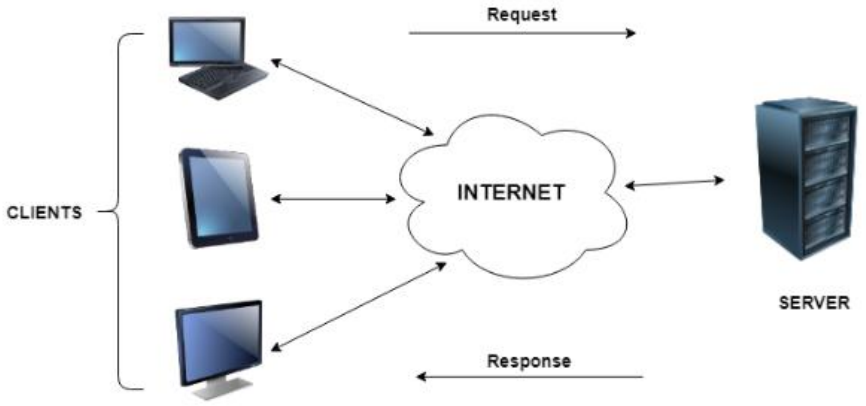
Unit I

Introduction to Client – Server Computing, Peer-to-Peer Computing, Distributed Computing,Collaborative Computing, Cloud Computing

Client – Server Computing

In client server computing, the clients requests a resource and the server provides that resource. A server may serve multiple clients at the same time while a client is in contact with only one server. Both the client and server usually communicate via a computer network but sometimes they may reside in the same system.



Characteristics of Client Server Computing

The salient points for client server computing are as follows:

- The client server computing works with a system of request and response. The client sends a request to the server and the server responds with the desired information.
- The client and server should follow a common communication protocol so they can easily interact with each other. All the communication protocols are available at the application layer.
- A server can only accommodate a limited number of client requests at a time. So it uses a system based to priority to respond to the requests.

- Denial of Service attacks ability to respond to authentic client requests by inundating it with false requests.
- An example of a client server computing system is a web server. It returns the web pages to the clients that requested them.

Difference between Client Server Computing and Peer to Peer Computing

The major differences between client server computing and peer to peer computing are as follows:

- In client server computing, a server is a central node that services many client nodes. On the other hand, in a peer to peer system, the nodes collectively use their resources and communicate with each other.
- In client server computing the server is the one that communicates with the other nodes. In peer to peer to computing, all the nodes are equal and share data with each other directly.
- Client Server computing is believed to be a subcategory of the peer to peer computing.

Advantages of Client Server Computing

The different advantages of client server computing are:

- All the required data is concentrated in a single place i.e. the server. So it is easy to protect the data and provide authorisation and authentication.
- The server need not be located physically close to the clients. Yet the data can be accessed efficiently.
- It is easy to replace, upgrade or relocate the nodes in the client server model because all the nodes are independent and request data only from the server.
- All the nodes i.e clients and server may not be build on similar platforms yet they can easily facilitate the transfer of data.

Disadvantages of Client Server Computing

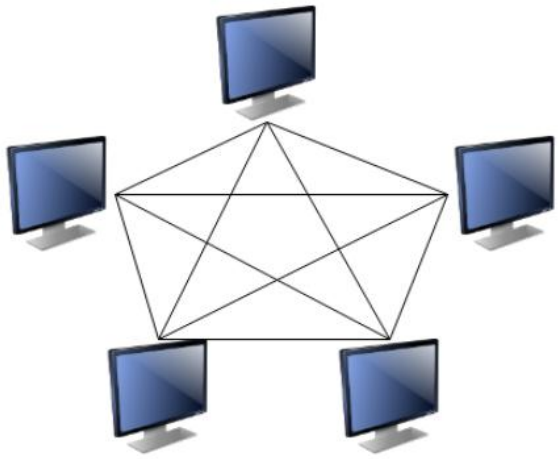
The different disadvantages of client server computing are:

- If all the clients simultaneously request data from the server, it may get overloaded. This may lead to congestion in the network.
- If the server fails for any reason, then none of the requests of the clients can be fulfilled. This leads of failure of the client server network.
- The cost of setting and maintaining a client server model are quite high.

Peer-to-Peer Computing:

The peer to peer computing architecture contains nodes that are equal participants in data sharing. All the tasks are equally divided between all the nodes. The nodes interact with each other as required as share resources.

A diagram to better understand peer to peer computing is as follows:



Characteristics of Peer to Peer Computing

The different characteristics of peer to peer networks are as follows:

- Peer to peer networks are usually formed by groups of a dozen or less computers. These computers all store their data using individual security but also share data with all the other nodes.

