

## Experiment No. 1

**Aim:** Study of Basic Concepts of Cloud Computing

### Theory:

- Cloud computing is the on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user.
- The term is generally used to describe data centers available to many users over the Internet.
- Large clouds, predominant today, often have functions distributed over multiple locations from central servers. If the connection to the user is relatively close, it may be designated an edge server.
- Clouds may be limited to a single organization (enterprise clouds, or be available to multiple organizations (public cloud).
- Cloud computing relies on sharing of resources to achieve coherence and economies of scale.

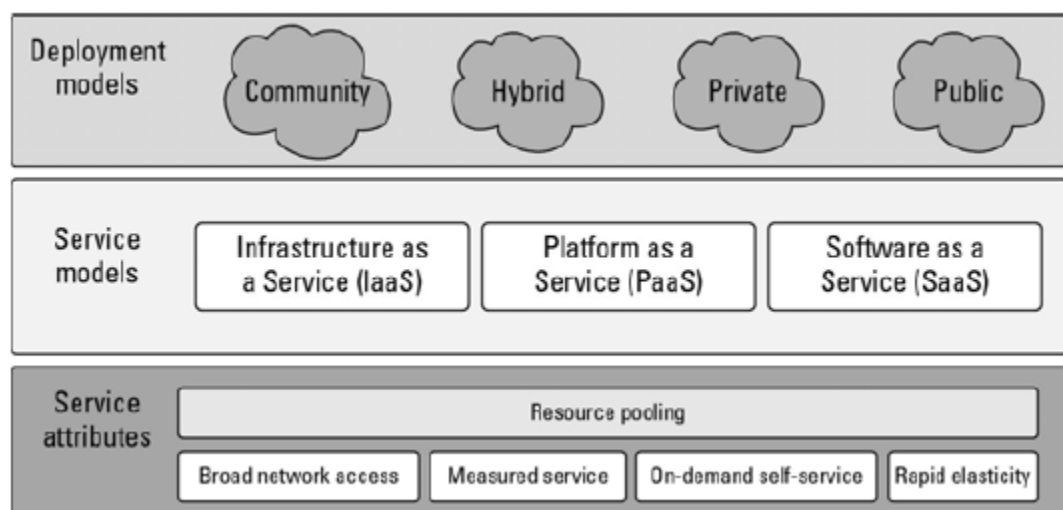
### According to Amazon

- Cloud computing is the on-demand delivery of IT resources over the Internet with pay-as-you-go pricing. Instead of buying, owning, and maintaining physical data centers and servers, you can access technology services, such as computing power, storage, and databases, on an as-needed basis from a cloud provider like Amazon Web Services (AWS).

### The NIST Model:

**US National Institute of Standards and Technology (NIST) defines Computing as:**

- “ Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. ”



## **Essential Characteristics**

### **On-demand self-service**

- A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

### **Broad network access**

- Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops, and workstations).

### **Resource pooling**

- The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand.

### **Measured Service**

- Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.

### **Rapid elasticity**

- Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

## **Cloud Services Models**

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

- The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface.
- The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.

### **Cloud Infrastructure as a Service (IaaS)**

- The capability provided to provision processing, storage, networks, and other fundamental computing resources. Consumer can deploy and run arbitrary software.

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

- The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider.
- The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.

## **Types of Cloud (Deployment Models)**

### **Private cloud**

The cloud infrastructure is operated solely for an organization.

E.g Window Server 'Hyper-V'.

### **Community cloud**

The cloud infrastructure is shared by several organizations and supports a specific goal.

### **Public cloud**

The cloud infrastructure is made available to the general public

E.g Google Doc, Spreadsheet,

### **Hybrid cloud**

The cloud infrastructure is a composition of two or more clouds (private, community, or public)

E.g Cloud bursting for load balancing between clouds.

## **Cloud Technologies:**

### **Virtualization:**

- In computing, **virtualization** is the act of creating a virtual (rather than actual) version of something, including virtual computer hardware platforms, storage devices, and computer network resources.
- Hardware virtualization or platform virtualization refers to the creation of a virtual machine that acts like a real computer with an operating system. Software executed on these virtual machines is separated from the underlying hardware resources. For example, a computer that is running Microsoft Windows may host a virtual machine that looks like a computer with the Ubuntu Linux operating system; Ubuntu-based software can be run on the virtual machine.
- In hardware virtualization, the host machine is the machine that is used by the virtualization and the guest machine is the virtual machine. The words host and guest are used to distinguish the software that runs on the physical machine from the software that runs on the virtual machine. The software or firmware that creates a virtual machine on the host hardware is called a hypervisor or virtual machine monitor.

### **Different types of hardware virtualization include:**

- **Full virtualization** – almost complete simulation of the actual hardware to allow software environments, including a guest operating system and its apps, to run unmodified.
- **Paravirtualization** – the guest apps are executed in their own isolated domains, as if they are running on a separate system, but a hardware environment is not simulated. Guest programs need to be specifically modified to run in this environment.

### **Web service:**

- A service offered by an electronic device to another electronic device, communicating with each other via the World Wide Web, or
- A server running on a computer device, listening for requests at a particular port over a network, serving web documents (HTML, JSON, XML, images), and creating web applications services, which serve in solving specific domain problems over the Web (WWW, Internet, HTTP)

- In a Web service a Web technology such as HTTP is used for transferring machine-readable file formats such as XML and JSON.
- In practice, a web service commonly provides an object-oriented Web-based interface to a database server, utilized for example by another Web server, or by a mobile app, that provides a user interface to the end-user.

**Conclusion:** Hence I have studied the NIST Model in detail and basic concepts of Cloud Computing.