Website Performance Analysis Based on Component Load Testing: A Review

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Abstract—Developers typically measure a Web application’s quality of service in terms of response time, throughput, and availability. Poor QoS translates into frustrated customers, which can lead to bad opportunities. One way to assess IT infrastructure performance is through load testing, which assess how the website supports its expected workload by running specified set of scripts that emulate behavior at different load levels. This paper addresses the website performance analysis based on component load testing with different QoS measures.

1. Introduction

The Goal of a Load test is to uncover functional and performance problems of a system under load. Performance problems refer to the situations where a system suffers from unexpectedly high response time or low throughput. It is difficult to detect performance problems in a load test due to the absence of formally-defined performance objectives and the large amount of data that must be examined. When we develop a high-traffic Website, a Web service, or some other server components, then we can see that how much load the site or service can handle. Performance is defined as the time between the submission of a request from a user and the completion of the response. In effect, it is the mean response time that a single HTTP request of a web application system spends from end to end. This measure is one of the critical factors in the evaluation of web services. A performance test can help determine whether the product meets the performance goals. For performance test reporting, four types of information may be provide:

- Latency for each type of request
- Throughput information, or how much load server received(for example, requests per second)
- Server-side resource utilization( such as CPU usage, memory consumption, and so on.
- Test run configurations

Performance of many website depends on the load on the application at peak time under varying conditions. Performance testing is normally conducted in a reasonably simulated environment with the help of Performance testing tools. However Performance of Web application and Website depends on various parameters and each parameter must be tested under varying stress levels. Different parts of the Website must be tested with different parameters under varying condition and stress levels. In such circumstances, it is necessary to decompose the website into many components, which represents the behavior of various components.

Although we can evaluate the performance of website by testing the complete page but this may not be a good idea for two reasons. First, when we evaluate the WebPages and websites, it does not specify the reason for not loading a web page if any. Second, it does not specify the link or an item detail where the maximum time has been spent when we check the performance of WebPages and website. Therefore, there is need to test the individual components through which the performance of the said components can be evaluated.

2. Load Testing

The time website takes to load a webpage in a browser so that all the elements of the page can be viewed. The time depends on a number of factors including the amount of network traffic, amount of video, audio, graphic and animation technology on the page. It is the process of putting demand on a system device and measuring its response. Load testing is performed to determine a system’s behavior under both normal and anticipated peak load conditions. It helps to identify the maximum operating capacity of an application as well as any bottlenecks and determine which element is causing
degradation. When the load placed on the system is raised beyond normal usage patterns, in order to test the system’s response at usually high or peak loads, it is known as “Stress Testing”.

In Figure 1, The script recorder creates user interaction scripts based on actual requests. The load generator then sends a realistic load, based on scripts and test parameters, to the website, and the performance monitor measures its performance.

3. Requirement of Load Test:

- The failure of a mission-critical web application can be costly.
- Assure performance and functionality under real world conditions.
- Locate and resolve potential problems before it hits on the users.
- Performance is the key to success of any web based application. Load test will able to provide the maximum capacity, the system can handle for an application.

4. Test Objectives of Load Testing

Many concurrent users running the same application to see whether a system handles the load without compromising functionality or performance. Measurement of no. of concurrent users that can the system handle without increase in the expected response time.

Parameters affecting the Load Testing are as follows:

- System Requirements
- Response Time
- Think Time
- Work Load
- Transaction Mix
- Throughput

4.1 System:
4.2 Response Time: Time in which the system responds for a particular transaction request.

4.3 Think Time: Time taken for selecting a new transaction after the response for the previous transaction has been received.

4.4 Work Load: Work Load depends on the following factors which are as follows:
- Number of users
- Transactions

4.5 Throughput: The amount of work that can be performed by a system or component in a given period of time. Throughput depends on following factors:
- Transactions/sec
- Web Interactions/sec
- Pages/sec
- Bytes/sec

5. Steps involved in Load Testing:

- Planning Load Tests:
  - Information that is required for load testing a system.
  - Organizing the system information collected
  - Using the information effectively to carry out load tests.

- Creating VUsers (Virtual User Technology)
  - Simulates a real user
  - Requires less resources- machines and people
  - Greater control over test execution
- Can synchronize actions performed by users
- Collect and analyze results in a better way
- Vusers can communicate directly with a server by executing calls to the server API without relying on client software.

![Diagram of virtual user generator in the loading of websites]

6. Performance Testing

- Performance testing is the process to determine the speed or effectiveness of a computer, network, software program or device. In other words, Performance testing is to evaluate the response time (speed), throughput and utilization of system to execute its required functions in comparison with different versions of the same product or a different competitive product. This is done to derive benchmark. The factors that governs Performance testing are as follows:
  - Throughput
  - Response Time

7. Test Objectives of Performance Testing

- Identifies problems at an early stage before they become costly to resolve.
- Reduces development cycles.
- Produces better quality, more scalable code.
- Prevents revenue and credibility loss due to poor web site performance.
- Enables intelligent planning for future expansion.
- To ensure that the system meets performance expectations such as response time, throughput etc. under given levels of load.
- Expose bugs that do not surface in cursory testing, such as memory management bugs, memory leaks, buffer overflows, etc.

8. Requirements of Performance Testing:

At various phases requirement of performance testing are as follows:

**Design Phase:** Pages containing lots of images and multimedia for reasonable wait times. Heavy loads are less important than knowing which types of content cause slowdowns.
Development Phase: To check results of individual pages and processes, looking for breaking points, unnecessary code and bottlenecks.

Deployment Phase: To identify the minimum hardware and software requirements for the application.

9. Proposed Approach for Load and Performance Testing of Website:

10. Conclusion

Based on identified parameters, proposed Approach will be able to calculate the Load and Performance of the complete Website with the individual components performance.

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