

# Cloud Computing Overview

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.

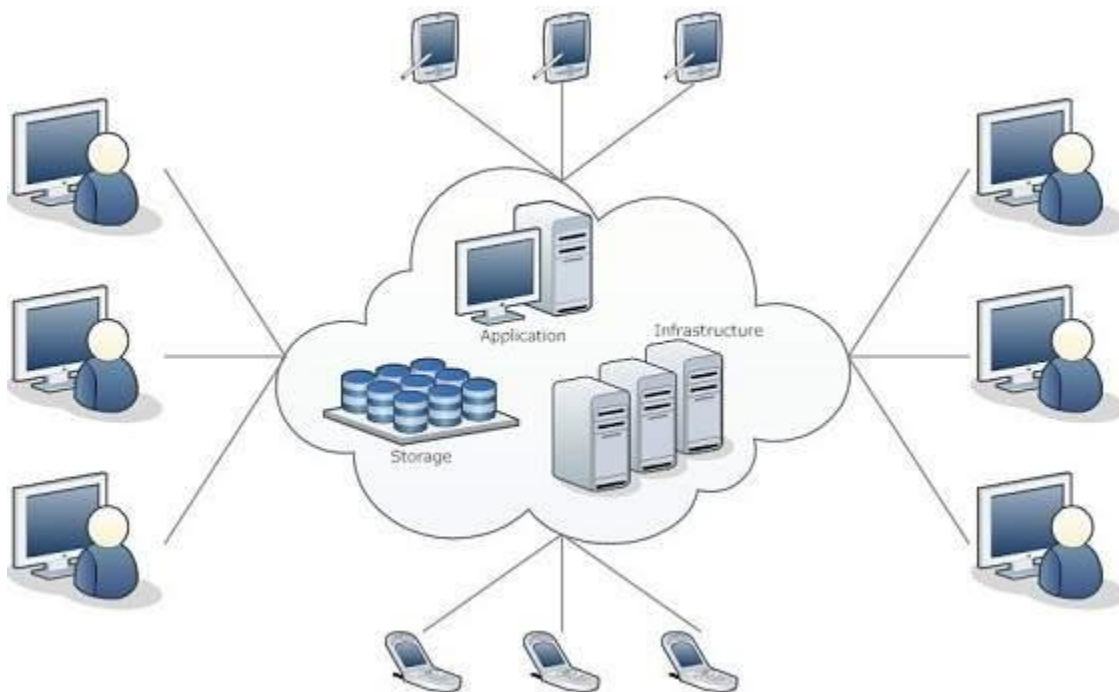
## *What is Cloud?*

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.

Applications such as e-mail, web conferencing, customer relationship management (CRM) execute on cloud.

## *What is Cloud Computing?*

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



Cloud computing offers **platform independency**, as the software is not required to be installed locally on the PC. Hence, the Cloud Computing is making our business applications **mobile** and **collaborative**.

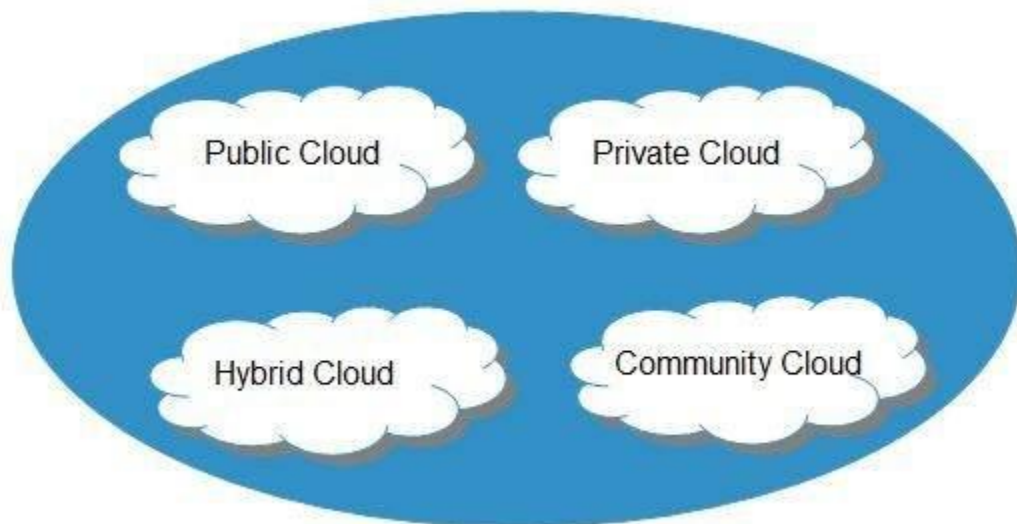
## *Basic Concepts*

There are certain services and models working behind the scene making the cloud computing feasible and accessible to end users. Following are the working models for cloud computing:

- Deployment Models
- Service Models

### Deployment Models

Deployment models define the type of access to the cloud, i.e., how the cloud is located? Cloud can have any of the four types of access: Public, Private, Hybrid, and Community.



#### *Public Cloud*

The **public cloud** allows systems and services to be easily accessible to the general public. Public cloud may be less secure because of its openness.

#### *Private Cloud*

The **private cloud** allows systems and services to be accessible within an organization. It is more secured because of its private nature.

#### *Community Cloud*

The **community cloud** allows systems and services to be accessible by a group of organizations.

### Hybrid Cloud

The **hybrid cloud** is a mixture of public and private cloud, in which the critical activities are performed using private cloud while the non-critical activities are performed using public cloud.

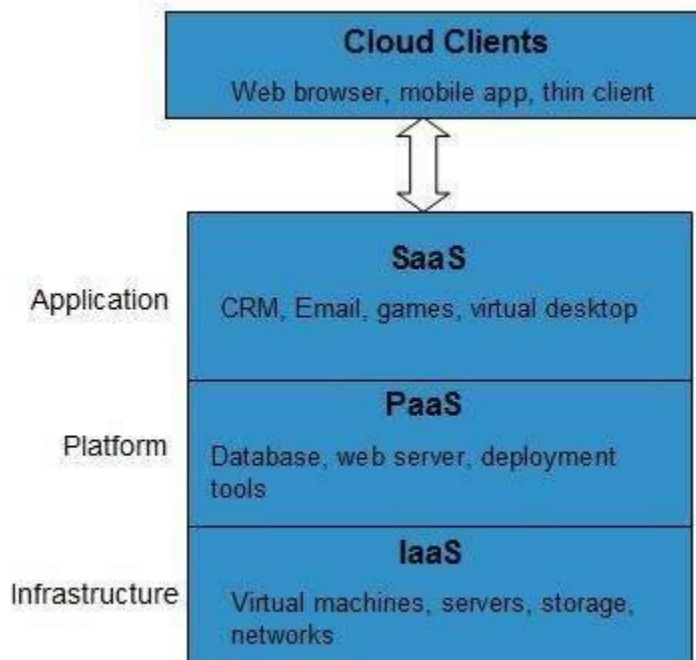
### Service Models

Cloud computing is based on service models. These are categorized into three basic service models which are -

- Infrastructure-as-a-Service (IaaS)
- Platform-as-a-Service (PaaS)
- Software-as-a-Service (SaaS)

**Anything-as-a-Service (XaaS)** is yet another service model, which includes Network-as-a-Service, Business-as-a-Service, Identity-as-a-Service, Database-as-a-Service or Strategy-as-a-Service.

The **Infrastructure-as-a-Service (IaaS)** is the most basic level of service. Each of the service models inherit the security and management mechanism from the underlying model, as shown in the following diagram:



### Infrastructure-as-a-Service (IaaS)

**IaaS** provides access to fundamental resources such as physical machines, virtual machines, virtual storage, etc.

## Platform-as-a-Service (PaaS)

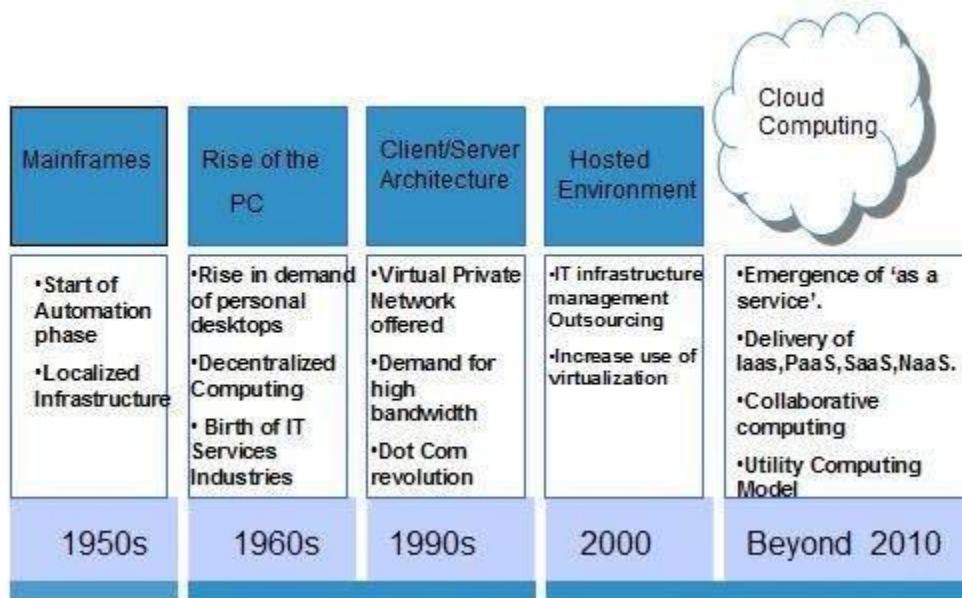
**PaaS** provides the runtime environment for applications, development and deployment tools, etc.

## Software-as-a-Service (SaaS)

**SaaS** model allows to use software applications as a service to end-users.

## History of Cloud Computing

The concept of **Cloud Computing** came into existence in the year 1950 with implementation of mainframe computers, accessible via **thin/static clients**. Since then, cloud computing has been evolved from static clients to dynamic ones and from software to services. The following diagram explains the evolution of cloud computing:

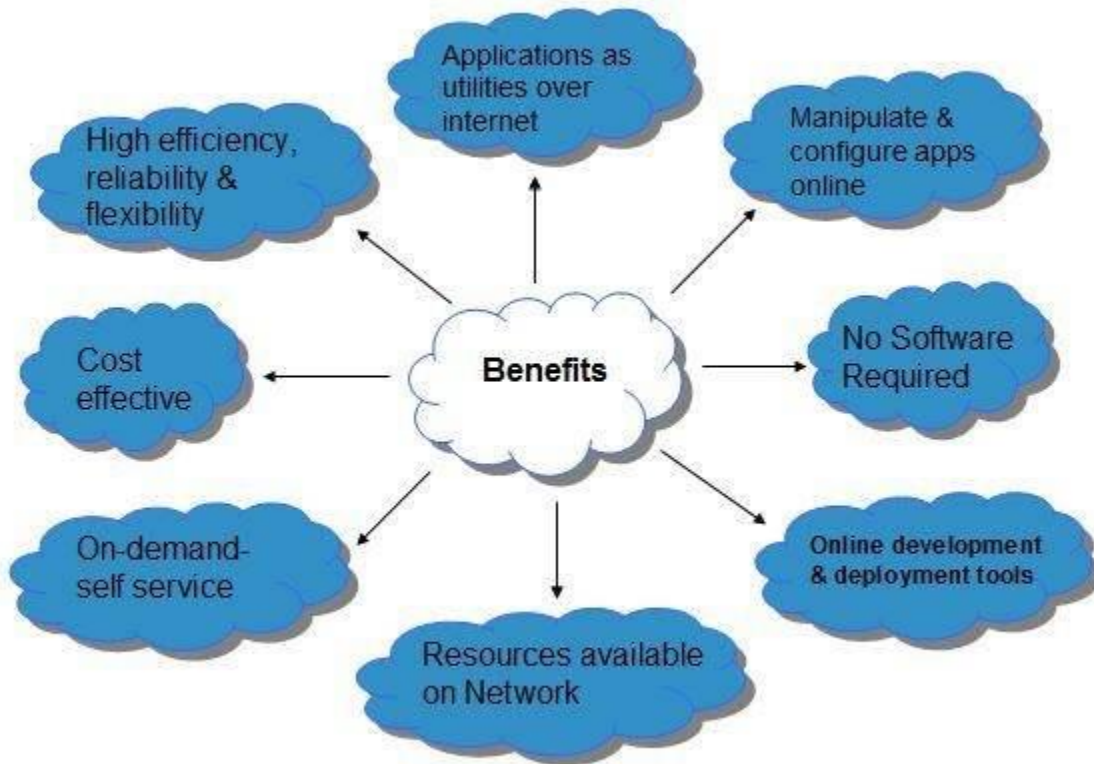


## Benefits

Cloud Computing has numerous advantages. Some of them are listed below -

- One can access applications as utilities, over the Internet.
- One can manipulate and configure the applications online at any time.
- It does not require to install a software to access or manipulate cloud application.
- Cloud Computing offers online development and deployment tools, programming runtime environment through **PaaS model**.
- Cloud resources are available over the network in a manner that provide platform independent access to any type of clients.

