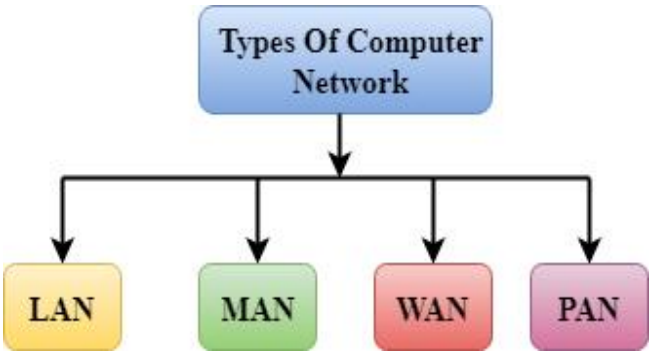
Que: 1 what is network, internetwork and protocol?

Network

A computer network is a group of computers linked to each other that enables the computer to communicate with another computer and share their resources, data, and applications.

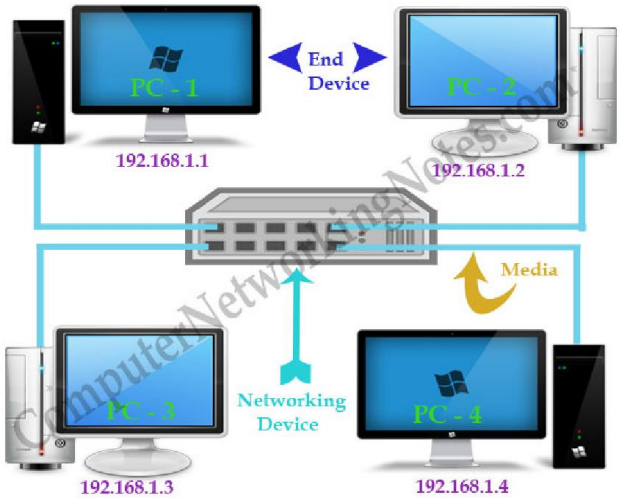
A computer network can be categorized by their size. A **computer network** is mainly of **four types**:



Internetwork

Internetworking is the practice of connecting a computer network with other networks through the use of gateways that provide a common method of routing information packets between the networks. The resulting system of interconnected networks is called an *internetwork*, or simply an *internet*.

The most notable example of internetworking is the Internet, a network of networks based on many underlying hardware technologies, but unified by an internetworking protocol standard, the Internet Protocol Suite, often also referred to as TCP/IP.



Protocol

A network protocol is an established set of rules that determine how data is transmitted between different devices in the same network. Essentially, it allows connected devices to communicate with each other, regardless of any differences in their internal processes, structure or design. Network protocols are the reason you can easily communicate with people all over the world, and thus play a critical role in modern digital communications.

Similar to the way that speaking the same language simplifies communication between two people, network protocols make it possible for devices to interact with each other because of predetermined rules built into devices' software and hardware. There are following are types of protocol

1. Transmission Control Protocol (TCP)
2. Internet Protocol (IP)
3. User Datagram Protocol (UDP)
4. Post office Protocol (POP)
5. Simple mail transport Protocol (SMTP)
6. File Transfer Protocol (FTP)
7. Hyper Text Transfer Protocol (HTTP)
8. Hyper Text Transfer Protocol Secure (HTTPS)
9. Telnet
10. Gopher

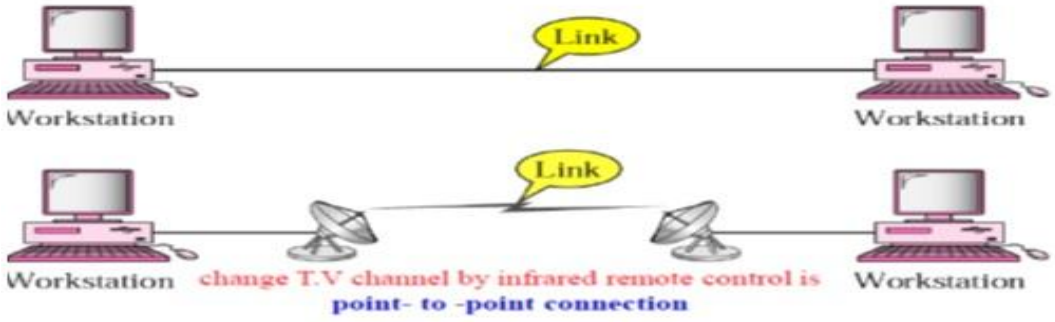
Que : 2 Explain types of connections

A network is two or more devices connected through links. A link is a communications pathway that transfers data from one device to another. For communication to occur, two devices must be connected in some way to the same link at the same time.

There are two possible types of connections: point-to-point and multipoint.

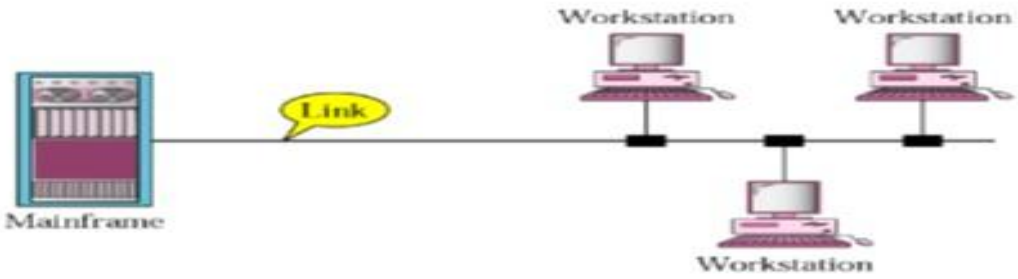
1.Point-to-Point:

- A point-to-point connection provides a dedicated link between two devices. The entire capacity of the link is reserved for transmission between those two devices.
- When you change television channels by infrared remote control, you are establishing a point-to-point connection between the remote control and the television's control system.
- In this communication, there is one transmitter and one receiver.
- Point-to-point communication provides security and privacy because communication channel is not shared.
- Most point-to-point connections use an actual length of wire or cable to connect the two ends, but other options, such as microwave or satellite links, are also possible which are shown in the following figure.



2. Multipoint:

A multipoint (also called multidrop) connection is one in which more than two specific devices share a single link as shown in the following figure.

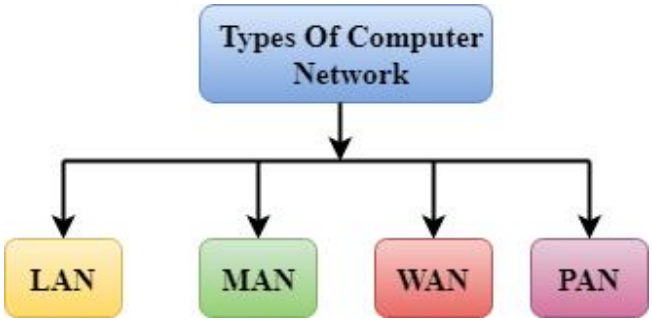


- In a multipoint environment, the capacity of the channel is shared, either spatially or temporally.
- If several devices can use the link simultaneously, it is a spatially shared connection.
- In this communication, there is one transmitter and many receivers.
- Multi-point communication does not provide security and privacy because communication channel is shared.
- If users must take turns, it is a timeshared connection.

Que : 3 Types of Computer Network

A computer network is a group of computers linked to each other that enables the computer to communicate with another computer and share their resources, data, and applications.

