# SWAMI SAHAJANAND COLLEGE OF COMPUTER SCIENCE

## BCA Semester – V

**Subject:** **Data Communication and Networking**

**UNIT 2**

## Introduction to Computer Network

- Meaning of the basic terms: – Network, Internetwork, Protocol.
- Types of Connection (Point to Point and Multipoint.)
- Types of Computer Network (LAN, MAN, WAN).
- Different types of Server: File Server, Application Server,
- Mail Server, Web Server, Database Server

## Introduction to Network

**What is Computer Network ?**

- When two or more computers are connected by a physical connection for communication, it is called as computer network.
- **Example: - LAN (Local Area Network), MAN (Metropolitan Area Network), WAN (Wide Area Network).**

**What is Internetwork?**

- When two or more networks are connected, they become an internetwork. So it is interconnection of computer networks.
- Internet and Intranet are Internetworks.
- Individual networks are joined into internetworks by the use of internetworking devices.
- **Example:** An Internet is a most commonly used internet.

**What is Protocol?**

- A protocol is a set of rules and guidelines for communicating data.
- Rules are defined for each step and process during communication between two or more computers. Networks have to follow these rules to successfully transmit data.
- **Example: TCP/IP, FTP, HTTP,DHCP, SMTP etc...**

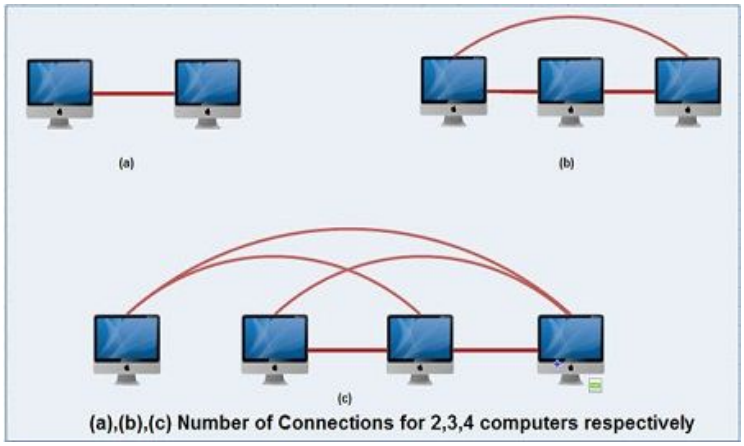
## Types of Connection (Point to Point and Multipoint)

### (1) Point to Point Connection (PPP):

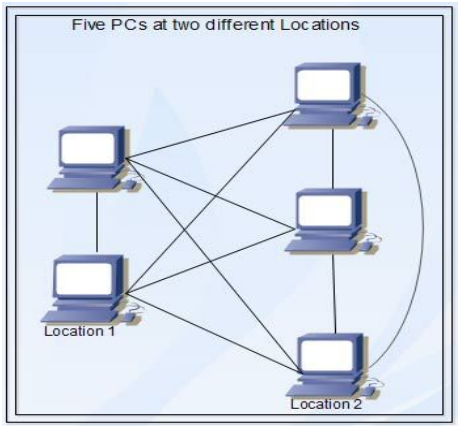
- The point-to-point provides separate communication channels for each pair of computers.
- When more than two computers need to communicate with one another, the number of connections grows very quickly as number of computer increases.
- Above figure shows that 2 computers need 1 connection, 3 computers need 3 connections and 4 computers need 6 connections.
- As the Figure illustrates that the total number of connection grows more rapidly than the total number of computers. Mathematically, the number of connection needed for N computers is proportional to the square of N.

**Point-to-point connections required = (N2 (N)/2).**

- Many connections may follow the same physical path.
- Figure shows a point- to-point connection for 5 computers located at different locations of a building. As there are 5 PCs, total 10 connections will be required for point-to-point connection.