- Cloud Computing offers **on-demand self-service**. The resources can be used without interaction with cloud service provider.
- Cloud Computing is highly cost effective because it operates at high efficiency with optimum utilization. It just requires an Internet connection
- Cloud Computing offers load balancing that makes it more reliable.



## ***Risks related to Cloud Computing***

Although cloud Computing is a promising innovation with various benefits in the world of computing, it comes with risks. Some of them are discussed below:

### **Security and Privacy**

It is the biggest concern about cloud computing. Since data management and infrastructure management in cloud is provided by third-party, it is always a risk to handover the sensitive information to cloud service providers.

Although the cloud computing vendors ensure highly secured password protected accounts, any sign of security breach may result in loss of customers and businesses.

### Lock In

It is very difficult for the customers to switch from one **Cloud Service Provider (CSP)** to another. It results in dependency on a particular CSP for service.

### Isolation Failure

This risk involves the failure of isolation mechanism that separates storage, memory, and routing between the different tenants.

### Management Interface Compromise

In case of public cloud provider, the customer management interfaces are accessible through the Internet.

### Insecure or Incomplete Data Deletion

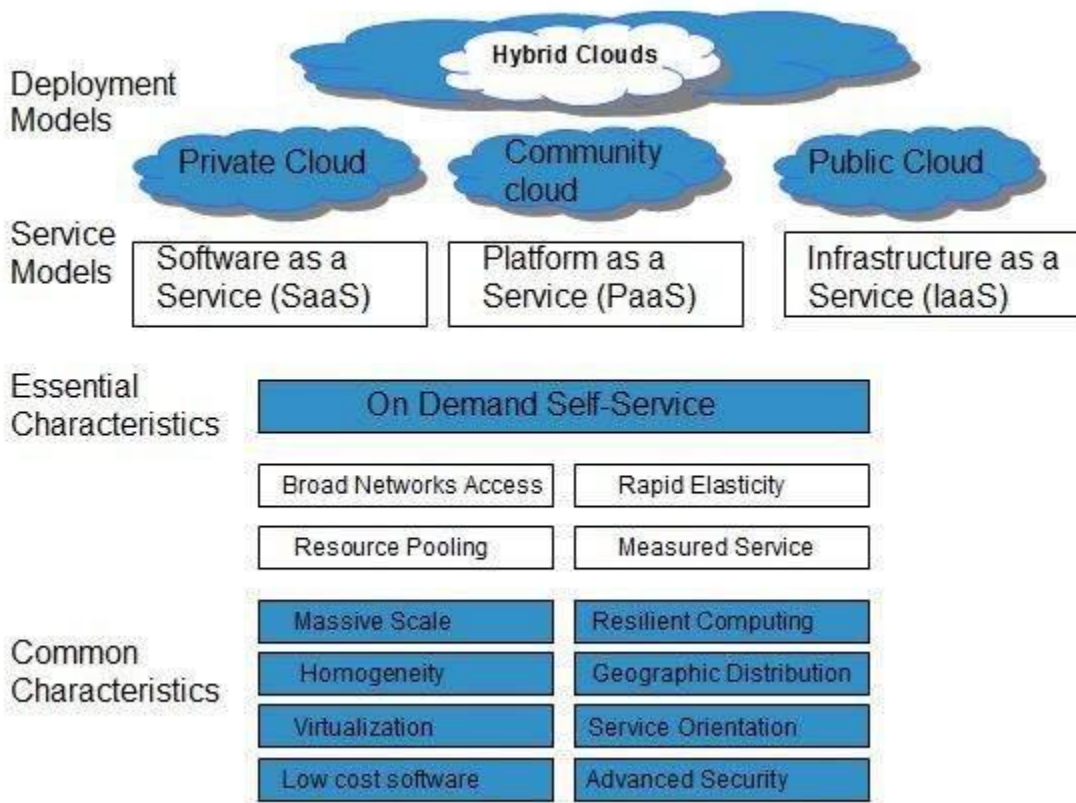
It is possible that the data requested for deletion may not get deleted. It happens because either of the following reasons

- Extra copies of data are stored but are not available at the time of deletion
- Disk that stores data of multiple tenants is destroyed.

