

Performance Testing for Web based Application using a Case Study

V. Neethidevan

Assistant Professor

Department of MCA

Mepco Schlenk Engineering College, Sivakasi

Abstract

Performance Testing, is a type of testing performed to check how application or software performs under workload in terms of responsiveness and stability. The primary Goal is to identify and remove Performance bottlenecks from an application. This test is mainly performed to check whether the software meets the expected requirements for application speed, scalability, and stability. Providing the service of more than 20000 trains every day, Indian Railways is one of the world's busiest rail networks. Carrying more than 2,00,00,000 crore people every day, More than 6,00,000 ticket booking is made through online. So to measure performance of the system there is a need for performance testing. To ensure the performance of the system with more number of transactions, this testing is performed using any one of the performance testing tools. In this system, IRCTC web site as a Case study and this site is tested with more than 1,00,000 virtual users and its performance is shown with the help of Graphical charts. It can be used to simulate a heavy load on a server or group of servers, database, or network to test its strength, or to analyze overall performance under different load types.

Keywords- Web Performance Testing, Test Type, Load, Test Method, Apache Jmeter

I. INTRODUCTION

A. What is Performance Testing?

It is a type of testing done to measure the performance of the application under test with various load in terms of responsiveness and stability. The primary objective is to identify and remove Performance issues from an application.

Its overall objective is to ensure the software meets the expected requirements for application speed, scalability, and stability.

B. Load Testing

To test its performance on normal and peak load. Complete Performance of an application is checked with respect to its response to the user request and its ability to respond consistently within an accepted tolerance on different user loads.

C. The Key Considerations are:

- 1) What is the maximum load the application is able to hold before the application starts behaving unexpectedly?
- 2) How much data the Database able to handle before system slows or the crash is observed?
- 3) Are there any network related issues to be addressed?

D. Stress Testing

Stress testing is used to find ways to break the system. The test also provides the range of maximum load the system can hold.

Generally, stress testing has an incremental approach where the load is increased gradually. The test is started with a load for which the application has already been tested. Then, more load is added slowly to stress the system. The point at which we start seeing servers not responding to the requests is considered the breaking point.

E. Volume Testing

Volume testing is to verify that the performance of the application is not affected by the volume of data that is being handled by the application. In order to execute a Volume Test, a huge volume of data is entered into the database. This test can be an incremental or steady test. In the incremental test, the volume of data is increased gradually.

Generally, with the application usage, the database size grows, and it is necessary to test the application against a heavy database. A good example of this could be a website of a new school or a college having small amounts of data to store initially, but after 5-10 years, the data stores in the database of the website is much more.

II. LITERATURE SURVEY

In [1] Testing is indispensable in software development process. Due to increasing complexity of software being built the necessity of testing and time consumed by testing is increasing. Web based applications are common these days. The quality of web based applications needs to be good because of economic relevance of these applications. Manual testing takes a lot of effort and time, both can be reduced by automated testing tools. There are a number of testing tools available for web based automation testing. How to choose the best tool for your task is tricky. Various parameters like ease of installation and learning, performance cost etc., need to be considered. This article describes the various automated software testing tools for web based applications in detail based upon which it is easy for a tester to choose the best web based automation testing tools for the task according to his requirements.

In [2], Software testing is a separate discipline from software development. It is both a process and a discipline. Software testing is a technique aimed at evaluating an attribute or usability/capability of a program or system/product and determining that it meets its quality. It is an activity to check whether the actual results match, the expected results and to ensure that the software system is defect free. The objective of this research paper is to evaluate and analyze the performance of some testing tools and compare them to determine their effectiveness and reliability, used in software testing. In this research paper, two testing tools: WAPT and NEoload are used, which are implemented and worked on a web application. WAPT provides a load, stress and performance testing of websites and web applications with web interface. Whereas, The NEoload is a load and performance testing software solution designed for web applications to monitor server behavior. The performance of these testing tools is evaluated and compared and their results will help in adoption.