A computer network can be categorized by their size. A **computer network** is mainly of **four types**:



LAN(Local Area Network)

- Local Area Network is a group of computers connected to each other in a small area such as building, office.
- LAN is used for connecting two or more personal computers through a communication medium such as twisted pair, coaxial cable, etc.
- It is less costly as it is built with inexpensive hardware such as hubs, network adapters, and ethernet cables.
- The data is transferred at an extremely faster rate in Local Area Network.
- Local Area Network provides higher security.

Advantages of LAN

Here are pros/benefits of using LAN:

- Computer resources like hard-disks, DVD-ROM, and printers can share local area networks. This significantly reduces the cost of hardware purchases.
- You can use the same software over the network instead of purchasing the licensed software for each client in the network.
- Data of all network users can be stored on a single hard disk of the server computer.
- You can easily transfer data and messages over networked computers.
- It will be easy to manage data at only one place, which makes data more secure.
- Local Area Network offers the facility to share a single internet connection among all the LAN users.

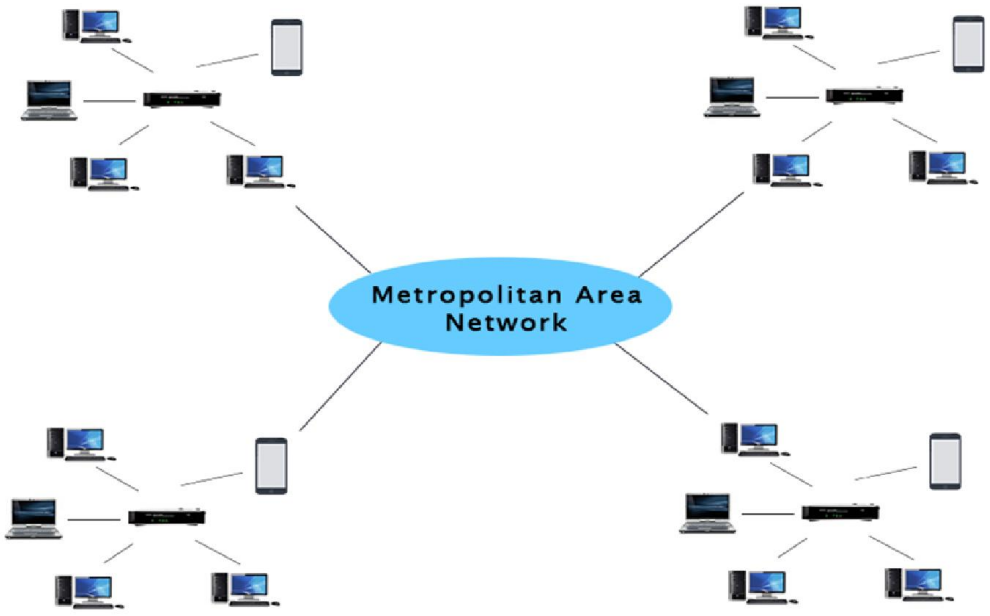
Disadvantages of LAN

Here are the important cons/ drawbacks of LAN:

- LAN will indeed save cost because of shared computer resources, but the initial cost of installing Local Area Networks is quite high.
- The LAN admin can check personal data files of every LAN user, so it does not offer good privacy.
- Unauthorized users can access critical data of an organization in case LAN admin is not able to secure centralized data repository.
- Local Area Network requires a constant LAN administration as there are issues related to software setup and hardware failures

MAN(Metropolitan Area Network)

- A metropolitan area network is a network that covers a larger geographic area by interconnecting a different LAN to form a larger network.
- Government agencies use MAN to connect to the citizens and private industries.
- In MAN, various LANs are connected to each other through a telephone exchange line.
- The most widely used protocols in MAN are RS-232, Frame Relay, ATM, ISDN, OC-3, ADSL, etc.
- It has a higher range than Local Area Network(LAN).



Uses Of Metropolitan Area Network:

- MAN is used in communication between the banks in a city.
- It can be used in an Airline Reservation.
- It can be used in a college within a city.
- It can also be used for communication in the military.

Advantages of MAN

Here are pros/benefits of using MAN system:

- It offers fast communication using high-speed carriers, like fiber optic cables.
- It provides excellent support for an extensive size network and greater access to WANs.
- The dual bus in MAN network provides support to transmit data in both directions concurrently.
- A MAN network mostly includes some areas of a city or an entire city.

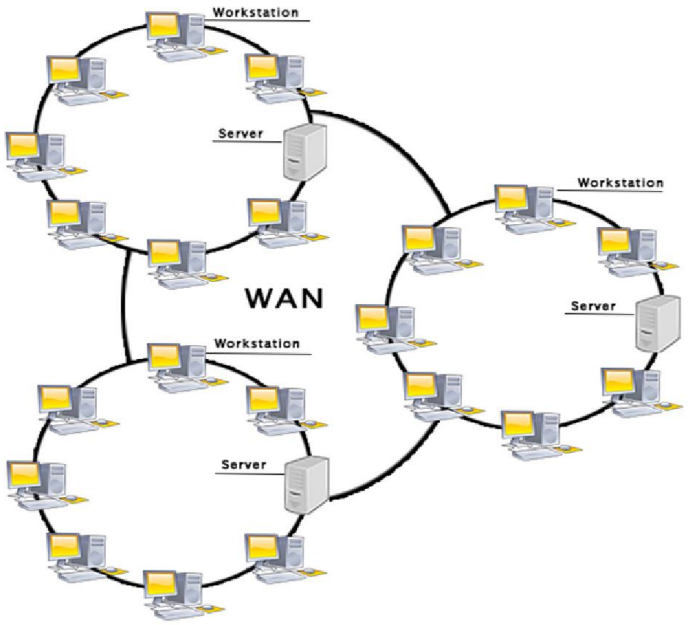
Disadvantages of MAN

Here are drawbacks/ cons of using the MAN network:

- You need more cable to establish MAN connection from one place to another.
- In MAN network it is tough to make the system secure from hackers

WAN(Wide Area Network)

- A Wide Area Network is a network that extends over a large geographical area such as states or countries.
- A Wide Area Network is quite bigger network than the LAN.
- A Wide Area Network is not limited to a single location, but it spans over a large geographical area through a telephone line, fibre optic cable or satellite links.
- The internet is one of the biggest WAN in the world.
- A Wide Area Network is widely used in the field of Business, government, and education.



Examples Of Wide Area Network:

- **Mobile Broadband:** A 4G network is widely used across a region or country.
- **Last mile:** A telecom company is used to provide the internet services to the customers in hundreds of cities by connecting their home with fiber.
- **Private network:** A bank provides a private network that connects the 44 offices. This network is made by using the telephone leased line provided by the telecom company.

Advantages Of Wide Area Network:

Following are the advantages of the Wide Area Network:

- **Geographical area:** A Wide Area Network provides a large geographical area. Suppose if the branch of our office is in a different city then we can connect with them through WAN. The internet provides a leased line through which we can connect with another branch.
- **Centralized data:** In case of WAN network, data is centralized. Therefore, we do not need to buy the emails, files or back up servers.
- **Get updated files:** Software companies work on the live server. Therefore, the programmers get the updated files within seconds.

- **Exchange messages:** In a WAN network, messages are transmitted fast. The web application like Facebook, Whatsapp, Skype allows you to communicate with friends.
- **Sharing of software and resources:** In WAN network, we can share the software and other resources like a hard drive, RAM.
- **Global business:** We can do the business over the internet globally.
- **High bandwidth:** If we use the leased lines for our company then this gives the high bandwidth. The high bandwidth increases the data transfer rate which in turn increases the productivity of our company.