- The nodes in peer to peer networks both use resources and provide resources. So, if the nodes increase, then the resource sharing capacity of the peer to peer network increases. This is different than client server networks where the server gets overwhelmed if the nodes increase.
- Since nodes in peer to peer networks act as both clients and servers, it is difficult to provide adequate security for the nodes. This can lead to denial of service attacks.
- Most modern operating systems such as Windows and Mac OS contain software to implement peer to peer networks.

Advantages of Peer to Peer Computing

Some advantages of peer to peer computing are as follows:

- Each computer in the peer to peer network manages itself. So, the network is quite easy to set up and maintain.
- In the client server network, the server handles all the requests of the clients. This provision is not required in peer to peer computing and the cost of the server is saved.
- It is easy to scale the peer to peer network and add more nodes. This only increases the data sharing capacity of the system.
- None of the nodes in the peer to peer network are dependent on the others for their functioning.

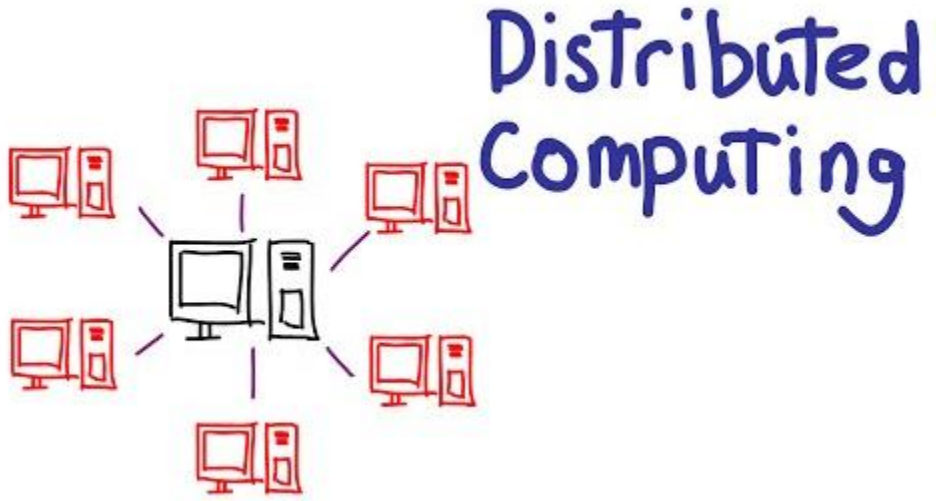
Disadvantages of Peer to Peer Computing

Some disadvantages of peer to peer computing are as follows:

- It is difficult to backup the data as it is stored in different computer systems and there is no central server.
- It is difficult to provide overall security in the peer to peer network as each system is independent and contains its own data.

Distributed computing:

Distributed computing: a method of computer processing in which different parts of a computer program are run on two or more computers that are communicating with each other over a network.



Distributed computing is where multiple computing units are connected to achieve a common task. The larger computing power enables a lot more tasks to be performed than in a single unit, and searches can be coordinated for efficiency. Successes usually give the finder credit.

Distributed computing involves processing happening on multiple computers in parallel enabling huge amounts of data to be processed. Without distributed computing processing models, search engines and other services would not have been possible.

In distributed computing, a single problem is divided into many parts, and each part is solved by different computers. As long as the computers are networked, they can communicate with each other to solve the problem. If done properly, the computers perform like a single entity.

The ultimate goal of distributed computing is to maximize performance by connecting users and IT resources in a cost-effective, transparent and reliable

manner. It also ensures fault tolerance and enables resource accessibility in the event that one of the components fails.

Advantages of Distributed Systems

Some advantages of Distributed Systems are as follows:

- All the nodes in the distributed system are connected to each other. So nodes can easily share data with other nodes.
- More nodes can easily be added to the distributed system i.e. it can be scaled as required.
- Failure of one node does not lead to the failure of the entire distributed system. Other nodes can still communicate with each other.
- Resources like printers can be shared with multiple nodes rather than being restricted to just one.

