

12th HSC

Networking Technology

Lecture 1 (introduction)

Probable marks : 28

Scope of syllabus

- Study of transmission media : cables media coaxial cable , twisted pair cable , fiber optics.
- Introduction to wireless media
- Network topologies – access method , topology , ethernet , token ring .
- Protocols : internet protocols
- Introduction to connectivity devices
- Modem , hubs, repeaters , routers

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Study of Transmission
Media

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What is transmission media

- The pathway through which individual system are connected in network are called as transmission media
- It makes the transmission of electronics signals possible from one computer to another computer.
- This signal are nothing but binary pulses.
- Each transmission media has special characteristic that makes it suitable for a specific type of services

Characteristic :

- Cost of media
- Installation requirement
- Bandwidth
- Attenuation
- Immunity from electromagnetic interference.

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Wireless Media & Advantages
of wireless media

Lecture 3

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- What is wireless media ?

- ❖ Wireless technology refers to technology that allow us to communicate without using cables
- ❖ Wireless technology includes radio frequency wave and infrared wave
- ❖ In this media data is transfer from one to another in the form of IR & RF waves.
- ❖ Wireless communication has extra ordinary convenience .
- ❖ There are basic three types of wireless media : 1) LAN 2) extended LAN (WAN) 3) mobile computing.

- Advantages of wireless media

- ❖ High data rate by using large bandwidth
- ❖ Wireless media gives transmission speed around 24 kbps
- ❖ By this media the communication can reach rural and hilly area
- ❖ Bandwidth for digital data 1 to 10 mbps.

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Advantages of Computer
Networks
&
WAN and LAN

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Advantages of computer networks

- ❖ Computer networks is an interconnected collection of autonomous computer capable of sharing resources controlling services.
- ❖ Network provide resource sharing
- ❖ It provide exchange of information and software
- ❖ It provide high reliability by using other machine if one machine fails in the network like air and traffic control.
- ❖ Access to any file and data
- ❖ Finally the system is saving money by network only.

LAN & WAN

- ❖ **LAN :**

- ❖ A LAN (local area network) is a group of computer interconnected within a small area such as room , building or a campus
- ❖ Data transfer speed is comparatively high such as thousand bits per second
- ❖ Co-axial cable are generally used to connect the computer and other devices .
- ❖ Due to short distance short circuit errors are minimum
- ❖ Ex : a computer lab in a college

- ❖ **WAN :**

- ❖ A WAN (wide area network) is the interconnection of LAN can be located entirely within a state country or around the world
- ❖ Data transfer rate is comparatively slower such as in Kbit / sec 10 million bit per second
- ❖ It allow device to connect over a wide geographic area
- ❖ It connect devices via wired or wireless services.

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Transmission Media :

Co-axial Cable

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Co-axial Cable

- ❖ In co-axial cable , there are two conductor sharing a common axis.
- ❖ The component of coaxial cable are as follow :
 - ❖ A center conductor is a solid copper wired or standard wire .
 - ❖ An outer conductor form a tube surrounding the inner conductor
 - ❖ This conductor is made up of metallic wire .
 - ❖ The outer is called shield
 - ❖ This serves as a ground and protect inner conductor from EMI
 - ❖ An insulator layer keeps outer conductor spaced evenly from the inner conductor
 - ❖ A plastic jacket protect cable from damage.

Advantages and Disadvantages of Co-axial cable

- **Advantages :**

- the co-axial cable is better shielded than the twisted pair cable
- It can span longer distance at higher data transmission speed
- Attenuation is less than twisted pair cable table
- It provide better resistance and EMI

