

Hand Work is the key to Success

Unit-1

Introduction to Computer Network

Network:-

A network is a series of points or nodes interconnected by communication path. Network can interconnect with other networks and contain sub-networks.

Computer Network :-

A computer network is defined as interconnected connection of autonomous computers. Computers are said to be interconnected if they are able to exchange information. Connection is physically established through cables, ledgers, microwave, fibre optic and communication satellite.

Objective of Computer Network :-

- Day to Day, the need of computers is growing fastly. A computer has developed in each department. The following are the objectives of the computer network :-

a) Resource sharing is the main objective of the computer network.

The goal is to provide all

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the program and hardware is available to everyone on the network without regarding to the physical location of the resource and the user.

b) It is to provide high reliability. It is achieved by replacing the files two or more machines. So, in case of unavailability, the other copies can be used.

c) Computer networks to help people who live or work apart to report together. When the one user prepared some document, he can make the document online embedding. Thus, computer network is a powerful communication medium.

Application of Computer Network :-

There are following application of computer network :-

i) Marketing Professional use them to collect, exchange and analyse data relating to customers need and product development cycles.

ii) Financial Service includes Credit history Search, foreign exchange and investment

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Service and electronic fund transfer, which allow a user to transfer money without going to bank.

iii) Email transfer the message between two or more users in a network. With this application, user can transfer the information in the form of text, picture, video and voice.

iv) Directory Service allow list of file to be stored in central location to speed up the world wide search operation. For example :- Search engine, such as Google, Yahoo, etc.

v) Information Services include bulletin board and data bank. A "WWW" site offering the technical specification for a new product in a information service.

vi) It allows conference to occur without the participant being in the same location. It includes :-

1. Text Conferencing :- Participant communicates through their keyboards & monitors.

2. Voice Conferencing :- Participant at a no. of location communicate simultaneously through phone.

iii) Video Conferencing :- Participant can see as well as talk to another.

vii) Cellular Telephone :- Wireless phone communication even while travelling through long distance.

Categories of Networks

There are three primary categories of network :-

1) LAN (Local Area Network)

It is designed for small physical area such as an office, group of buildings or a factory. LANs are used widely as they are easy to design and to find troubleshoot.

Personal computers and workstations are connected to each other through LANs.

We can use different types of topologies through LAN, there are Star, Ring, Bus, Tree, etc. It can be a simple network like connecting two computers, share file and

network among each other. Local Area Network have data rates are 4 to 16 Mbps.

Today, however speeds are increasing and can reach 100 Mbps with Gigabyte

System (In Development).

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Advantage of LAN

- i) Local Area Network connects users to a set of common resources.
- ii) Sharing and accessing of information in this way is easier and economical. LANs can improve productivity in an organisation.
- iii) Cost per unit of storage is significantly reduced.
- iv) Easy to install. Generally Micro-Computers are used.

Disadvantage of LAN

- i) In Local Area Network, the distance is limited.
- ii) The distance is limited, the number of computers are limited.

2) MAN (Metropolitan Area Network)

A MAN is designed to extend over an entire city. It may be a single network such as a cable network or it may be a means of connecting a number of local area networks into a large network so that resources may be shared to local area network as well as device

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to device. For example:- A company can use a MAN to connect the LAN in all of its office throughout the city. A MAN maybe owned and operated by private company or it maybe a service provided by a public company.

Advantage of MAN :-

- i) MAN can cover wider area than LAN.
- ii) MAN networks are usually operated at airports or at a local school.
- iii) Mainframe Computers are used in this network.
- iv) Data Transmission more widely, rapidly and significantly.

Disadvantage of MAN :-

- i) The cost is what inhibits to the geographical reach of MANs.
- ii) Difficult to install.
- iii) This equipment generally has to be installed for the first time.

3) WAN (Wide Area Network) :- (i) (ii)
 A WAN provides long distance transmission of data, voice, image and video information over large geographical area that may comprise a country, a continent, or even the whole world. A WAN that is own and used by a single company is often referred to as an enterprise network. It actually consists of two or more different networks. Internet is a Wide Area Network.

Advantage of WAN :-

- i) Message can be sent very quickly to anyone. These message can have pictures, sounds, or data.
- ii) Expensive things can be shared by all the computers on the network without having to buy a different peripherals for each computer.
- iii) Every one on the network can use the same data. This avoids problems where some users may have older information than others.

Disadvantages of WAN :-

- i) Setting up a network can be an expensive and complicated.

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- ii) Security is a real issue.
- iii) Information may not meet local needs.
- iv) Valuable to hackers.
- v) Once setup.

Unit - 2 Network Structure

In computing, a network structure is anything pertaining to a computer network. These systems may be anything from the design of the network all the way through implementation and use.

A network structure can be many different things to different people. It is a collection of wire, computers and components.

Host :- A network host is a computer connected to a computer network. A network host may offer information, access resources, services and applications to users. A network host is a network node that is assigned a network layer host address. In other hand,

- i) a computer system that is accessed by a user working at a remote location. Typically, the term is used when there are two computer systems connected by modem or telephone network.
- ii) a computer that is connected to a TCP/IP network including the Internet. Each host has a unique IP address.

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Server :-

Server is the strongest machine within a network that has huge memory capacity, multi-processor, multiple disks, and loaded with services. It is also known as Service Provider within a network. Node or Software Program that provides service to client. A system that shares resources within one or more workstations in a network.

Or,

A server is a computer program that provides services to other computer programs in the same or other computers.

Client :-

Clients are machines, which are used in network as service requester. The hardware requirement such as Memory Disk Capacity and Processor Capacity is minimum. A client is the requesting program or user in a client/Server relationship.

Subnet :-

A subnet is a logical grouping of connected network devices. Nodes on a subnet tend to be located in close physical proximity to each other on a LAN. A subnet is an identifiable separate part

of an organisation's network. A subnet may represent all the machines at one geographical place, without subnets, an organisation could not get multiple connections to the internet.

