

## **Non functional Testing ( Performance/ Security)**

**Non-functional testing is a type of software testing to test non-functional parameters such as reliability, load test, performance and accountability of the software.**

**Any software application or system requires to be tested for its functional requirements i.e. working of modules and functions and its non-functional requirements i.e. load handling, performance, recovery, scalability, usability, stress handling, security, compatibility, etc.**

**In performance testing, we not only measure the response time of the application but also several other quality attributes like – stability, reliability, robustness, scalability, resource utilization, etc.**

The primary purpose of non-functional testing is to test the reading speed of the software system as per non-functional parameters. The parameters of non-functional testing are never tested before the functional testing.

### **What is Performance Testing?**

Performance testing is a type of non-functional testing technique in which the performance of an application is evaluated under simulated expected or higher than expected workload.

**Functional testing** tests 'what' the system does and **Non-functional testing** tests 'how' the system operates.

**Functional testing** checks the correctness of internal functions while **Non-Functional testing** checks the ability to work in an external environment.

**Functional testing** tests the functionality of an app. **Nonfunctional testing** tests the performance of these functions.

**Non-functional testing** is the testing of software application for its non-functional requirements which are not covered under functional testing. It tests whether the system meets the non-functional quality attributes and makes sure that the system behaves or operates in the required manner.

Non-functional testing holds equal importance in the testing process as functional testing. Sometimes, the project manager, QA team and even the client focus only on functional aspects of the software. But when the software is in the market, and it is used by real users, it might start developing some issues related to performance such as slow response time, compatibility issues with browsers or devices, vulnerabilities towards attacks on security, etc. These issues, in turn, might affect end-user satisfaction.

Hence it is really important that the software is tested also for non-functional requirements and not just for functional requirements.

### **Why is Performance Testing required?**

- Helps in the identification of performance bottlenecks
- To check if the application is reliable and provides correct and consistent output.
- Performance tests like load tests and endurance tests help in evaluating the system correctness under the expected workload for a predefined time(load test) or large durations(endurance testing).
- Performance tests help in the identification of the performance bottlenecks in the application that slow down the system.
- Helps in evaluating the scalability of the application
- On running performance tests with a different number of concurrent users, we can check if the application is capable of scaling up to a higher number of users.
- This also helps in finding the adequate infrastructure/server requirement for the system.
- Helps in checking the robustness of the application
- With stress testing, we can check the robustness of the application at a workload higher than expected.
- This helps in knowing the upper limit or the break-even point to which the application can handle concurrent users without getting crashed.

### **Examples of non-functional testing scenarios**

- To check how many users can simultaneously use the system.
- To check whether the system is compatible with various desired devices, operating systems, browsers, etc.
- Check whether the customer's credit/debit card information (any payment-related private information) is encrypted and secure.
- Check how quickly or easily the user is able to learn the application usage.

### **Attributes of Non-Functional Testing**

- Performance
- Scalability
- Reliability
- Compatibility
- Recovery
- Security
- Usability
- Portability
- Efficiency

## Performance Testing

In simple words, performance testing tests the performance of the software.

Performance testing is required to make sure the response time of the system is as per the desired requirement. It can also be part of integration testing.

- **Load Testing** – Load testing is done by checking the system's ability to manage a load of multiple users using the system at the same time. During this testing, the testing team tries to put pressure on the system by logging with multiple users and accessing any particular module or function simultaneously. The results of the testing will be checked for the system's required response time, whether it is achieved or not.
- Loading capacity means more and more people can work on the system simultaneously.
- **Stress Testing** – Stress testing is carried out to test the robustness of the system under severe stress. In load testing, maximum capacity of the system is found out while in stress testing, load is increased gradually, even more than the maximum capacity, and the system's behaviour is checked.
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- **Scalability Testing**
- Scalability testing is required to check the scalability of the system which means in events of change in data volume, a number of users, etc. the system should work as required and it should be able to handle the increased parameters.

## Recovery Testing

- Recovery testing checks the system's performance in case of any failure or crash and its ability to recover in the desired time without loss of any data.
- **Volume Testing** – Volume testing helps in checking the system performance when the database size is increased. After increasing the database size, multiple queries can be fired simultaneously to check how effectively system is able to exchange the data. It will also check for any data loss and slowness in response. It is important to note that load testing, stress testing and volume testing are basically part of performance testing.
- **Example of why performance testing is important:** When American actress Jennifer Aniston debuted on Instagram in 2019, due to a large number of users accessing her profile, Instagram crashed temporarily. Such scenarios are very rare, but it still affects the application's performance and most importantly, end-user satisfaction.

## Security Testing

- Security testing is one of the most crucial testing types of non-fictional testing. In this type of testing, the system's readiness to fight back against any external or internal attacks is tested. It makes sure that only authorized and authenticated users are allowed to access the software, and users' data is secured and available to them whenever required.

### **Usability Testing ( we have already covered)**

- Usability testing checks how easily a user can use the system. It is required to see how quickly or effortlessly the user is able to learn and run through the system.
- If the user cannot browse through the system easily, the user might lose interest in the application and it will, in turn, affect customer satisfaction.

### **Compatibility Testing ( we have already covered)**

- The system should be able to run efficiently, meeting all its functionalities without any issues on the desired platform or device. This compatibility check with different devices, operating systems, or browsers is done using compatibility testing.

### **Non-Functional Testing Automation Tools**

**JMeter** – Apache JMeter is a performance testing tool written in JAVA. It is open-source software, freely available, and platform-independent. Moreover, it supports integration with Selenium, it can also be used as a unit testing tool.

**LoadRunner** – Like JMeter, LoadRunner is also a performance testing tool and, can be used as a unit and integration testing tool. It is a market leader when it comes to performance testing. LoadRunner also supports scripts from JMeter and Selenium by declaring an interface library. It is not free but allows a certain number of users in the trial version.

**NeoLoad** – It is a performance testing tool written in JAVA. They have different pricing plans and one of them is free, but it comes with a limited set of users. It also supports existing Selenium scripts written in JAVA.

**WebLOAD Professional** – Another performance testing tool that has various pricing plans, and like NeoLoad it comes with a free plan with a limited set of users. It also supports Selenium and Perfecto Mobile.

**LoadTracer** – It is a performance testing tool developed in C language by Trace Technologies Pvt. Ltd. Currently, it is freely available.

### **Advantages of Non-functional testing**

- It provides a higher level of security. Security is a fundamental feature due to which system is protected from cyber-attacks.
- It ensures the loading capability of the system so that any number of users can use it simultaneously.
- It improves the performance of the system.

- Test cases are never changed so do not need to write them more than once.
- Overall time consumption is less as compared to other testing processes.

### **Disadvantages of Non-Functional Testing**

- Every time the software is updated, non-functional tests are performed again.
- Due to software updates, people have to pay to re-examine the software; thus software becomes very expensive.

### **What is Performance testing?**

- Performance testing is a discipline where we test our system to evaluate the system performance when subjected to virtual user load.

### **How is Load Testing different from Stress Testing?**

- **Load Testing:** It is the simplest form of testing which is done by increasing load step by step to reach the defined limit or goal.
- **Stress Testing:** We can also call it as negative testing as we test the system beyond its capacity to find out the break point of the system.

### **What is concurrent user load in performance testing?**

- Concurrent user load can be defined as when multiple users hit to any functionality or transaction at the same time.