ACME LABS SOFTWARE	Http_Load	HT

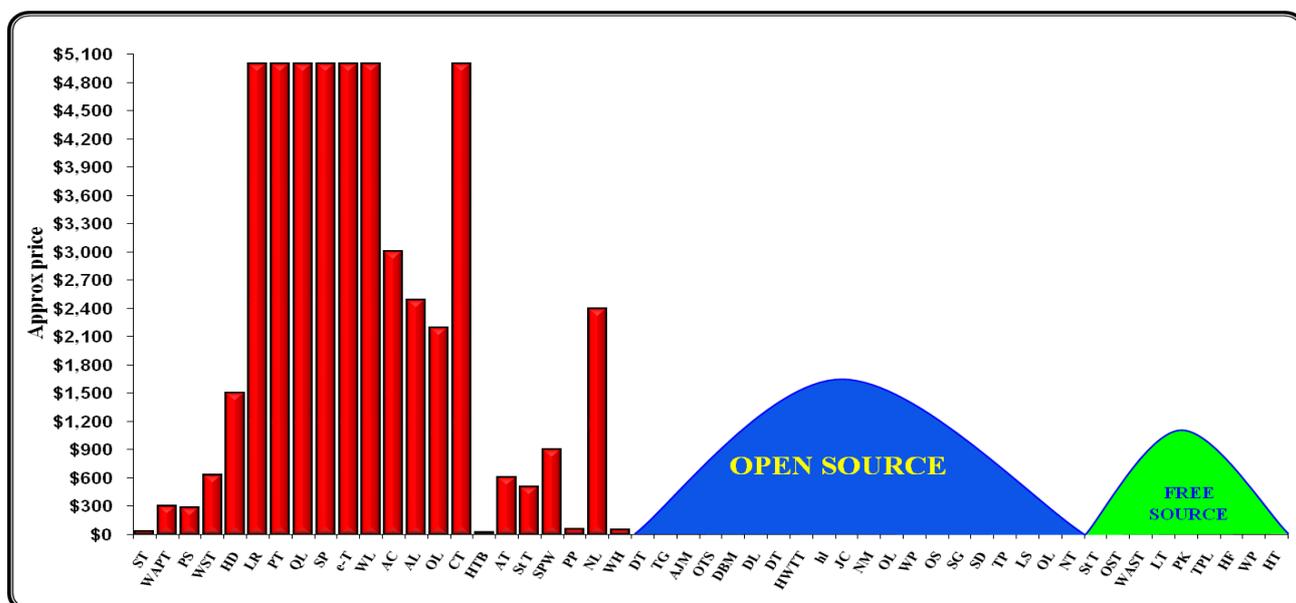**Figure 3: Price vice List of above Mentioned Testing Tools**

Figure 5: Available Paid and Open Source Testing tool

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