

A Study on Web-Based Load Testing Tools

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Abstract:

Load testing is a process in which the performance of the servers under heavy load is inferred. It helps the development team to know the threshold of the requests on which the server’s latency spikes to a large extent and also finds the breakpoint of the server. There are many load testing tools in the market. Some of them are free of use while others are commercial. This study covers various load testing tools in brief. The merits and demerits will be studied. In this paper, the tools that are going to be studied are Apache JMeter, HP LoadRunner, WebLoad and k6.

Keywords — load testing, testing tools, JMeter, Load Runner, WebLoad, k6

I. INTRODUCTION

Performance becomes a key concern for both developers and users as websites and online applications get more complex and feature-rich. It's important to think about how quickly you can get your site to customers and have it rendered in their browsers given that studies have shown that faster sites create more traffic, more transactions, and more engaged users.

Load testing is a process where multiple client requests are simulated just like a number of users are requesting a web resource to check the performance of the servers. The statistics of the process are saved and a log or report is generated. Preference on a specific load testing tool can be due to multiple factors like infrastructure that includes operating system and hardware, budget, compatibility, ease of use and features.

This topic of research is known as web performance optimization, and a number of best practices, approaches, and technologies have been developed recently to improve the web experience. Many of these techniques focus on reducing the amount of downloads required for web pages, enhancing

JavaScript, and reducing the number of individual HTTP requests required for a website.

Some of the key terms in load testing are

- **Latency:** Latency is how fast a server generates a response to the client. The lower value corresponds to a good outcome. Latency could be affected by network speed as it is calculated on the client.
- **Throughput:** Throughput is the number of requests that can be handled and responses generated in a second. Higher the throughput value faster is the server.

Through load testing one can find if the hardware resources are enough or require an upgrade, the response time is enough for clients under higher load, check if the server runs as fast as theoretically calculated results, run efficiently and check if API calls function as expected.

II. LITERATURE SURVEY

There are plenty of load testing tools available. Some are open-source while some of them are commercial tools.

JMeter:

Apache JMeter is an open-source tool and is completely built on java. JMeter allows independent developers to use source code for development of their project. It allows different thread groups to run in parallel. It can run different test cases at the same time. For example, one can perform multiple testing of different URLs which are grouped within a test case folder [1]. Hence, it offers a multithreaded environment. The results can be viewed in various formats such as logs and graphical representation like charts, graphs and trees. Some of the protocols [7] supported for testing are HTTP, FTP, SOAP, JDBC, LDAP and JMS. JMeter supports Load Testing, Functional testing and Distributed testing. JMeter [7] also supports automated web testing integration. It supports Selenium for automated testing. JMeter is used to capture user activity from the browser and simulate it in a web application.

There are four components in a thread group. They are Thread Group, Samplers, Listeners and Configurations. Thread Group consists of a number of threads. Each thread simulates a single user. While performing load testing, it simulates each thread as a single user request. Samplers simulate the user requests in a test. Listeners show the result of requests made by sampler displays in a tree, graph, table or as a log file. Configuration information consists of HTTP cookie manager, HTTP request defaults, FTP request defaults and CSV Dataset configs.

JMeter doesn't accept AJAX requests by default. JMeter GUI is not fully optimized [4]. It utilizes more RAM than usual load testing tools.

HP LoadRunner:

HP LoadRunner was acquired by HPE in 2006. Different technologies, programming tools, and communication protocols are supported by LoadRunner[2], [3], [4]. In fact, there is no other product on the market that supports as many protocols for Performance Testing as this one does. HP LoadRunner has no rival in the Testing industry which incorporates almost all protocols in it. Since clients frequently use LoadRunner to cross-verify your performance benchmarks, the programme has

a well-established reputation. If you're already utilising LoadRunner for performance testing, you'll feel better. The way LoadRunner operates is by simulating virtual users for the application under consideration. These Virtual Users, also known as VUsers, repeat clients' requests and anticipate an appropriate response before passing a transaction. The architecture of LoadRunner is complex but it basically consists of VUGen, Controller and Agent machines or injectors.

The unique selling point of LoadRunner is that it provides users with an accurate and thorough picture of an app's E2E (end-to-end) performance. As a result, users may quickly find and resolve performance problems. The performance testing tool can mimic tens of thousands of users at once. Then, your QA team may prepare your app for deployment by simulating real-world user loads. The software collects data, analyses it exhaustively, and then provides illuminating justifications for its behaviour. Users can quickly ascertain what is wrong with the programme as a result. On the other side, LoadRunner is incredibly adaptable and supports a wide range of programmes.

WebLoad:

WebLoad is a software as a service model. The parent company is RadView. It is the best alternative to LoadRunner [5]. It consists of record and playback features and has native JavaScript programming language for use with code libraries and highly complicated business logic. It has support for Perfecto Mobile and Selenium displaying real user statistics. JavaScript can be used to define custom code for additional feature attachment and enhancement. It has a built-in web UI interface to view test results. It also has powerful analysis tools and customizable reports.

K6:

K6 is an open-source performance testing tool which is productive for developer teams. Reliability and performance can be tested with K6 [8]. It supports scripting in JavaScript ES6 with remote and local modules. It has CLI and a user-friendly API. It is also used for browser testing, resilience

and chaos testing, performance and synthetic monitoring. Even though K6 does browser testing, it does not work exactly like a browser. It does not open pages exactly like a traditional browser. One can simulate web traffic and inject faults in kubernetes. K6 allows to set predefined test cases scheduled [6] to run periodically on the servers to check server health and turn on alerts through the API.

III. COMPARISON

A comparison between the four tools in various aspects such as scalability, performance, ease of use, platform dependency, Scripting language, Maintenance and robustness is made. The below table 1 shows the different aspects of the Load testing tools.

	JMeter	Load Runner	WebLoad	K6
Platform	Runs on JVM. Platform Independent	Runs only on Windows and Linux	Supports Windows, Mac, Android, Iphone and Linux	Used in cloud services like kubernetes.
Written In	Java	C Language	JavaScript	Go
Pricing	Free	Too Costly when compared other three	Quote based	Has free version and customizable fee structure
Scripting Language	Java	VUGen (Virtual User Generator)	JavaScript	JavaScript
Concurrent users	Thousands with some restrictions	Better than Jmeter	Better than Jmeter and Load Runner	Thousands without any restrictions.
Ease of Use	GUI is simple and is easier than Load Runner	Has Complex features and architecture	Better than JMeter.	Has the most customizability out of the four.
Maintenance	Lack of documentation, Weak	Lack of Community answers and	Has great customer support and	Easy to maintain. Rich

	User Interface.	hard to maintain due to its complex architecture	supports up to date technologies.	documentation as it is in JavaScript.
Stability	Not suitable when there are more users as resource utilization is poor.	Sometimes it crashes under heavy load.	More stable than Jmeter and LoadRunner	Excellent resource utilization , takes up less memory and is light weight.

III. CONCLUSION

Usage of JMeter is suggested in the proposed solution because of its open source codebase and java dependance. A good alternative to the same approach with JavaScript as language would be k6 but it does not support node.js. If the requirement does not require additional user customizability one can go for HP LoadRunner and WebLoad. Even though HP load Runner and WebLoad are paid, they offer high stability under high load and is more reliable than JMeter.

V. REFERENCES

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