Eg. 100BASET

- 100 Mbps
- Baseband
- Unshielded Twisted Pair

10BASE5, 10Mbps, Baseband, 5*100Meters.

Baseband:

A signaling technology that sends digital signals over a single frequency as discrete electrical pulses. The baseband signal is bidirectional so that a baseband system can both transmit and receive signals simultaneously. Use time-division multiplexing **(TDM)** to accommodate multiple channels over a single baseband transmission line. Baseband signals can be regenerated using repeaters in order to travel longer distances before weakening and becoming unusable because of attenuation. Eg. Ethernet

Braodband:

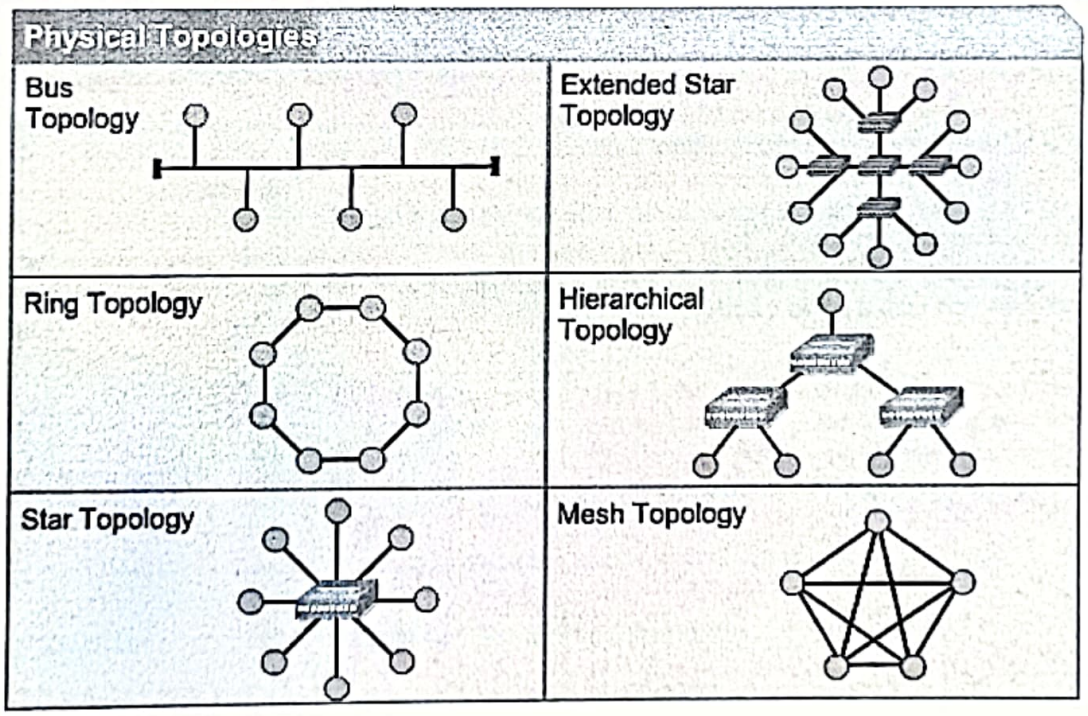
A signaling technology that sends signals simultaneously over a range of different frequencies as electromagnetic waves. These signals are unidirectional—traveling in only one direction at a time—so a broadband system can generally either transmit or receive but cannot do both simultaneously. Broadband signals can be regenerated using amplifiers in order to travel longer distances before becoming attenuated. Broadband transmissions are divided into multiple bands or channels by multiplexers using a multiplexing scheme such as frequency-division multiplexing **(FDM).**

Eg.One good example of broadband signaling would be how you view different channels through your cable box and a signal coaxial cable carrying multiple signals in cable television.

Physical Topology and Logical Topology:

Physical topology The term physical topology refers to the way in which a network is laid out physically. The actual layout of the wire or media. Two or more devices connect to a link; two or more links form a topology.

Logical topology: Defines how the hosts access the media to send data. Shows the flow of data on a network.



