Performance Evaluation of JMeter, LoadComplete and WAPT

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----------**ABSTRACT**----------
Load testing is used to monitor the changes in system performance with increase in load to the system. Load testing is a non functional testing which is used to understand the system behavior under a specific expected load. At present there is a huge shift towards web applications and large numbers of tools are available in the market for web application performance analysis. In this paper three load testing tools namely Apache JMeter, LoadComplete and WAPT are compared. The main focus of the study is to discuss these load testing tools and compare them on the basis of key parameter called response time. The response time of these tools is compared by varying number of concurrent users. The primary objective is to study these load testing tools and identify which one of them is better and more efficient .In this study it is concluded that in term of response time WAPT has better performance than that of Apache JMeter and LoadComplete.

Keywords – Apache JMeter, LoadComplete, Load Testing Tools, Performance Testing, Response Time, WAPT.

1. Introduction

Software testing is an important phase of software development life cycle. Any software under development go through various types of testing to identify and quantify its quality. Testing is a process used for disclosing defects in software and establishing that software has gained a specified degree of quality with respect to selected attributes [2].

Today there is a huge shift towards web applications; therefore it is necessary to determine the performance of web applications. Performance of web applications can be determined in terms of Availability, Response Time, Throughput, Utilization and Latency [10]. To determine the performance of web applications, various types of performance testing can be done i. e. Load Testing, Stress Testing, Spike Testing, Endurance Testing, Volume Testing and Scalability Testing.

Load testing is used to determine the changes in system performance with increase in load to the system. The load can be determined in terms of number of concurrent users. Load testing is a non functional testing which is used to understand the system behavior under a specific expected load. It is conducted to determine the system behavior under normal and peak load conditions [12]. Load generator is used to simulate real life user load for the target application.

In this paper, section 1 gives the introduction about load testing and section 2 describes the literature survey related to the study. Section 3 describes the introduction about the selected tools for the study. Section 4 describes the

comparative analysis of selected testing tools and section 5 describes the conclusion and future scope of the work.

2. Literature Survey

Monika Sharma et al. [11] gave a comparative study of JMeter, HP LoadRunner, WebLOAD and Grinder on the basis of parameters like Server Monitoring, Unlimited Load generation, ease of use, cost, etc. After comparison it is concluded that JMeter is best tool as it is free, having great load generation and easy user interface. Manju Kaushik and Pratibha Fageria [6] conducted a comparative study on performance analysis of Neoload, WAPT, LoadUI on the basis of parameters like throughput, response time, number of hit pages, error rate, memory and CPU utilization etc. Rigzin Angmo and Monika Sharma [1] gave a Performance Evaluation of Web Based Automation Testing Tools namely selenium webdriver and watir webdriver. Here the performance of these testing tools is evaluated and compared, and concluded that watir webddriver is suitable under specific situation, but selenium webdriver is better choice in various conditions like using domain specific language. Cheng-hui Huang, and Huo Yan Chen [4] gave a Tool to Support Automated Testing for Web Application Scenario named WASATT (Web Application Scenario Automated Testing Tool), the tool support the automated testing for scenario of web-based applications. Vandana Chandel et al. [3] has done a comparative study of testing tools: Apache JMeter and Load Runner which compare these tools based on the criteria such as performance, speed, throughput and efficiency and concluded that JMeter is better tool to go forward with. Harpreet Kaur and Gagan Gupta [5] conducted a comparative study of automated testing Tools: Selenium, Quick Test Professional and Testcomplete on the basis of their usability and effectiveness and concluded that one can select a testing tool based on the type of application need to be tested, budget and the efficiency required. Vinita Malik and Mamta Gahlan [9] has given a comparative study of automated web testing tools of automated testing namely Quick Test Professional, Selenium, Watir and Sahi based on the criteria such as efforts involved with generating test scripts, capability to play back the scripts, result reports, speed and cost and concluded that QTP is the best tool among them all. Rifa Nizam Khan and Shobhit Gupta [8] has given a comparative study of automated testing tools: Rational Functional Tester, Quick Test Professional, Silk Test and Loadrunner and determine their usability and efficiency and concluded QTP is a good tool. Dipika Kelkar and Kavita Kandalgaonkar [7] has given an analysis and comparison of performance testing tools namely LoadRunner and JMeter and determine their accuracy of responses and recommend going ahead with HP LoadRunner as it is very stable and robust.

3. Overview of Load Testing Tools

There are number of load testing tools available in the market. Load testing tools help to determine the performance of web application under heavy load and quantify the elements responsible for performance degradation. They simulate heavy load in terms of number of concurrent users and thus help to analyze the system performance under different load conditions. In this paper, three load testing tools are selected namely Apache JMeter, LoadComplete and WAPT.

