

Load Testing of Web Applications Using HP Load Runner and CA Wily Introscope Tools

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Abstract

In this paper load testing has been performed for web applications with HP loadRunner and CA Wily Introscope Tools. Performance testing is as much important as other types of the testing are for a web-based application. There are different types of the performance testing like static, dynamic and performance etc., these testing have been applied on the web applications in software industries. In each industry software tester has a responsibility to check all the aspects of a given software like correctness and load testing, so that it become reliable and error free. The reliability of the software is depend on the software testing. Load testing is one of the most important testing which is responsible for performance of the web application/software. The LoadRunner tool is used to calculate the response time, error rate and load on the system while CA Wily Introscope tool is used to generate the report and send a message for failure in web application.

Keywords: Software Testing, Web Application Testing, Performance Testing, Load Testing, Testing Tools.

1. INTRODUCTION

Web application's performance testing can be done for the different purpose on the different tools. There are many types of the software testing to calculate the performance testing such as stress testing, volume testing, smoke testing, load testing, soak testing and scalability testing etc. As we know that nowadays there so many web applications are around us in our daily life. How these applications are useful for us. When a web application opened then we have a concern about its reliability and good performance. The performance testing not used only finding the bugs in the web application but used to eliminate the performance bottlenecks. There are not only some concerns of the performance testing like functionality of function etc. [1, 2, 3].

An application perform under its response time and up to expected load, it has been checked. The performance testing is checked a web application under the criteria like speed, scalability and stability. In the speed tester

determine whether the software responds quickly or not. In scalability the tester determine that the software application can handle the maximum user load and in stability it has been determined that the application is stable under the varying loads [2, 3, 7].

2. LOAD TESTING

The load testing is a process of checking the user load on the web application. How much customer can use a given application simultaneously. Also checked the bottleneck of the web application before its delivery to the customer. With the use of the load testing tester checked many thing about the web application. The tester checked where the application can fail when used with some number of virtual customers. When the web application will run slow. When should it run fast? It has been in many web application at the peak time of the business the web application not run fast. It is a major concern about the web application on the peak of the business. As many business men give a special discount on a particular session so load testing is very important for that particular period [1, 2, 3, 7, 8].

3 HP LOADRUNNER AND CA WILY INTROSCOPE TOOLS

HP LoadRunner is a software testing tool from Hewlett-Packard launched in 2006. HP LoadRunner is tool which used for load performance of application, measuring system behavior. It is a very powerful tool which simulate thousands of user concurrently using application software, and store the performance of the web application and later analysed the performance of different part of the applications. LoadRunner is a good tool which simulates user activity by generating messages between application components rather than simulating interactions with the user interface such as key presses or mouse movements. The messages which are generated during load checked is

written as test script. LoadRunner can generate the scripts by recording them, such as logging HTTP requests between a client web browser and an application's web server.

Nowadays all the industries are going to online so they relies on good web applications for their business. The success or failure of the business depends on the online application of the business how fast it is and how much time it take to complete customer's tasks. It also depends on the solutions of all the problems to be fix in a minimum time. In web application environment it is more difficult to solve the issues came during the operations of the web application. As business grows the most complex problems came in the limelight so testing need a real time intelligence system to vigilance of the web application performance and should have a quality to find the cause of failure of the web application quickly. CA Wily Introscope is a tool which vigilance 24 hours all the days on the web application in the production environment. With the use of CA wily Introscope tool testers easily resolve all the errors came during access of web application.

4 EXPERIMENTAL SETUP

For the experiment with HP LoadRunner and CA Wily Introscope we developed a web application for banking system and checked its performance with both the tools. Once the scripts are ready we need to upload it in Load Generator and create scenarios with appropriate workload that has been decided and then we need to perform the testing.

The banking website has the following functions

- Login/Logout.
- Add payee
- Check Balance
- Amount Transfer
- View Account Statement
- Credit Card Payment

4.1 Analysis Test Report

Once every test is completed, the logs and results are collected from the controller machine. The report is prepared with following:

LoadRunner Analysis Reports

- Transaction Response Time
- Transaction Pass/Failed
- Throughput (Kilobytes/sec)
- Errors Rate vs. Load on the system

Degradation of response times with load on the system.

4.2 Test Cases and Load Distribution

We tester prepared the test data for scripting and test the performance testing for the web application of banking

system. The load distribution is define here with their name and functioning.

- Login Logout: Launch application with given URL and user data. Login into the web application using the user data. Logout the application.
- Add Payee: Launch application with given URL and user data. Login into the application using the user data. Click on payments tab available on top of the screen. Enter account, name, IFSC code and other details. Click on add button. Click on verify. Enter the verification code and then click on verify.
- Check Balance: Launch application with given URL and user data. Login into the Application using the user data. Click on payments tab available on top of the screen. Click the check balance button. Select the saving account. Logout the application.
- Amount Transfer: Launch application with given URL and user data. Login into the application using the user data. Click on payments tab available on top of the screen. Click on make a payment. Select the account from which you want to pay. Select the account to whom you want to pay. Click on submit button. Enter the verification code and then click on verify. Click on submit button. Logout the application.
- View Account Statement: Launch application with given URL and user data. Login into the application using the user data. Click on payments tab available on top of the screen. Click on view statement. Select the format and period in which you want the statement. Click on submit button. Enter the Verification code and then click on Verify.
- Credit Card Payment: Launch application with given URL and user data. Login into the application using the user data. Click on bill pay and recharge tab available on top of the screen. Click on continue. Select the biller whose bill you want to pay. Select the Amount option to pay. Click on submit button. Logout the application.

