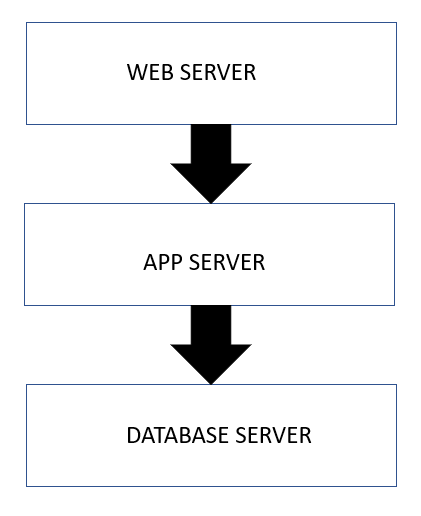
3-TIER ARCHITECTURE

**3-TIER ARCHITECTURE:**



3-tier architecture consists of three layers. They are:

* Web layer
* Application layer
* Database layer

WEB LAYER:

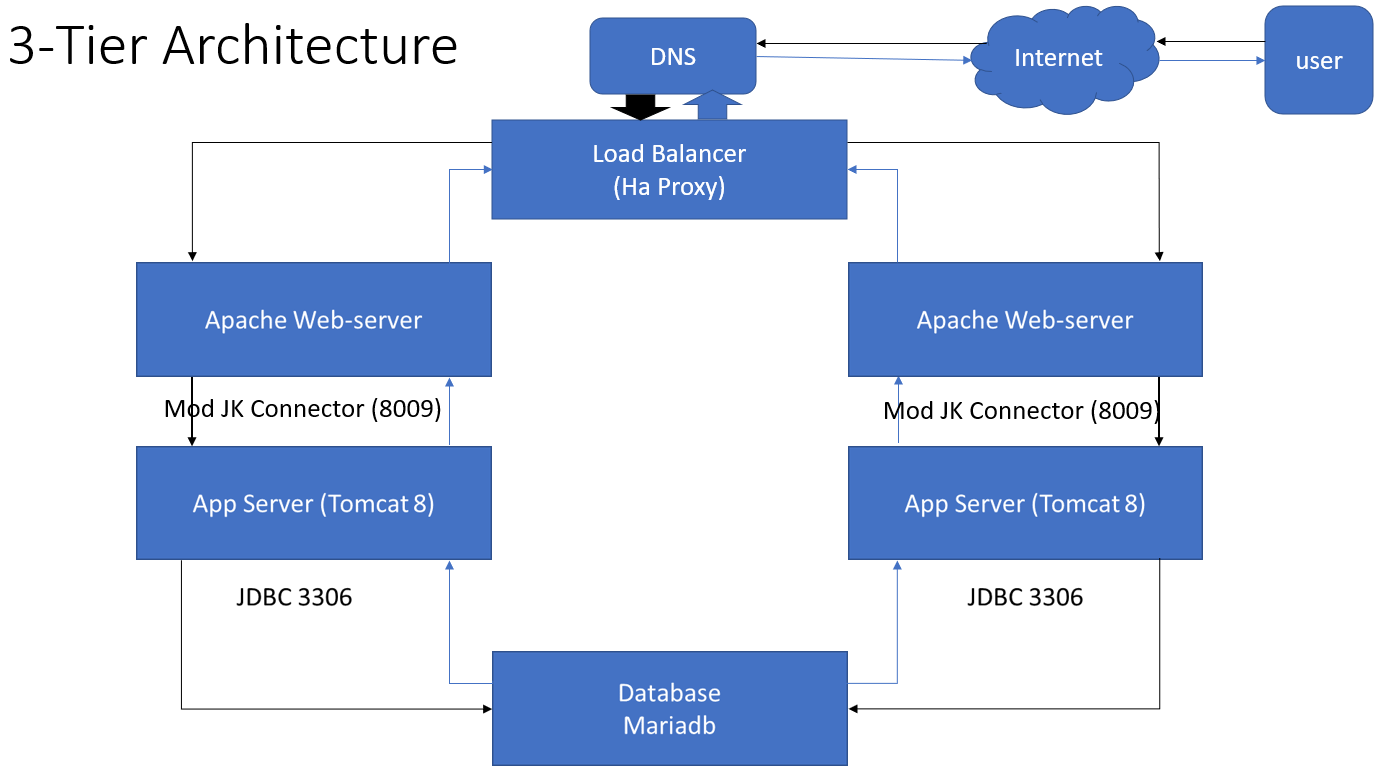
* Web server's basic job is to accept user requests and send responses to those requests.

APP LAYER:

* App layer takes the request from web layer and process the request

DATABASE LAYER:

* Database stores the data given by the user and also extract the data when user requires.