In [3], with the web services used widely in all aspects of social life, the web application performance testing is gaining wide attention. In the paper, we firstly analyses and research the types, indicators and testing methods of the performance testing of the web, and then we put forward some testing process and methods to optimize the strategy. In [4], recently, enterprises, organizations, and software companies are building more and more web applications to provide their services over the Internet. In order to fulfill various requirements, the complexity of web applications nowadays is increasing dramatically. As a result, the performance characteristics of web applications, including response time, throughput, etc, become more critical than before and should be taken into careful consideration. If the response time of a web application is poor, users may lose their interests even the function of the web application is correct. Therefore, how to execute performance testing on a complex web application systematically and efficiently will be an important issue. In this paper, a performance testing framework for REST-based web applications is introduced. The performance testing framework aims to provide software testers with an integrated process from test cases design, test scripts generation, to test execution. Based on the test cases designed by software testers and the appropriate software artifacts preserved by the framework (e.g., API document), the framework generates the corresponding performance test scripts, which can be executed by specific performance test tools. This helps software testers to focus more in the design of performance test cases. In addition, effort needed to understand the design and implementation of the application and to learn the operation of testing tools decrease. Thus, the efficiency of performance testing can be highly facilitated.

In [5], during software engineering life cycle to ensure software quality and reliability. Performance testing is a type of software testing that is done to show how web application behaves under a certain workload. Cloud computing as an emerging technology can be used in the field of software engineering to provide cloud testing in order to overcome all deficiencies of conventional testing by leveraging cloud computing resources. As a result, testing-as-a-service (TaaS) is introduced as a service model that performs all testing activities in fully automated manner, on demand with a pay-for use basis. Moreover, TaaS increases testing efficiency and reduces time and cost required for testing. In this paper, performance TaaS framework for web applications is introduced which provides all performance testing activities including automatic test case generation and test execution. In addition, the proposed framework addresses many issues as: maximize resource utilization and continuous monitoring to ensure system reliability.

In [6], Cloud-based performance testing is a stem of cloud-based testing and it is viewed as one of the cloud-based testing models among others. Since the performance measurement that is done is relative to the cloud, it is a requirement to model the test suites that undoubtedly and totally imitates the real life scenarios. Cloud-based testing closes the gap in the hardships of creating the test cases that can number up to several thousands, which is very expensive and needs vast amount of time. In this paper we give a short literature of the proposed and implemented cloud-based performance testing frameworks, made an analysis of the presently found cloud-based testing models against cloud-based providers, our recommended parameters that are required to be taken into consideration whilst performing cloud-based performance testing along with their expected practical results.

In [7], Performance testing is an process of determine the speed or effectiveness of a computer, network, software program or device. The focus of Performance testing is checking a software program's Speed - Determines whether the application responds very quickly, Scalability Determines maximum user load the software application can handle. Stability - Determines if the application is stable under varying loads. Performance testing mainly divided into Stress and Load testing. jMeter is a Open Source testing software. It is 100% pure Java application for load and performance testing. In this paper we discussed performance testing tools and proposed best Performance tool for web application Industry.

In [8], RACT Web application performance testing is the emerging and most important field of software engineering. The performances of the web applications depends upon several different type of the testing process like load testing, soak testing, smoke testing and stress testing. The load testing is used in this paper to determine how the web application behaves under varying load. In this paper the Multi Objective Particle Swarm Optimization (MOPSO) proposed to optimize the server behaviour for

improving the performance in the web application. The MOPSO select the more number of server behaviour such as work load, CPU, bandwidth, throughput, response time, hits per second, database locks, thread count, number of position in the service queue, round trip time, server mean service time. The optimized server parameter tested with JMeter performance tools which return the better services to the user. The result shows that MOPSO increase the performance of the web application in terms of less workload, maximum CPU utilization, less bandwidth and less response time.

