Cloud Computing:

The term cloud refers to a network or the internet. It is a technology that uses remote servers on the internet to store, manage, and access data online rather than local drives. The data can be anything such as files, images, documents, audio, video, and more. There are the following operations that we can do using cloud computing are :

- Developing new applications and services
- Storage, back up, and recovery of data
- Hosting blogs and websites
- Delivery of software on demand
- Analysis of data
- Streaming videos and audios

Small as well as large IT companies, follow the traditional methods to provide the IT infrastructure. That means for any IT company, we need a Server Room that is the basic need of IT companies. The characteristics of cloud computing are given below:

1) Agility - The cloud works in a distributed computing environment. It shares resources among users and works very fast.

2) High availability and reliability - The availability of servers is high and more reliable because the chances of infrastructure failure are minimum.

3) High Scalability - Cloud offers "on-demand" provisioning of resources on a large scale, without having engineers for peak loads.

4) Multi-Sharing - With the help of cloud computing, multiple users and applications can work more efficiently with cost reductions by sharing common infrastructure.

Types of Cloud :

There are the following 5 types of cloud that you can deploy according to the organization's needs and requirements :

1.Public Cloud

- Public cloud is open to all to store and access information via the Internet using the pay-per-usage method.
- In public cloud, computing resources are managed and operated by the Cloud Service Provider (CSP).
- Due to its open architecture, anyone with an internet connection may use the public cloud, regardless of location or company size.
- Users can use the CSP's numerous services, store their data, and run apps. By using a pay-per-usage strategy, customers can be assured that they will only be charged for the resources they actually use, which is a smart financial choice.
- Some examples of public cloud are : Amazon elastic compute cloud (EC2), IBM SmartCloud Enterprise, Microsoft, Google App Engine, Windows Azure Services Platform.

Advantages of Public Cloud :

- Public cloud is owned at a lower cost than the private and hybrid cloud.
- Public cloud is easier to integrate. Hence it offers a better flexibility approach to consumers.
- Reduced time and effort in hardware procurement and setup.
- Public cloud is location independent because its services are delivered through the internet.

There were certain disadvantages to in using Public cloud like -

Public Cloud is less secure because resources are shared publicly. Dependency on the cloud service provider for availability and service level agreements. Dependency on the cloud service provider for availability and service level agreements.

2.Private Cloud :

- Private cloud is also known as an internal cloud or corporate cloud. It is used by organizations to build and manage their own data centers internally or by the third party.
- An on-premise private cloud is situated within the physical infrastructure of the organization. It involves setting up and running a specific data center that offers cloud services just for internal usage by the company.

- An outsourced private cloud involves partnering with a third-party service provider to host and manage the cloud infrastructure on behalf of the organization. The provider may operate the private cloud in their data center or a colocation facility.
- Some examples of Private Cloud are VMware vSphere, OpenStack, Microsoft Azure Stack, Oracle Cloud at Customer, and IBM Cloud Private.

Compared to public cloud options, both on-premise and external private clouds give businesses more control over their data, apps, and security. Private clouds are particularly suitable for organizations with strict compliance requirements, sensitive data, or specialized workloads that demand high levels of customization and security.

3.Hybrid Cloud :

Hybrid Cloud is a combination of the public cloud and the private cloud. Hybrid cloud is partially secure because the services which are running on the public cloud can be accessed by anyone, while the services which are running on a private cloud can be accessed only by the organization's users.

In a hybrid cloud setup, organizations can leverage the benefits of both public and private clouds to create a flexible and scalable computing environment. Some examples of hybrid cloud are Google Application Suite (Gmail, Google Apps, and Google Drive), Office 365 , Amazon Web Services.

Some of the advantages of Hybrid cloud were :

Hybrid cloud is suitable for organizations that require more security than the public cloud and offers flexible resources because of the public cloud and secure resources because of the private cloud. Hybrid offers cost optimization by allowing organizations to choose the most suitable cloud platform for different workloads.

Cluster Computing :

Cluster Computing is a collection of tightly or loosely connected computers that work together so that they act as a single entity. The connected computers execute

operations all together thus creating the idea of a single system. The clusters are generally connected through fast local area network(LAN).

Advantages of Cluster Computing :

- **Parallel Processing:** Clusters enable parallel processing by distributing tasks among the interconnected nodes. This parallelism leads to faster execution of computations by dividing the workload across multiple machines.
- **High Performance:** They offer high computational power by harnessing the collective processing and storage capacities of the cluster's nodes. This architecture allows for scalability - more nodes can be added to increase computing power.
- **Shared Resources:** Typically, clusters share storage resources, allowing data to be accessed from various nodes. This shared storage can be important for data-intensive applications.
- **Types of Clusters:** Clusters can be categorized as High-Performance Computing (HPC) clusters used in scientific simulations, Big Data clusters for handling large datasets, or Load-Balancing clusters for distributing tasks efficiently.
- **Parallel Applications:** They're well-suited for applications that can be divided into smaller independent tasks, such as scientific simulations, data analytics, weather forecasting, and rendering in computer graphics.
- **Management and Communication:** Cluster computing requires effective management and communication between nodes. Software tools and communication protocols ensure efficient coordination and sharing of tasks.

Applications of Cluster Computing :

- Various complex computational problems can be solved.
- It can be used in the applications of aerodynamics, astrophysics and in data mining.
- Weather forecasting.
- Image Rendering.
- Various e-commerce applications.
- Earthquake Simulation.
- Petroleum reservoir simulation.

Network Computing :

A computer network is a collection of two or more computer systems that are linked together. A network connection can be established using either cable or wireless media. Hardware and software are used to connect computers and tools in any network.

A computer network is a system that connects numerous independent computers in order to share information (data) and resources.

Computer Networks simply work using nodes and links. Data communication equipment is simply termed as Nodes. For example, Modems, Hubs, Switches, etc. whereas links in Computer networks can be referred to as a connection between two nodes. We have several types of links like cable wires, optical fibers etc.

Computer Networks help in providing better connectivity that helps nowadays. Modern computer networks have the following functionality like

1. Computer Networks help in operating virtually.
2. Computer Networks integrate on a large scale.
3. Computer Networks respond very quickly in case of conditions change.
4. Computer Networks help in providing data security.

Distributed Computing :

Distributed computing refers to a system where processing and data storage is distributed across multiple devices or systems, rather than being handled by a single central device.

Distributed computing involves multiple computers working together on a common task, collaborating over a network.

- **Task Distribution:** In distributed computing, tasks are divided among multiple independent computers, known as nodes or hosts. Each node works on a portion of the task independently, contributing to the overall computation.
- **Decentralization:** Unlike centralized systems where a single server controls all activities, distributed computing operates in a decentralized manner. Nodes communicate and coordinate among themselves to achieve the desired outcome.
- **Scalability:** Distributed systems offer scalability by allowing additional nodes to join the network. This scalability facilitates handling larger workloads and accommodating increased demands for computational resources.

Distributed Computing Systems have a number of applications like,

- **Cloud Computing:** Cloud Computing systems are a type of distributed computing system that are used to deliver resources such as computing power, storage, and networking over the Internet.
- **Peer-to-Peer Networks:** Peer-to-Peer Networks are a type of distributed computing system that is used to share resources such as files and computing power among users.
- **Distributed Architectures:** Many modern computing systems, such as microservices architectures, use distributed architectures to distribute processing and data storage across multiple devices or systems.