- **Disadvantages :**

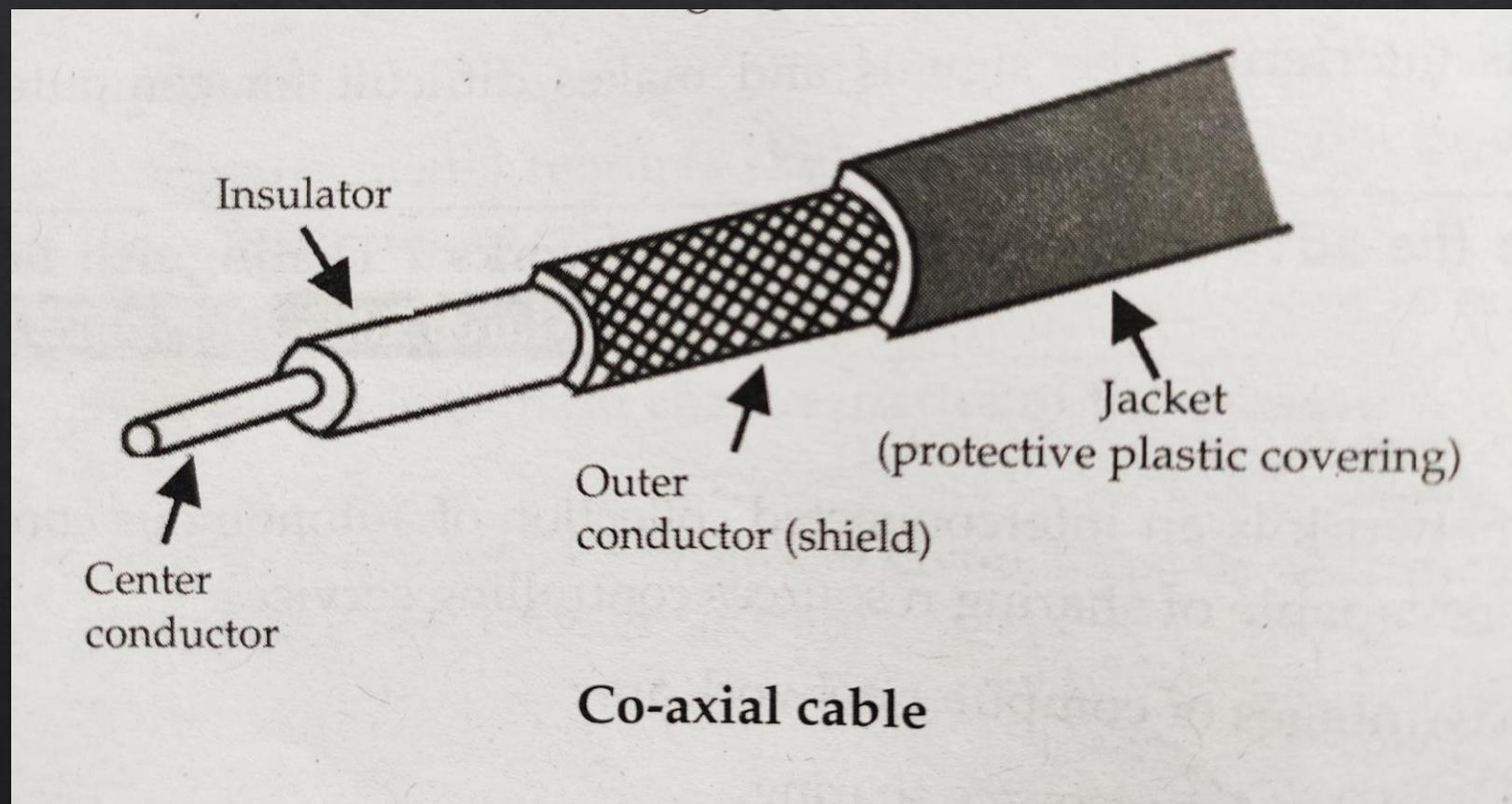
- It relatively more expensive than twisted pair cable but less than fiber optic cable
- Bandwidth capacity is comparatively less than fiber optic cable.