Types of Subnet :-

i) Circuit Switched Subnet :-

A subnet in which a dedicated circuit is established between sender and receiver. In this subnet, all data passes over the circuit. The telephone system is the common example of Circuit Switch Subnet.

ii) Packet Switched Subnet :-

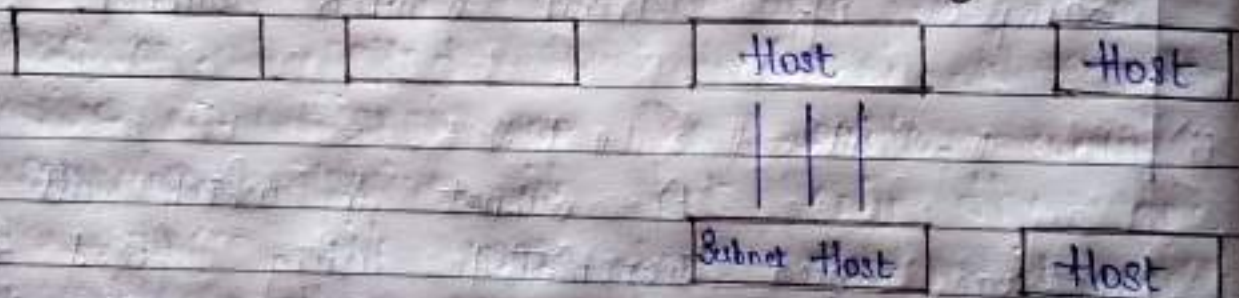
A subnet in which all data messages are transmitted using fixed size package called packets. More efficient use of a tele-communication line since packet from multiple sources can share the medium.

iii) Broadcast Subnet :-

A subnet typically found in Local Area Network but occasionally found in Wide Area Network. A workstation transmit its data to all other workstations that is connected to the network.

iv) Communication Subnet:- A subnet is a logical subtraction of an IP network. Subnet is used to divide a large network into two or more smaller networks, that are easier to manage. A service provider with a large block of IP address creates Subnet so that it can allocate block of IP address to subscribers just like networks on the internet routers.

Class B address before Subnetting



Class B after Subnetting



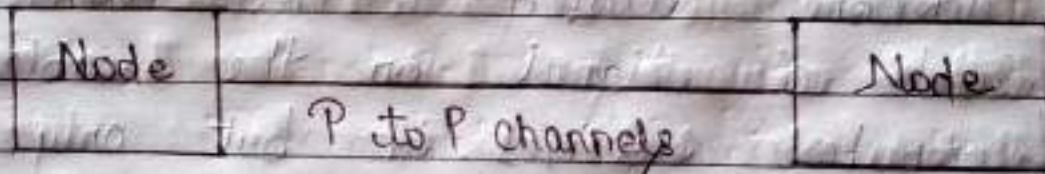
Network Address

In decimal notation, Subnet mask value 1 to 255 represent network address and value 0 represents host address. In binary notation, Subnet mask ON bit (1) represent network address while OFF bit (0) represents host address.

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Point-to-Point Channel / Communication :-

A point-to-point line configuration provides a dedicated link between two devices, the entire capacity of channel is reserved for transmission b/w those two devices. Most point-to-point line configuration use an actual length of wire or cable to connect the two ends. But, other position such as Microwaves or Satellite links are also possible. When we change television channels by infrared remote control, we are establishing a point-to-point line configuration b/w remote control & television control system.



Topology (Network Topology) :-

A network topology is the arrangement with which computer system or network devices are connected to each other. Topologies may define both physical and logical aspect of the network. Both logical and physical topologies could be same or different in a same network.

Types of Topology :-

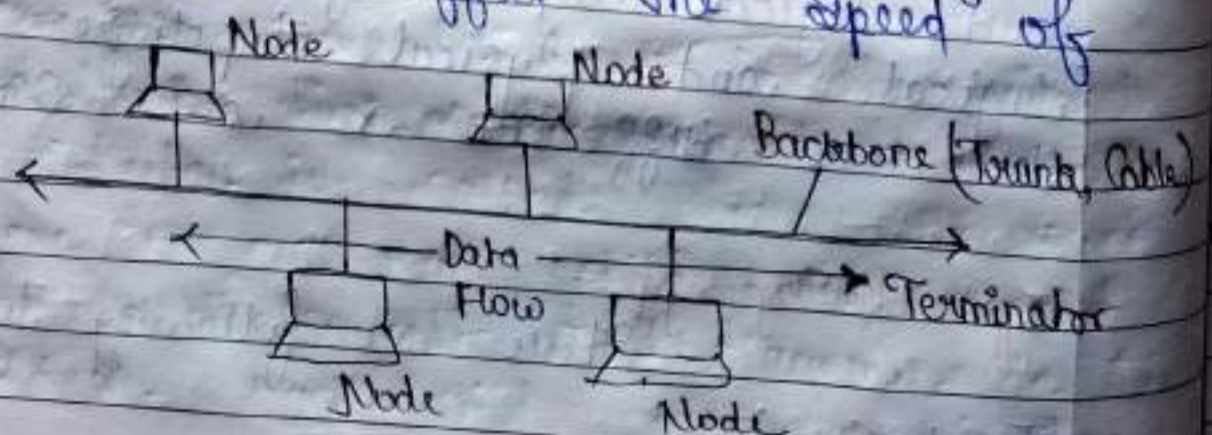
These are following types of Topologies :-

- i) Bus Topology
- ii) Ring Topology
- iii) Star Topology
- iv) Mesh Topology
- v) Tree Topology
- vi) Hybrid Topology

i) Bus Topology :-

In case of Bus Topology, all devices share single communication line or cable. It is the simplest type of topology that can be used in the network. It has a single cable acting as a backbone, called trunk. When a computer sends a signal on the cable, every computer receives it but only the one for whom it was sent takes it while rest of the computers discard it.

In this topology, only one computer can send a message at a time. Therefore, the no. of computers can affect the speed of bus.



Advantages of Bus Topology :-

- i) Easy to connect a computer or peripheral to a linear bus.
- ii) Require less cable length.
- iii) Bus Topology is mostly used in small networks, good for LAN.