Apache JMeter an open source, a 100% pure JAVA application designed to load test and functional behavior [13]. It is a cross – platform tool developed by Apache Software Foundation. JMeter simulates the number of users sending request to the target server, return statistics and show the performance of target server in the form of graph, table etc [16].

LoadComplete is used for load, stress, scalability testing of websites and web applications [14]. LoadComplete is a free forever load testing tool developed by SmartBear Software used for on demand load generation, uses record and replay to record a load test to test a wide variety of web application and easily monitor server performance.

WAPT is Web Application Performance Testing tool used for load, stress, performance testing of web applications [15]. WAPT supports

distributed load generation used for server and database performance monitoring. WAPT simulates real life condition as accurate as possible and gives detailed test report with graphical representation.

4. Comparative Analysis of Load Testing Tools

This section represents a comparative analysis of the selected tools along with their observed results. The tests were conducted at the same instant of time at same network speed. For this study we use the current version of JMeter that is 2.13 r1665067, LoadComplete 4 and WAPT 9.0. Table I represents basic information about selected load testing tools. Whereas in Table II the performance of tools was evaluated on the basis of critical parameter called response time. Response time of Apache JMeter, LoadComplete and WAPT is measured by varying the number of concurrent users from 1 virtual user to 10 virtual users and 20 virtual users.

Table I: Basic Information of Load Testing Tools

Sr. No.	Parameters	JMeter	LoadComplete	WAPT
1	**Operating System**	Cross Platform	Windows 7 or later	Windows
2	**Developed By**	Apache Software	Smartbear Software	Soft Logica Software
3	**Language Support**	Java, Beanshell, Javascript, Perl	Javascript, HTML, C#, Python, .Net	ASP.NET, Java
4	**Initial Release**	15-12-1998	18-07-2011	14-10-2003
5	**Latest Release**	14-03-2015	03-03-2016	17-08-2015
6	**License and Pricing**	Open Source free Tool	Free forever up to 50 VUs	700 USD + 300 USD Maintenance fee per year
7	**Browser Support**	Multi Browser	Multi Browser	Multi Browser
8	**Requirements**	Java6+	Microsoft Internet Information Services (IIS) 7.0 or later, .NET Framework 3.5 or later, Microsoft Data Access (if you need to work with the database files).	50-500 MB disk space, 1.2 GB RAM, better/ CPU Gigabit Ethernet.
9	**Protocols**	HTTP, HTTPS, SOAP, FTP, JDBC, LDAP, SMTP(S),	HTTP, HTTPS, AMF, SOAP, JSON.	HTTPS, SSL.

		POP3(S), IMAP(S), TCP.		

In Table I, basic information of selected load testing tool is given. This table describes the operating system, browser support for the tools, license and pricing, initial release and current release of these tools. It describes that all these tools support multiple browsers and JMeter is platform independent, whereas LoadComplete and WAPT are only supported by windows.

Table II: Average Response Time of Load Testing Tools

	Number of Virtual Users	JMeter	LoadComplete	WAPT
1	1	256 m sec	1160 m sec	50 m sec
2	10	1683 m sec	2100 m sec	110 m sec
3	20	922 m sec	853 m sec	110 m sec

Table II describes the average response time of tools for 1virtual user, 10 virtual users and 20 virtual users and concluded that WAPT is better than that of Apache JMeter and LoadComplete.

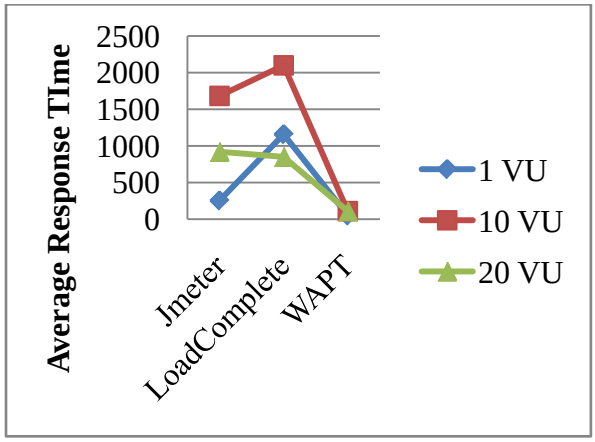

Figure I: Average Response Time of Load Testing Tool

Figure I depict the graphical representation of the average response time of Jmeter, LoadComplete and WAPT.

5. Conclusion and Future Scope

Load testing is concerned to analyze performance of web applications under different normal load testing conditions and anticipated peak conditions then analyze which factor degrade the performance. In this study Apache Jmeter, LoadComplete, and WAPT are analyzed and compared. The tests were performed at same instant of time and at same network speed. From the above observation it is concluded that in term of response time WAPT has better performance than that of Jmeter and LoadComplete. Since, it is hard to determine the performance on the basis of a single parameter. Thus, this work can be extended for more tools and more parameters to provide more realistic and efficient results.

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