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Twisted pair cable

Lecture 6

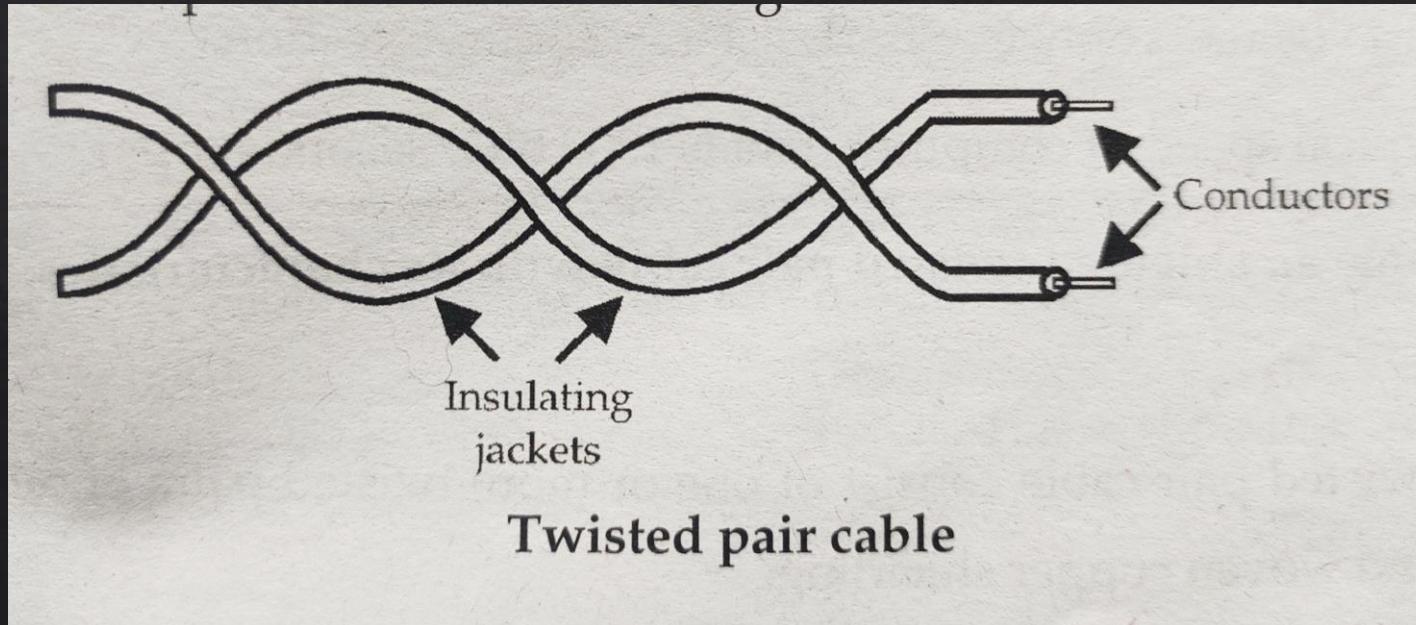
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Co-axial cable



Twisted pair cable

- ❖ Twisted pair cable consist of two wires of conducting material like copper, insulated from each other by plastic.



Twisted pair cable

- ❖ It consists of two or more strand of copper wire twisted together .
- ❖ This twisting reduces the sensitivity of cable to EMI (electromagnetic interference) and also reduces the tendency of the cable to radiate radio frequency noise
- ❖ This cable is used to connect a PC to either HUB or MAU. Also commonly used in telephone network.
- ❖ Twisted pair cable are of two type :
 - ❖ Shielded twisted pair cable
 - ❖ Unshielded twisted pair cable

Types of twisted pair cable

❖ **Shielded twisted pair cable :**

- ❖ Shielded twisted pair cable consist of one or more twisted pair of cables enclosed in a foil wrap and woven copper shielding.
- ❖ the shield is connected to the ground portion of electronic device to which cable is connected . Ground portion id electrical reference point
- ❖ A properly grounded shield prevents signals from getting into or out of the cable

Types of twisted pair cable

- ❖ **Unshielded twisted pair cable :**
- ❖ The unshielded twisted pair cable dose not have a braided shield into its structure .
- ❖ The characteristics of UTP are similar to that of STP
- ❖ Telephone systems commonly use UTP cable .
- ❖ In some networks UTP cable is used .

Advantages and disadvantages

- ❖ **Advantages :**

- ❖ This medium is inexpensive and easy to install
- ❖ Since wire are twisted it reduces EMI and also avoids RF radiation
- ❖ Twisted wires also reduces cross talk