Disadvantages of Bus Topology :-

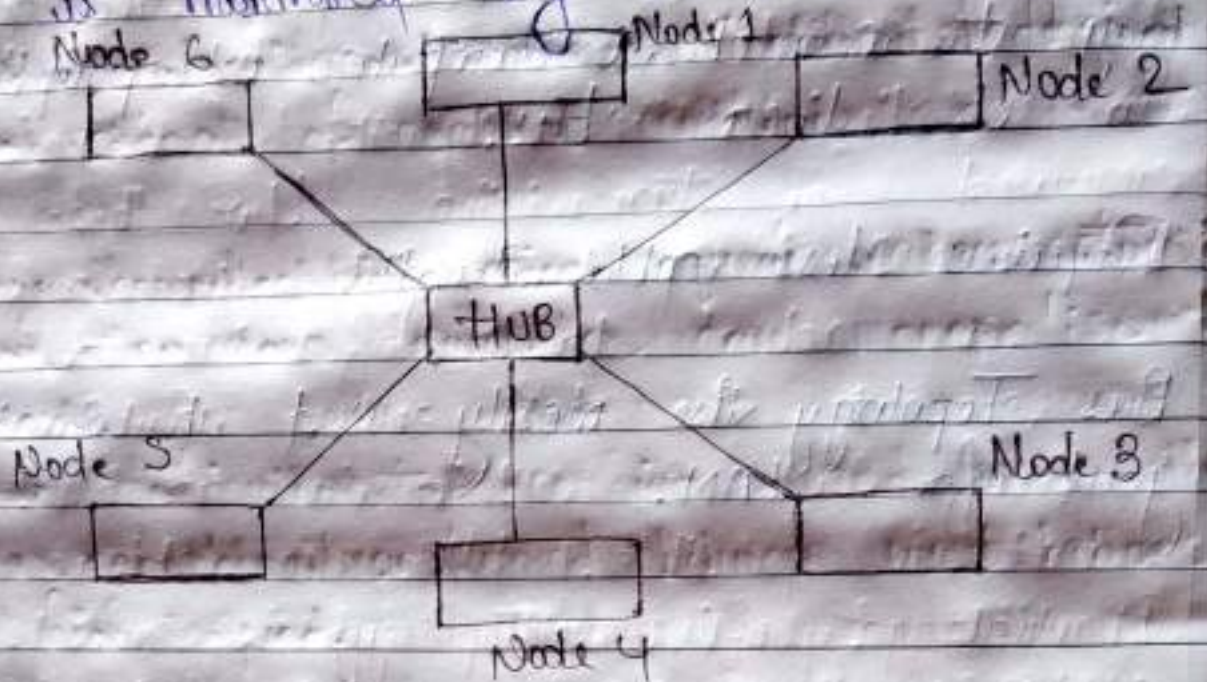
- i) Entire network shuts down if there is a break in the main cable.
- ii) Difficult to identify the problem if the entire network shuts down.
- iii) The data transmission can slow because each computer is checked to receive the message and then forward.

ii) Star Topology :-

All hosts in Star Topology that are connected to a central device known as hub. Computers connected to a hub by cabling segments send their traffic to the hub, that resend the message either to all the computers or only to the destination computer. A hub lies

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in the centre of all computers and it is monitored by network.



In failure of a single computer or a network, cable does not affect the entire network.

Advantages of Star Topology :-

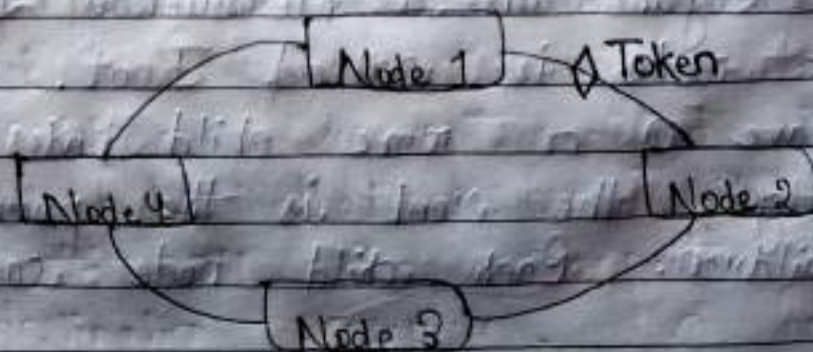
- i) Easy to modify.
- ii) The centre of a star network is good place to diagnose network faults.
- iii) We can use several types in the network with a hub that can accommodate multiple cable types.
- iv) Flexible & easiest to diagnose.

Disadvantages of Star Topology :-

- i) If the central hub fails, the whole network fails.
- ii) Many star networks require a device at the central point to subbroadcast.
- iii) It costs more to cable a star network.

iii) Ring Topology :-

In Ring Topology, each host machine connects the exactly two other machines, creating a circular structure. When one host tries to communicate or send message to a host which is not adjacent to it, the data travels through all intermediate host. To connect one or more host in the existing structure, the administrative may need only one more extra cable. The receiving strips the data from the token and send the token back to the sending computer with an acknowledgement. Only the computer with the token can transmit data.



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Advantages of Ring Topology

- i) All data flows in one direction reducing the chance of packet collisions.
- ii) Every computer is given equal access to the token, no one computer can monopolise the network.
- iii) Data can be transferred between workstations at high speed.

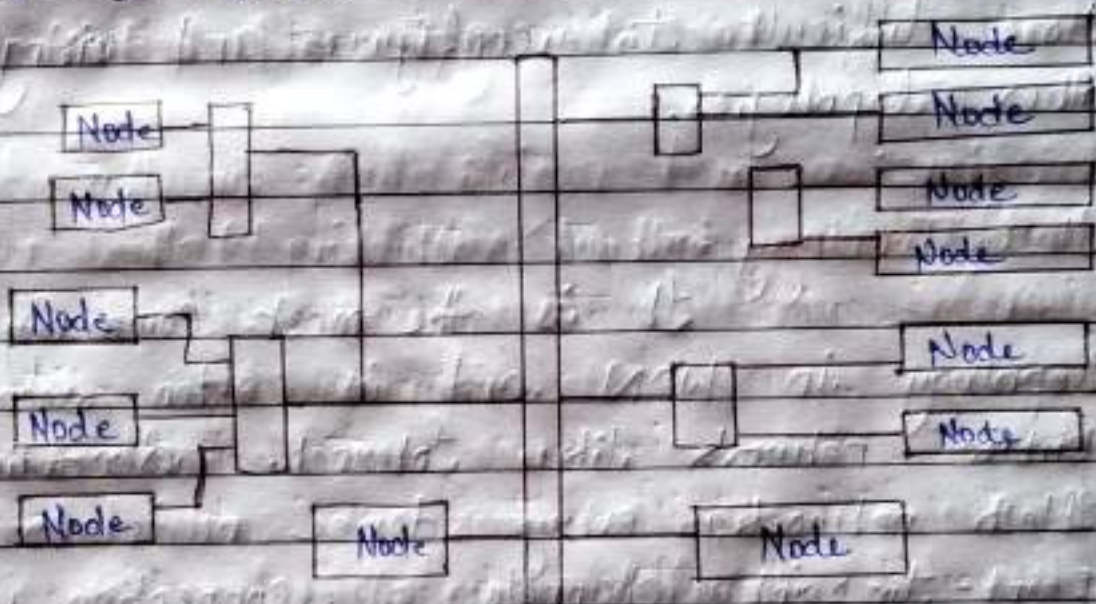
Disadvantages of Ring Topology

- i) Failure of one computer in the ring can effect the whole network.
- ii) It is difficult to troubleshoot in a ring network.
- iii) Adding or Removing computers disturb the network.

iv) Tree Topology :-

This is a network topology containing zero or more nodes that are linked together in a hierarchical fashion. The topmost node is called Root. The root may have 0 or more child nodes connected by Edge, the root is the parent node to its children. Each child node can in turn

have 0 or more children of its own. Nodes sharing the same parents are called Siblings. Every node in a tree has exactly one parent node and all the nodes in the tree are descendants of the start node. These relationships ensure that there is one and only one path from one node to any other node in tree.



