

# A Survey on Performance Testing Approaches of Web Application and Importance of WAN Simulation in Performance Testing

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**ABSTRACT-**In today's era of internet most of the applications developed are either web applications or web interface is provided to the applications. In either of the cases it's very much critical for developers of such applications to know how their application behaves over the internet. This paper gives a review on various approaches used to test the performance of web application. This paper begins with describing various approaches in performance testing of web application. Then it explains the importance of WAN simulation in performance testing.

**Keyword-** Performance Testing , WAN simulation, Latency, Bandwidth, Packet Loss.

## I. INTRODUCTION

The use of internet in day to day life and in any area has increased at an exponential rate over the last decade. Due to this reason most of the software development organizations have made their applications as a web based application or they are providing web interface to their applications. In this regards performance of web application over the internet plays an important role in the success of business. So it is very much critical for the developers of such applications to know how their application will behave over the internet. Thus performance testing of web application is very much critical for the success of product and therefore for the success of overall business.

In this regards here we described various approaches in performance testing and we will also describe how WAN simulation plays an important role in performance testing.

## II. PERFORMANCE TESTING

Testing is a very critical phase in the Software Development Life Cycle (SDLC) and web applications are not an exception in it. The testing ensures a bug free application which results in better user satisfaction and thereby plays a major role in the success of entire software.

There are various testing strategies that can be applied during various stages of SDLC such as black box testing, white box testing, unit testing, integration testing, performance testing, system testing and so on. We are here focusing only on performance testing in upcoming sections. Before taking a deep dive in various approaches of performance testing let's first understand the aim of performance testing and various performance related parameters.

### A. Aim of Performance Testing:

Performance testing of web applications mainly aims at determining the maximum load that system can withstand with. In performance testing, various data are used based on the requirement of specific performance testing index and a specific load is derived at which system running out of resources. Performance testing aims

at determining the load at which system performance is unacceptable.

#### B. Performance Index:

There are various parameters based on which performance of the system is measured. They are known as performance Index. Some of them are as follows:

##### 1) Resource Utilization:

Resource Utilization is the number of resources used to serve the user request. These resources can be memory, processors, Disk IO and Network utilizations. To achieve better system performance, resource allocation should be done efficiently. Efficient resource utilization leads to better system performance.

##### 2) Response Time:

It's the amount of time taken by the system to respond to user's request. It depends on the amount of time required to process the user request and delay introduced by the network. For better performance of the system minimum response time is desired.

##### 3) Throughput:

Throughput is the number of transactions that can be completed within the specific unit of time. For web applications it's the number of user request that can be fulfilled within the specific unit of time. For better system performance higher system throughput is expected.

### III. VARIOUS APPROACHES IN PERFORMANCE TESTING

Different researchers have used various terminologies to describe various approaches in performance testing. In their article about performance testing of .NET application [1] describes mainly 3 ways of performance testing:

##### 1) Load Testing:

Load testing allows us to measure the performance of system based on actual user behavior. In this type of testing simulated users are developed who periodically sends the request to the web application. The accuracy of results of performance testing depends on the similarity between the simulated user and actual user.

##### 2) Stress Testing:

Stress testing allows us to determine the ultimate load condition at which the system performance is unacceptable. In this type of performance testing the system performance is measured under the gradually increasing load. This helps testers to determine the ultimate failure point of the system.

##### 3) Strength Testing:

Strength testing can be viewed as longer version of stress testing and load testing. Unlike previous two testing strategies which run for few minutes, the strength testing can run for few hours to few days. It generally tries to find the errors which in shorter duration of testing couldn't be magnified.

Apart from above mentioned performance testing strategies, [2] mentioned in their paper on performance testing, another type of performance testing strategy known as Capacity Testing. It determines the server's failure rate [2].

### IV. IMPORTANCE OF WAN SIMULATION IN PERFORMANCE TESTING

From the above discussion of various approaches of performance testing, it's very clear that for the performance testing, some kind of mechanism is needed to simulate the load. Generally there are mainly two types of delays that web application suffers: network delay and application generated delay.

For developers, it's easy to find the application generated delay by simply measuring the response time. But mostly application developers doesn't test the application in WAN during development [3]. Further it's very costly and risky to test the individual modules of web application in WAN environment. But in order to make it reliable and performance effective developers of web application should know how their application will behave over the internet. In order to achieve this, some sort of mechanism is required that simulate the WAN environment in the LAN environment. These kinds of tools are popularly known as WAN simulators. WAN simulators provide facilities to simulate the network parameters such as latency, packet loss, bandwidth etc. By using this facility testers can test the application under high latency, low bandwidth and heavy packet loss. These extreme conditions will give an idea to the tester that how the system will perform under such condition.

As discussed in previous section in performance testing, specific load is generated and performance of the web

application is measured against that load. To simulate network related environment WAN simulators are used. In their paper on framework related to distributed network simulation, [4] used native interface to ns-3 network simulator to test the performance of multiplayer online Game application.

In their paper on controlling wide area power plant, [5] used network induced delays to control the power plant system.

#### V. CONCLUSION

In this paper we began with discussing the importance of performance testing for web application. Then we discussed various approaches in performance testing such as load testing, stress testing, strength testing and capacity testing. In the load testing, system performance measured against the simulated user load where as in stress testing the performance of application is measured against the gradually increasing load. Strength testing is the longer version of load testing or stress testing. Capacity testing is the complement of load testing.

In the last section we described how WAN simulation plays an important role in the performance testing of web application.

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