- ❖ **Disadvantages :**

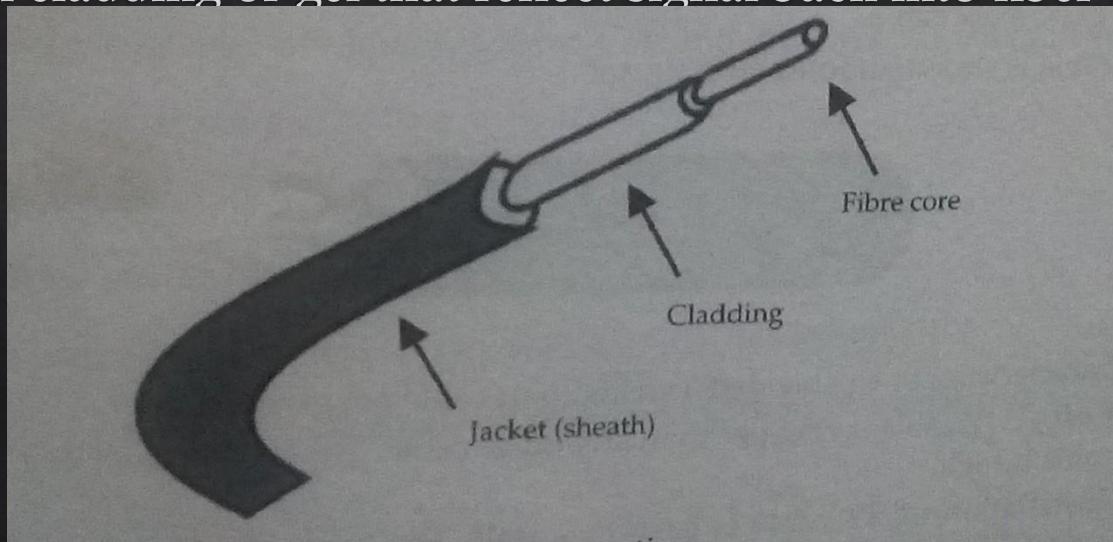
- ❖ They can be used only for short distance communication
- ❖ The typical speed for computer data is 1200 bits/second.

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Fiber optic cable

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Fiber optic cable

- ❖ The light wave can be efficiently conducted through transparent glass fiber cable known as optic fiber cables.
- ❖ The center conductor of this cable is a fiber that consist of highly refined glass or plastic.
- ❖ It is designed to transmit light signal with little loss
- ❖ Fiber is coated with cladding or gel that reflect signal back into fiber to reduce signal loss .



points

- ❖ A plastic sheet protect the fiber from damage
- ❖ This cable carry much information at a time.
- ❖ This cable have extremely high bandwidth.
- ❖ **Characteristics :**
 - ❖ **Cost** : the cost of fiber optic cable is higher than coaxial and twisted pair cable
 - ❖ **Installation** : it required skilled installation
 - ❖ **Capacity** : it supports high data rate and even with long run cable.
 - ❖ **Attenuation** : attenuation for this is much lower than otherer cables

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Radio waves , Microwaves
Infrared wave

Lecture 8

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Radio waves :

- ❖ Radio waves are easy to generate , they can travel long distance and can penetrate building also
- ❖ Radio waves are used for indoor and outdoor purpose also..
- ❖ Radio waves are omnidirectional travel in all direction
- ❖ Radio waves communication have variety of frequency ranges that are utilized for various communication application
- ❖ It cover large distance
- ❖ It have major drawback that it may be disturb by rains
- ❖ It offer low bandwidth for data communication.

Microwaves

- ❖ Microwaves travels in straight lines and therefore narrowly focused concentrating all the energy into beam
- ❖ For microwaves transmitting and receiving anntennas should be accurately aligned
- ❖ This allow multiple transmitter linear in row to communicate with multiple receiver liner on a row
- ❖ Since microwave travels in straight lines for long distances periodic repeaters are necessary.
- ❖ Lower frequency microwave can not penetrate buildings.

Infrared and millimeter waves

- ❖ This infrared waves are widely used for short range communication.
- ❖ The remote controls used on television used infrared communication
- ❖ They are relatively directional cheap and easy to generate
- ❖ Major draw back is these waves can not pass through solid object

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Ethernet Network
Technology

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Ethernet

- ❖ Ethernet is a local area network technology , with network traditionally operating within single building
- ❖ Atmost ethernet devices can have a few hundred meters of cable between them
- ❖ Modern technology allows ethernet to span up to 10kms.
- ❖ ethernet devices are connected to a common shared medium that provide the path along with electronic signals will travel
- ❖ In previous days this medium wad co axial cable but now a days twisted pair cable and optic fiber cable are also used.