Disadvantages of Wide Area Network:

The following are the disadvantages of the Wide Area Network:

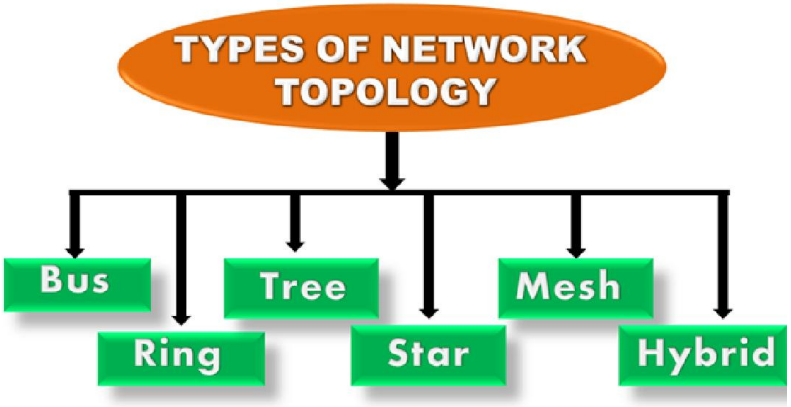
- **Security issue:** A WAN network has more security issues as compared to LAN and MAN network as all the technologies are combined together that creates the security problem.
- **Needs Firewall & antivirus software:** The data is transferred on the internet which can be changed or hacked by the hackers, so the firewall needs to be used. Some people can inject the virus in our system so antivirus is needed to protect from such a virus.
- **High Setup cost:** An installation cost of the WAN network is high as it involves the purchasing of routers, switches.
- **Troubleshooting problems:** It covers a large area so fixing the problem is difficult.

Que : 4 Network Topologies

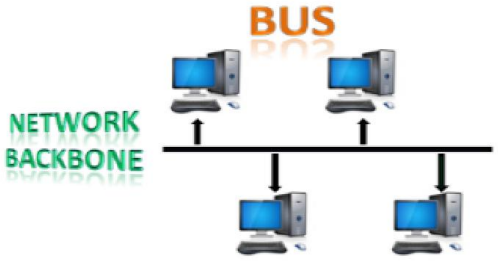
What is Topology?

Topology defines the structure of the network of how all the components are interconnected to each other. There are two types of topology: physical and logical topology.

Physical topology is the geometric representation of all the nodes in a network.



Bus Topology



- The bus topology is designed in such a way that all the stations are connected through a single cable known as a backbone cable.
- Each node is either connected to the backbone cable by drop cable or directly connected to the backbone cable.
- When a node wants to send a message over the network, it puts a message over the network. All the stations available in the network will receive the message whether it has been addressed or not.
- The bus topology is mainly used in 802.3 (ethernet) and 802.4 standard networks.

- The configuration of a bus topology is quite simpler as compared to other topologies.
- The backbone cable is considered as a **"single lane"** through which the message is broadcast to all the stations.
- The most common access method of the bus topologies is **CSMA** (Carrier Sense Multiple Access).

CSMA: It is a media access control used to control the data flow so that data integrity is maintained, i.e., the packets do not get lost. There are two alternative ways of handling the problems that occur when two nodes send the messages simultaneously.

- **CSMA CD:** CSMA CD (**Collision detection**) is an access method used to detect the collision. Once the collision is detected, the sender will stop transmitting the data. Therefore, it works on "**recovery after the collision**".
- **CSMA CA: CSMA CA (Collision Avoidance)** is an access method used to avoid the collision by checking whether the transmission media is busy or not. If busy, then the sender waits until the media becomes idle. This technique effectively reduces the possibility of the collision. It does not work on "recovery after the collision".

Advantages of Bus topology:

- **Low-cost cable:** In bus topology, nodes are directly connected to the cable without passing through a hub. Therefore, the initial cost of installation is low.
- **Moderate data speeds:** Coaxial or twisted pair cables are mainly used in bus-based networks that support upto 10 Mbps.
- **Familiar technology:** Bus topology is a familiar technology as the installation and troubleshooting techniques are well known, and hardware components are easily available.
- **Limited failure:** A failure in one node will not have any effect on other nodes.

Disadvantages of Bus topology:

- **Extensive cabling:** A bus topology is quite simpler, but still it requires a lot of cabling.
- **Difficult troubleshooting:** It requires specialized test equipment to determine the cable faults. If any fault occurs in the cable, then it would disrupt the communication for all the nodes.

- **Signal interference:** If two nodes send the messages simultaneously, then the signals of both the nodes collide with each other.
- **Reconfiguration difficult:** Adding new devices to the network would slow down the network.
- **Attenuation:** Attenuation is a loss of signal leads to communication issues. Repeaters are used to regenerate the signal.

Ring Topology

- Ring topology is like a bus topology, but with connected ends.
- The node that receives the message from the previous computer will retransmit to the next node.
- The data flows in one direction, i.e., it is unidirectional.
- The data flows in a single loop continuously known as an endless loop.
- It has no terminated ends, i.e., each node is connected to other node and having no termination point.
- The data in a ring topology flow in a clockwise direction.
- The most common access method of the ring topology is **token passing**.
    - **Token passing:** It is a network access method in which token is passed from one node to another node.
    - **Token:** It is a frame that circulates around the network.

Working of Token passing

- A token moves around the network, and it is passed from computer to computer until it reaches the destination.
- The sender modifies the token by putting the address along with the data.
- The data is passed from one device to another device until the destination address matches. Once the token received by the destination device, then it sends the acknowledgment to the sender.
- In a ring topology, a token is used as a carrier.

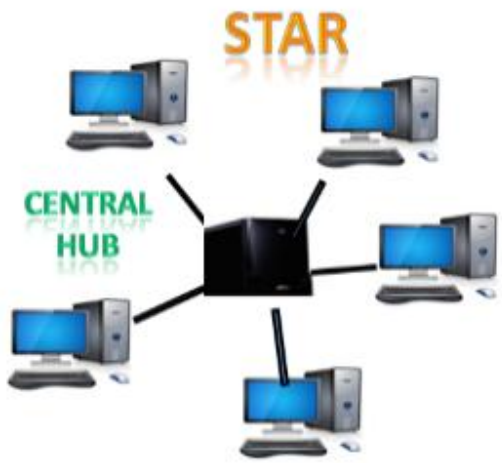
Advantages of Ring topology:

- **Network Management:** Faulty devices can be removed from the network without bringing the network down.
- **Product availability:** Many hardware and software tools for network operation and monitoring are available.
- **Cost:** Twisted pair cabling is inexpensive and easily available. Therefore, the installation cost is very low.
- **Reliable:** It is a more reliable network because the communication system is not dependent on the single host computer.

Disadvantages of Ring topology:

- **Difficult troubleshooting:** It requires specialized test equipment to determine the cable faults. If any fault occurs in the cable, then it would disrupt the communication for all the nodes.
- **Failure:** The breakdown in one station leads to the failure of the overall network.
- **Reconfiguration difficult:** Adding new devices to the network would slow down the network.
- **Delay:** Communication delay is directly proportional to the number of nodes. Adding new devices increases the communication delay.

Star Topology



- Star topology is an arrangement of the network in which every node is connected to the central hub, switch or a central computer.
- The central computer is known as a **server**, and the peripheral devices attached to the server are known as **clients**.
- Coaxial cable or RJ-45 cables are used to connect the computers.
- Hubs or Switches are mainly used as connection devices in a **physical star topology**.
- Star topology is the most popular topology in network implementation.