**Apache Web Server:**

* Apache Web server is one of the most popular web servers.
* It was developed by the Apache Software Foundation open source community.
* Most of the web server machines run the Apache web server.
* According to google almost 50% of web servers around the world runs on Apache web server.

**Apache Tomcat Server:**

* Apache Tomcat is an open source web server.
* It was developed by Apache Software Foundation. ASF executes Java servlets and JavaServer pages including JSP coding.
* Tomcat is developed and maintained by an open collaboration of developers.
* It is available in both binary and source versions from the Apache Web site.
* It requires a JRE (Java Runtime Enterprise) that conforms to JRE 1.1 or later.
* It can be used as its own internal web server or with other web servers like Apache, Netscape Enterprise Server, Microsoft Personal Web Server and Microsoft Internet Information Server (IIS).

Features of Apache Server

* Apache server is a free and an open source web server.
* It can be installed on all operating systems like Linux, Windows, Unix, FreeBSD, Solaris, Mac OS X etc.
* It is a powerful, flexible, HTTP/1.1 compliant web server.
* This server is highly configurable and extensible with third party modules.
* It provides complete source code and comes with an unrestricted license.
* Apache supports some of the capabilities like CGI (Common Gateway Interface) and SSI (Server Side Includes), URL redirection, loading modules support, user authentication, proxy caching abilities etc.
* It is also widely used in the software companies.

## MariaDB Database:

MariaDB is a popular fork of MySQL created by MySQL's original developers. It grew out of concerns related to MySQL's acquisition by Oracle. It offers support for both small data processing tasks and enterprise needs. It aims to be a drop-in replacement for MySQL requiring only a simple uninstall of MySQL and an install of MariaDB.

MariaDB is a relational database management system. It stores data in various tables. Primary keys and foreign keys are used to establish relationship between these tables.

### **Key Features of MariaDB:**

The important features of MariaDB are −

* All of MariaDB is under GPL, LGPL, or BSD.
* MariaDB includes a wide selection of storage engines, including high-performance storage engines, for working with other RDBMS data sources.
* MariaDB uses a standard and popular querying language.
* MariaDB runs on a number of operating systems and supports a wide variety of programming languages.
* MariaDB offers support for PHP, one of the most popular web development languages.
* MariaDB offers Galera cluster technology.
* MariaDB also offers many operations and commands unavailable in MySQL, and eliminates/replaces features impacting performance negatively.

**LOAD BALANCER:**

Load balancing is a key component of highly-available infrastructures commonly used to improve the performance and reliability of web sites, applications, databases and other services by distributing the workload across multiple servers.

**Load balancing** refers to efficiently distributing incoming network traffic across a group of backend servers, also known as a server farm or server pool.

HAPROXY serves as a load balancer which is widely used in the companies.

## DNS:

The domain name system (DNS) connects URLs with their IP address. With DNS, it’s possible to type words instead of a string of numbers into a browser, allowing people to search for websites and send emails using familiar names. When you search for a [domain name](https://www.namecheap.com/) in a browser, it sends a query over the internet to match the domain with its corresponding IP. Once located, it uses the IP to retrieve the website’s content. Most impressively, this whole process takes just milliseconds.

**Connectors:**

Connectors are used to establish connection between the servers.

**Mod\_jk connector:**

The mod\_jk connector is an Apache HTTPD module that allows HTTPD to communicate with Apache Tomcat instances over the AJP protocol.  The module is used in conjunction with Tomcat's AJP Connector component.

**Mod-JK Configuration:**

cd /etc/apache2/

vim workers.properties

worker.list=worker1

worker.worker1.type=ajp13

worker.worker1.host=<IP-ADDRESS-OF-TOMCAT-SERVER>

worker.worker1.port=8009

vim /etc/apache2/mods-available/jk.conf

JkWorkersFile /etc/apache2/workers.properties

JkLogFile /var/log/apache2/mod\_jk.log

vim /etc/apache2/sites-enabled/000-default.conf

JkMount /studentapp\* worker1

**Java database connectivity (JDBC):**

**Java Database Connectivity** (**JDBC**) is an [application programming interface](https://en.wikipedia.org/wiki/Application_programming_interface) (API) for the programming language [Java](https://en.wikipedia.org/wiki/Java_(programming_language)), which defines how a client may access a [database](https://en.wikipedia.org/wiki/Database). It is a Java-based data access technology used for Java database connectivity. It is part of the [Java Standard Edition](https://en.wikipedia.org/wiki/Java_Standard_Edition) platform, from [Oracle Corporation](https://en.wikipedia.org/wiki/Oracle_Corporation). It provides methods to query and update data in a database, and is oriented toward [relational databases](https://en.wikipedia.org/wiki/Relational_database). A JDBC-to-[ODBC](https://en.wikipedia.org/wiki/ODBC) bridge enables connections to any ODBC-accessible data source in the [Java virtual machine](https://en.wikipedia.org/wiki/Java_virtual_machine) (JVM) host environment.