Ethernet

- ❖ Ethernet network transmit data in small unit called frames.
- ❖ Each frame must contain source address as well as destination address which identifies recipient and sender message
- ❖ The address will uniquely identify node.
- ❖ No two ethernet devices can have same address

12th HSC Network Topologies

Lecture 10

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Previous year Board Question

Q. 1) what do you mean by network topology ? Explain in brief the two basic categories of topology ?
(march 2004, oct 2009)

Q. 2) what is topology ? Explain Bus topology in detail .
(oct-2006, 07,09,10, mar 11)

What is mean by network topology ?

- ❖ Topology refers to the way in which network of computer is connected
- ❖ A topology defines the arrangement of nodes , cables and connectivity devices that makes up the network
- ❖ There are two types of categories
- ❖ Physical topology
- ❖ Logical topology
- ❖ Physical topology describes actual layout of the network transmission media. It defines the way the network looks.
- ❖ Logical topology describes the logical pathway a signal follows as it passes among the network modes.
- ❖ it defines the data passes among the node

Topology

- ❖ Physical and logical topologies can take several forms.
- ❖ The most common topologies are :
- ❖ Bus topology
- ❖ Ring topology
- ❖ Star topology
- ❖ Mesh topology

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Networking Topology
(star, ring, bus)

Lecture-11
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Different types of topology:

- ❖ Bus Topology
- ❖ Ring Topology
- ❖ Star topology

Bus topology:

In a bus physical topology , all the device are connected to a common shared cable called back bone of the network

The bus is available for each node to send its data to each and every computer node

Most of the buses transmit signals in both direction on backbone cable and hence all workstations are able to receives signals. But some buses are unidirection and data is transmission on only one direction of backbone cable. Hence only down stream devices can receive signals .

The backbone cable carries transmission message along the cable. As message arrives at a workstation it checks whether the destination address matches to its own or not. If not it does no more and the message goes to next workstation.

Advantages of bus topology:

- ❖ The bus system much faster.
- ❖ The bus topology can be extended with sub branches to form another topology.
- ❖ Breakdown of any failure node does not affect other nodes communication.
- ❖ Bus topology is widely used in LAN network

Ring topology:

- ❖ Ring topology are wired in a circle. Each node connected to its neighbours on either side and the data transmits along the ring in one direction only.
- ❖ Each device incorporates a receiver and a transmitter and serves as a repeater that passes the signals onto the next devices in the ring.
- ❖ Ring topology are suited for networks that uses token passing access method. The token passing around the ring and the only node that holds the token can transmit data.
- ❖ This topology is always implemented as logical topology.
- ❖ The commonly used implementation for RING topology is token ring at 4-16 MBPS.

Advantages of ring topology :

- ❖ Cable failure affects limited users
- ❖ Each node has equal access speed to the ring .
- ❖ Equal access for all users .

Disadvantages of ring topology :

- ❖ Costly wiring is required for RING topology .
- ❖ Expensive adapters card.
- ❖ Difficult connection .

STAR topology :

- ❖ In a STAR topology all the workstations are connected to central hub .
- ❖ The hub receives signals from a workstation and routes it to the proper destination.
- ❖ STAR physical topology is often implemented to BUS or RING logical topology .

Advantages of STAR topology :

- ❖ Adding an new workstations is easier than in BUS and RING topology .
- ❖ The control is centralised due to use of hub.

Disadvantages of STAR topology :

- ❖ Hub failure affects all users .
- ❖ Hubs are slightly expensive
- ❖ STAR topology requires more cabling than BUS and STAR topology . Hence ,it costs more.

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Protocols

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Lecture no. 12

Q. What is meant by protocols ? Explain the concept of TCP/IP protocols .

(Mar-04, 08, 2011, oct-03,2004, June -2016, mar -18)

Ans.



Ans :

- ❖ A protocols is defined as an agreement between communication particle for how communication should be proceed
- ❖ protocols are rules by which computers communications i.e protocols is set of rules and formats for sending and receiving .
- ❖ Internet protocols are called TCP/IP (transmission control protocols / internet protocols) protocols .