Disadvantages of Distributed Systems

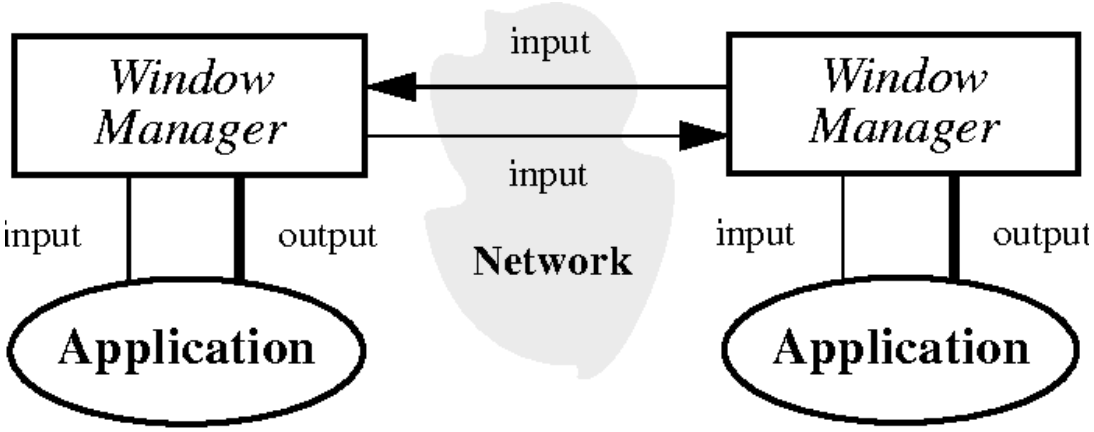
Some disadvantages of Distributed Systems are as follows:

- It is difficult to provide adequate security in distributed systems because the nodes as well as the connections need to be secured.
- Some messages and data can be lost in the network while moving from one node to another.
- The database connected to the distributed systems is quite complicated and difficult to handle as compared to a single user system.
- Overloading may occur in the network if all the nodes of the distributed system try to send data at once.

Collaborative System

A Collaborative System is an information system used to facilitate efficient sharing of data, documents, files, information, and knowledge between teams and employees in an organization.

Collaborative computing is described as a phenomenon where modern technology tools facilitate and enhance group work that exists through distributed technology – where individuals collaborate from remote locations.



Many different types of modern tools and technologies constitute collaborative programming resources. Some of the earliest systems focused on how to allow groups in distributed locations to view files, share information and chat amongst themselves in order to complete projects. As collaborative computing and general technology evolved, videoconferencing and multi-feature conferencing programs upped the ante in providing sophisticated platforms where remote teams could complete tasks like content management, or work on the full “life cycle” for a product or service

Collaborative computing tools really run the gamut – Google Hangouts could be called “collaborative computing.” Some of the proprietary platforms that remote teams use to deliver graphic design or copy projects could also be called collaborative computing tools. It is important to note that while early collaborative computing technologies focused on bringing together people in different places, many of today's tools focus

more on streamlining and organizing the collaborative work of large groups of people who may actually be within the same business campus or other location.

Much of the modern collaborative computing infrastructure offered to companies involves cutting down on face time, and replacing face-to-face meetings and interactions with digital ones. Collaborative computing can serve a business in many different ways, according to its footprint and operational needs.

Cloud Computing

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?

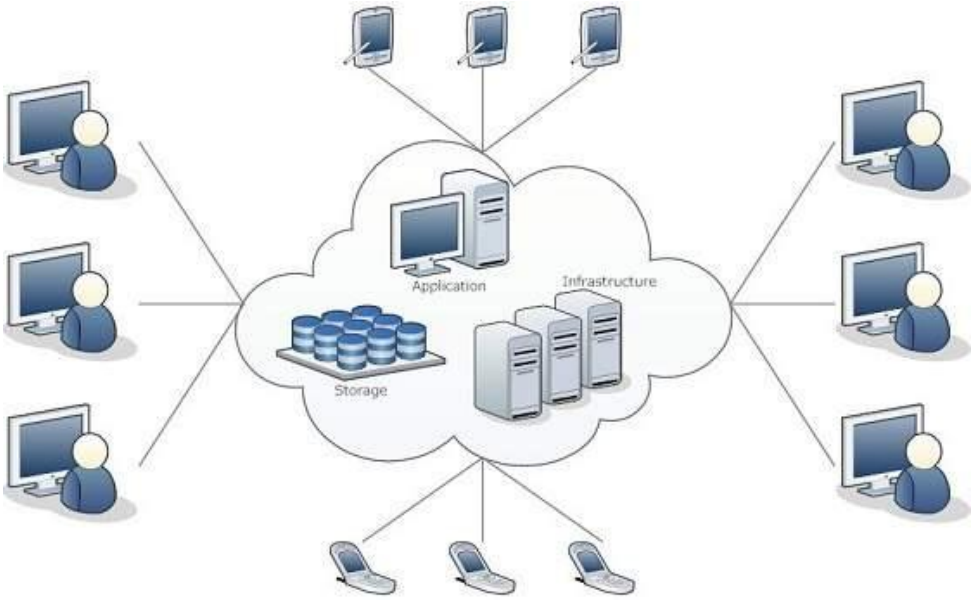
The term **Cloud** refers to a **Network** or **Internet.** In other words, we can say that Cloud is something, which is present at remote location. Cloud can provide services over public and private networks, i.e., WAN, LAN or VPN.

