COMPARATIVE ANALYSIS OF LOAD TESTING TOOLS

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Abstract: **Software testing is that the method of testing, validating and verifying, the user's requirements. During the finalization of the software development process. White Box Testing, Black Box, and grey-box testing are the three main forms of software testing. In equipment testing, the user doesn't know the intrinsic logic and elegance of the system. In white-box testing, Tester knows the inherent logic of code. In Grey box testing, Tester contains a bit of knowledge about the inside structure, code, and dealing of the system. it's commonly utilized within the case of Integration testing. Load testing is that the range of testing which helps us to research the performance of the system under heavy load or Zero load. With the help of automated load Testing Tools, we'll have a go at it in a very better way. The intention for scripting this research is to carry out a comparison of two automated load testing tools i.e. Apache JMeter, and K6 supported certain criteria i.e. test script generation, plug-in support, result reports, application support, and cost. the foremost focus is to test and analyze these load testing tools and identify which tool is best and more efficient. We assume this comparative analysis can help in selecting the foremost appropriate tool and motivates the utilization of open-source load testing tools. Keywords: K6, JMeter, load, testing**

I. INTRODUCTION

A software project must have responded to various testing while it had been under development. But to grasp whether or not your software can handle the amount of end-user's load testing is completed. Load testing is that the process of putting demand on software or electronic computer and measuring its response. Load testing is performed to see a system's behaviour under both normal and anticipated peak load conditions to spot the most operating capacity of an application still as any bottlenecks and determine which element is causing degradation.

II. RESEARCH METHODOLOGY

The experiment is going to be conducted to test the efficiency of the chosen tools, i.e. Apache JMeter, and K6tool.Testing could be a critical part of the SDLC. In recent times different automated software testing tools are available within the market. Several studies are available within which comparisons of various testing tools are done. in line with our observations, there's no comparative analysis on the load testing tools, like "JMeter , LoadRunner, andK6".Various testing tools are developed and designed for the testing of web services. By using these test tools, web engineers can perform their tasks easily and efficiently, thus improving the standard of the system. during this paper, we used the three varieties of tools in ioftware testing: JMeter and K6. Load testing is that the process that sets the service request web client number within the input, and gradually increases the client number of the net service request. The tester can get the client's average reaction time, and compare the common reaction time after the client number is increased on every occasion. The load testing of web applications can evaluate the operation of all parts of the net server, including the CPU, memory, process, reaction time, etc.

2.1. Apache JMeter

Apache JMeter is an Apache product that is used as a load testing tool for analyzing and measuring the performance of web applications.

Apache JMeter is a testing framework from Apache and is used for testing web applications. Apache JMeter is used to examine overall server performance under heavy load.

Features

- Apache JMeter can load test and performance test on different server/protocol like:

    o SOAP / REST
    o Web - HTTP, HTTPS
    o FTP
    o Database via JDBC
    o LDAP
    o Message-oriented middleware (MOM) via JMS
    o Mail - SMTP(S), POP3(S), and IMAP(S)
    o MongoDB (NoSQL)
    o Native commands or shell scripts
    o TCP

Advantages

- Apache JMeter is portable and 100% working pure java.

- Apache JMeter encompasses a full multithreading framework that permits concurrent sampling by many threads and simultaneous sampling of various functions by separate thread groups.

- Its GUL is carefully designed which allows faster test plan building and debugging.

- Apache JMeter has pluggable samples which permit unlimited testing capabilities.

- With pluggable timers, the tester can choose various load statistics.

- Data analysis and visualization plugins give great extensibility and personalization.

Disadvantages

- Apache JMeter is just for web-based applications and isn't for windows-based applications.

- Apache JMeter doesn't control Graphical interface elements as an example simulate pressing a button or scrolling a page.

- Apache JMeter can't be used for desktop applications for instance MS office.

- Apache JMeter isn't a browser and can't execute JavaScript.

2.2. K6.io

k6 could be a developer-centric, free, and open-source load testing tool built for creating performance testing a productive and enjoyable experience.

Using k6, you will be ready to catch performance regression and problems earlier, allowing you to create resilient systems and robust applications.

Key features

k6 is filled with features, which you'll learn all about within the documentation. Key features include:
CLI tool with developer-friendly APIs.

Use cases

k6 users are Developers, QA Engineers, and DevOps. They use k6 for testing the performance of APIs, micro services, and websites. Common k6 use cases are:

- **Load testing**

  k6 is optimized for the slightest utilization of system resources. It's a high production tool designed for running tests with rising load (spike, stress, soak tests) in pre-production and QA environments.