Backbone

Advantages of Tree Topology :-

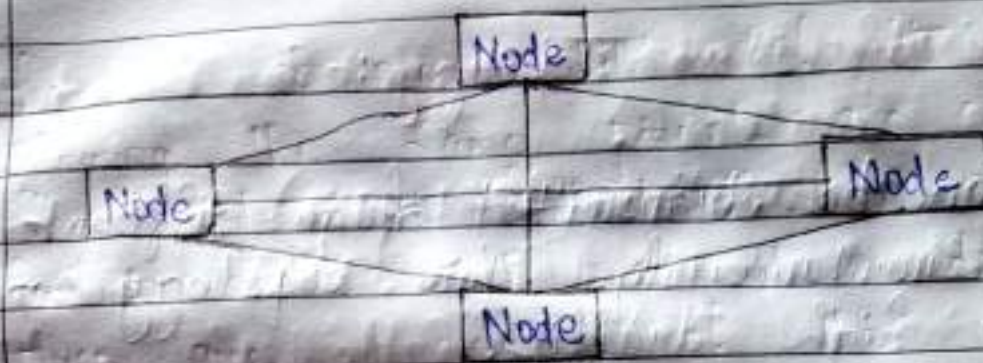
- i) Point-to-Point wiring for individual segments.
- ii) The distance to which a signal can travel increases the signal passes through a chain of hubs.
- iii) Supported by several hardware & software vendors.

Disadvantages of Tree Topology :-

- i) Overall length of segment is limited by the type of the cabling used.
- ii) If the backbone line breaks, the entire segments goes down.
- iii) More difficult to configure and wiring than other topologies.

Mesh Topology :-

It is the most commonly used topology in WAN and is often seen in public network like Internet. According to Mesh network, every device needs to have point-to-point channels or connection with the every other device on the network. This network is used in hybrid approach with the every other device on the network. This network is used in hybrid approach with the only most important devices interconnected in the mesh. This is so because it is impractical to do so in normal condition, we can say that peer-to-peer networking.



Types of Mesh Topology :-

i) Full Mesh Topology :-

It is used only for backbone network. Its main advantage is that the network traffic can be redirected to other nodes if one of the nodes go down.

ii) Partial Mesh Topology :-

In partial mesh topology, the workstations are indirectly connected to other devices. This one is less costly, and also ~~reduces~~ less redundancy.



Advantage of Mesh Topology :-

- i) Data can be transmitted from different devices simultaneously. This topology can withstand high traffic.
- ii) Even if one of the components fail, there is always an alternative present so data can transfer doesn't get affected.
- iii) Extension and modification in this topology can be done without disturbing other nodes.

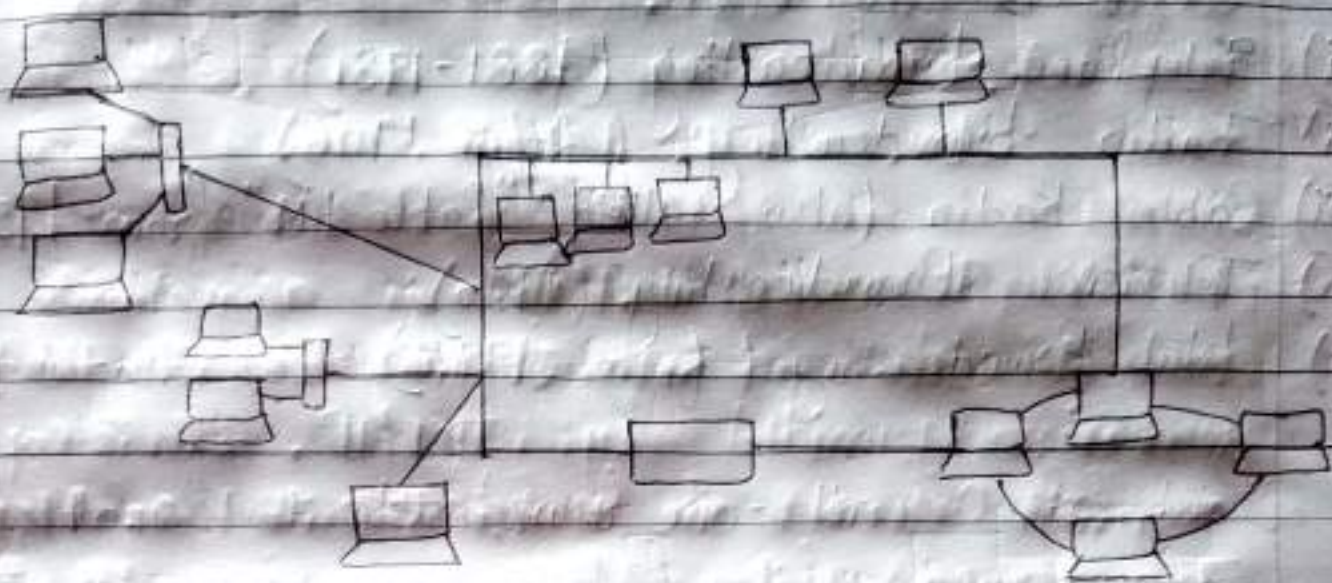
Disadvantage of Mesh Topology :-

- i) There are high chances of redundancy in many of network connections.
- ii) Overall cost of this network is too high as compared to other network topologies.
- iii) Setup and maintenance of this topology is very difficult.

Hybrid Technology :-

A hybrid technology is a type of network topology that uses two or more other network topologies including bus topology, mesh topology, ring topology

and tree topology.



Broadcasting Network Channel :-

Broadcast network has a single communication channel or medium that is shared by all the machine on the network. Broadcast is the distribution of audio & video content to dispersed audience via any audio or visual mass communication medium but usually are using electromagnetic radiation that means radio waves. The receiving parties may include the general public, or a relatively large subset thereof. Broadcasting has been used for purpose of private, recreation, non-commercial, exchange of messages, experimentation, self-training and emergency communication. Such as radio and television.