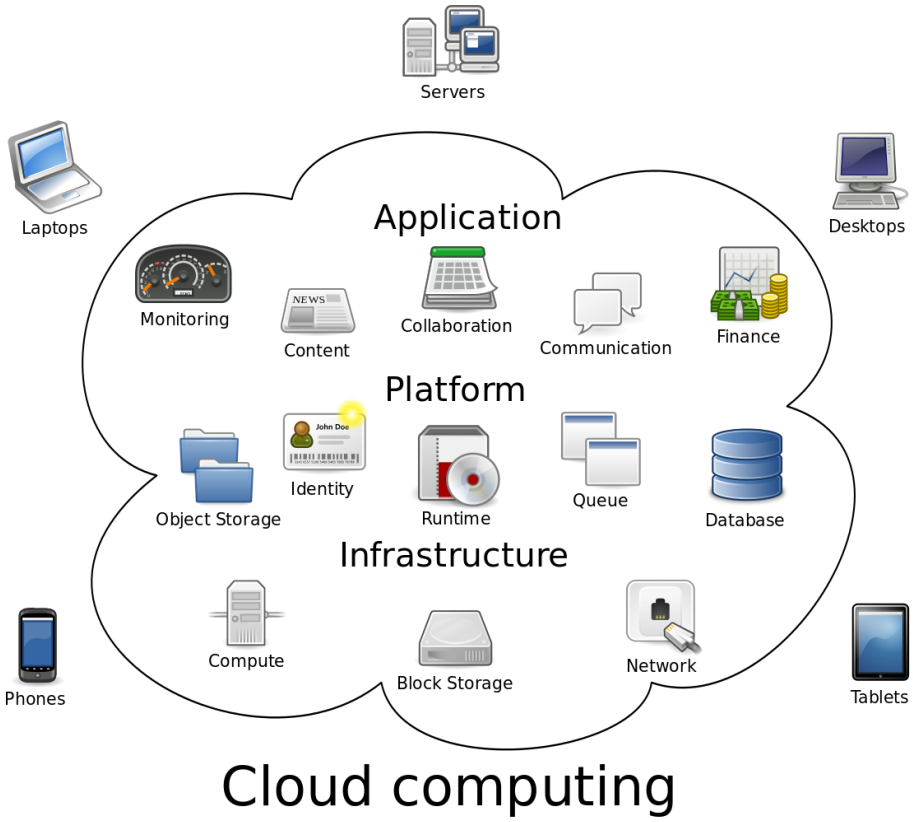
Applications such as e-mail, web conferencing, customer relationship management (CRM) execute on cloud.

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.**





Cloud computing

Characteristics of Cloud Computing

The characteristics of cloud computing are given below:

1) Agility

The cloud **works in the distributed computing environment**. It shares resources among users and works very fast.

2) High availability and reliability

Availability of servers is high and more reliable, because **chances of infrastructure failure are minimal**.

3) High Scalability

Means **"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.

5) Device and Location Independence

Cloud computing enables the users to access systems using a web browser regardless of their location or what device they use e.g. PC, mobile phone etc. As infrastructure is off-site (typically provided by a third-party) and accessed via the Internet, users can connect from anywhere.

6) Maintenance

Maintenance of cloud computing applications is easier, since they **do not need to be installed on each user's computer and can be accessed from different places**. So, it reduces the cost also.

7) Low Cost

By using cloud computing, the cost will be reduced because to take the services of cloud computing, **IT company need not to set its own infrastructure** and pay-as-per usage of resources.

8) Services in pay-per-use mode

Application Programming Interfaces **(APIs) are provided to the users so that they can access services on the cloud** by using these APIs **and pay the charges as per the usage of services**.

Disadvantages of Cloud Computing

There are various disadvantages of cloud computing technology. The important disadvantages of cloud computing are given below.

1) Require a constant Internet Connection

Cloud computing is impossible without Internet connection. To access any applications and documents you need a constant Internet connection.

2) Require High Speed Internet connection

Similarly, a low-speed Internet connection makes cloud computing painful at best and often impossible. Web based apps often require a lot of bandwidth to download, as need to download large documents.

3) Stored Data Might Not Be Secure

With cloud computing, all your data is stored in the cloud. That's all well and good, but how secure is the cloud? Can't unauthorized users gain access to your confidential data?