Advantages of Star topology

- **Efficient troubleshooting:** Troubleshooting is quite efficient in a star topology as compared to bus topology. In a bus topology, the manager has to inspect the kilometers of cable. In a star topology, all the stations are connected to the centralized network. Therefore, the network administrator has to go to the single station to troubleshoot the problem.
- **Network control:** Complex network control features can be easily implemented in the star topology. Any changes made in the star topology are automatically accommodated.
- **Limited failure:** As each station is connected to the central hub with its own cable, therefore failure in one cable will not affect the entire network.
- **Familiar technology:** Star topology is a familiar technology as its tools are cost-effective.

- **Easily expandable:** It is easily expandable as new stations can be added to the open ports on the hub.
- **Cost effective:** Star topology networks are cost-effective as it uses inexpensive coaxial cable.
- **High data speeds:** It supports a bandwidth of approx 100Mbps. Ethernet 100BaseT is one of the most popular Star topology networks.

Disadvantages of Star topology

- **A Central point of failure:** If the central hub or switch goes down, then all the connected nodes will not be able to communicate with each other.
- **Cable:** Sometimes cable routing becomes difficult when a significant amount of routing is required.

Tree topology

- Tree topology combines the characteristics of bus topology and star topology.
- A tree topology is a type of structure in which all the computers are connected with each other in hierarchical fashion.
- The top-most node in tree topology is known as a root node, and all other nodes are the descendants of the root node.
- There is only one path exists between two nodes for the data transmission. Thus, it forms a parent-child hierarchy.

Advantages of Tree topology

- **Support for broadband transmission:** Tree topology is mainly used to provide broadband transmission, i.e., signals are sent over long distances without being attenuated.
- **Easily expandable:** We can add the new device to the existing network. Therefore, we can say that tree topology is easily expandable.
- **Easily manageable:** In tree topology, the whole network is divided into segments known as star networks which can be easily managed and maintained.
- **Error detection:** Error detection and error correction are very easy in a tree topology.
- **Limited failure:** The breakdown in one station does not affect the entire network.
- **Point-to-point wiring:** It has point-to-point wiring for individual segments.

Disadvantages of Tree topology

- **Difficult troubleshooting:** If any fault occurs in the node, then it becomes difficult to troubleshoot the problem.
- **High cost:** Devices required for broadband transmission are very costly.
- **Failure:** A tree topology mainly relies on main bus cable and failure in main bus cable will damage the overall network.
- **Reconfiguration difficult:** If new devices are added, then it becomes difficult to reconfigure.

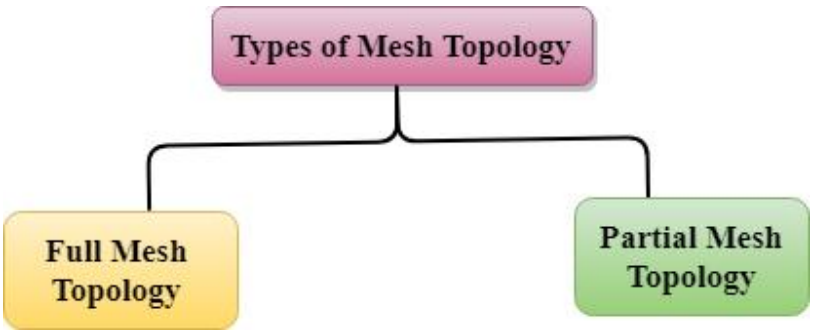
Mesh topology

- Mesh technology is an arrangement of the network in which computers are interconnected with each other through various redundant connections.
- There are multiple paths from one computer to another computer.
- It does not contain the switch, hub or any central computer which acts as a central point of communication.
- The Internet is an example of the mesh topology.
- Mesh topology is mainly used for WAN implementations where communication failures are a critical concern.
- Mesh topology is mainly used for wireless networks.
- Mesh topology can be formed by using the formula:
  Number of cables = (n*(n-1))/2;

Where n is the number of nodes that represents the network.

Mesh topology is divided into two categories:

- Fully connected mesh topology
- Partially connected mesh topology



- **Full Mesh Topology:** In a full mesh topology, each computer is connected to all the computers available in the network.
- **Partial Mesh Topology:** In a partial mesh topology, not all but certain computers are connected to those computers with which they communicate frequently.

Advantages of Mesh topology:

Reliable: The mesh topology networks are very reliable as if any link breakdown will not affect the communication between connected computers.

Fast Communication: Communication is very fast between the nodes.

Easier Reconfiguration: Adding new devices would not disrupt the communication between other devices.

Disadvantages of Mesh topology

- **Cost:** A mesh topology contains a large number of connected devices such as a router and more transmission media than other topologies.
- **Management:** Mesh topology networks are very large and very difficult to maintain and manage. If the network is not monitored carefully, then the communication link failure goes undetected.
- **Efficiency:** In this topology, redundant connections are high that reduces the efficiency of the network.

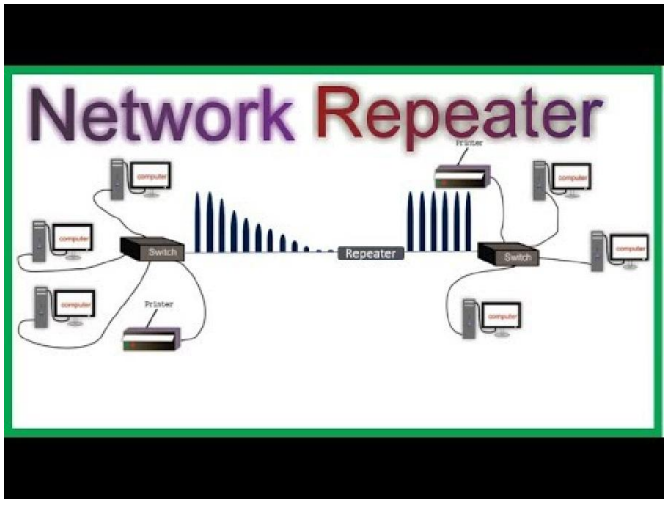
Que : 5 functions of various networking Components

Repeater

The repeater is a Physical layer device. As the name suggests, the repeater is mainly used to regenerate the signal over the same network and it mainly regenerates before the signal gets corrupted or weak.

They are incorporated into the networks in order to extend the coverage area. Repeaters can connect signals by making the use of diffrent types of cables.

- Repeaters are cost-effective.
- Repeaters are very easy o install, and after their installation, they can easily extend the coverage area of the network.
- But there is a problem with repeaters and it is they cannot those networks that are not of the same type.
- Repeaters do not help to reduce the traffic in the network.



Types of repeaters:

Types of repeaters that are available are as follows:

1. Analog Repeaters These are only used to amplify the analog signals.

2. Digital Repeaters These are only used to amplify digital signals.

3. Wired Repeaters These repeaters are mainly used in wired Local area networks.

4. Wireless Repeaters These are mainly used in wireless local area networks and also in cellular networks.

5. Local Repeaters These are used to connect segments of a local area network that are separated by a small distance.

6. Remote Repeaters These are mainly used to connect those local area networks that are far away from each other.

Hub

Hubs are those devices that are used to link several computers together. Hubs repeat one signal that comes in on one port and then copies it to other ports.