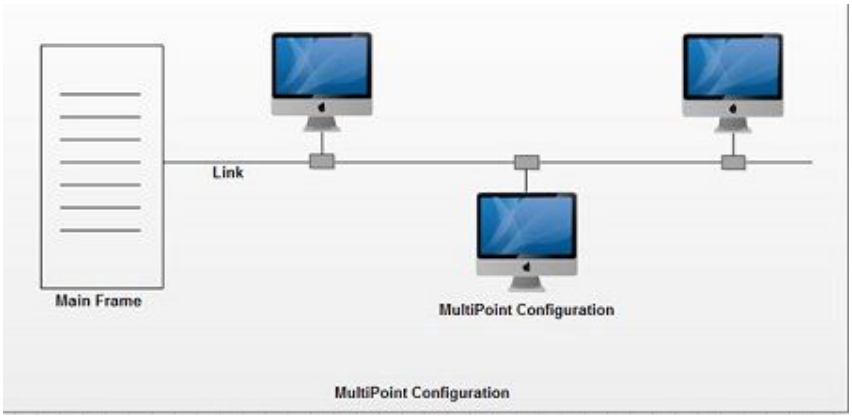


(a),(b),(c) Number of Connections for 2,3,4 computers respectively



## (2) Multi Point Connection:

- A multipoint connection is a link between 3 or more devices.
- It is also known as Multi-drop configuration.
- The networks having multipoint configuration are called **Broadcast Networks**.
- In broadcast network, a message or a packet sent by any machine is received by all other machines in a network.
- The packet contains address field that specifies the receiver.
- Upon receiving a packet, every machine checks the address field of the packet.
- If the transmitted packet is for that particular machine, it processes it; otherwise it just ignores the packet.




- Broadcast network provides the provision for broadcasting & multicasting.
- Broadcasting is the process in which a single packet is received and processed by all the machines in the network.
- It is made possible by using a special code in the address field of the packet.
- When a packet is sent to a subset of the machines i.e. only to few machines in the network it is known as multicasting.
- LAN environments with multipoint connections link with network devices in various configurations.

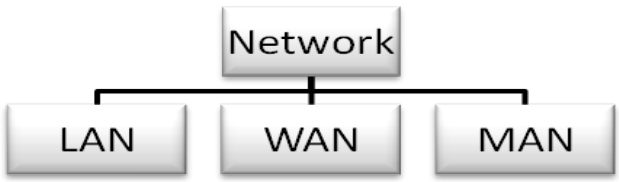
## Types of Computer Network (LAN, MAN, WAN)

**Explain: - Types of Network**

**Computer Network mainly classified into 3 categories which are .....**

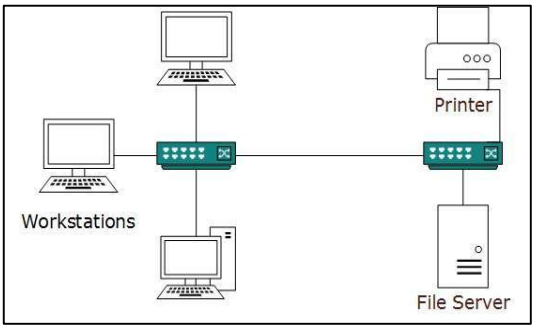
1. LAN (Local Area Networks)
2. MAN (Metropolitan Area Networks)
3. WAN (Wide Area Networks)

- Into which category, a network falls is determined by its size, its ownership, the distance it covers and its physical architecture.
- The Campus Area Network (CAN) is one type/example of MAN.



**(1) Local Area Network (LAN):**

- A Local Area Network (LAN) is two or more computer connected in a room or building.
- LAN is usually privately owned network that connect devices in office or building.
- LAN can be as simple as 2 or more computers with printer and other hardware in home/office.
- Storage, printer, CD/DVD and other hardware can be shared between computers (workstations).
- LAN provides a useful way of sharing the resources between end users.
- Star Topology is popular LAN Topology.
- LANs have high data speed of 4 to 100 Mbps.
- Speeds can increases up to 1000 Mbps with gigabit systems.




- LAN covers an organization's offices, schools, colleges or universities.

