

Performance Evaluation and Comparison of Web Application Testing Tools: WAPT Pro and Apache JMeter

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Abstract--Web Applications are widely known as the building blocks of typical service oriented applications. Performance of such an application system is mainly dependent upon the components of web applications. Testing web application is nothing but to find out errors in its content, function, usability, navigability, performance, capacity, and security. Performance testing is used to determine the responsiveness, throughput, reliability and scalability of a system under a given workload. In recent years, various tools and techniques are developed for measurement and evaluation of quality of service of web applications. In this paper, two testing tools WAPT Pro and Apache JMeter are compared and implemented on a same website. The two tools WAPT Pro and Apache JMeter are compared in terms of their different performance metrics (parameters) results. Performance metrics results generated by these performance testing tools have been evaluated and analyzed. The same website has been tested for performance under these performance testing tools then differences in results of various performance metrics like average response time, bandwidth, error rate, throughput, memory and CPU utilization, median, standard deviation etc. are obtained.

I. INTRODUCTION

Internet-users commonly interact with websites, many of which are dynamic in nature. These sites generate content to suit user requests instead of only serving static web pages. Due to this functionality and interactivity provided by these dynamic websites they are more appropriately considered as *Web Applications* [8]. The primary task of a web-application performance-testing tool is to generate load. Load is represented by number of users accessing the tested application simultaneously. Because the testing tool only simulates these users, they are called virtual users. Each virtual user represents one individual user working with the application [4]. Performance testing objective is used to verify the performances of system (e.g. response time, service availability). It is executed by simulating hundreds or more simultaneous users' accesses over a defined time interval. Information about accesses are recorded and then analyzed to estimate the load levels exhausting system resources. Most of the performance tests depend on a set of predefined, documented, and agreed-upon performance objectives. Knowing the objectives from the beginning helps to make the testing process more efficient. Evaluate our application's performance by comparing it with the performance objectives. Performance objectives often include the Response time or latency, Throughput, Resource utilization (CPU, network I/O, disk I/O, and memory), Workload. Web performance test is mainly for the goal to maintain the performance of the system and find effective

strategies of the improvement. In the Web application performance test, big differences between test environment and real environment, uncertain load of the test, difficulties of simulation environment and simulation real user behavior become the bottleneck of the performance test [3].

The performance test model mainly consists of the performance index, performance parameters and performance indicators. At present the performance of existing models use measures mainly include response time, throughput, system resources utilization, concurrent users, network statistics, resource requests queue length, number of HTTP affairs/SEC and session number/SEC etc[1]. In this paper, two different performance testing tools are used for performance testing for same website and results are generated for different performance parameters.

II. RELATED WORK

Zhang Hui-li, Zhang Shu, Li Xiao-jie, Zhang Pei, Zhengzhou and Liu Shao-bo [10] implemented load testing for the e-commerce applications system by means of LoadRunner testing tool, analysed results, and improved the performance of the system based on the test results. In "Web Application--A Study on Comparing Software Testing Tools" by Dr. S. M. Afroz, N. Elezabeth Rani and N. Indira Priyadarshini [2], Dart and Apollo software web tools have been compared in terms of their dynamic test generation ability. A survey has been presented on static and dynamic testing analysis. Osama Hamed and Nedat Kafri [5] proposed a performance testing approach for web based applications early in the development process. They compared performance in terms of response time for two web application architectures. The performance goals were based on comparing the response time and memory utilization for the implemented applications. Pooja Ahlawat and Sanjay Tyagi [6], proposed A Comparative Analysis of Load Testing Tools Using Optimal Response Rate. This paper compared three load testing tools such as WAPT, LOADUI and LOADSTER. Rina and Sanjay Tyagi [7], proposed A Comparative Study of Performance Testing Tools. In this study three different performance testing tools NeoLoad, WAPT and Loadster are compared in terms of their different performance parameters results in different browsers. Sheetal S.Patil, Prof. S.D.Joshi [9], proposed Identification of Performance Improving Factors for Web Application by Performance Testing.

In this research paper, the two tools WAPT Pro and Apache JMeter are compared in terms of their different performance metrics (parameters) results. Performance metrics results generated by these performance testing tools have been evaluated and analyzed.

III. PERFORMANCE TESTING TOOLS

Performance tools are used for different types of performance testing including load test, stress test, volume test and endurance test. These tools are either open source or proprietary tools. For this research, two performance testing tools WAPT Pro and Apache JMeter have been selected.

A. WAPT Pro 3.1

WAPT Pro is a useful application designed to provide users with load, stress and performance testing for Web Sites, Applications and Servers. It preserves all the benefits of regular version, including its ease of use, ability to create comprehensive tests in a matter of minutes, flexible specification of virtual user behavior, descriptive graph and reports for test results.