- A network hub is basically a centralized distribution point for all the data transmission in a network.
- Hub is a passive device.
- The hub receives the data and then rebroadcasts the data to other computers that are connected to it. Hub mainly does not know the destination of a received data packet. Thus it is required to send copies of data packets to all the hub connections.
- Also, Hubs consumes more bandwidth on the network and thus limits the amount of communication.
- One disadvantage of using hubs is that they do not have the intelligence to find out the best path for the data packets which then leads to inefficiencies and wastag

Types of Hub

1. Active Hub:

Active Hubs make use of electronics in order to amplify and clean up the signals before they are broadcast to other ports. Active Hubs are mainly used to extend the maximum distance between nodes. It works both as a wiring center as well as a repeater.

2. Passive Hub:

Passive Hubs are those hubs that connect only to Active Hubs. Passive Hubs are simply used to connect all ports together electrically and these are usually not powered. These hubs are cheaper than Passive hub. Passive hubs neither amplifies the signal nor regenerates the signal.

3. Intelligent Hub:

Intelligent hubs give better performance than active and passive hubs. Nowadays Intelligent hubs are widely used and are in more demand than active and passive hubs. These hubs are mainly used to connect various devices. It supports amplification and regeneration of signals at any point of incoming signals.

Intelligent hub sustains the network along with the selection path. The tasks of both passive and active are manageable by the intelligent hub.

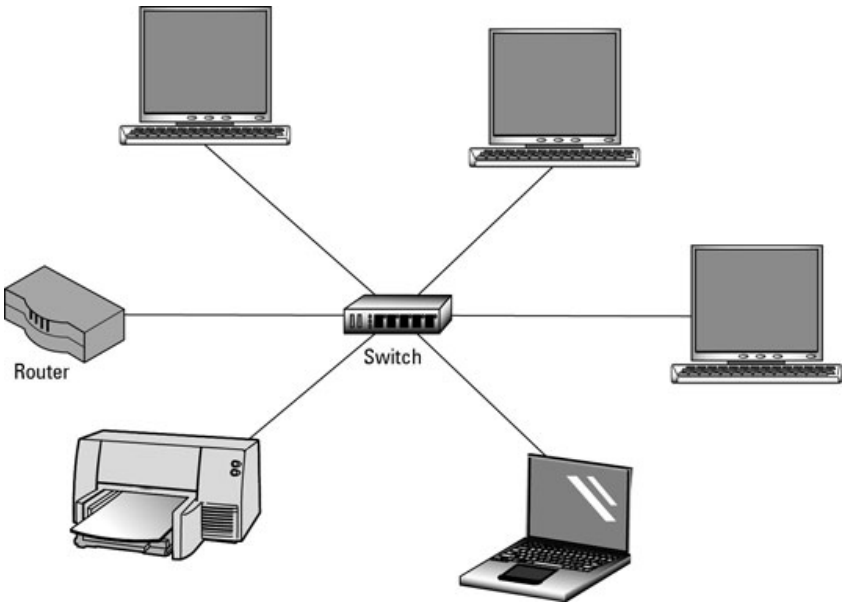
With the help of an Intelligent hub, the Speed and efficiency of the whole network increases which helps to gain the fast and efficient performance of the network.

Switch

Switch mainly resembles a Hub. It is a layer-2 device and it is used for the intelligent forwarding of messages. By intelligent we mean the decision-making ability of the switch. As hub works in the way by sending data to all ports on the device, whereas the switch sends the data to only that port that is connected with the destination device.

- The switch is a network component and is mainly used to connect the segments of the network.
- The switch is more intelligent than the network hub.
- Mainly Switches are capable of inspecting the data packets as soon as they are received, then determine the source and destination of that packet, and then forward it appropriately.
- Switch differs from the hub as it also contains ports of different speeds.

- Before forwarding the data to the ports switch performs the error checking and this feature makes the switch efficient.
- As the switch delivers the message to the connected device it was intended for, thus it conserves the bandwidth of the network and offers better performance than the hub.
- The most important feature of the switch is that it supports unicast(one to one), multicast(one to many), and broadcast(one to all) communications.
- The switch makes use of MAC address in order to send data packets to the selected destination ports.



Switches are categorized into 4:

1. Managed Switch These are expensive switches and are mainly used in those organizations that have large and complex networks. Managed switches are configured using the Simple Network Management Protocol(SNMP). These switches provide a high level of security, complete management of the network thus beside their expensiveness these are used in large organizations because they provide high scalability and flexibility

2. Unmanaged Switch These are cheap switches and are mainly used in home networks and in small businesses. The unmanaged switch does not need to be configured. Unmanaged switches can be easily set up just by plugging them into the network, after plugging they instantly start operating.

3. PoE Switch These are referred to as **Power over Ethernet** switches. With the help of the PoE technology, these switches combine the data and power transmission over the same cable, and

with the help of that devices connected to this switch are able to receive both electricity as well as data over the same line. Thus PoE switches offer more flexibility.

4. LAN Switch LAN switch is referred to as Local Area Network switch and it is mainly used to connect devices in the internal local area network of an organization. These are helpful in reducing network congestion. Bandwidth with these switches is allocated in a manner such that there is no overlapping of data packets in the network.

Router

The router is a network component that is mainly used to **send or receive data** on the computer network. The process of forwarding data packets from the source to the destination is referred to as **Routing.**

- The router is a Network Layer(i.e Layer 3) device.
- The main responsibilities of the router are receiving data packets, analyzing them, and then forwarding the data packets among the connected computer networks.
- Whenever any data packet arrives, then first of all the router inspects the destination address and then consults with its routing tables in order to decide the optimal route and then transfers the packet along this route towards the destination.
- Routers are mainly used to provide protection against broadcast storms.
- Routers are expensive than a hub, switches, repeaters, and bridges.
- Routers can also connect different networks together and thus data packets can also be sent from one network to another network.
- Routers are used in both LAN as well as in WAN(wide area network).
- Routers share data with each other in order to prepare and refresh the routing tables.

Types of Routers:

Different types of routers are as follows:

1.Core Routers Core routers are mainly used by service providers(like AT&T, Vodafone) or by cloud providers like (Amazon, Microsoft, and Google). Core Routers provide maximum bandwidth so as to connect additional routers or switches. Core routers are used by large organizations.

2.Edge Routers An edge router is also known as a Gateway router or gateway simply. The gateway is the network's outermost point of connection with external networks and also includes the **Internet.** These routers are mainly used to optimize bandwidth and are designed in order to connect to other routers so as to distribute data to end-users. Border Gateway protocol is mainly used for connectivity by edge routers.

These are further categorized into two:

- subscriber edge routers
- label edge routers.

3. Brouters Brouter means bridging routing device. These are special routers and they also provide functionalities of bridges. They perform the functioning of the bridge as well as of router; like a bridge, these routers help to transfer data between networks, and like the router, they route the data within the devices of a network.

4.Broadband Routers It is a type of networking device that mainly allows end-users to access broadband Internet from an Internet service provider (ISP). The Internet service provider usually provides and configures the broadband router for the end-user.

5.Distribution Routers These routers mainly receive the data from the edge router (or gateway) via a wired connection and then sends it on to the end-users with the help of Wi-Fi.