**Advantages of LAN:**

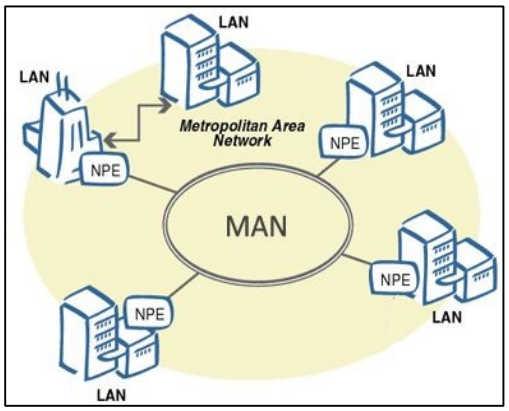
1. Low cost of implementation.
2. Easy to design and implement.
3. Data and Hardware Sharing.
4. Very High Speed (up to 1000Gbps).
5. Easy to Access.
6. Can be use for both privately and publicly.

**Disadvantages of LAN:**

1. Limited for Small area
2. Security issues are big concern
3. It is easy to have access to programs and data of all connected computers.

**(2) Metropolitan Area Network (MAN):**

- The Metropolitan Area Network (MAN) span up to city or mega city.
- A metropolitan area network is designed to extend over an entire city / Metro City.
- **Example:** Digital Cable TV network example of simple MAN.
- **Example:** Computer Network based on Ethernet, Token-ring, Asynchronous Transfer Mode (ATM), and Fiber Distributed Data Interface (FDDI) is Metropolitan area network.
- This service enables its users to expand their Local Area Networks up to a city area.




Example: MAN can use to connect all of its offices in a city of an organization.

- It may be a single network, or it may be a means of LAN-to-LAN as well as device-to-device.
- A MAN may be owned and operated by a private company, or it may be a service provided by a public company, such as a local telephone company.

**Advantages of MAN:**

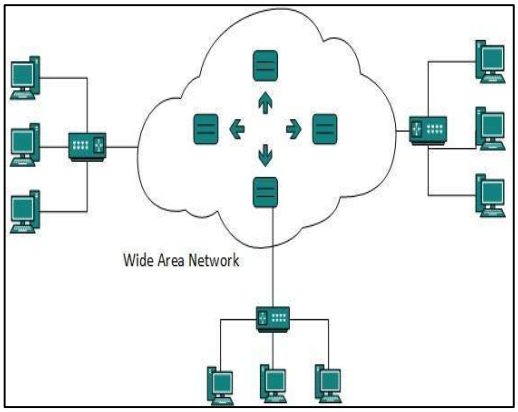
1. Can cover very large area than LAN.
2. Very high speed for longer distance communication.

**Disadvantages of MAN:**

1. Higher cost of Installation as distance increases.
2. Require special networking hardware.
3. Difficult to maintain connectivity.

**(3) Wide Area Network (WAN):**

- Wide Area Network (WAN) covers area which may span across the world.
- WAN is a collection of LANs and other network types connected using router.
- Internet is an example of Computer network.
- These networks also provide connectivity to MAN and LAN.
- WAN are equipped with high speed communication links.
- WANs use specialized network equipment like routers.
- A wide area network provides long-distance transmission of data, voice, image and video information.
- In contrast to LAN, WAN may utilize public, leased or private communication devices, usually in combinations and can therefore span all over the world.
- WAN can be owned privately and used by a single company is called as Enterprise Network.




**Advantages of WAN:**

1. It covers large geographical distance compare to LAN and MAN.
2. It spans all over the world
3. It can be public or private.
4. High Speed Communication

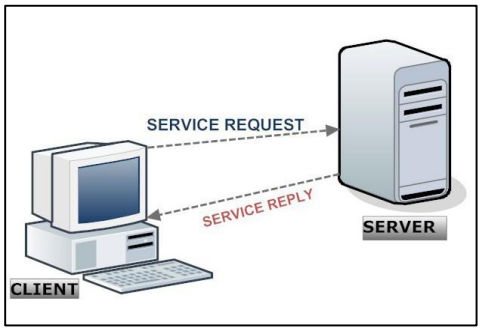
**Disadvantages of WAN:**

1. Very high cost of implementation.
2. Require many networking equipments and communication links.
3. Difficult to maintain the network.
4. Lower security compare to LAN and MAN.