**JDBC Connection:**

Update context.xml for DB Connections

vim /var/lib/tomcat8/conf/context.xml

Add the following config just before the last line

<Resource name="jdbc/TestDB" auth="Container" type="javax.sql.DataSource"

maxActive="50" maxIdle="30" maxWait="10000"

username="student" password="student@1"

driverClassName="com.mysql.jdbc.Driver"

url="jdbc:mysql://<IP ADDRESS OF DB SERVER>:3306/studentapp"/>

## Scaling:

Scaling is the process of increasing or decreasing the capacity of the system by changing the number of processes available to service requests. Scaling out a system provides additional capacity, while scaling in a system reduces capacity. Scaling is also a critical part of configuring a deployment for high availability.

Methods of adding more resources for a particular application fall into two broad categories:

* Scale vertically (scale up)
* Scale horizontally (scale out)

### **Scale up:**

“Scale up” is when you upgrade a machine to a more powerful machine (e.g. faster CPU, faster GPU, engine with more HP, etc…) to get more processing power.

To scale vertically (or scale up) means to add:

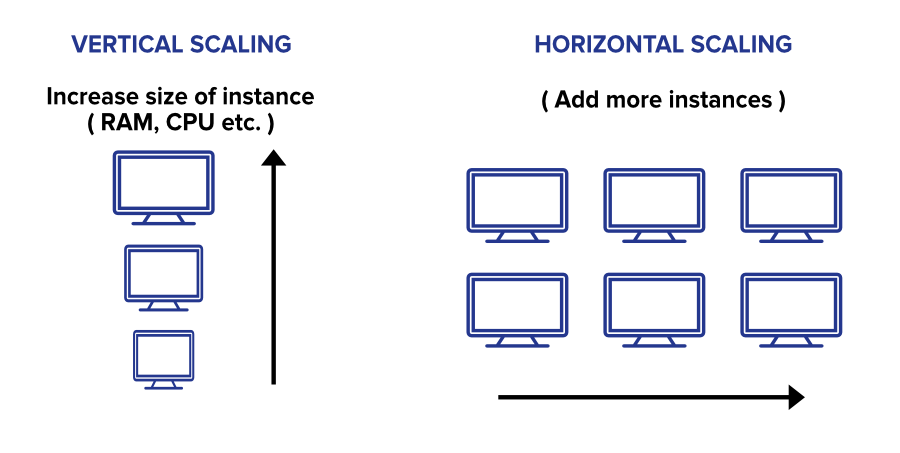
* resources (addition of CPUs or memory)
* or process (addition of the same process)

to a single node in a system.

### **Scale out:**

“Scale out” is when you increase the number of processing machines (computers, processors, servers, etc) to increase processing power.

To scale horizontally (or scale out) means to add more nodes to a system, such as adding a new computer to a distributed software application.



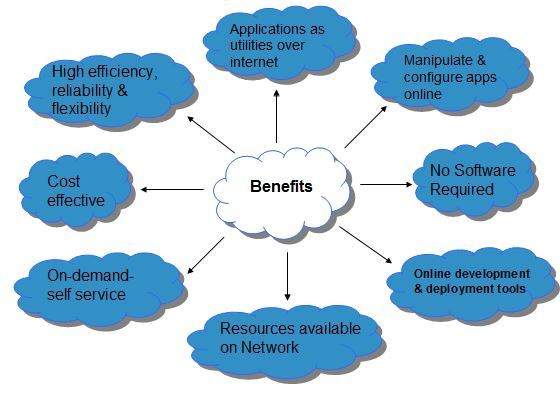
**Cloud:**

The term **Cloud** refers to a **Network** or **Internet.** In other words, we can say that Cloud is something, which is present at remote location. Cloud can provide services over public and private networks, i.e., WAN, LAN or VPN.

Cloud Computing provides us means of accessing the applications as utilities over the Internet. It allows us to create, configure, and customize the applications online.

Cloud Computing refers to **manipulating, configuring,** and **accessing** the hardware and software resources remotely. It offers online data storage, infrastructure, and application.

## Benefits



All though there are so many cloud based technologies, these 3 are widely used clouds. They are:

* AWS (Amazon Web Services)
* Microsoft Azure
* Google Cloud Platform (GCP)

**Note:**

In our project we have used Google Cloud Platform.

**GCP Servers:**