Types of Broadcasting :-

- i) Telephone broadcasting (1881-1931)
- ii) Radio broadcasting (from 1906)
- iii) Cable Radio (also called "Cable FM" from 1922)
- iv) Television Broadcasting (1930)
- v) Web Broadcasting (from 1998)

List of Over-the-air broadcaster

- | | |
|-------------|-----------------------|
| i) BBC | vi) Fox |
| ii) ITV | vii) The CW |
| iii) Sky TV | viii) CTV |
| iv) NBS | ix) GLOBAL |
| v) CBS | x) The Radio talk etc |

Network Architecture is the design of a communication network. It is a framework for specification of a network's physical components and their functional organisation and configuration, its operational principles and procedures as well as data formats in its operation. Network architecture refers to the layout of the network consisting of the hardware, software, connectivity, communication protocols and mode of transmission such as wired or wireless.

Protocol :-

A protocol is a set of rules that governs the communications between computers on a network. In other words, protocol is a set of rules that enables network device to initialise within a network. It provides the rule for of network for providing or receiving services within a network or when computer communicate with each other needs to be a set of rules and instructions that each computer follow. A specific set of communication rules are called Protocol.

There are 2 types of Protocol that are :-

i) H/W Protocol :-

Hardware directly deals with network device within a network. All physical layer and data link layer are hardware protocol.

Ex. :- ATM, IEEE 802.1, etc.

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ii) S/W Protocol :-

Software Protocol deals with application software within a network from network layer

to application layer. Layer is covered by Software Protocol.

Ex. - FTP, TCP/IP, etc.

FTP (File Transfer Protocol) :-

It is the standard mechanism provided by TCP/IP, for copying a file from one host to another. Transferring files from one computer to another is one of the most common tasks expected from the network in an internet working environment. FTP is used to file transfer b/w inter-network nodes. FTP is peer-to-peer protocol, it has ability to transfer file b/w dissimilar host because it uses a file structure that is OS-independent.

SMTP (Simple Mail Transfer Protocol) :-

It is a TCP/IP protocol that specify how computers exchange email. It works with post office protocol. It is used to upload mail directly from the client to an intermediate host but only computers constantly connected such as internet service provides to the internet can use SMTP to receive mail.

TCP/IP (Transmission Control Protocol / Internet Protocol)

TCP and IP are two distinct computer network protocols. When 2 computers follow the same protocol, the same set of rules and they can understand each other and exchange data. TCP & IP are so commonly used together however that TCP/IP has become standard terminology for referring to this suite of protocols. TCP divides a message or file into packets that are transmitted over the internet and then reassembled when they reach their destination. IP is responsible for the address of each packet so it is sent to the correct destination. TCP/IP technically apply to network communication where the TCP transport is used to deliver data across IP networks. It is also called Connection-Oriented Protocol.

HTTP (Hypertext Transfer Protocol):

It is used to manage the links b/w one hypertext document to another. It is the mechanism that opens the related documents when we select a hypertext link, no matter where that documents reside on the web. Web documents are made for formatting and linking with HTML and web server uses HTTP to deliver webpages. It works equally well on standalone computers.

LAN, WAN and the global internet on all major desktop computing platform (UNIX, OS, PC etc).

ICMP (Internet Control Message Protocol) :-

ICMP is a network protocol used in internet protocol network management and administration. It is a required element of IP implementation. ICMP is a control protocol meaning that it doesn't carry application data, but rather information about the status of the network itself. ICMP can be used to error in the communication of network application & network congestion. ICMP also supports track route that can identify the intermediate host b/w a given source and destination.

Point-to-Point Protocol :-

P2P supports the transmission of network packets over a Serial P2P link by specifying mechanism for encapsulating network protocols such as internet protocol, internetwork packet exchange. Its encapsulation is based on the high level data link control derived from the mainframe environment. A typical dial-up station using P2P protocol is completely

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automated and require no realtime user input.
It has four stages :-

- i) Link establishment
- ii) User Authentication
- iii) Call-back
- iv) Configuration

POP (Post Office Protocol) :-

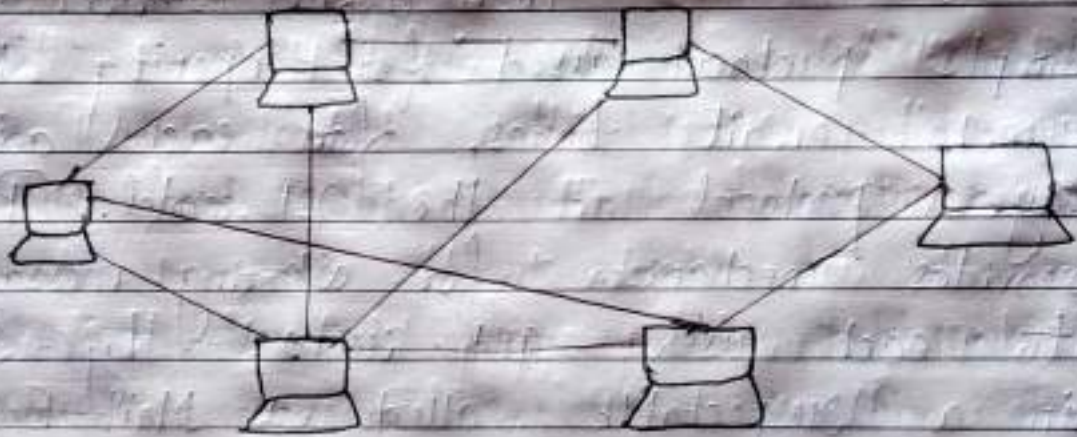
Post Office Protocol is a simple protocol used for opening the remote email boxes, for each an application layer protocol in the OSI model. POP3 provides mechanism for storing messages sent to each user and receive by SMTP in a susceptible called a Mail-Box. When we retrieve a message from a POP3 server, a POP3 client establishes a transmission-control protocol session using TCP. A series of POP3 commands :-

- a) Start :- waiting to be retrieved.
- b) list :- determine the size of each msg.
- c) retrieve :- Retrieve individual msg.
- d) quit :- End of POP3 session.

Peer-to-Peer Process :-

In this architecture, all the computers within a network are equal.

There is no any administration / over here. All the resource sharing is based on mutual understanding b/w users. It is very less secure network and doesn't deal routine within a network for avoiding congestion. There may be some limited no. of clients connected in this architecture. Generally, this architecture is used where there security is issue.