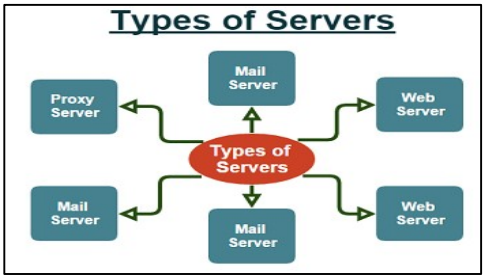
## Different types of Server: File Server, Application Server, Mail Server, Web Server, Database Server

**What is a Server?**

- Server is a computer that accepts and responds to requests made by another computer known as a client.
- A server is a computer with a set of programs and protocols that provide various services, which other machines or clients request, to perform certain tasks.
- Server and its clients form a client/server network, which provides centralized access to information, resources, stored data, Shared Devices etc…..



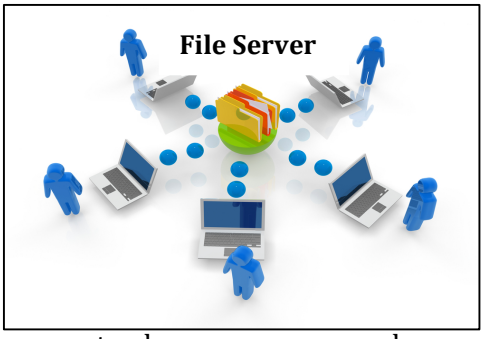
- At the most ground level, one can consider it as a technology solution that serves files, data, print, fax resources and multiple computers.




## Types of Servers

- The multiple types of servers are as follows:
- **Server:** Server platform is the combination of specialized hardware, software and protocol that drives the server. It uses Server operating system.

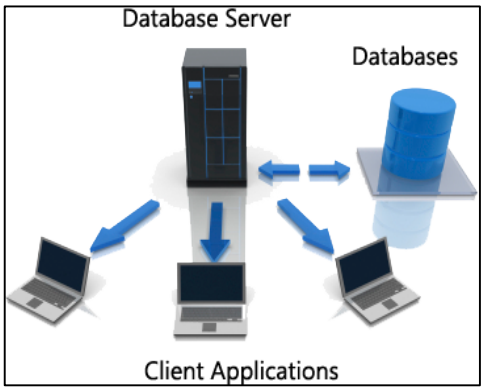
### (1) File Servers




- A file server is a computer on a network that is used to provide users on a network with access to files.
- Using file server, client computers passes requests for files or file records over a computer network to the file server.
- This form of computer network data service requires large bandwidth and can slow a computer network with many users down considerably.
- Traditional LAN (Local area Network) computing allows users to share resources, such as data files and peripheral devices, by moving them from standalone PCs onto a Networked File Server.

**Advantages of File Server**:

1. Remote Access.
2. Centralized Management of Permissions.
3. Data Security & Backup.
4. Data Recovery Made Easy.
5. Monitor Your Employees.
6. Increase User Control.




### (2) Database Servers

- A database server is a computer system that provides services related to accessing and retrieving data from a database.
- Access to the database server may occur via a "front end" running locally on a user's machine (e.g., phpMyAdmin, Oracle) or "back end" running on the database server itself, accessed by remote system.
- In database servers, client's passes SQL (Structured Query Language) requests as messages to the server and the results of the query are returned over the network.
- The code that processes the SQL request and the data resides on the server allowing it to use its own processing power to find the requested data, rather than pass all the records back to a client and let it find its own data as was the case for the file server.

**Advantages of Database Server**

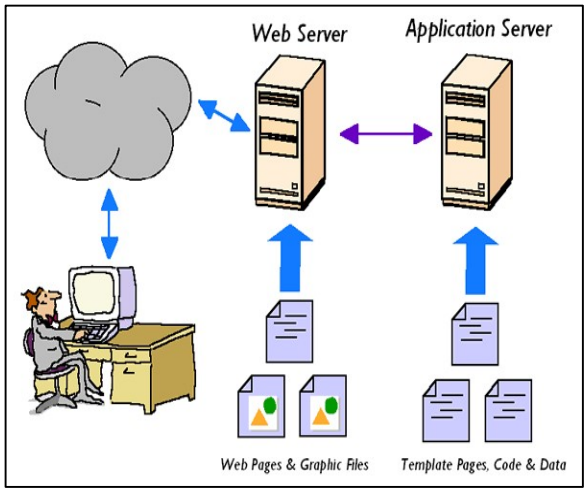
- Centralized storage of data.
- Reduced data redundancy
- Improved data access
- Improved data security
- User management.
- Backup and restore of DB.
- Support for transactions and locking.
- High performance and scalability.