## *Characteristics of Cloud Computing*

There are four key characteristics of cloud computing. They are shown in the following diagram:





## On Demand Self Service

Cloud Computing allows the users to use web services and resources on demand. One can login to a website at any time and use them.

## Broad Network Access

Since cloud computing is completely web based, it can be accessed from anywhere and at any time.

## Resource Pooling

Cloud computing allows multiple tenants to share a pool of resources. One can share single physical instance of hardware, database and basic infrastructure.

## Rapid Elasticity

It is very easy to scale the resources vertically or horizontally at any time. Scaling of resources means the ability of resources to deal with increasing or decreasing demand.

The resources being used by customers at any given point of time are automatically monitored.

## Measured Service

In this service cloud provider controls and monitors all the aspects of cloud service. Resource optimization, billing, and capacity planning etc. depend on it.

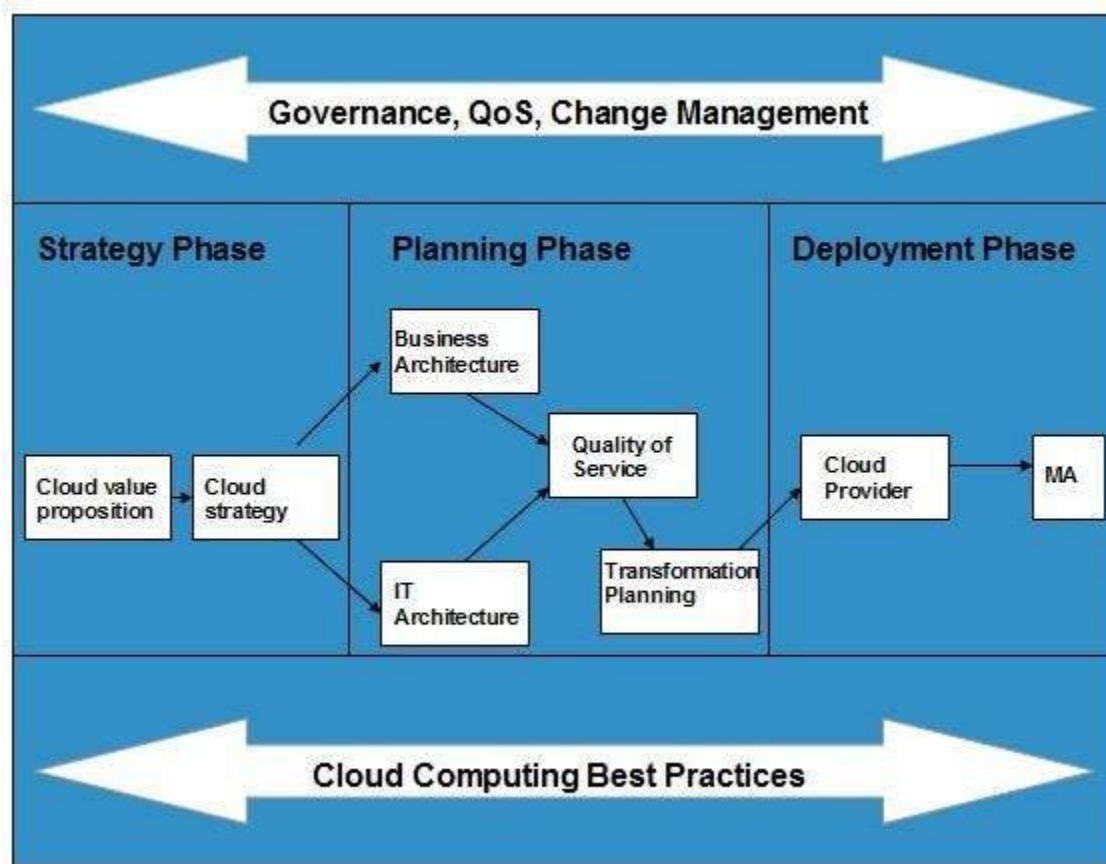
## Cloud Computing Planning

Before deploying applications to cloud, it is necessary to consider your business requirements. Following are the issues one must consider:

- Data Security and Privacy Requirement
- Budget Requirements
- Type of cloud - public, private or hybrid
- Data backup requirements
- Training requirements
- Dashboard and reporting requirements
- Client access requirements
- Data export requirements

To meet all of these requirements, it is necessary to have well-compiled planning. In this tutorial, we will discuss the various planning phases that must be practised by an enterprise before migrating the entire business to cloud. Each of these planning phases are described in the following diagram:





## ***Strategy Phase***

In this phase, we analyze the strategy problems that customer might face. There are two steps to perform this analysis:

- Cloud Computing Value Proposition
- Cloud Computing Strategy Planning

### **Cloud Computing Value Proposition**

In this, we analyze the factors influencing the customers when applying cloud computing mode and target the key problems they wish to solve. These key factors are:

- IT management simplification
- operation and maintenance cost reduction
- business mode innovation
- low cost outsourcing hosting
- high service quality outsourcing hosting.

All of the above analysis helps in decision making for future development.

## **Cloud Computing Strategy Planning**

The strategy establishment is based on the analysis result of the above step. In this step, a strategy document is prepared according to the conditions a customer might face when applying cloud computing mode.

## ***Planning Phase***

This step performs analysis of problems and risks in the cloud application to ensure the customers that the cloud computing is successfully meeting their business goals. This phase involves the following planning steps:

- Business Architecture Development
- IT Architecture development
- Requirements on Quality of Service Development
- Transformation Plan development

### **Business Architecture Development**

In this step, we recognize the risks that might be caused by cloud computing application from a business perspective.

### **IT Architecture Development**

In this step, we identify the applications that support the business processes and the technologies required to support enterprise applications and data systems.

### **Requirements on Quality of Service Development**

Quality of service refers to the non-functional requirements such as reliability, security, disaster recovery, etc. The success of applying cloud computing mode depends on these non-functional factors.

### **Transformation Plan Development**

In this step, we formulate all kinds of plans that are required to transform current business to cloud computing modes.

## ***Deployment Phase***

This phase focuses on both of the above two phases. It involves the following two steps:

- Selecting Cloud Computing Provider
- Maintenance and Technical Service

## **Selecting Cloud Computing Provider**

This step includes selecting a cloud provider on basis of Service Level Agreement (SLA), which defines the level of service the provider will meet.

## **Maintenance and Technical Service**

Maintenance and Technical services are provided by the cloud provider. They need to ensure the quality of services.