In [9], A multi-tier Internet server application needs to be analyzed for its performance before it is released. Performance analysis is usually done by (a) load testing of the application on a testbed and (b) building a performance model of the application. While there are a plethora of Web load-generator tools available, there are two problems with these tools: one, the tests have to be configured manually, which can lead to a time-consuming trial-and-error process until the desired performance charts in the appropriate load ranges are obtained; and two, the load generator tools do not produce output that is directly useful for creating a performance model of the application. In this paper, we present AutoPerf, a load generator tool designed to meet two distinct goals, named capacity analysis and profiling. The goal of capacity analysis is to run a comprehensive load test on a Web application, in an appropriately chosen range, at a minimal number of load levels, while still producing an accurate graph of throughput and response time vs load levels. The goal of profiling is to generate a detailed server resource usage profile per request type, without instrumenting the application code. This data (e.g. CPU execution time by Web server for one request) is crucial for parameterizing performance models of the application. AutoPerf intelligently plans and configures its load tests by using analytical results from queuing theory along with some heuristics. Results show that AutoPerf is able to run performance tests very efficiently while still producing an accurate chart of performance metrics.

In [10], Automated testing provides the run time valuation of software project to obtain the execution time analysis. This testing is able to identify the module level error tracking, integration tracking, load testing and the fault identification. To identify the software errors, there are some such tools and the applications. In this paper, two of the most significant load testing tools are analyzed called Sahi and Selenium. In this paper an evaluation on web-based software testing tools; API of Sahi and Selenium, Sahi OS and Selenium IDE, based on execution time, recording and playback efficiency, browser and platform compatibility, result reporting, ease of learning and cost has been presented. It will help testers to take informed decision to choose a tool according to their requirements and resources.

III. EXPERIMENTAL EVALUATION

Steps in using JMeter tool

To open Jmeter

Jmeter->apache-jmeter-5.0->apache-jmeter-5.0->bin->ApacheJmeter.jar

Step 1:

Testplan-> add-> threads(users)-> threadgroup->

Number of threads(users):100

Rampup period(in seconds):100

Loop Count:100

Step 2:

Thread group->Add->Config element->HTTP Request Defaults->

servername or IP->www.google.com-

portnumber->80

path->calendar

step:3

Thread group->add-> Sampler->HTTP Request

servername or IP->www.google.com-

portnumber->80

path->calendar

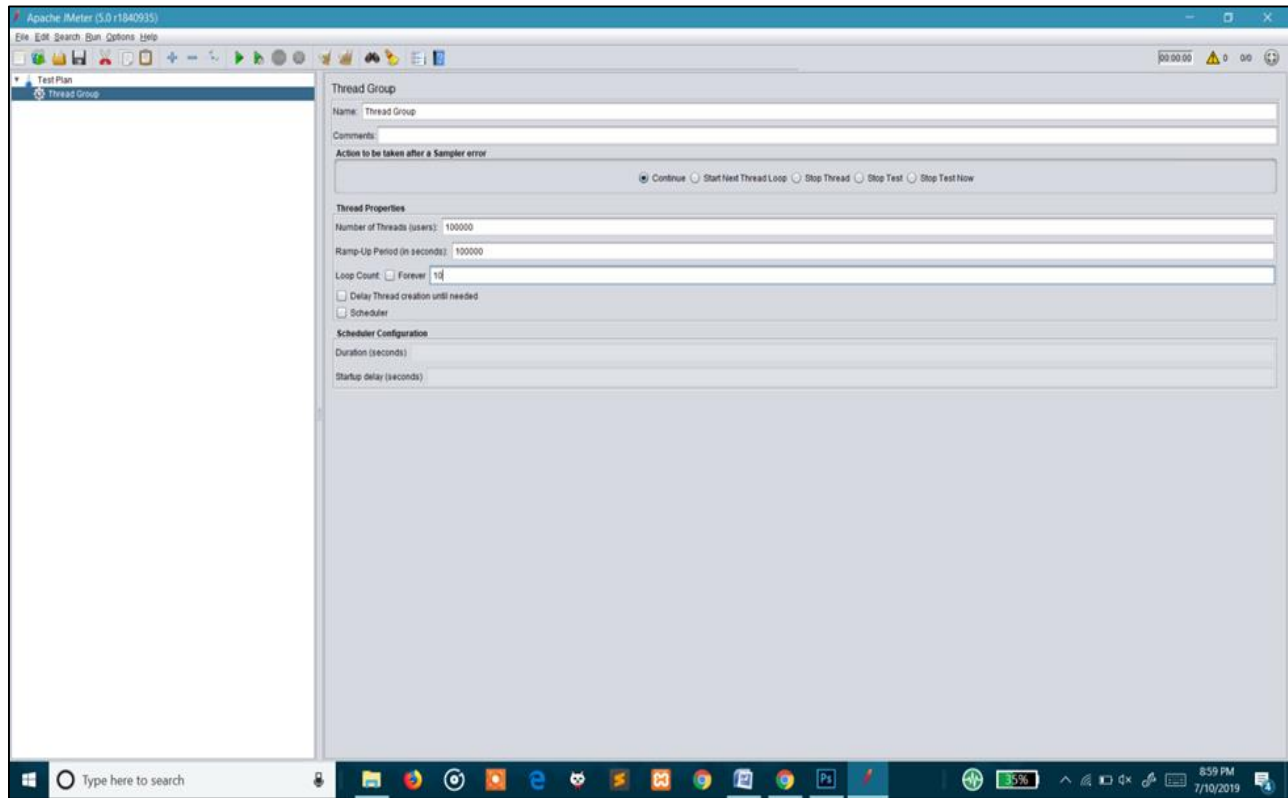
Step 4:

Thread group->add->listener->Graph Results

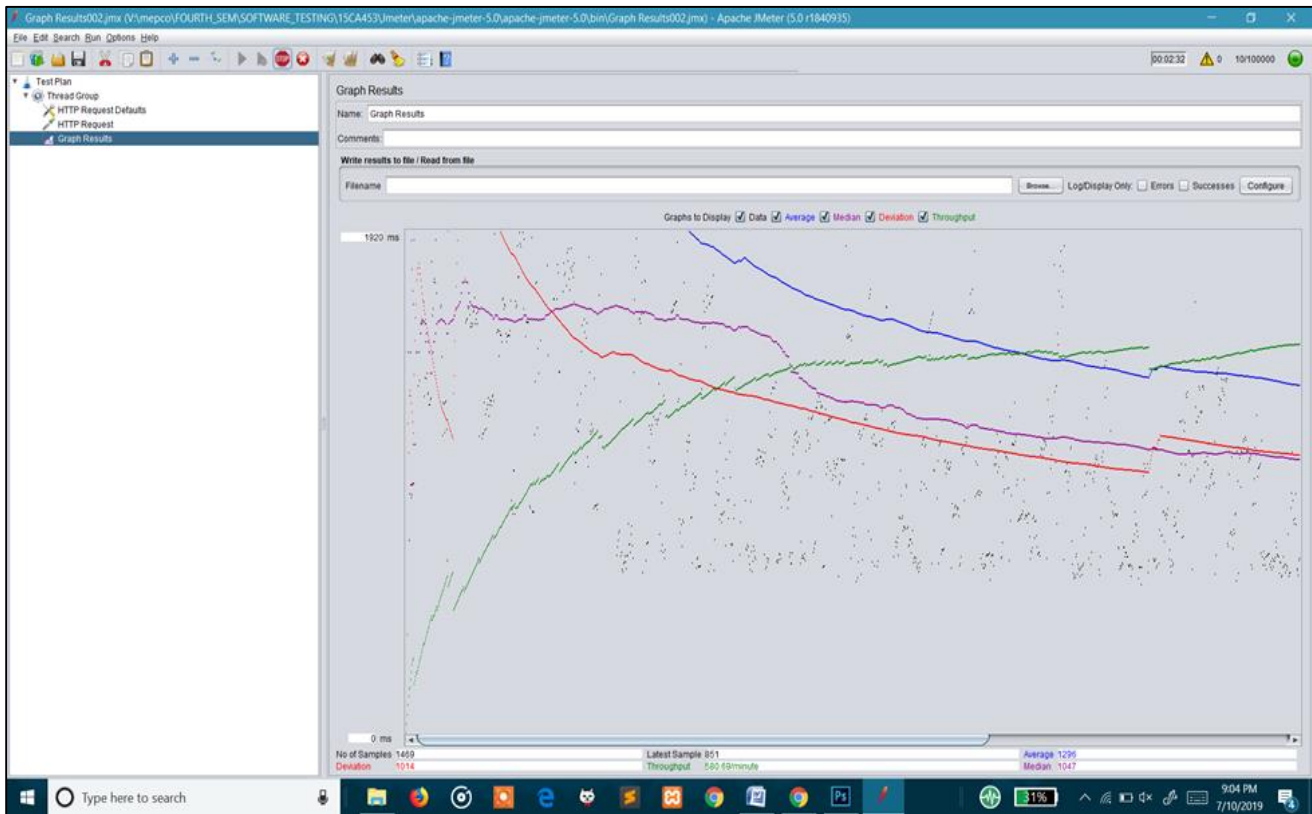
Save&run

IV. EVALUATION PHASE

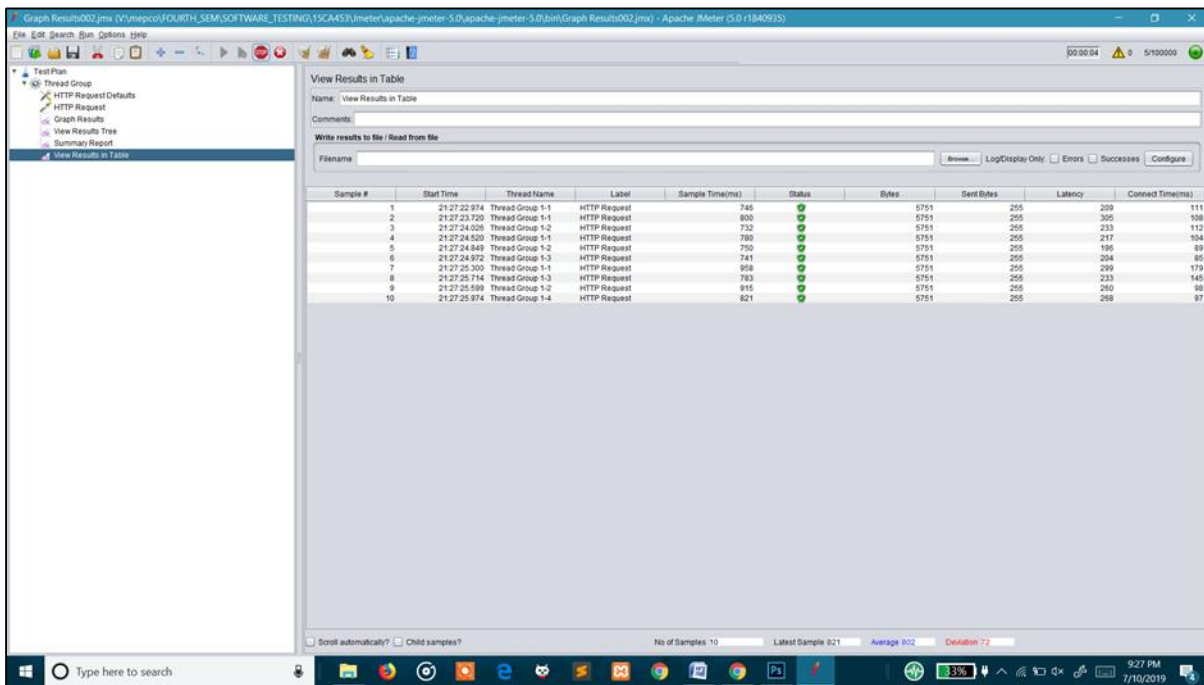
Thus performance testing is performed for IRCTC, a website for online train reservation system, is tested with one lakh virtual users and its performance measured in terms of charts.