Bus Topology:

A networking topology that connects networking components along a single cable or that uses a series of cable segments that are connected linearly. A network that uses a bus topology is referred to as a "bus network." Bus networks were the original form of Ethernet networks, using the 10Base5 cabling standard. Bus topology is used for:

- Small work-group local area networks (LANs) whose computers are connected using a thinnet cable
- Trunk cables connecting hubs or switches of departmental LANs to form a larger LAN
- Backboning, by joining switches and routers to form campus-wide networks

Advantages:

- Easy to install
- Costs are usually low
- Easy to add systems to network
- Great for small networks

Disadvantages:

- out of date technology.
- include difficult reconnection and fault isolation
- Can be difficult to troubleshoot.
- Unmanageable in a large network
- If cable breaks, whole network is down

Ring Topology

In a ring topology, each device has a dedicated point-to-point connection with only the two devices on either side of it. A signal is passed along the ring in one direction, from device to device, until it reaches its destination. Each device in the ring incorporates a repeater. When a device receives a signal intended for another device, its repeater regenerates the bits and passes them along.

A ring is relatively easy to install and reconfigure. Each device is linked to only its immediate neighbors (either physically or logically). To add or delete a device requires changing only two connections. The only constraints are media and traffic considerations (maximum ring length and number of devices). In addition, fault isolation is simplified. Generally in a ring, a signal is circulating at all times. If one device does not receive a signal within a specified period, it can issue an alarm. The alarm alerts the network operator to the problem and its location. However, unidirectional traffic can be a disadvantage. In a simple ring, a break in the ring (such as a disabled station) can disable the entire network. This weakness can be solved by using a dual ring or a switch capable of closing off the break.

However, unidirectional traffic can be a disadvantage. In a simple ring, a break in the ring (such as a disabled station) can disable the entire network. This weakness can be solved by using a dual ring or a switch capable of closing off the break.

Advantages:

- Very orderly network where every device has access to the token and the opportunity to transmit
- Performs better than a bus topology under heavy network load
- Does not require network server to manage the connectivity between the computers

Disadvantage:

- One malfunctioning workstation or bad port in the MAU can create problems for the entire network
- Moves, adds and changes of devices can affect the network
- Network adapter cards and MAU's a Multistation Access Unit are much more expensive than Ethernet cards and hubs
- Much slower than an Ethernet network under normal load

Mesh Topology:

In a mesh topology, every device has a dedicated point-to-point link to every other device. The term dedicated means that the link carries traffic only between the two devices it connects. To connect n nodes in Mesh topology, we require n(n-1)/2 duplex mode links.

Advantages:

1. The use of dedicated links guarantees that each connection can carry its own data load, thus eliminating the traffic problems that can occur when links must be shared by multiple devices.
2. Robust, If one link becomes unusable, it does not incapacitate the entire system.
3. Advantage of privacy or security.
4. point-to-point links make fault identification and fault isolation easy , Traffic can be routed to avoid links with suspected problems.

Disadvantage:

1. Required high amount of cabling and the number of I/O ports.
2. the sheer bulk of the wiring can be greater than the available space (in walls, ceilings, or floors) can accommodate.
3. the hardware required to connect each link (I/O ports and cable) can be prohibitively expensive.

One practical example of a mesh topology is the connection of telephone regional offices in which each regional office needs to be connected to every other regional office.

Star Topology:

In a star topology, each device has a dedicated point-to-point link only to a central controller, usually called a hub. The devices are not directly linked to one another. Unlike a mesh topology, a star topology does not allow direct traffic between devices. The controller acts as an exchange: If one device wants to send data to another, it sends the data to the controller, which then relays the data to the other connected device .

Advantages:

- Less Expensive than Mesh topology.
- In a star topology, each device needs only one link and one I/O port to connect it to any number of other devices. This factor also makes it easy to install and reconfigure.
- Less Cabling, Addition and Deletion involves only one connection between the devices and the Hub or Switch.
- Easy for Fault identification and fault isolation. If one link fails, only that link is affected. All
- other links remain active.

Disadvantage:
One big disadvantage of a star topology is the dependency of the whole topology on one single point, the hub. If the hub goes down, the whole system is dead.

An extended star topology links individual stars together by connecting the hubs or switches.

A hierarchical topology is similar to an extended star. However, instead of linking the hubs or switches together, the system is linked to a computer that controls the traffic on the topology.

Logical Topology:

The logical topology of a network determines how the hosts communicate across the medium. The two most common types of logical topologies are **broadcast and token passing.**

The use of a **broadcast topology** indicates that each host sends its data to all other hosts on the network medium. There is no order that the stations must follow to use the network. It is first come, first serve. Ethernet works this way as will be explained later in the course.

