



## Cloud Computing UNIT-1

Computer Science (Jawaharlal Nehru Technological University, Hyderabad)



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# CLOUD COMPUTING

# **UNIT-1**

## *Computing Paradigms*

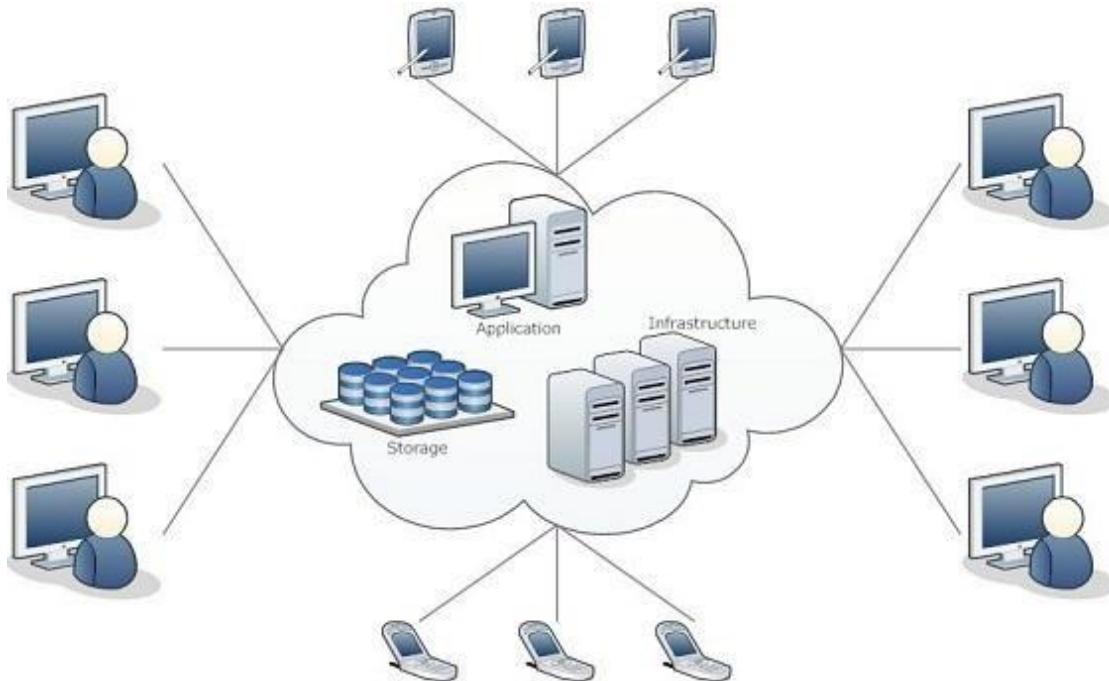
### **What is Cloud?**

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 network, i.e., on public networks or on private networks, i.e., WAN, LAN or VPN.

Applications such as **e-mail**, **web conferencing**, **customer relationship management (CRM)**, all run in cloud.

### **What is Cloud Computing?**

**Cloud Computing** refers to **manipulating**, **configuring**, and **accessing** the



applications online. It offers online data storage, infrastructure and application.

## **High-Performance Computing**

In high-performance computing systems, a pool of processors (processor machines or central processing units [CPUs]) connected (networked) with other resources like memory, storage, and input and output devices, and the deployed software is enabled to run in the entire system of connected components.

Thus, examples of HPC include a small cluster of desktop computers or personal computers (PCs) to the fastest supercomputers. HPC systems are normally found in those applications where it is required to use or solve scientific problems. Most of the time, the challenge in working with these kinds of problems is to perform suitable simulation study, and this can be accomplished by HPC without any difficulty

## **Parallel Computing**

Parallel computing is also one of the facets of HPC. Here, a set of processors work

cooperatively to solve a computational problem. These processor machines or CPUs

are mostly of homogeneous type. Therefore, this definition is *the same* as that of HPC

and is broad enough to include supercomputers that have hundreds or thousands of

processors interconnected with other resources.

In serial or sequential computers, the following apply:

- It runs on a single computer/processor machine having a single CPU.
- A problem is broken down into a discrete series of instructions.
- Instructions are executed one after another.

In parallel computing, since there is simultaneous use of multiple processor machines, the following apply:

- It is run using multiple processors (multiple CPUs).
- A problem is broken down into discrete parts that can be solved concurrently.
- Each part is further broken down into a series of instructions.
- Instructions from each part are executed simultaneously on different processors.
- An overall control/coordination mechanism is employed.