- ❖ This protocols do not belongs any one company and technology is available to every body .
- ❖ TCP/IP protocols use three types of addresses for network addressing :
- ❖ **Hardware or physicals addresses** is used by the data link and physicals layers .
- ❖ **Internet protocols address** provides logical node identification .
This address is unique address assinged by administrators expressed in four parts dotted notation .e.g 123.144.131.21
- ❖ **Logical node names** are easier to remember than an IP address.

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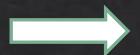
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★ Token ring network

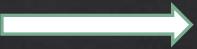
Lecture-13

Explain token ring network in detail.



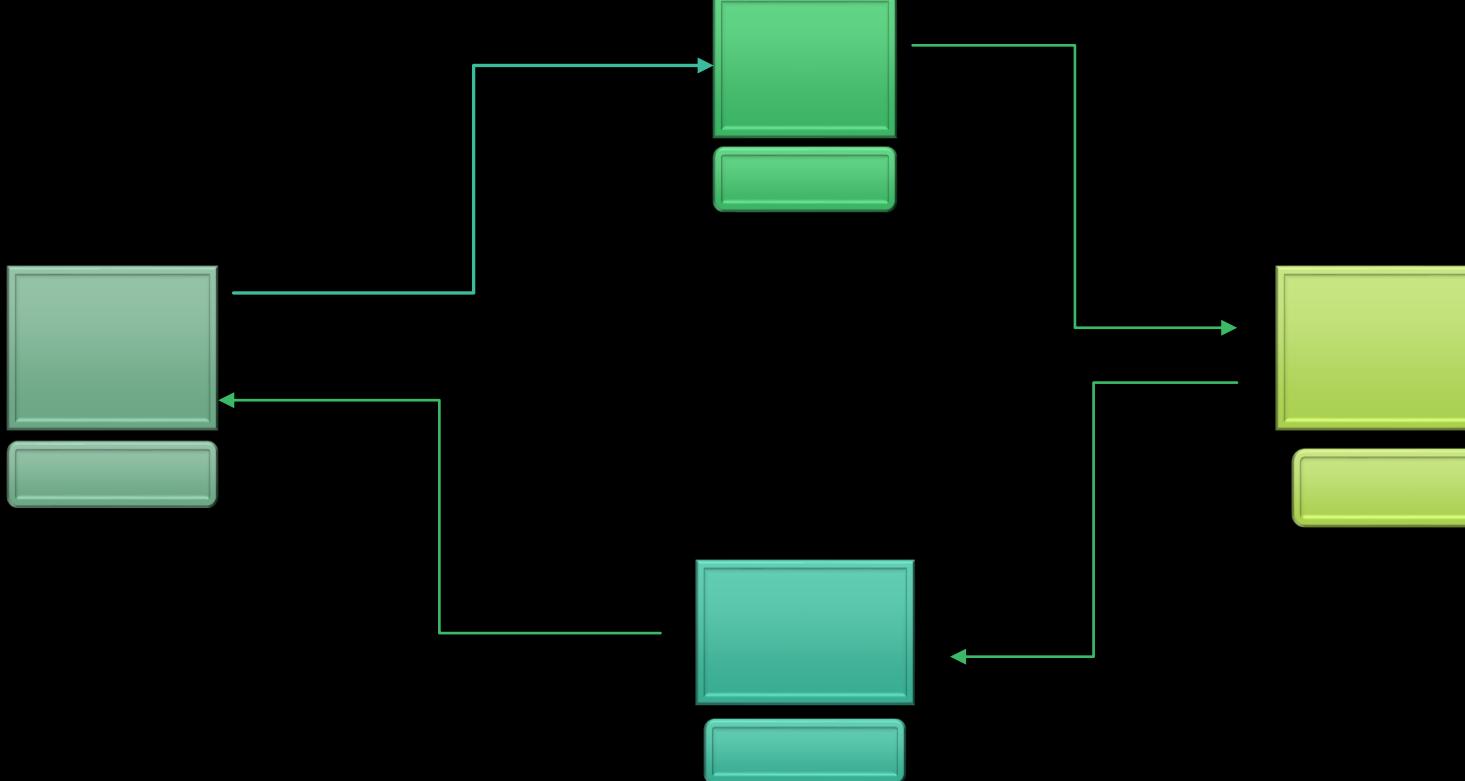
- ❖ Token ring network was originally developed by IBM and it is almost identical and compatible to IBM.
- ❖ Token ring uses token passing architecture. The topology is physically a STAR . But it uses a logical ring to pass the token.
- ❖ Each token ring network device is connected to a central concentrator called as multistation access unit (MSAU and MAU) . Because of MSAU, a single computer failure will not take the entire LAN down.
- ❖ Token passing networks moves a small frame , called token around the network.