B. Apache JMeter 2.4

Apache JMeter is a Java-based load testing tool. It can be used to load test applications over a variety of protocols and APIs (Application Programming Interfaces), including HTTP, SOAP (Simple Object Access Protocol), JDBC (Java Database Connectivity), LDAP (Lightweight Directory Access Protocol), JMS, POP3 (Post Office Protocol) and IMAP (Internet Message Access Protocol). Apache JMeter is a lightweight desktop application with a simple graphical user interface (GUI).

C. Methodology

This section describes the performance metrics and evaluating those metrics of both the tools (WAPT Pro and Apache JMeter).

Aim of this paper is to compare two testing tools on the basis of performance metrics. This is done by loading 20 users to the website using both tools. Finally WAPT Pro and Apache JMeter generate different performance metrics of the given website. Performance metrics of WAPT Pro are Successful sessions, Failed sessions, Successful pages, Failed pages, Successful hits, Failed hits, Total KBytes sent, Total KBytes received, Avg Response time, sec (with page elements), Response time, sec (with page elements), KBytes sent, KBytes received, Sending speed, kbit/s, Receiving speed, kbit/s, Sending per user speed, kbit/s, Receiving per user speed, kbit/s, Load Agent utilization, %. Performance Metrics of Apache JMeter are Average, Min, Max, Std. Dev., Error %, Throughput, Kb/sec, Avg. Bytes. The common metrics for both the tools are Avg Response/ sec, Bandwidth(KB/Sec) and Error. These common metrics are considered to compare the two testing tools, along with this common metrics response time (min, max, avg) of HTTP Page Request are also used for comparison and analyze the best tool for testing web applications performance.

IV. TOOL RESULTS

A. WAPT Pro

Fig.1 shows the summary report of shopping site for testing and analyzing its metrics such as successful sessions, failed sessions, successful pages, failed pages, total KB sent, total KB received and average response time with page elements.

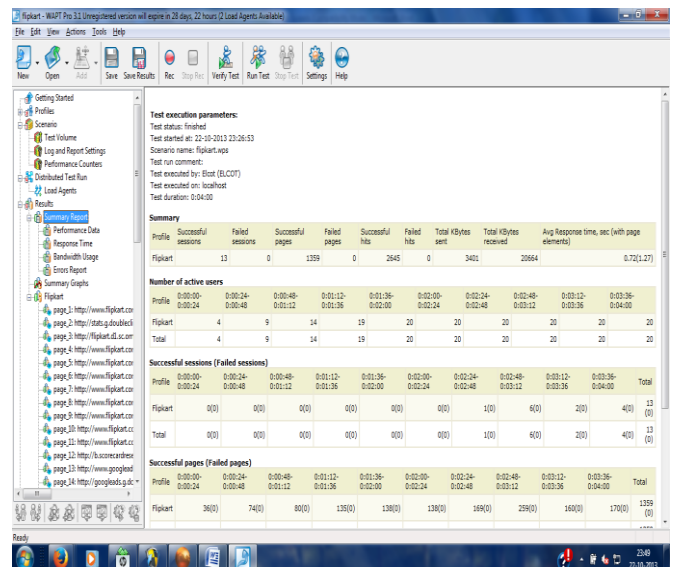
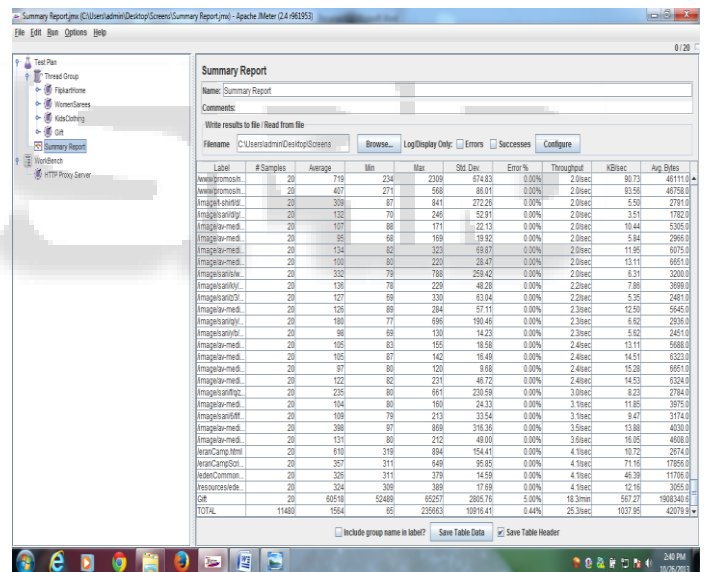


Fig. 1: Summary Report for performance

B. Apache JMeter

The below summary report shows the shopping site for testing and analyzing its metrics such as sample, average response time, median, 90%line, minimum elapsed time, maximum elapsed time, error percentage, transaction throughput, KB received and average bytes received .