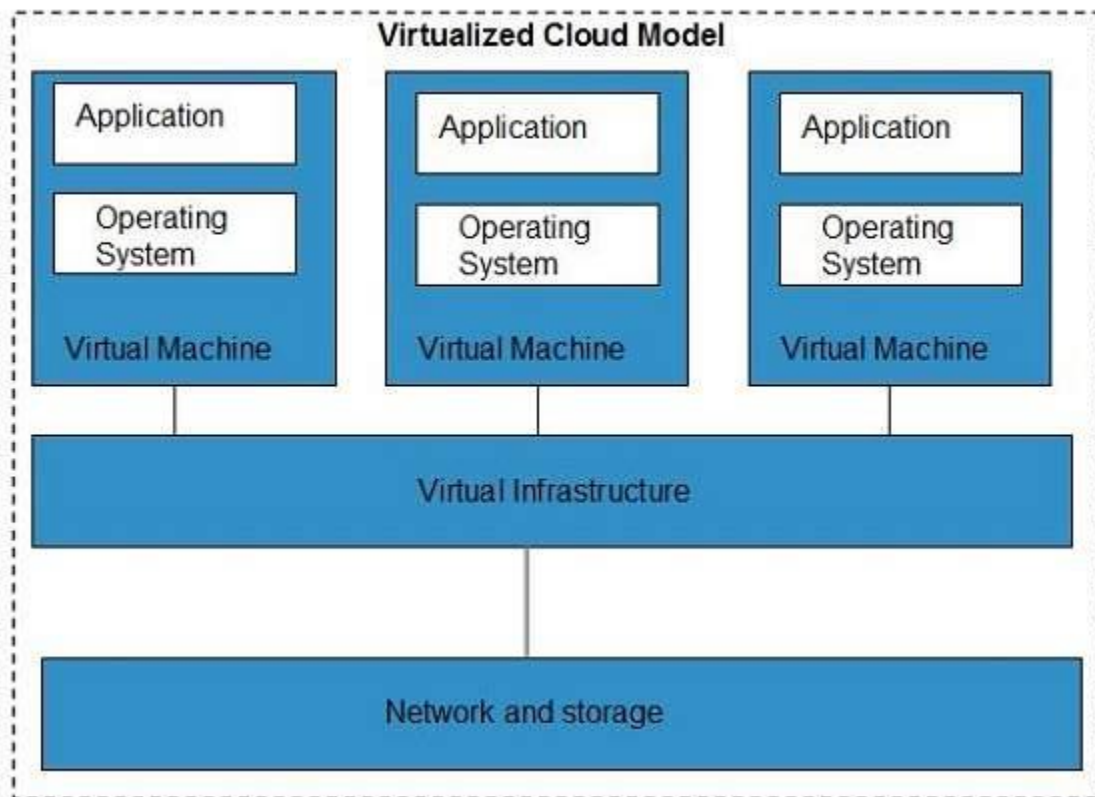
## Cloud Computing Technologies

There are certain technologies working behind the cloud computing platforms making cloud computing flexible, reliable, and usable. These technologies are listed below:

- Virtualization
- Service-Oriented Architecture (SOA)
- Grid Computing
- Utility Computing

### Virtualization

**Virtualization** is a technique, which allows to share single physical instance of an application or resource among multiple organizations or tenants (customers). It does this by assigning a logical name to a physical resource and providing a pointer to that physical resource when demanded.

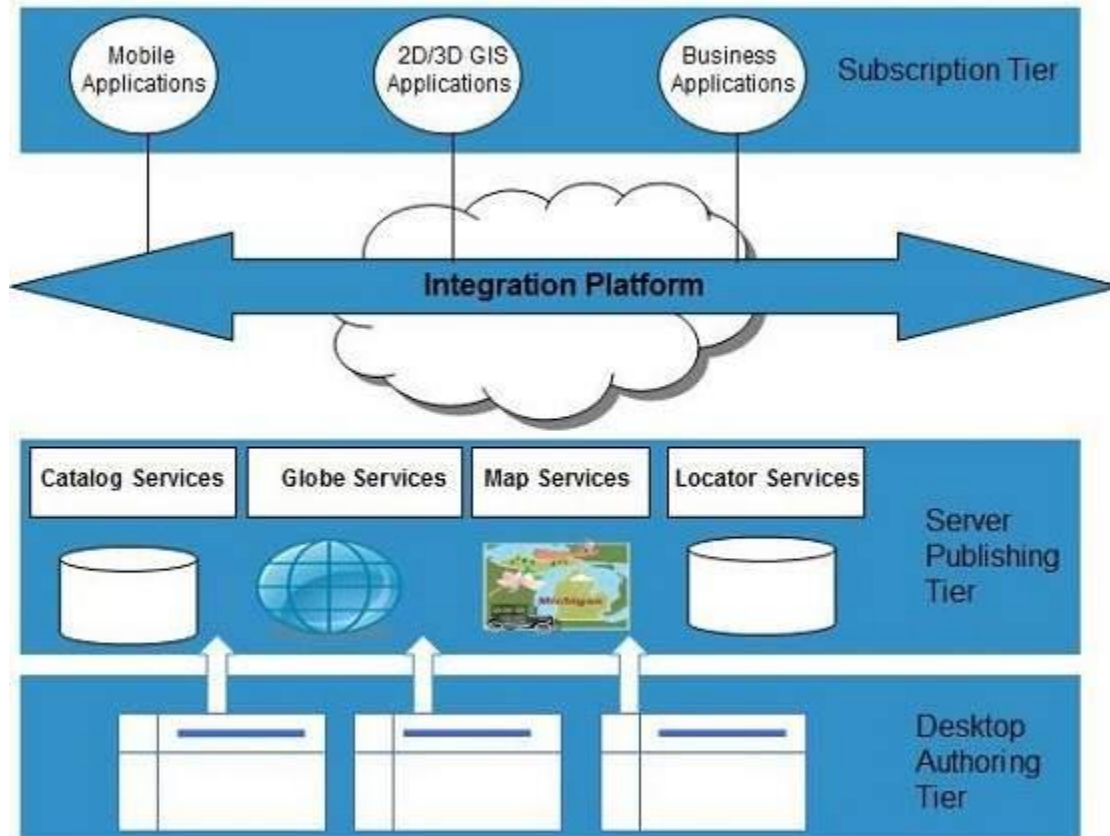


The **Multitenant** architecture offers **virtual isolation** among the multiple tenants. Hence, the organizations can use and customize their application as though they each have their instances running.