DNS (Domain Name System)

DNS is a distributed database system that works at the transport layer to provide name to address mapping for client applications. Domain Name System are internet's equivalent of a Phonebook. They maintain a directory of domain name and translate them to I/P addresses. This is necessary because although domain names are easy for people to remember, computers or machines access

website based on IP addresses. In the internet, the domain name space is divided into two different sections:-

- i) Generic domain name
- ii) Country domain name

i) Generic domain name :-

It defines registered host acc. to their generic behaviour. Each node defines a domain name which is an index to the domain name space database. These labels describe the organisation types are listed below:-

Label	Description
com	Commercial Organisation
edu	Educational Institution
gov	Government Institution
int	International Institution
mil	Military Groups
org	Non-Profit Organisation
net	Network Support Center

ii) Country Domain Name :-

It follows the same format as the generic domain name but uses two character country abbreviations in place of three

character organisational abbreviations.

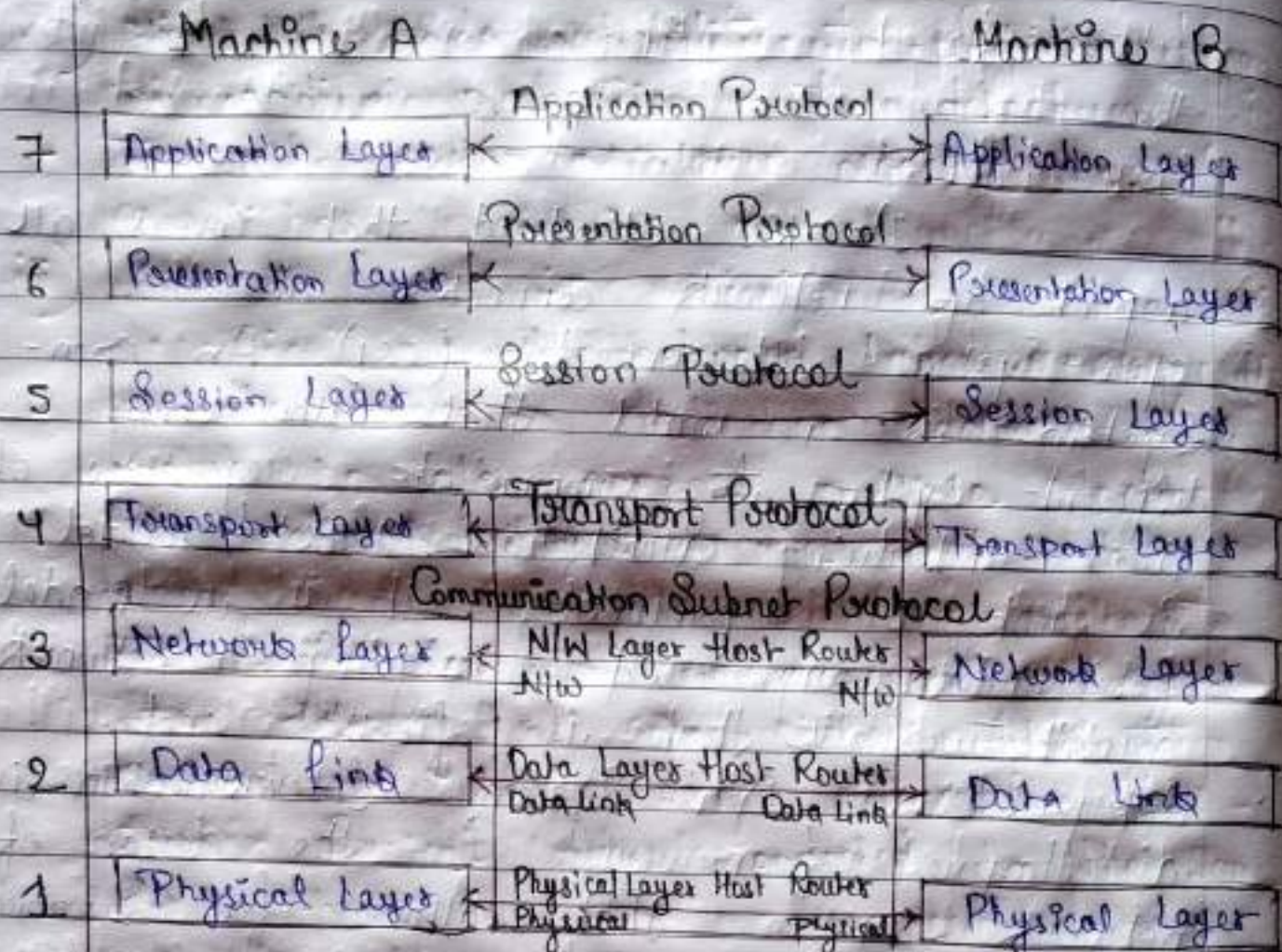
Label Description

in	India
sa	South Africa
uk	United Kingdom
us	United States

Unit-4 OSI Reference Model

OSI Model :-

An ISO standard that covers all aspect of network connection in the open-system interconnection (OSI). An Open-System is a model that allows only 2 different systems to communicate regardless of their underlying architecture. OSI model is not a protocol, it is a model for understanding and designing a network architecture that is flexible and interpretable. Open-System Interconnection is a layered framework for the design of network system that allows for communication across all types of computer systems. It consists of seven separate layers but related layers - each of which define a segment of the process of moving information across a network. The OSI model is sometimes called The Seven Layer Model. It was developed by International Standard Organisation (ISO) in 1983.



1. Physical Layer :-

The physical layer co-ordinates the function required to transmit a bit sitting over a physical medium. It deals with a transmission medium, it also defines the procedure and function that the physical devices and interfaces have to perform for transmission to occur. It is responsible for the actual physical connection between the devices, such physical connection may be made by using twisted pair

cables, fibre optic, co-axial cable or wireless communication. It defines how devices are connected to a network. The transmission state is also defined by the physical layer.

(ii) Data Link Layer :-

Data Link Layer transforms the physical layer, a raw transmission facilities into a variable link is responsible for node to node delivery. It map physical layer appear error-free to the upper-layer. Specific responsibilities of the data link including following :-

- The data link layer divides the stream of bits received from the network layer into manageable data units called frame.
- If frames are to be distributed, different system on the network, the DL adds a header to the frame to define the physical address of the sender that is source address & receiver that is Destination address of the frame.
- The state at which the data are asserted by the sender is less than the state produces in the sender, the DL imposes a flow control mechanism to prevent over the receiver.

d) The Dll adds reliability to physical layer by adding mechanism to detect a transmit damage or lost frame.

iii) Network Layer :-

The network layer is responsible for the source to destination delivery of a packet possible across multiple networks. The network layer ensures that each packet gets from its point of origin to its final destination wherever the Dll oversees the delivery of the packets b/w two systems on the same network. If two systems are connected to the same link there is usually no need for a network layer. However, if the two systems are attached to different networks with connecting devices b/w the network there is often a need for the network layer to accomplish source to destination delivery. If a packet passes the network boundary we need another addressing system to help distinguish the source and destination systems. The network layer adds a header to the packet coming from the upper layer that among other things include the logical address of the sender and receiver. When independent networks

and links are connected together to create an internetwork or a large network, the connecting devices called Router and Gateway, route the packet to their final destination.

