

# What is Load testing in software testing? Examples, How To Do, Importance, Differences

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Load testing is a type of **non-functional testing**. A load test is type of **software testing** which is conducted to understand the behavior of the application under a specific expected load. Load testing is performed to determine a system's behavior under both normal and at peak conditions.

Load testing one among the different kinds of **performance testing** that determines the performance of the system in real time load conditions. It is basically used to ensure that the application performs satisfactorily when many users try to access or use it at the same time.

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2. Code change could affect the performance of the application

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Difference Between: Load Testing vs Stress Testing

Other popular articles:

## What is Load Testing?

- Load testing is used to identify whether the infrastructure used for hosting the application is sufficient or not
- It is used to find if the performance of the application is sustainable when it is at the peak of its user load
- It tells us how many simultaneous users can the application handle and the scale of the application required in terms of hardware, network capacity etc., so that more users could access the application
- It helps to identify the maximum operating capacity of an application as well as any bottlenecks and determine which element is causing degradation. E.g. If the number of users are increased then how much CPU, memory will be consumed, what is the network and bandwidth response time.

Iterative model

Spiral model

Prototype Model

Software Testing Levels

Unit testing

Component testing

Integration testing

Big Bang integration testing

Incremental testing

Component integration testing

System integration testing

System testing

Acceptance testing

Alpha testing

Beta testing

Software Test Types

Functional testing

Non functional testing

Functionality testing

Reliability testing

Usability testing

Efficiency testing

Maintainability testing

Portability testing

Baseline testing

Compliance testing

Documentation testing

Endurance testing

Load testing

Performance testing

Compatibility testing

Security testing

Scalability testing

Volume testing

Stress testing

Difference between Volume, Load and stress testing in software

Recovery testing

Internationalization testing and

Localization testing

Confirmation testing

Regression testing

Structural testing

# What Is Load Testing?

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- Load testing can be done under controlled lab conditions to compare the capabilities of different systems or to accurately measure the capabilities of a single system.
- Load testing involves simulating real-life user load for the target application. It helps you determine how your application behaves when multiple users hits it simultaneously.
- Load testing differs from **stress testing**, which evaluates the extent to which a system keeps working when subjected to extreme work loads or when some of its hardware or software has been compromised.
- The primary goal of load testing is to **define the maximum amount** of work a system can handle without significant performance degradation.
- Load testing falls under the category – **non-functional testing**. Its mainly used for testing the performance of Client/Server and applications which are web based.
- In many organizations load testing is performed at the end of the **software development life cycle** while some organization do not perform load testing at all. In case there are performance issues in the application, this could result in loss of revenue to the customer.

## Examples of load testing include

- Downloading a series of large files from the internet
- Running multiple applications on a computer or server simultaneously
- Assigning many jobs to a printer in a queue
- Subjecting a server to a large amount of traffic

Maintenance Testing

Impact analysis

Chapter 3. Static Techniques

Test design techniques

Static test technique

What is static Testing?

Uses of Static Testing

Informal reviews

Formal reviews

The roles and responsibilities of the moderator, author, scribe, reviewers and managers involved during a review

Types of review

Walkthrough

Technical review

Inspection

What is static analysis?

What is a static analysis tools?

Chapter 4. Test design techniques

Test analysis

Traceability

Test design

Test implementation

Test design technique

Categories of test design techniques

Static testing techniques

Dynamic testing technique

i. Black box testing or Specification-based

Equivalence partitioning (EP)

Boundary Value Analysis (BVA)

why it is important to do both EP and BVA

Decision tables

State transition testing

Use case testing

ii. White box testing or Structure-based

iii. Experience-based testing

Error guessing

- Writing and reading data to and from a hard disk continuously

## Types of Load Testing Tools

Load testing could be done manually as well as by using an automation testing tools:

### 1. Load testing performed manually

This type of load testing is done manually hence it cannot provide enough stress on the application. Also, it could be very expensive to do load testing manually as it requires lot of manpower.

### 2. Load testing tools developed within the company

An organization could build its own proprietary tools to perform load testing on its applications.

### 3. Load testing tools (Open source)

These tools are available free for charge but they are not as classy as licensed load testing tools mentioned below. Most commonly used open source load testing tool is Jmeter.

### 4. Licensed load testing tools (Enterprise)

Licensed load testing tools support many protocols so that load testing could be performed on many different types of applications such as ERP/CRM, Streaming Media etc. Also they are able to mimic a lot of virtual users. Most commonly used licensed load testing tool is Loadrunner.

## Process – How To Do Load Testing?

The process of load testing involves the following steps:

Exploratory testing

Structure based technique

Test coverage

Where to apply this test coverage?

Why to measure code coverage?

How we can measure the coverage?

Types of coverage

Statement coverage

Branch Coverage or Decision Coverage

Condition coverage

How to choose that which technique is best?

Chapter 5. Test management

Roles and responsibilities of a Test Leader

Roles and responsibilities of a Tester

Purpose and importance of test plans

Things to keep in mind while planning tests

What testing will involve and what it will cost?