The second logical topology is **token passing.** In this type of topology, an electronic token is passed sequentially to each host. When a host receives the token, that host can send data on the network. If the host has no data to send, it passes the token to the next host and the process repeats itself. Two examples of networks that use token passing are Token Ring and Fiber Distributed Data Interface **(FDDI).** A variation of Token Ring and FDDI is Arcnet. Arcnet is token passing on a bus topology.

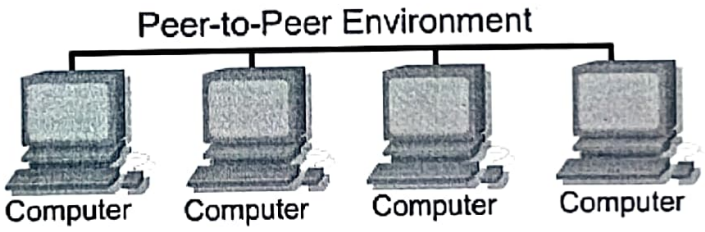
Network Architecture:

Two types of Network Architecture:

1. Peer-to-Peer Model
2. Client-server Model

Peer-to-Peer Model:

In a peer-to-peer network, networked computers act as equal partners, or peers. As peers, each computer can take on the client function or the server function. Computer A may request for a file from Computer B, which then sends the file to Computer A. Computer A acts like the client and Computer B acts like the server. At a later time, Computers A and B can reverse roles.



In a peer-to-peer network, individual users control their own resources. The users may decide to share certain files with other users. The users may also require passwords before they allow others to access their resources. Since individual users make these decisions, there is no central point of control or administration in the network. In addition, individual users must back up their own systems to be able to recover from data loss in case of

failures. When a computer acts as a server, the user of that machine may experience reduced performance as the machine serves the requests made by other systems.

As networks grow, peer-to-peer relationships become increasingly difficult to coordinate. A peer-to-peer network works well with ten or fewer computers. Since peer-to-peer networks do not scale well, their efficiency decreases rapidly as the number of computers on the network increases. Also, individual users control access to the resources on their computers, which means security may be difficult to maintain. The client/server model of networking can be used to overcome the limitations of the peer-to-peer network.

Peer-to-peer networks are relatively easy to install and operate. No additional equipment is necessary beyond a suitable operating system installed on each computer. Since users control their own resources, no dedicated administrators are needed.

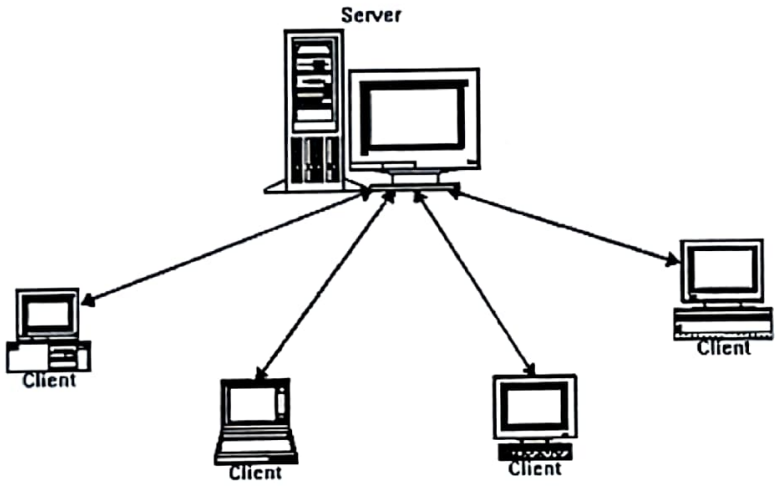
The advantages of peer-to-peer:

- No need for a network administrator
- Network is fast/inexpensive to setup & maintain
- Each PC can make backup copies of its data to other PCs for security.
- Easiest type of network to build, peer-to-peer is perfect for both home and office use.

Client-server Model:

The term *client-server* refers to a popular model for computer networking that utilizes client and server devices each designed for specific purposes. The client-server model can be used on the Internet as well as local area networks (LANs). Examples of client-server systems on the Internet include Web browsers and Web servers, FTP clients and servers, and DNS.