ii) Transport Layer :-

The transport layer is responsible for source to destination delivery of the data message whereas network layer oversees end-to-end delivery of individual packets. It doesn't recognise any relationship between those packets. It treats each one independently. The transport layer on the other hand ensures that the whole message arrive in fact and in order, overseeing both error control and flow control, all the source to destination level. For added security, the transport layer may create a connection b/w the two end parts. A connection is a single logical path between the source and destination that is associated with all packets in a message creating a connection involve three steps :-

- i) Connection Establishment
- ii) Data Transfer
- iii) Connection Release

v) Session Layer :-

The service provided by the

first three layers are not sufficient for some process. This session layer is the network dial-up controller. It establishes, maintains and synchronises the interconnection b/w communication. Some specific responsibilities of the session layer are as follows:-

i) Dialog Control :- The session layer allows two systems to enter into dialog box. It allows the communication b/w processes to take place either in half-duplex or full-duplex.

ii) Synchronization :- The session layer allows a process to add checkpoint synchronization to point into a stream of bits.

vi) Presentation Layer :- The presentation layer is concerned with the syntax of the information exchange b/w two systems. Specific responsibilities of the presentation layer are

i) Translation :- The process in two system is usually exchanging information in the

form of character, string, numbers and so on. The information should be changed to bit stream before being transmitted. The presentation layer is responsible for this different encoding.

ii) Encryption :-

Encryption means that the sender transforms the original information to another form to send the resulting message out over the network. Decryption means Reverse the original process to transform the message back to its original form.

iii) Compression :-

Data compression reduces the number of bits to be transmitted. Data compression becomes important in the transmission of multimedia such as Text, Audio & Video.

vi) Application Layer :-

The application layer enables the user or software to access the network. It provides user interface & support for services. The application layer included following services:-

i) File Transfer Access and Management :-

This application allows the user to access file in a remote

Computer to retrieve file and to manage file in a remote computer.

ii) Mail Services :-

This application provides the basis for email forwarding and storage.

iii) Directory Services :-

This application provides distributed database source and access for global information about various objects and services.

iv) Network Virtual Terminal :-

A network virtual terminal is a software version of physical terminal & allows the user to log on to a remote host.

TCP/IP Reference Model

TCP/IP means Transmission Control Protocol and Internet Protocol. It is the network model used in the current internet architecture as well. Protocols are set of rules which govern every possible communication over a network. These protocols describe the movement of data b/w the source and destination on the internet. These protocols offer simple naming and

Addressing Scheme

Application Layer

Transport Layer

Internet Layer

Host-to-N/W Layer
(N/W Access Layer)

i) Host-to-N/W Layer :-

a) Lowest layer of all the layers.

b) Protocol is used to connect to the host so that the packets can be sent over it.

c) Varies from host-to-host and network to network.

ii) Internet Layer :-

a) Selection of a packet-switching network which is based on a Connection-less internetwork is called an Internet layer.

b) It is the layer which holds the whole architecture together.

c) It helps the packet to travel independently to this destination.

ii) Transport Layer - from OSI model.

Connectionless

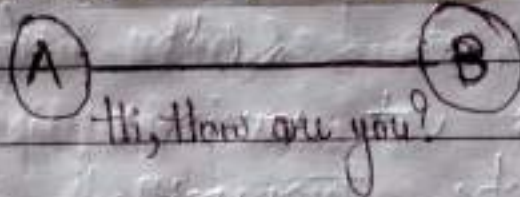
It means end-to-end connection.

Connectionless Communication is usually achieved by transmitting information in one direction from source to destination without checking to see if the destination is still there or if it is prepared to receive the information. In environment where there is difficulty than reaching to the destination information maybe transmitted several times before the complete message is received.

Walkie-Talkie, Citizens-banned radio are a good example of Connectionless Communication. We speak into the mike and radio transmitter sends out the signal, if the person receiving us doesn't understand, then there is nothing radio can do it to correct thing. The speaker must send a message box to repeat a lost message.

Connection-Oriented :-

It is the model after telephone system to talk to someone, we pickup the phone, to dial a number, talk and then disconnect it. Similarly, to use a Connection-oriented network services. The services ~~are~~ first establish the connection, use the connection and then release the connection. It acts like a table. The sender pushes object in one end, receiver takes them out in the same order at the other end.



UNIT 45: Transmission Media

Topic: Transmission Media.

⇒ Transmission media is a Pathway that carries the information from sender to receiver. we use different type of cables or, waves to transmit the data. Data is transmitted normally through electrical or, electromagnetic signal. An electrical signal is in the form of current. An electromagnetic signal is a series of electromagnetic energy pulsed at various frequencies. These signals can be transmitted through copper wire, optical fibre, atmosphere, water and vacuum different media have different properties like bandwidth, delay, cost and ease of installation and maintenance. Transmission media is also known as communication channel.

Types of transmission media:-

⇒ There are two types of transmission media that are —

ii) wired or, Guided or, Bounded transmission media.

⇒ Bound transmission media are the cables that have physical existence and are limited by the physical geography. Media in which the signals are transmitted through a solid medium known as guided media. Popular bound transmission media in use are twisted pair cable, co-axial cable and optical fibre cable.

iii) wireless or, unguided or, unbound transmission media.

⇒ Media in which the signals are not transmitted through a solid medium is called unguided media. It is also known as wireless communication. Now, ^{days} ~~it is~~ wireless communication is becoming popular. Wireless LAN are being installed in office and college campus. This transmission media uses microwave, radiowave, Infrared are some of popular are bound transmission media.

Communication media

Guided media

Unguided media

Twisted pair cable	Co-axial cable	Optical fibre	Micro wave	Radio wave	Infrared
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Topic:- Twisted Pair Cable.

- 2) It is a pair of copper wire with diameter of 0.4 to 0.8 mm, twisted together and wrapped with a plastic coating. The twisting increases the electrical noise immunity and reduces error rate of the data transmission. Each conductor is separately insulated by some low smoke and fire retardant substance. The twisting process serves to include the performance of the medium by containing the electromagnetic field within the pair. The radiation of electromagnetic energy here is by reducing the strength of

Signal within the wire is improved over a distance. These are popular for telephone network, the maximum transmission speed is limited the data rate in this category 28 Kbps. The wire in twisted pair cabling are twisted together in pair. Each pair would negative and positive. Any noise that appears on first wire of the pair would occur on the other wire. Twisted pair cables are most effectively used in systems that use a balance line method of transmission.