Estimation techniques

Factors affecting test effort

Test strategy

Test monitoring

Test control

Configuration management

Risks in software testing

Product risk

Project risk

Risk-based testing

Risk analysis

Incident management

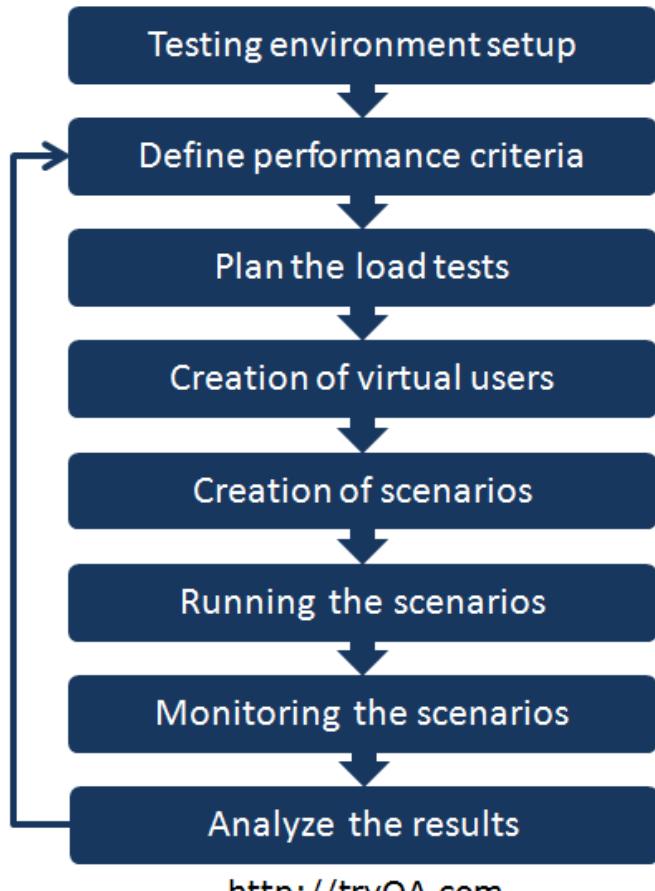
Incident logging Or How to log an Incident

What are incident reports?

How to write a good incident report?

What is test status report?

## How To Do Load Testing?



### 1. Test environment setup

In this step the test environment for the load test is setup. The test environment should be setup as close to the production environment as possible in terms of hardware, network, software specifications etc

### 2. Define performance criteria

Performance metrics for the load test are defined in this step and success criteria are finalized. This can include defining acceptable limits on throughput, response time, transactions etc

### 3. Planning the test

It involves development of a clearly defined load test plan and setting up the test environment.

### 4. Creation of virtual users (vuser)

Involves creation of Vuser scripts which contain various tasks performed by every vuser. Tasks performed by vusers could be measured as transactions.

### 5. Creation of scenarios

A scenario is a combination of machines (agents), scripts, and vusers that run during a testing session. In Loadrunner, scenarios are created using Loadrunner controller. Scenarios could be of two types: manual and goal oriented.

## Chapter 6. Tool support for testing

### Types of test tools

Tool for management of testing and tests

#### Test management tools

#### Requirements management tools

#### Incident management tools

#### Configuration management tools

Static testing tools

#### Review process support tools

#### Static analysis tools (D)

#### Modelling tools (D)

Test specification tools

#### Test design tools

#### Test data preparation tools

Test execution and logging tools

#### Test execution tools

#### Test harness/ Unit test framework tools (D)

#### Test comparators

#### Coverage measurement tools (D)

#### Security tools

Performance and monitoring tools

#### Dynamic analysis tools (D)

#### Performance testing, Load testing and stress-testing tools

#### Monitoring tools

#### Advantages and benefits of using testing tools

#### Disadvantages and risks of testing tools

#### Factors for software testing tool selection

#### Proof-of-concept or piloting phase for tool evaluation

## 6. Running the scenario

The load on the server is emulated by running multiple vusers to perform the tasks simultaneously. Before running the scenario, scenario configuration and scheduling need to be set up. We can run the entire scenario, vuser groups or individual vusers.

## 7. Monitoring the scenario

Scenario could be monitored using the Loadrunner online monitors such as run-time transaction, system resource, web resource, network delay etc.

## 8. Analyzing test results

This is the most important step in load testing process. In this step tester analyzes the performance bottlenecks using graphs and reports generated during scenario execution. Load test may have to be repeated after fixing issues identified in the load test.

## Why is load testing important?

Load testing is important because of the following reasons:

### Why is Load Testing important?

- Load testing simulates real user scenarios
- Code change could affect the performance of the application
- Load testing saves money and indirectly generates revenue

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### 1. Load testing simulates real user scenarios

While testing the website or an app under a load, tester is actually simulating how it will perform when hundreds, thousands or even millions of users visit it in real time.