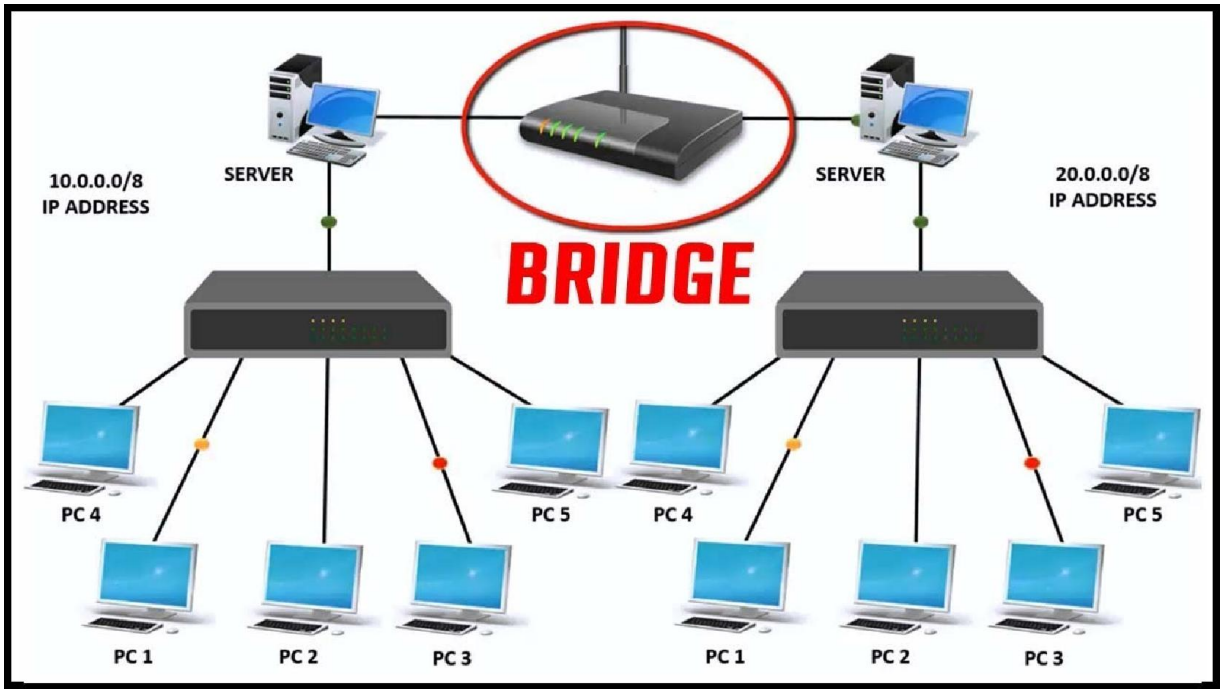
5.Wireless Routers These routers combine the functioning of both edge routers and distribution routers. These routers mainly provide a WiFi connection to WiFi devices like laptops, smartphones, etc. These routers also provide the standard Ethernet routing. For indoor connections, the range of these routers is 150 feet while for outdoor connections it is 300 feet.

Bridge

It is another important component of the computer network. The bridge is also a layer-2(that is data link layer device). A bridge is mainly used to connect two or more local area networks together. These are mainly used as they help in the fast transferring of the data.

But these are not versatile like routers.

Thus Bridge can mainly transfer the data between different protocols (i.e. a Token Ring and Ethernet network) and operates at the data link layer or level 2 of the OSI (Open Systems Interconnection) networking reference model as told above.



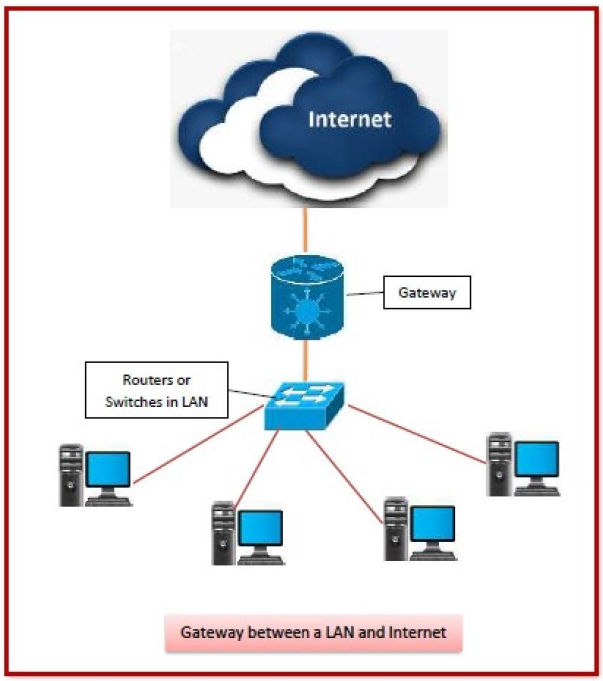
Bridges are further divided into two:

- **Local bridge** These are ordinary bridges.
- **Remote bridges** These are mainly used to connect networks that are at a distance from each other. Generally Wide Area Network is provided between two bridges

Some Bridge protocols are spanning tree protocol, source routing protocol, and source routing transparent protocol.

Gateway

A gateway is a network node that forms a passage between two networks operating with different transmission protocols. The most common type of gateways, the network gateway operates at layer 3, i.e. network layer of the OSI (open systems interconnection) model. However, depending upon the functionality, a gateway can operate at any of the seven layers of OSI model. It acts as the entry – exit point for a network since all traffic that flows across the networks should pass through the gateway. Only the internal traffic between the nodes of a LAN does not pass through the gateway.



Features of Gateways

- Gateway is located at the boundary of a network and manages all data that inflows or outflows from that network.
- It forms a passage between two different networks operating with different transmission protocols.
- A gateway operates as a protocol converter, providing compatibility between the different protocols used in the two different networks.
- The feature that differentiates a gateway from other network devices is that it can operate at any layer of the OSI model.
- It also stores information about the routing paths of the communicating networks.
- When used in enterprise scenario, a gateway node may be supplemented as proxy server or firewall.

- A gateway is generally implemented as a node with multiple NICs (network interface cards) connected to different networks. However, it can also be configured using software.
- It uses packet switching technique to transmit data across the networks.

Types of Gateways

On basis of direction of data flow, gateways are broadly divided into two categories −

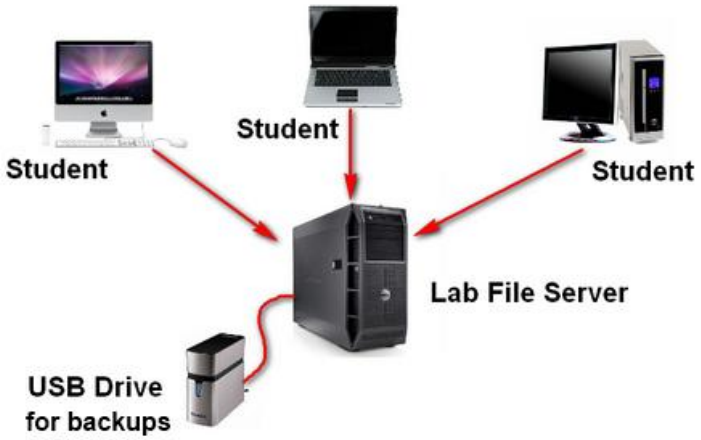
- **Unidirectional Gateways** − They allow data to flow in only one direction. Changes made in the source node are replicated in the destination node, but not vice versa. They can be used as archiving tools.
- **Bidirectional Gateways** − They allow data to flow in both directions. They can be used as synchronization tools.

Que : 5 Explain different Types of Servers

A **server** is a software or hardware device that accepts and responds to requests made over a network. The device that makes the request, and receives a response from the server, is called a client. On the Internet, the term "server" commonly refers to the computer system that receives requests for a web files and sends those files to the client.