In a client/server arrangement, network services are located on a dedicated computer called a server. The server responds to the requests of clients. The server is a central computer that is continuously available to respond to requests from clients for file, print, application, and other services. Most network operating systems adopt the form of a client/server relationship. Typically, desktop computers function as clients and one or more computers with additional processing power, memory, and specialized software function as servers.



Servers are designed to handle requests from many clients simultaneously. Before a client can access the server resources, the client must be identified and be authorized to use the resource. Each client is assigned an account

name and password that is verified by an authentication service. The authentication service guards access to the network. With the centralization of user accounts, security, and access control, server-based networks simplify the administration of large networks. The concentration of network resources such as files, printers, and applications on servers also makes it easier to back-up and maintain the data. Resources can be located on specialized, dedicated servers for easier access. Most client/server systems also include ways to enhance the network with new services that extend the usefulness of the network.

The centralized functions in a client/server network has substantial advantages and some disadvantages. Although a centralized server enhances security, ease of access, and control, it introduces a single point of failure into the network. Without an operational server, the network cannot function at all. Servers require a trained, expert staff member to administer and maintain. Server systems also require additional hardware and specialized software that add to the cost.

Client/server describes the relationship between two computer programs in which one program, the client, makes a service request from another program, the server, which fulfill the request. Although programs within a single computer can use the client/server idea, it is a more important idea in a network. In a network, the client/server model provides a convenient way to interconnect programs that are distributed efficiently across different locations. Computer transactions using the client/server model are very common. For example, to check your bank account from your computer, a client program in your computer forwards your request to a server program at the bank. That program might in turn forward the request to its own client program that sends a request to a database server at another bank computer to retrieve your account balance. The balance is returned back to the bank data client, which in turn serves it back to the client in your personal computer, which displays the information for you.

Advantages: Flexibility of the system, scalability, cost saving, centralized control and implementation of business rules, increase of developers productivity, portability, improved network and resource utilization.

Client-server Vs Peer-to-Peer Network:

Advantages of a Peer-to-Peer Network	**Advantages of a client-server Network**
Less Expensive to implementation	Provides of better security.
Does not require additional specialized network administration softwares.	Easier to administer when the network is large because administration is centralized.
Does not require a dedicated network administrator.	All date can be backed up on one central location.
Disadvantages of a Peer-to-Peer Network	**Disadvantage of a Client-server Network**
Does not scale well to large network and administration become unmanageable.	Requires expensive, specialized network administrative and operational software.
Less Secure	Requires a professional administrator.
All machine sharing the resources negatively impact the performance.	Has a single point of failure. User data is unavailable if the server is down.
Each user must be trained to perform administrative tasks.	Requires more expensive, more powerful hardware for the server machine.

Wireless LAN:

The infrastructure less network where, there is not required of any physical cable for network connection. In wireless LAN each client computer is connected to the Access Point though which they can share the file and access to the Internet.

These days People are becoming more mobile and want to maintain access to their business LAN resources from locations other than their desks. Workers in the office want to take their laptops to meetings or to a co-worker's office. When using a laptop in another location, it is inconvenient to rely on a wired connection.

WLAN VS LAN:

Characteristics	**802.11 Wireless LAN**	**802.3 Ethernet LANS**
Physical Layer	Radio Frequency (RF)	Cable
Media Access	Collision Avoidance (CSMA/CA)	Collision Detection(CSMA/CD)
Availability	Anyone with a radio NIC in range of an Access point	Cable connection required
Signal interference	Yes	Inconsequential
Regulation	Additional regulation by local authorities	IEEE standard dictates

- RF does not have boundaries, such as the limits of a wire in a sheath. The lack of such a boundary allows data frames traveling over the RF media to be available to anyone that can receive the RF signal.
- RF is unprotected from outside signals, whereas cable is in an insulating sheath. Radios operating independently in the same geographic area but using the same or a similar RF can interfere with each other.
- RF transmission is subject to the same challenges inherent in any wave-based technology, such as consumer radio. For example, as you get further away from the source, you may hear stations playing over each other or hear static in the transmission. Eventually you may lose the signal all together. Wired LANs have cables that are of an appropriate length to maintain signal strength.
- RF bands are regulated differently in various countries. The use of WLANs is subject to additional regulations and sets of standards that are not applied to wired LANs.