## **Distributed Computing**

Distributed computing is also a computing system that consists of multiple computers or processor machines connected through a network, which can be homogeneous or heterogeneous, but run as a single system. The connectivity can be such that the CPUs in a distributed system can be physically close together and connected by a local network, or they can be geographically distant and connected by a wide area network

## **Cluster Computing**

A cluster computing system consists of a set of the same or similar type of processor machines connected using a dedicated network infrastructure. All processor machines share resources such as a common home directory and have a software such as a message passing interface (MPI) implementation installed to allow programs to be run across all nodes simultaneously. This is also a kind of HPC category. The individual computers in a cluster can be referred to as *nodes*. The reason to realize a cluster as HPC is due to the fact that the individual nodes can work together to solve a problem larger than any computer can easily solve. And, the nodes need to communicate with one another in order to work cooperatively and meaningfully together to solve the problem in hand.

## **Grid Computing**

The computing resources in most of the organizations are underutilized but are necessary for certain operations. The idea of grid computing is to make use of such nonutilized computing power by the needy organizations, and thereby the return on investment (ROI) on computing investments can be increased.

Thus, grid computing is a network of computing or processor machines managed with a kind of software such as middleware, in order to access and use the resources remotely. The managing activity of grid resources through the middleware is called *grid services*. Grid services provide access control, security, access to data including

digital libraries and databases, and access to large-scale interactive and long-term storage facilities.

## Cloud Computing

It is a use of hardware and software to deliver a service over a network. It is invented by Joseph Carl Robnett Licklider in 1960's with his work on ARPANET(Advanced Research projects Agency Network).

EX: Google Gmail(gmail users can access files and applications hosted by google via the internet from any device)

In cloud computing, the IT and business resources, such as servers, storage, network, applications, and processes, can be dynamically provisioned to the user needs and workload. In addition, while a cloud can provision and support a grid, a cloud can also support nongrid environments

## Biocomputing

Biocomputing systems use the concepts of biologically derived or simulated molecules (or models) that perform computational processes in order to solve a problem. The biologically derived models aid in structuring the computer programs that become part of the application.

Biocomputing provides the theoretical background and practical tools for scientists to explore proteins and DNA. DNA and proteins are nature's building blocks, but these building blocks are not exactly used as *bricks*; the function of the final molecule rather strongly depends on the *order* of these blocks. Thus, the biocomputing scientist works on inventing the *order* suitable for various applications mimicking biology. Biocomputing shall, therefore, lead to a better understanding of life and the molecular causes of certain diseases.

## Mobile Computing

In mobile computing, the processing (or computing) elements are small (i.e., handheld devices) and the communication between various resources is taking place using wireless media.

Mobile communication for voice applications (e.g., cellular phone) is widely established throughout the world and witnesses a very rapid growth in all its dimensions including the increase in the number of subscribers of various cellular networks. An extension of this technology is the ability to send and receive data across various cellular networks using small devices such as smartphones. There can be numerous applications based on this technology; for example, video call or conferencing is one of the important applications that people prefer to use in place of existing voice (only) communications

on mobile phones.

Mobile computing-based applications are becoming very important and rapidly evolving with various technological advancements as it allows users to transmit data from remote locations to other remote or fixed locations.

## **Quantum Computing**

Manufacturers of computing systems say that there is a limit for cramming more and more transistors into smaller and smaller spaces of integrated circuits (ICs) and thereby doubling the processing power about every 18 months. This problem will have to be overcome by a new *quantum computing*-based solution, wherein the dependence is on quantum information, the rules that govern the subatomic world. Quantum computers are millions of times faster than even our most powerful supercomputers today. Since quantum computing works differently on the most fundamental level than the current technology, and although there are working prototypes, these systems have not so far proved to be alternatives to today's silicon-based machines.

## **Optical Computing**

Optical computing system uses the photons in visible light or infrared beams, rather than electric current, to perform digital computations. An electric current flows at only about 10% of the speed of light. This limits the rate at which data can be exchanged over long distances and is one of the factors that led to the evolution of optical fiber. By applying some of the advantages of visible and/or IR networks at the device and component scale, a computer can be developed that can perform operations 10 or more times faster than a conventional electronic computer.

## **Nanocomputing**

Nanocomputing refers to computing systems that are constructed from nanoscale components. The silicon transistors in traditional computers may be replaced by transistors based on carbon nanotubes.

The successful realization of nanocomputers relates to the scale and integration of these nanotubes or components.

## **Network Computing**

Network computing is a way of designing systems to take advantage of the latest technology and maximize its positive impact on business solutions and their ability to serve their customers using a strong underlying network of computing resources. In any network computing solution, the client component of a networked architecture or application will be with the customer or client or end user, and in modern days, they provide an essential set of functionality necessary to support the appropriate client functions at minimum cost and maximum simplicity. Unlike conventional PCs, they do not need to be individually configured and maintained according to their intended use. The other end of the client component in the network architecture will be a typical *server* environment to *push* the services of the application to the client end