CPU Utilization	38	-
Memory Utilization	107	-
Toal Throughput/sec	-	0.025
Standard Deviation	-	10916
Median	-	375

Table. 1: Comparative Performance Metrics of a Website in WAPT Pro and Apache JMeter

The above table describes the performance metrics of a given website in two tools (WAPT Pro and Apache JMeter). The common metrics of both the tools are average response time/sec, error and bandwidth (KB/sec). The WAPT Pro(1.27) takes less average Response time than Apache JMeter (1.6) and the bandwidth (KB/sec) in WAPT Pro (20664) is also lesser than Apache JMeter (42080) but the

Apache JMeter produce small error during the page load. So the above results shows that Apache JMeter is very effective and efficient tool for overall performance of shopping site (Web Applications) compared with WAPT Pro, because of more kilobytes received per second.

D. Response Time (with page elements) comparison of HTTP Requests in Tools

Table 2 shows the comparative response time/sec analysis of HTTP Request (http://www.flipkart.com/womens - clothing/ethnic-wear/saris/pr) with two tools. It contains the minimum (Min), maximum (Max) and average (Avg) values of response time. Then, compare the response time of the request and found the tool with lowest time.

Page Name	Response time/sec	Wapt Pro	Apache JMeter
http://www.flipkart.com/womens-clothing/ethnic-wear/saris/pr	Min	6.52	1.38
	Max	8.81	2.80
	Avg	7.83	1.80

Table. 2: Comparative Response Time/sec of HTTP Request (womens-saris)

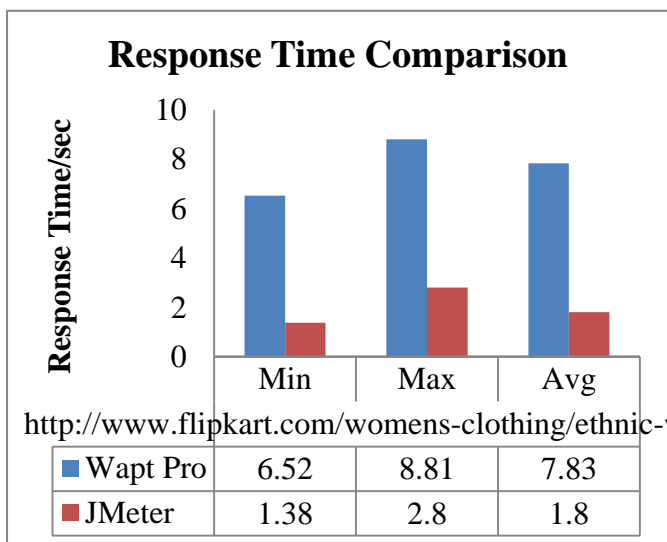


Fig. 3: Response Time for HTTP Request (womens-saris)

The fig. 3 describes the response time/sec of HTTP Request (http://www.flipkart.com/womens-clothing/ethnic-wear/ saris/pr) compared with two tools (WAPT Pro and Apache JMeter). The three response time (Min,Max,Avg) of

a given request is less in Apache JMeter. The results shows that Apache JMeter tool is very effective and efficient compared with WAPT Pro tool.

Page Name	Response time/sec	Wapt Pro	Apache JMeter
http://www.flipkart.com/kids-clothing/boys-wear/polos-t-shirts/pr	Min	5.79	1.46
	Max	7.70	2.13
	Avg	6.78	1.46

Table. 3: Comparative Response Time/sec of HTTP Request (kids-clothing)

Table 3 shows the comparative response time/sec analysis of HTTP Request (http://www.flipkart.com/kids-clothing/boys-wear/polos-t-shirts/pr) with two tools. It contains the minimum (Min), maximum (Max) and average (Avg) values of response time. Then, compare the response time of the request and found the tool with lowest time.

The fig. 4 describes the response time/sec of HTTP Request (http://www.flipkart.com/ kids-clothing/boys-wear/polos-t-shirts/pr) compared with two tools (WAPT Pro and Apache JMeter). The three response time (Min,Max,Avg) of a given request is less in Apache JMeter. The results shows that Apache JMeter tool is very effective and efficient compared with WAPT Pro tool.