Remaning ans.



- ❖ The node which passes token have right to send information .
- ❖ If the node possessing token has no information to send , then it passes token to next node .Each node can hold token for maximum period of time .
- ❖ If the node possessing token does have information to send , then it sends it to next workstation (node), which check whether information belongs to it or not , if not ,then sends it to next node. The information frame circulates the ring until it reaches to the destination .

Diagram of token ring network ↓



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Introduction to connectivity

devices

Lets study with us

Explain modem in detail .

- ❖ Computers store digital data , while telephone lines can only transfer analog data . If a computer is to be connected to internet through telephone , then it must convert digital data to analog data before transmitting the computer signals .
- ❖ Converting one signals from to another form is called modulation reconverting it to originals form is called as demodulation .
- ❖ Modem is modulator/ demodulator . Modem is used to connect computer to internet . Modem convert digital data to analog dadta and vice versa .

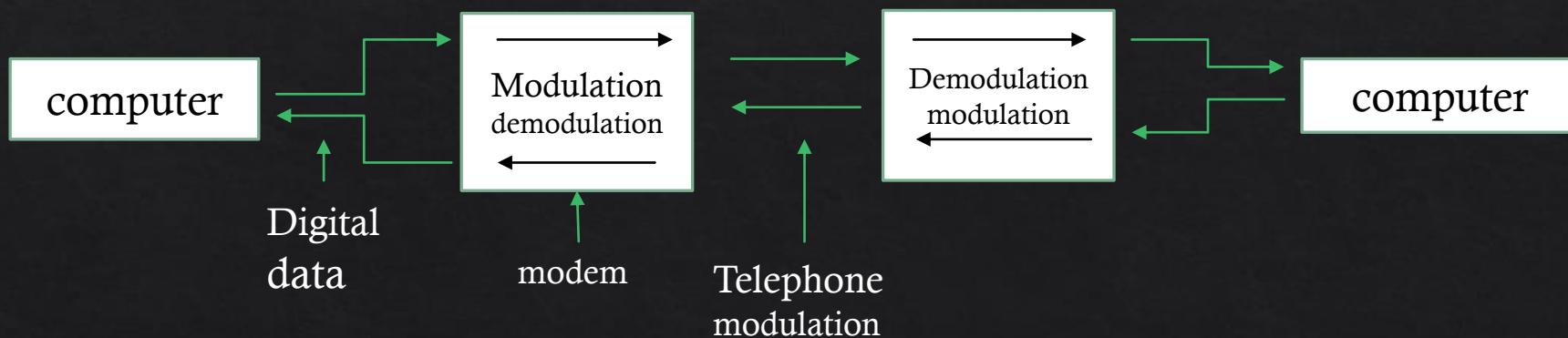
Remaning ans.



❖ They have two advantage :

- (1) modem allows higher speed of transmission on any given analog line.
- (2) modem reduce effect of noise and distortion .[

[a] The function of modem is described by following figure.



Types of modem :

❖ Modem are classified into two categories depending upon transmission method .

(1) asynchronous modem .

(2) synchronous modem .

(1) Asynchronous modem :

- ❖ In asynchronous modem , transmission clock is not used for synchronisation .
- ❖ Here each frame begins with bit that enables the receiving device to adjust to the timing of transmitted signals .
- ❖ Message are kept short
- ❖ It is used to transmit character data
- ❖ Asynchronous transmission is simple , inexpensive technology . It is used for PC to PC communication .

(2) Synchronous modem

- ❖ Synchronous modes uses clock on transmitting and receiving devices .
- ❖ It uses a ‘sync’ signal , which is a bit pattern and can be easily recognized by the receiver .
- ❖ A wider variety of data type can be transmitted .
- ❖ A long series of bits can also be transmitted .

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