- Highly reliable.

**Disadvantages of Database Server**

1. Database systems are complex, difficult, and time-consuming to design.
2. Substantial hardware and software start-up costs.
3. Damage to database affects virtually all applications programs.
4. Extensive conversion costs in moving form a file-based system to a database system.
5. Initial training required for all programmers and users.

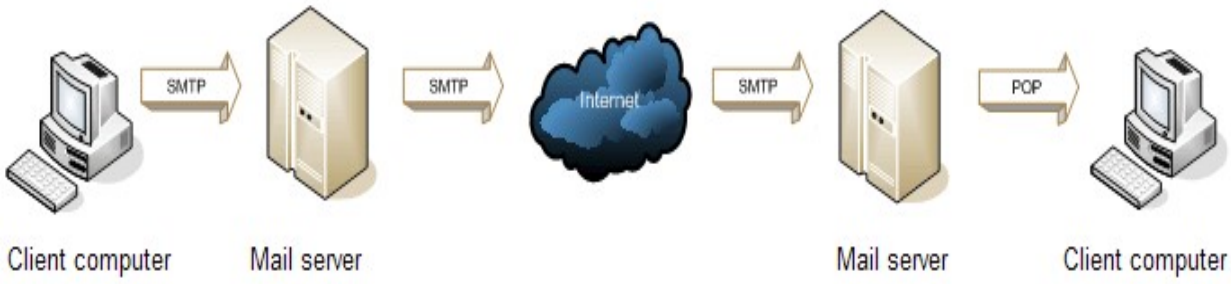
**(3) Application Server:**




- An **application server** is a software framework that provides both facilities to create web applications and a server environment to run them
- Also known as a type of middleware, it occupies a substantial amount of computing region between database servers and the end user, and is commonly used to connect the two.
- Following are some of the key differences in features of Web Server and Application Server.
- Most of the application servers have Web Server as integral part of them that means App Server can do whatever Web Server is capable of.
- Additionally Application Server has components and features to support Application level services such as Connection Pooling, Object Pooling, Transaction Support, Messaging services etc.
- Example: Web Server is designed to serve HTTP Content. App Server can also serve HTTP Content but is not limited to just HTTP.

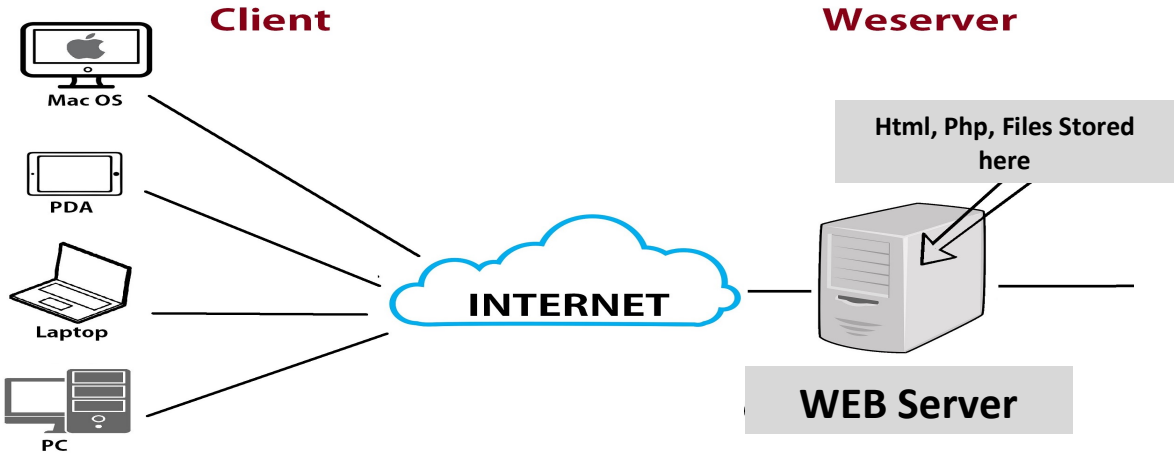
**(4) Mail Server:**

- Mail server (also known as e-mail server) is a server that handles and delivers e-mail over a network, usually over the Internet.
- Mail server can receive e-mails from client computers and deliver them to other mail servers.
- Mail server can also deliver e-mails to client computers.
- Client computer is normally the computer where you read your e-mails, for example your computer at home or in your office. Also an advanced mobile phone or Smartphone, with e-mail capabilities, can be regarded as a client computer in these circumstances.
- It transfers and stores emails over corporate networks through LANs, WANs and across the Internet.