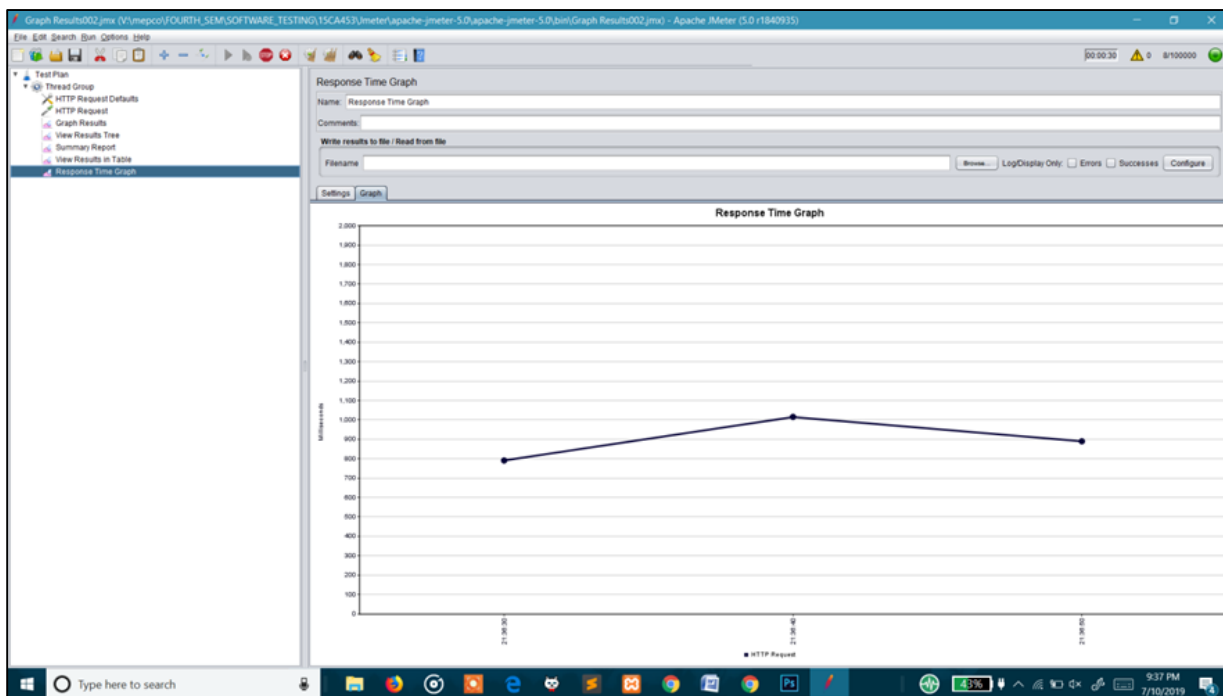
The above screen shows that the virtual users are created for one lakh users to access the site.



The above screen shows system performance in terms of graphical diagram.



The above diagram shows tabular representation of performance showing IRCTC application.



The above diagram shows response time graph for performance showing IRCTC application.

Thus the above screenshots shows performance of the IRCTC application when more number of users accessing the application. For a festival season more number of reservations will be done across the geographical area. To improve the performance of the system, application need high end hardware specification in terms of increasing server's capacity to process more number of simultaneous request and also improve the Internet bandwidth so that it could process more request in smooth manner.

V. CONCLUSION

All web systems must be thoroughly tested with any one of the performance testing tool, to ensure the quality of the system before deployment. Load testing, stress testing and volume testing must be conducted to improve system performance and then only customers will be having more reliability with the system.

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