[1]File server

- A file server is a central server in a computer network that provides file systems or at least parts of a file system to connected clients.
- File servers therefore offer users a **central storage place** for files on internal data media, which is **accessible to all authorized clients**.
- Here, the server administrator defines strict rules regarding which users have which **access rights**: F
- or instance, the configuration or file authorizations of the respective file system enable the admin to set which files can be seen and opened by a certain user or user group, and whether data can only be viewed or also added, edited, or deleted.


Student
Student
Student
Lab File Server
USB Drive
for backups

Que 6: Explain types of server.

What is server?

A server is **a computer or system that provides resources, data, services, or programs to other computers, known as clients, over a network**. In theory, whenever computers share resources with client machines they are considered servers. ... This means that a device could be both a server and a client at the same time.

Types of server

There are following types of servers are there such as

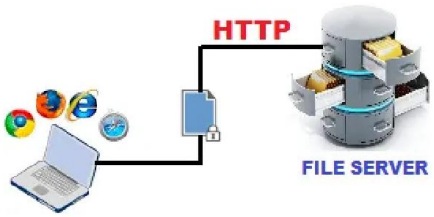
a. File server
b. Application server
c. Mail server
d. Web server
e. Database server

[A] File Server.

File server is a super performing computer system that has responsible for storing and fetching all types of files (audio file, images, video, database, and other documents), and these files are used by all client machines which are linked over the network.

A file server allows users to transfer all files over the entire network without using any physical medium of file transfer such as pen drive, floppy diskette or other external storage media. We can set up any computer as host that plays role as a file server.

In the other word, file server may be a simple computer system that has abilities to send and retrieve all requests for files over the **computer network**.



Types of File Server

File server is divided into two categories like **as**

- **Dedicated**
- **Non-Dedicated file server**.

Dedicated server is designed only for use as the File server, along with their workstation attached for reading or writing files as well as database. Non-dedicated server is designed for use as multipurpose like as file server and **database server**.

Advantages of File Server

There are few **benefits of file server**; such as –

- ✓ Less maintenance of your system
- ✓ Data is highly secured, and easy to get data backup.
- ✓ Easy to data recovery.
- ✓ Easy to handle all files centrally.
- ✓ It does not need change of application programs while changing of physical file
- ✓ Use of versions in future releases to allow programs from a previous release to run against a changed database.
- ✓ Easy to transition from old database to new database.
- ✓ It helps to decrease the storage space pressure of client system.
- ✓ It can be used one file server at once without changing of your entire system.
- ✓ File server can be accessed remotely with using of WebDAV and SCP.

Disadvantages of File Server

There are **limitations of file server**; like as –

- ✓ It may be costly, if it is used in small companies, where two or three employees work.
- ✓ Require well qualifies IT person to set up and administer.
- ✓ Increase network bandwidth while reading and writing files to and from the file server by all clients.
- ✓ If file server gets halt then all files are lost until it can be recovered from back up.

[B]Application Server

An application server is a special type of server that allows both web apps development and server environment for running them.

Application server helps to deliver best processing power and memory unit for running their applications in the real-time, as well as offering suitable environment to run particular applications.

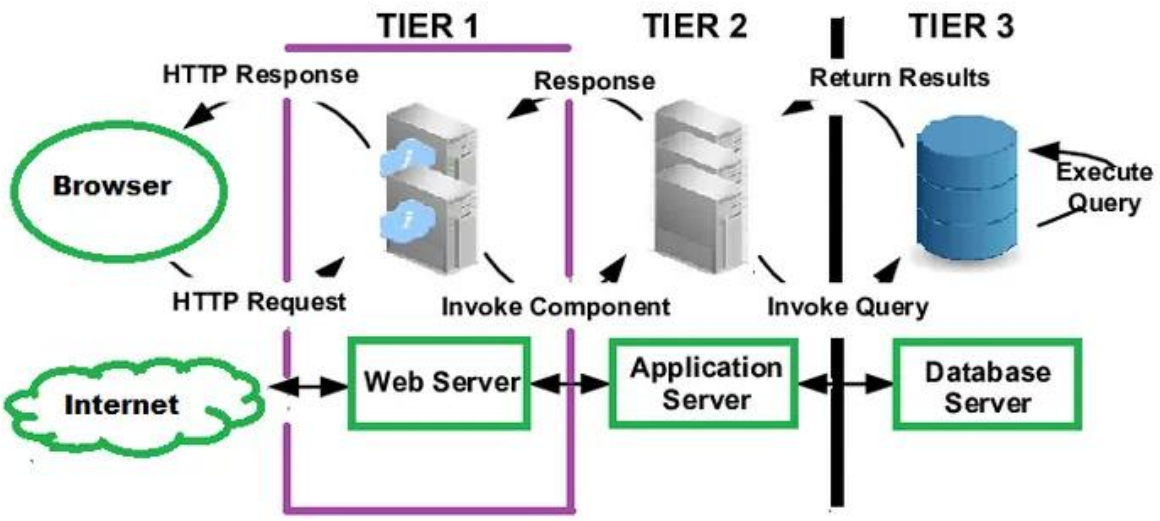
Different kinds of application servers such as:

- ✓ JBoss
- ✓ Oracle OC4J
- ✓ Apache Tomcat

Main purpose of **using of application** server is given below:

- ✓ To decrease the size and its complexity of all client programs
- ✓ To get best performance, it requires cache and handles the entire data flow.
- ✓ It implements protection for data and end-user traffic.

It is implemented in the web based application that contains the **3 tier architecture**.



- ➢ **Tier 1:** It acts as GUI interface that is placed at the client side, like as browser.
- ➢ **Tier 2**: It is known as middle tier that contains of Application server.
- ➢ **Tier 3**: This is called the backend server, such as Database Server.

As you can see in the application architecture, they make communication along with web server for sending all requests which are receiving from clients' side.

In the firstly, clients send a requests, which are forwarding to web server, and then web server moves it to second tier "Middle Tier", application server receives all information from third tier and push it back to web server side. Finally, web server moves toward back needed information to client system.

Types of Application Server

Application server is divided into three categories, such as:

Active Application Server: This server helps to offer support and better environment to use business logic that is enabled in the server side which is expressed like as rules, objects, and components, and it is also known as "Stateful Server".

Web Information Server: This type of server help to creating pages from database with enabling HTML templates, so it is also called the "Stateless Servers".

Component Server: This server plays major role in offering database access for using of software components like as COBRA, DLL, and Java Bean. It is more supportive for transaction processing requests.

[C]Mail Server

A mail server (sometimes also referred to an e-mail server) is a server that handles and delivers e-mail over a network, usually over the Internet.

A mail server can receive e-mails from client computers and deliver them to other mail servers. A mail server can also deliver e-mails to client computers.

A 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.

SMTP and POP3 server

when you press the "Send" button in your e-mail program (e-mail client) the program will connect to a server on the network / Internet that is called an SMTP server. **SMTP** is an acronym for **Simple Mail Transfer Protocol** and it is a protocol that is used when e-mails are delivered from clients to servers and from servers to other servers.