## Service-Oriented Architecture (SOA)

Service-Oriented Architecture helps to use applications as a service for other applications regardless the type of vendor, product or technology. Therefore, it is possible to exchange the data between applications of different vendors without additional programming or making changes to services.

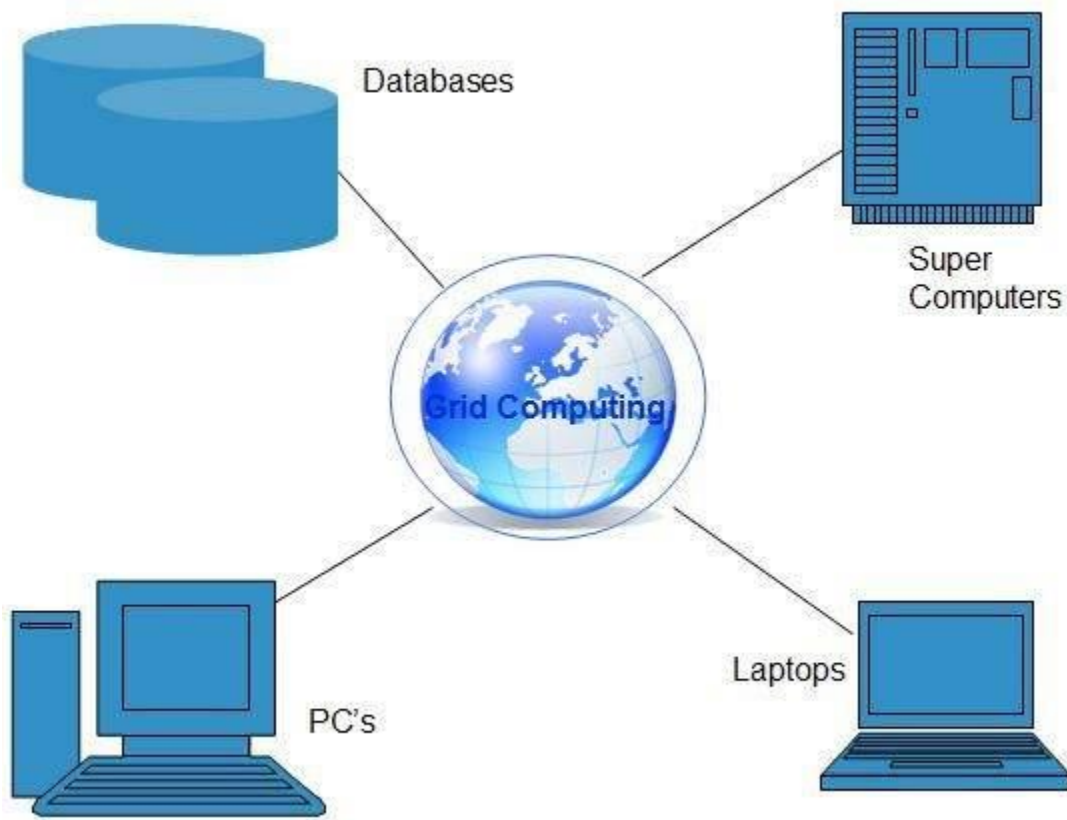
The cloud computing service oriented architecture is shown in the diagram below.



## Grid Computing

**Grid Computing** refers to distributed computing, in which a group of computers from multiple locations are connected with each other to achieve a common objective. These computer resources are heterogeneous and geographically dispersed.

Grid Computing breaks complex task into smaller pieces, which are distributed to CPUs that reside within the grid.



## *Utility Computing*

Utility computing is based on **Pay-per-Use model**. It offers computational resources on demand as a metered service. Cloud computing, grid computing, and managed IT services are based on the concept of utility computing.