Below Transactions have to be achieved in 1 hour steady state (excluding Users ramp up and ramp down)

Table 1. Table for workload distribution

Business functions	Transaction to achieved per hour
Login Logout	400
Add Payee	160
Check Balance	100
Amount Transfer	400
View Account Statement	200
Credit Card Payment	400

Below table depicts the number of user information that would be used for each business functionalities.

Table 2. Table for virtual users

Business functions	Number of Virtual Users
Login Logout	50
Add Payee	40
Check Balance	20
Amount Transfer	100
View Account Statement	50
Credit Card Payment	100

Below the table is given for the requirement of Hardware and Software.

Table 3. Table for hardware and software require

Hardware	Software
Processor: Pentium IV Dual 4.1 GHz.	Load Agent software should be installed in identified Load Generator Machines
RAM: 8 GB	
CPU Count: 4	

5 LOAD RUN

When we checked for the load test with each application on HP LoadRunner than found how much time these function failed and what is the failure percentage of these functions. Below the table for load test run is given the HP LoadRunner.

5.1 Analysis of load test

The graph displays the amount of throughput (in megabytes) on the Web server during the load test is shown in figure 1. Throughput represents the amount of data that the Virtual Users received from the server at any given second. This graph helps you to evaluate the amount of load Virtual Users generate, in terms of server throughput. Graph in figure 1 highlight the amount of bytes returned by the server during the course of load test. It can be seen when the users were getting ramped up into the application, the amount of bytes returned by the server is highly fluctuating and once all the users completely ramped up then the THROUGHPUT becomes stable. Graph in figure 1 shows how stable the test remained throughout as there were no peaks or spikes during the load test period. On an average, 200,000 bytes per second were returned by the server.

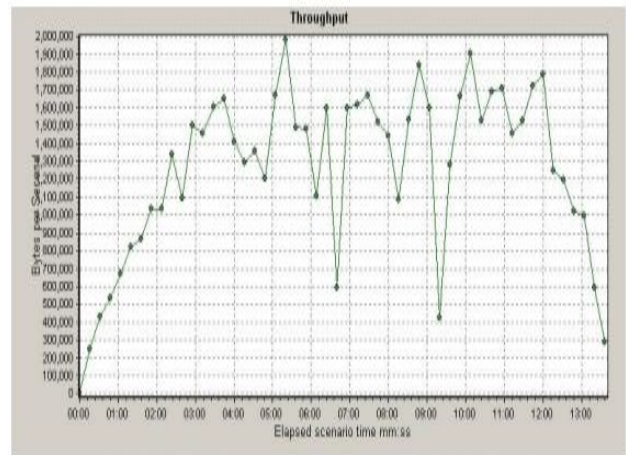


Figure 1. Throughput

Below graph is for the hits per second and it show the consistency with the throughput graph which is a very good sign when dealing with the performance testing. The amount of hits in a second is highly fluctuating during the initial ramp up duration and once all the users completely ramped up then the pattern becomes stable. On an average, 30 hits per second were observed.

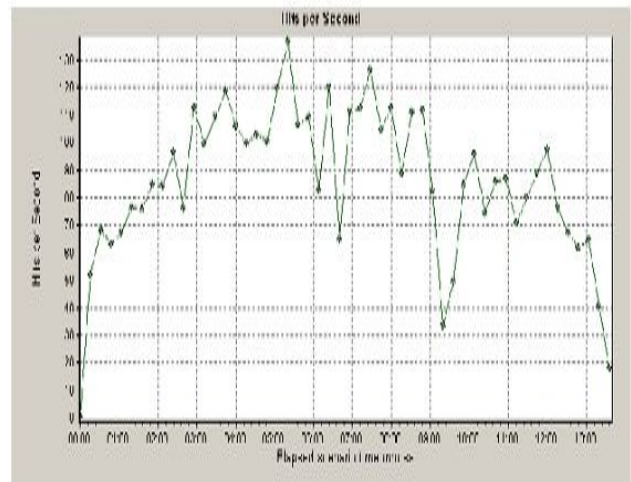


Figure 2. Hits Per Second Graph

The Load Test that we ran went successful with the Expected workload and the results were as mentioned below. All transactions response times were under the SLA (Service level agreement). 100% of the transaction volumes were achieved. No transaction was having errors or failures more than 10% average.

5.2 Smoke test Wily report

Some other reports are also generated by Wily Introscope tool. As garbage collection and web container etc. Garbage collection is a process of freeing memory taken up by the object no longer is use, once memory is freed up it is usable by other objects. So CA Wily Introscope tool generate a report on garbage collection which is very important shown in figure 3.