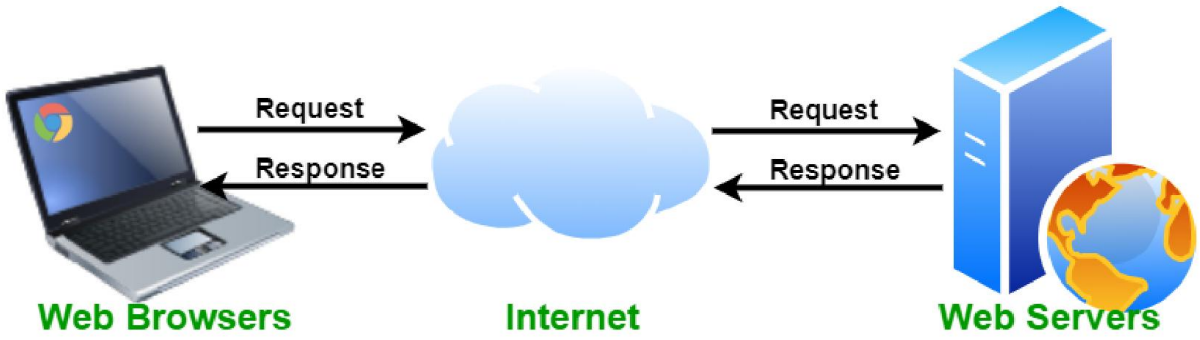
When you download e-mails to your e-mail program the program will connect to a server on the net that is known as a POP3 server. A POP3 server uses a protocol named POP3 for its communication. That is the reason why it is called a POP3 server and **POP3** is an acronym for **Post Office Protocol** version **3**.

Examples

- ✓ Gmail
- ✓ AOL
- ✓ Outlook
- ✓ Yahoo! Mail
- ✓ iCloud Mail
- ✓ Mozilla Thunderbird
- ✓ Yandex Mail

[D] Web Server

A web server is a computer that runs websites. The basic objective of the web server is to store, process and deliver web pages to the users. This intercommunication is done using Hypertext Transfer Protocol (HTTP). These web pages are mostly static content that includes HTML documents, images, style sheets, test etc. Apart from HTTP, a web server also supports SMTP (Simple Mail transfer Protocol) and FTP (File Transfer Protocol) protocol for emailing and for file transfer and storage.



Types of Server

Every Web site sits on a computer known as a Web server. This server is always connected to the internet. Every Web server that is connected to the Internet is given a unique address made up of a series of four numbers between 0 and 256 separated by periods. For example; 68.178.157.132 or 68.122.35.127. When you register a Web address, also known as a domain name, you have to specify the IP address of the Web server that will host the site. There are four leading web browsers: Apache, IIS, lighttpd and Jagsaw.

[1]Apache HTTP Server: This is the most popular web server in the world developed by the Apache Software Foundation. Apache web server is an open source software and can be installed on almost all operating systems including Linux, Unix, Windows, FreeBSD, Mac OS X and more. About 60% of the web server machines run the Apache Web Server.

[2]Internet Information Services: The Internet Information Server (lIS) is a high performance Web Server from Microsoft. This web server runs on Windows NT/2000 and 2003 platforms (and may be on upcoming new Windows version also). IIS comes bundled with Windows NT/20aO and 2003; Because IIS is tightly integrated with the operating system so it is relatively easy to administer it.

[3]Lighttpd: The lighttpd, pronounced *lighty* is also a free web server that is distributed with the FreeBSD operating system. This open source web server is fast, secure and consumes much less CPU power. Lighttpd can also run on Windows, Mac OS X, Linux and Solaris operating systems.

[4]Sun Java System Web Server: This web server from Sun Microsystems is suited for medium and large web sites. Though the server is free it is not open source. It however, runs on Windows, Linux and UNIX platforms. The Sun Java System web server supports various languages, scripts and technologies required for Web 2.0 such as JSP, Java Servlets, PHP, Perl, Python, and Ruby on Rails, ASP and ColdFusion etc.

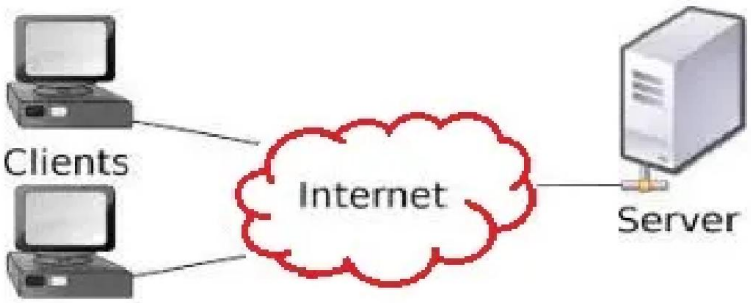
[5]Jigsaw Server: Jigsaw (W3C's Server) comes from the World Wide Web Consortium. It is open source and free and can run on various platforms like Linux, UNIX, Windows, and Mac OS X Free BSD etc. Jigsaw has been written in Java and can run CGI scripts and PHP programs.

[E]Database Server

Database server refers to combination of hardware and software where they are used to run the database, as per the context. As software, a database server works as back end portion for database application.

Database server likes as dedicated **server** that helps to offer database services, and this **type of server** run database management software.

Many large scale organizations use the database servers because they need lot of data regular basis. If those organizations implement **client server architecture** where all clients require process data with frequently, then database server associated with it, and they work together with more efficiently. Few companies hire file server for storing and process data, then database server is best option compare to file server.



Database server is a high performing computer system that helps to provide another computer along with services related for accessing as well as retrieving data from database side. “Front End” is run on the local machines which are operated by users for getting access permission to database server, and “Back End” is run on database server itself that is accessed by remote shell. After retrieving information from database, it is outputted to user requesting data.

Types of database server

Oracle

Oracle is most popular database that is used as object relational database management software, and it has latest version is 12c (12 Cloud Computing). It can also support to many Windows, Linux and UNIX versions.

Microsoft SQL Server

This server was introduced in 1989, and its latest update was released in 2016. Several languages are used for writing it like as Assembly, C, Linux, C++. It can support of Linux and Windows **operating systems**. It allows various users to use same database at once.

MySQL

MySQL is getting more popularity for different web based applications. It is available in freeware and paid version.

It can be run on Linux and Windows **operating system**.

Features are:

- ✓ Offering much functionality in free version database
- ✓ It has several user interfaces which can be implemented.
- ✓ It supports to other database systems like as DB2 and Oracle.

Microsoft Access

It depends only Microsoft Windows, and it has latest updated version is 16.0.4229.1024. This database management system is cost effective, so it is used for E-Commerce websites.

SQLite

SQLite is open source database management tool, and it is written by C language. This database system is implemented for mobile devices. It can support to Mac, Windows, and Linux **operating system**.

It is comfortable for storing small to medium size data of websites, and it needs only less space.

MongoDB

This database system is available in free and commercial version. It is developed for those applications, which use both structured and unstructured data. This engine can support both JSON and NoSQL documents. It has latest updated version MongoDB 3.2.

Que : 7 Characteristics of LAN

Resource Sharing – LAN offers to great facility resource sharing such as printer, modem, plotter, scanner, and more.

Software Program Sharing – LAN allows using single software program with multiple computer that are linked in network. So, no need to buy separate licensed application program for every client machine.

Simple and Fast Communication – In Local Area Network (LAN), huge data and other types of messages can simply be shared with another linked computer terminal over network.

Cost-Effective – Local Area Network (LAN) is cheapest to setup and maintain compare to other like WAN and MAN, because in LAN system no need to large cabling and other infrastructure. Due to local nature of LAN, it gets easy troubleshooting and maintenance.

Centralized Storage – All data and messages are stored in the storage medium on centralized server machine. It allows to all users for accessing of those data on the network.

Data Protection – All data are saved on the local server computer machine, and it is not easy task to leak those data. So LAN is more protected.

Internet Sharing – Local Area Network (LAN) offers to great functionality to share internet connection with multiple LAN connected users.

Computer identification – Every computer machine has own MAC address that is stored in the switch or router during communication between multiple computers. With the help of these MAC addresses, each client machine can identify that where to send and receive all data.