The application might perform well for one user during functional testing but its performance might degrade when many users try to access it simultaneously during load testing due to lack of system resources.

Therefore it is better to load test to understand, analyze and fix bugs before they actually happen in real time.

## **2. Code change could affect the performance of the application**

Even if you performed load testing as part of the testing process few months ago but if the code got changed several times after that then it is better to perform load testing again. All the changes that have been made to the code after your load testing might have affected the system's ability to handle load.

To make sure that the end user is not surprised by the system's performance, it is good to run an automated load test as part of continuous integration cycle.

## **3. Load testing saves money and indirectly generates revenue**

Hiring testers to do load tests could incur additional cost but the cost of fixing a website that crashes in real time is even more expensive.

### **Importance of Load Testing – Examples**

- Target.com lost \$780,000 in sales in just 3 hours when the site was down during a promotion in 2015
- When Amazon.com servers crashed in 2013 for 30 minutes, Amazon lost \$66,240 per minute
- In Sept 2010, Virgin Blue airlines experienced a series of outages and crashes for 11 days which resulted in its checkin, online booking, reservations and boarding systems being down. This lead to a loss of \$20 million in addition to thousands of frustrated customers. The company Navitaire, which managed reservation for Virgin Blue had to compensate Virgin Blue for \$20million.



- According to a survey, 75% users said that if a site crashed or if it was slow, they would leave the site

- 50% of the users said that they will shop elsewhere if the website or app did not load in 3 seconds
- As you can see, more people tend to purchase products during a promotional event like Black Friday, Cyber Monday, Diwali or when there is a promotional offer / discount etc
- More people tend to book flight tickets during holidays or on the days when an airline has an offer
- If your site crashes during such an event visitors may leave your website and go to a competitors website. This can lead to loss of revenue and market share.
- Such situations can be prevented by load testing the system and fixing any issues that are detected

## Advantages of Load Testing

- Issues related to performance and bottlenecks could be identified before production
- The system's scalability is improved in terms of database, software, network etc
- There is minimization of the risk associated with down time of the application / system
- Cost of failure is reduced and satisfaction of the customer is increased

## Disadvantages of Load Testing

- Testers need knowledge of tools and in some complex cases, the programming languages to perform load testing
- There is significant cost associated with load testing as tools may be expensive, additional resources with special knowledge of the testing tools may be required

## Load testing tools

The following includes open source as well as licensed load testing tools, but almost all the licensed tools have a free trial version so that the users get the chance to work hands-on before deciding which is the best tool for their needs:

### 1. Webload

Organization wide load and performance testing tool for web applications.

## 2. LoadUI NG Pro

LoadUI's easy-to-use graphical interface makes it simple for new users to setup load scenarios.

## 3. SmartMeter.io

It provides advanced testing features with Jmeter at its core.

## 4. Triscentis Flood

It is a cloud-based, distributed load testing tool.

## 5. Loadview

It is a fully managed, on-demand load testing tool that allows for completely hassle-free load and stress testing.

## 6. Apache Jmeter

It is an open source load testing tool and it is a Java platform application.

## 7. HP Loadrunner

This is an HP product which can be used as a load testing tool. It can handle and create thousands of virtual users at the same time.

## Load testing online (load testing from the cloud)

Cloud is a pay per use kind of a model. Moving load testing to the cloud brings benefits such as lower costs and support of distributed team.

It also allows to simulate millions of concurrent users from multiple geographic locations.

7 essential cloud-based load testing tools:

## 1. Load Impact

It is a SaaS based performance testing solution for modern DevOps teams.

## 2. Flood IO

It is a cloud based, distributed load testing solution that ensures applications run reliably before, during and after DevOps releases.

### 3. Loader

It is a free load testing service that allows you to stress test your web-apps and API's with thousands of concurrent connections.

### 4. Load storm

It is an easy and cost effective load testing tool for web and mobile applications.

### 5. Blazemeter

It is 100% compatible with Apache Jmeter and other open-source tools like Jenkins and Selenium Webdriver.

### 6. Load Focus

It is an easy and cost effective way to test websites, mobile/web applications, web services and API's.

### 7. Octoperf

It is a SaaS based performance testing tool powered by Jmeter for the web, API, REST and mobile app.

## Difference Between: Load Testing vs Stress Testing

### Load Testing

A load test is a planned test to perform a specified number of requests to a system in order to test the performance of the system.

### Stress Testing

A stress test is a test designed to increase the number of simultaneous requests on a system past a point where performance degrades, possibly even to a point of complete failure of the system.

The goal of a load test is to prove that a system can handle the expected

The goal of stress testing is to find the breaking point of the

number of concurrent users with minimal to acceptable performance degradation system and see where it crashes

In load testing, number of simultaneous users on a system are increased to a reasonable extent intention is to continue increasing load on the system until the resources are overloaded

Often times, when running the A load test and stress test are certainly not completely independent from one another upper boundaries of a load test, you may end up running a stress test where you push the system past the limits of available resources

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