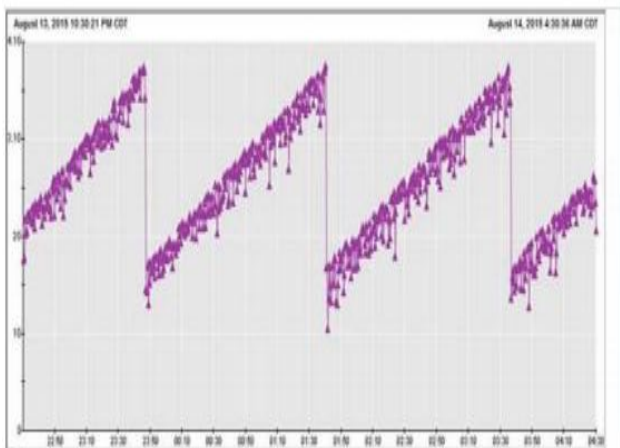


Figure 3. Garbage Collection

The other important feature of CA Wily Introscope is to generate Web Container report. Basically responsibility of web container is to run and deploy the applications services. Results are shown in figure 4.

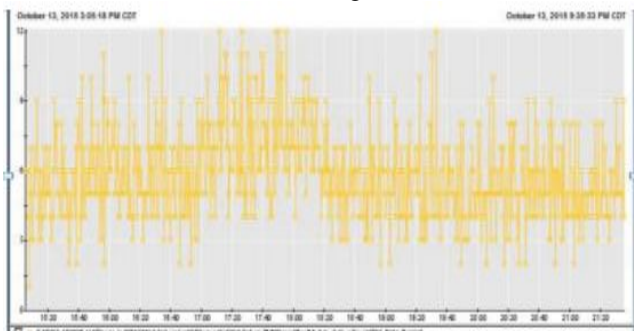


Figure 4. Web Container

6. CONCLUSION

The load test went fine and the load test successfully executed without any issue with respect to its throughput and hits per second. In this paper two tools are used for the load testing HP loadRunner and CA Wily Introscope. The HP loadRunner gives the graph of throughput and hits per second and CA Wily Introscope represents some reports these are garbage collection, web container and web CPU. With the use of virtual clients actual load was calculated and run under these test cases successfully. So the combination of these two tools give us the better result compare to single tool. While HP LoadRunner generate the report CA Wily Introscope report and alert the tester about the error and failure of the web application on appropriate tool.

REFERENCES

[1]. Kuhn, D. Richard, Dolores R. Wallace, and Albert M. Gallo Jr. "Software fault interactions and implications for software testing." *Software Engineering, IEEE Transactions on* 30.6 (2004): 418-421.

[2]. Verbaauwhede, Ingrid, Patrick Schaumont, and Henry Kuo. "Design and performance testing of a 2.29-GB/s Rijndael processor." *Solid-State Circuits, IEEE Journal of* 38.3 (2003): 569-572.

[3]. Weyuker, Elaine J., and Filippos I. Vokolos. "Experience with performance testing of software systems: issues, an approach, and case study." *IEEE transactions on software engineering* 12 (2000): 1147-1156.

[4]. Ward, C. L., et al. "Design and performance testing of quantitative real time PCR assays for influenza A and B viral load measurement." *Journal of Clinical Virology* 29.3 (2004): 179-188.

[5]. Menascé, Daniel. "Load testing of web sites." *Internet Computing, IEEE* 6.4 (2002): 70-74.

[6]. Zhao, Nai Yan, and Mi Wan Shum. "Technical Solution to Automate Smoke Test Using Rational Functional Tester and Virtualization Technology." *Computer Software and Applications Conference, 2006. COMPSAC'06. 30th Annual International. Vol. 2. IEEE, 2006.*

[7]. Mahajan, Manish, Sumit Kumar, and Rabins Porwal. "Applying genetic algorithm to increase the efficiency of a data flow-based test data generation approach." *ACM SIGSOFT Software Engineering Notes* 37.5 (2012): 1-5.

[8]. Khan Rijwan and Mohd Amjad, " Automatic test case generation for unit software testing using genetic algorithm and mutation analysis", 2015 IEEE UP Section Conference on Electrical Computer and Electronics (UPCON) pages: 1-5, DOI: 10.1109/UPCON.2015.7456734

[9]. 12. Khan, R., Amjad, M., Performance testing (Load) of web applications based on test case management, *Perspectives in Science* (2016), <http://dx.doi.org/10.1016/j.pisc.2016.04.073>

[10]. Khan, Rijwan, and Mohd Amjad. "Automatic Generation of Test Cases for Data Flow Test Paths Using K-Means Clustering and Generic Algorithm." *International Journal of Applied Engineering Research* 11.1 (2016): 473-478.

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Rijwan Khan received the B.Tech. and M.Tech. degrees in Computer Science and Engineering in 2006 and 2010, respectively. Now he is a research scholar in JMI, New Delhi. His area of research is software Testing.