**(5) Web Server:**

- It provides static content to a web browser by loading a file from a disc and transferring it across the network to the user's web browser.
- This exchange is intermediates by the browser and the server, communicating using HTTP.
- Web servers are responsible for hosting website files and serve it up through a web browser.

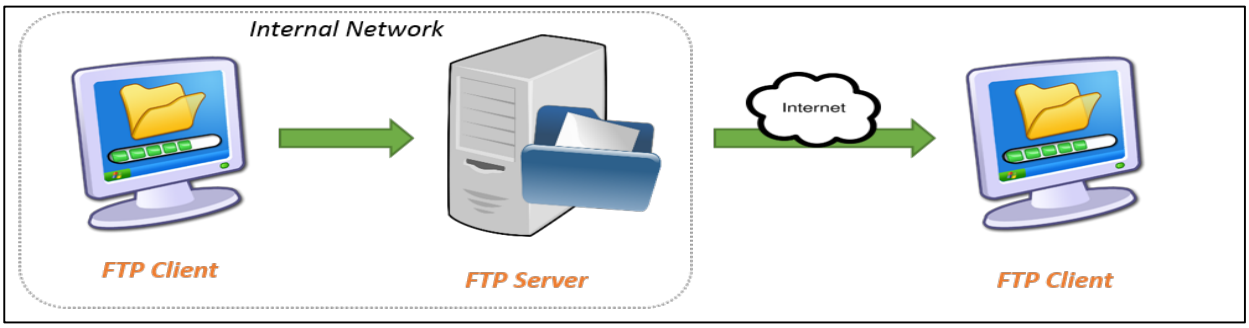



- It loads an individual file of a web page and loads it to display in the browser as one complete page. HTTP or HTTPS (Hypertext Transfer Protocol) communicate between server and web browser to load a web page.
- Web Server is mostly designed to serve static content.
- Most Web Servers have plugging to support scripting languages like Perl, PHP, ASP, JSP etc. through which these servers can generate dynamic HTTP content.

**(6) FTP Server:**

- An FTP server is also known as an FTP site.
- An FTP server is a computer which has a file transfer protocol (FTP) address and is dedicated to receiving an FTP connection.
- It provides a secure file transfer between computers while ensuring file security and transfer control. It is responsible for transferring files from server to a computer and vice versa.
- It works on one of the oldest of the Internet services, the File Transfer Protocol (FTP).

- An FTP server needs a TCP/IP network for functioning and is dependent on usage of dedicated servers with one or more FTP clients. In order to ensure that connections can be established at all times from the clients, an FTP server is usually switched on.




- An FTP server is an important component in FTP architecture and helps in exchanging of files over internet.
- FTP server ensures the security and integrity of data during the transfer.
- It is commonly used by web servers, it enables user to upload, edit or delete files from websites using FTP clients.

**Advantages of FTP clients**

- Allows you to transfer multiple files and directories.
- The ability to resume a transfer if the connection is lost.
- The ability to add items to a "queue" to be uploaded/downloaded.
- Many FTP clients have the ability to schedule transfers.
- No size limitation on single transfers.
- Many clients have scripting capabilities through command line.
- Most clients have a synchronizing utility.
- Faster transfers then HTTP.
- Supported on almost all hosts.

**Disadvantages FTP clients**

- Usernames, passwords and files are sent in plain text.
- Filtering active FTP connections is difficult on your local machine.
- Servers can be spoofed to send data to a random port on an unintended computer
- Hard to script jobs
- Easy for inexperienced users to wipe out work.
- Inconsistency/inability to track what has been uploaded on the remote system.