- **Performance monitoring**

  k6 provides great primitives for performance testing automation. you'll run tests with a little amount of load to continuously monitor the performance of your production environment.

2.3. TOOLS AND PLATFORM

- **HOST MACHINE SPECIFICATION**

  Operating System: Windows 10 64bit

  Processor: Intel® Core™ i5-8400F CPU @ 2.80GHz (6 Cores),

  Installed RAM: 12.0 GB

  SSD:240 GB Hard Disk Size: 2 TB

- **PLATFORM**

  1.Apache JMeter

  3.K6

- **DATASET USED**

  The data sets used in the project are the following website

  https://opensource-demo.orangehrmlive.com/index.php/dashboard

III. MODELING AND ANALYSIS

Evaluation of a website was conducted to test the performance and resource utilization of both of the load testing tools. Tests were conducted by virtually adding several user loads into both the application as well as the resource utilization, which were parallelly monitored. The evaluation was conducted using Apache JMeter and K6.io.

Apache JMeter

Implementation with 10 users

Fig:1:The above figure shows the result of a successful run in Apache JMeter where virtually 10 users were added and the loads were tested. The image contains information about the number of bytes sent, Latency, connect time, etc.

Implementation with 50 users

Fig:2: The above figure shows the result of a successful run in Apache JMeter where virtually 50 users were added and the loads were tested. The image contains information about the number of bytes sent, Latency, connect time, etc.

Fig:3: This image shows the summary of the load applied when 50 users were added to test the load.

K6.io Tool

Implementation with 10 users

Fig:4: the above image shows the representation of the change in the load that happened while testing with 10 users. The image shows peak RPS, AVG response time, and failures.
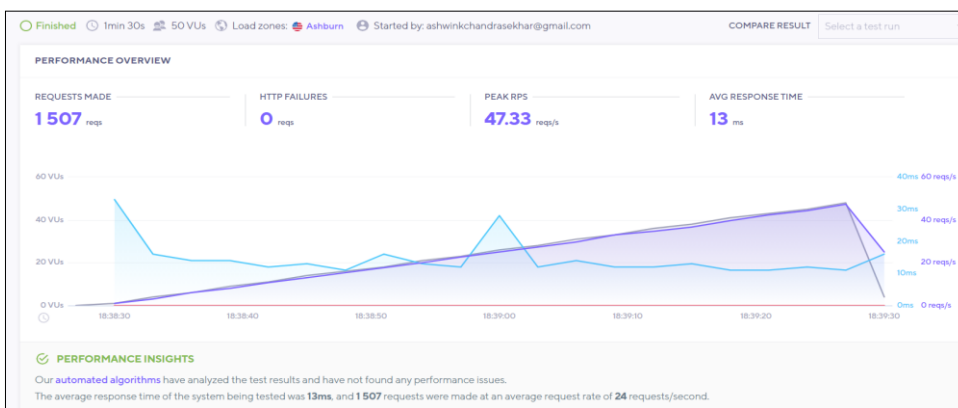
Implementation with 50 users

Fig:5: the above image shows the representation of the change in the load that happened while testing with 50 users.

IV. RESULTS AND DISCUSSION

4.1. RESULT

	Apache JMeter	K6.io
CPU utilization	more	less
Response time	low	high
Memory utilization	More	less
Open Source	yes	yes
speed to write	slow	fast
Recording functionality	yes	no
open source	yes	yes

Fig:6: This table shows the result of comparing Apache JMeter and K6.io based on performance and user-friendliness. The result shows that each of the tools has priority for different purposes. My analysis is as given below.

JMeter is most used when:

- You have to perform a fancy load including different protocols.
- You can record scenarios.
- Robust support and training ecosystem.
- Require that a full scenario be written for every test.
- If you wish to simulate a particular load with some custom ramp-up patterns.

If you only prefer UI desktop app for scripts creation, otherwise you just don't know JavaScript/YAML/JSON to an adequate degree

K6 solves some specific problems:

- CLI tool with developer-friendly APIs.
- Checks and Thresholds – for goal-oriented, automation-friendly load testing.
- Open source, great support, and documentation.
- Lightweight uses JavaScript.
- Does not run in NodeJS and doesn't run during a browser.

4.2. CONCLUSION

In this paper, two load testing tools were compared to find out which tool is more user-friendly as well as provides better performance. Neither tool supports: JMeter is best for traditional testing teams those looking for a GUI-driven testing tool with tons of third-party tutorials and extensive protocol support. k6 is best for collaborative, cross-functional engineering teams where testing spans multiple roles.

V. ACKNOWLEDGMENT

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