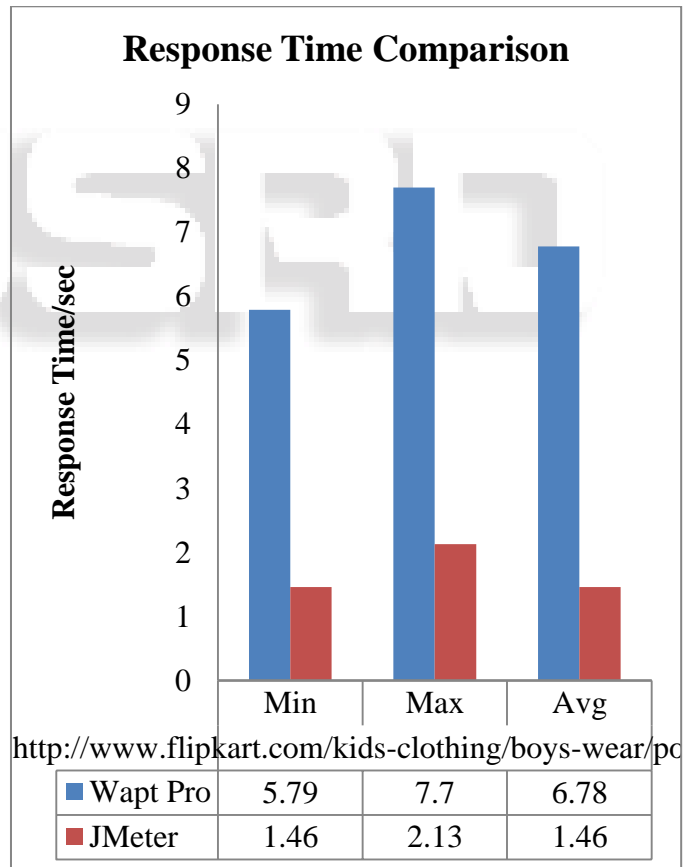


Fig. 4: Response Time for HTTP Request (kids-clothing)

Table 4 shows the comparative response time/sec analysis of HTTP Request (http://www.flipkart.com/books/gifting-store) with two tools. It contains the minimum (Min), maximum (Max) and average (Avg) values of response time. Then, compare the response time of the request and found the tool with lowest time.

Page Name	Response time/sec	Wapt Pro	Apache JMeter
http://www.flipkart.com/books/gifting-store	Min	9.38	0.91
	Max	11.1	2.02
	Avg	10.2	1.28

Table. 4: Comparative Response Time/sec of HTTP Request (books-gifting)

The fig. 5 describes the response time/sec of HTTP Request (http://www.flipkart.com/books/gifting-store) compared with two tools (WAPT Pro and Apache JMeter). The three response time (Min,Max,Avg) of a given request is less in Apache JMeter. The results show that Apache JMeter tool is very effective and efficient compared with WAPT Pro tool.

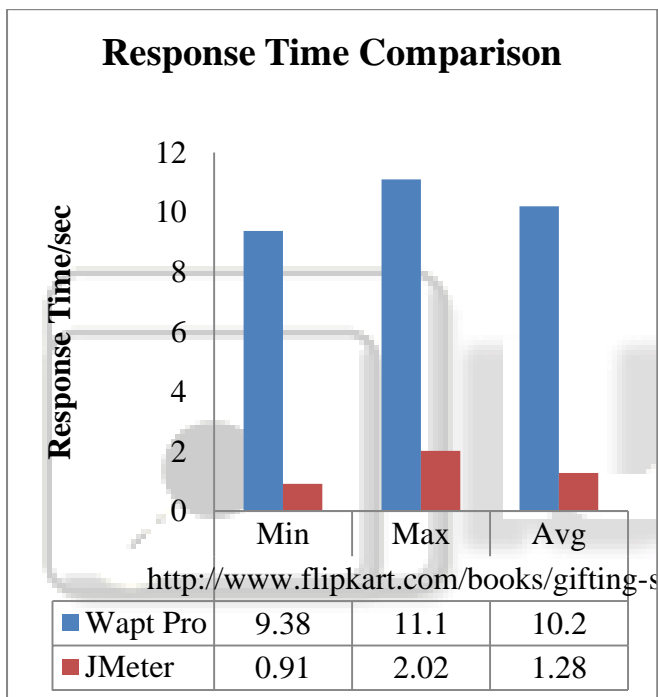


Fig. 5: Response Time for HTTP Request (books-gifting)

V. CONCLUSION AND FUTURE WORK

The central contribution of this research work is to test the performance of a website and analyze the performance metrics given by the tools. Even though there are many performance testing tools available, this research work used WAPT Pro and Apache JMeter tool and analyze the performance metrics. The same website has been tested for performance under these two performance testing tools. After testing many performance metrics are generated by both two tools. This research work considered the three common metrics (Avg Response/ sec (with page elements), Bandwidth (KB/Sec) and Error) are analyzed and also compared the response time (with page elements) of three HTTP Request for selecting the best tool. Finally, this research work was concluded that Apache JMeter is very effective and efficient for testing web applications (website), because of its bandwidth (kilobytes received per second).

This research work can be further enhanced by including more testing tools for comparison so that, it could find more suitable testing tools for testing the web applications. Further, some different metrics can be used for performance evaluation so that comparison could be more realistic and reliable.

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