Advantage of twisted pair cable:

- ⇒ • The oldest method of data transmission, man power to repair and service this media of communication are easily available.
- In a telephone system signal can travel several kilometer without amplification.
- This media can be used for both analog and digital data transmission.

The band width depends on the thickness of the wire. It is the least expensive media of transmission for short distance.

Disadvantage of twisted pair cable

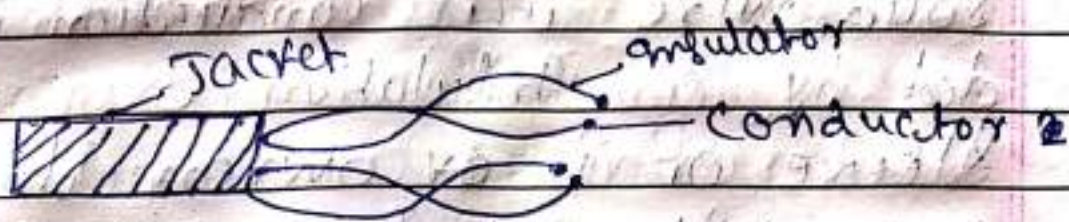
- It is likely to break easily.
- It can support 19200 BPS to 50 feet RS-282.

Types of Twisted Pair cable

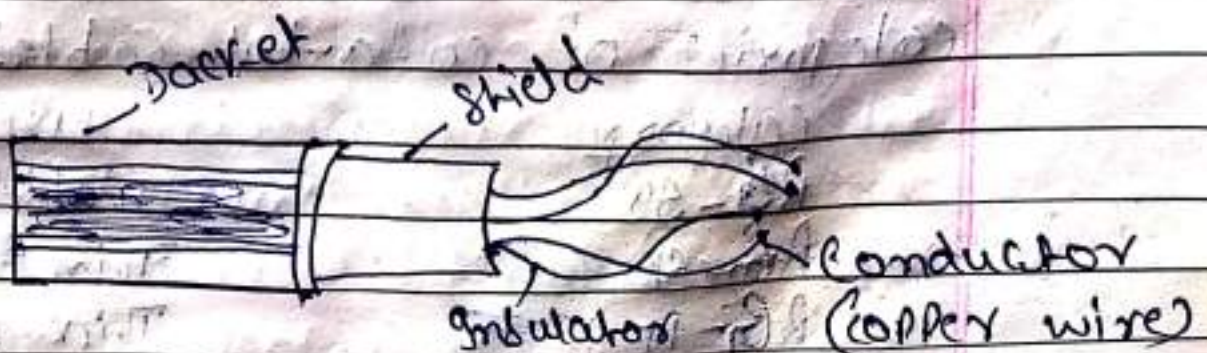
- 1) UTP (Unshielded Twisted Pair cable)
- 2) STP (Shielded Twisted Pair cable)

- 1) It is the most common type of telecommunication medium is used today. It is the most suited for both data and voice transmission hence each commonly used in telephone system. The cable has four pairs inside the jacket. Each pair is twisted with a different number of twisted pair is to help interference from adjacent pairs and other electrical device. Each twisted pair consist of two metal conductor that are insulated with their own clear plastic insula-

tion the horizontal wiring is limited to a maximum of 90 meters. A UTP contains 2-4200 twisted pair.



2) STP differ from UTP in the metallic shield or screen which surrounds the pair, which may or may not be twisted. The pairs can be individually shielded. A single shield can surround a cable containing multiple pairs or, both techniques can be employed in modern. The shield itself is made of aluminium, steel or copper. This shield is in the form of a metallic foil and is electrically grounded although less effective the shield. Some times it is in the form of nickel or gold plating of the individual conductor.



Topic:- Co-axial Cable.

⇒ Co-axial cable has a single central conduction which is made up of solid wire. This conduction is surrounded by an insulation over which sleeve of is or woven the block any outside interfaces. This is again shielded by and outer covering of a thick material known as Jacket. Although Co-axial cable is difficult to install, it is highly resistance to signal interface. It can support greater cable length between network devices than twisted pair cable. It also offer higher bandwidth. A Co-axial cable is capable of transmission data rate of 10 mbps. It is more expensive per foot but cheaper per bytes of data are transferred in a record. Co-axial cable is used in cable T.V. Network.

Categories of Co-axial Cable:-

Category

RG-59

RG-58

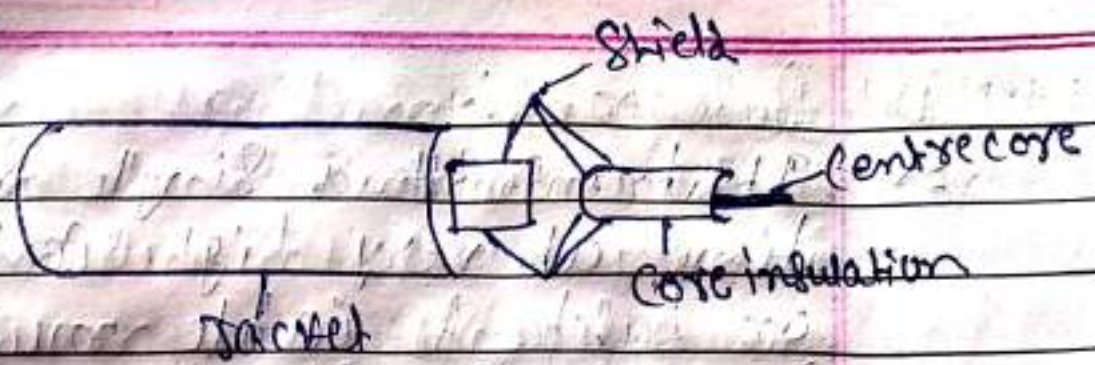
RG-11

Use

Cable TV

Thin Ethernet

Thick " " "



Advantage of co-axial Cable

- ⇒ • It can be longer distance than shield pair cable and unshield pair cable without the need of repeater.
- Co-axial cable is less expensive than fibre optic cable.
- It has greater capacity than UTP cable.
- It has higher bandwidth upto 400 mbps.

Disadvantage of co-axial Cable:-

- ⇒ • Co-axial cable is more expensive to install than Twisted Pair cable.
- It has a limited number of connection that can be made to it.
- It is limited in its distance.

Types of Co-axial Cable:-

- ⇒ There are two types of co-axial cable —

i) Base band:-

⇒ It transmits a single signal at a time at very high speed. The signal on baseband cable must be amplified at a specified distance. It is used for local area network.

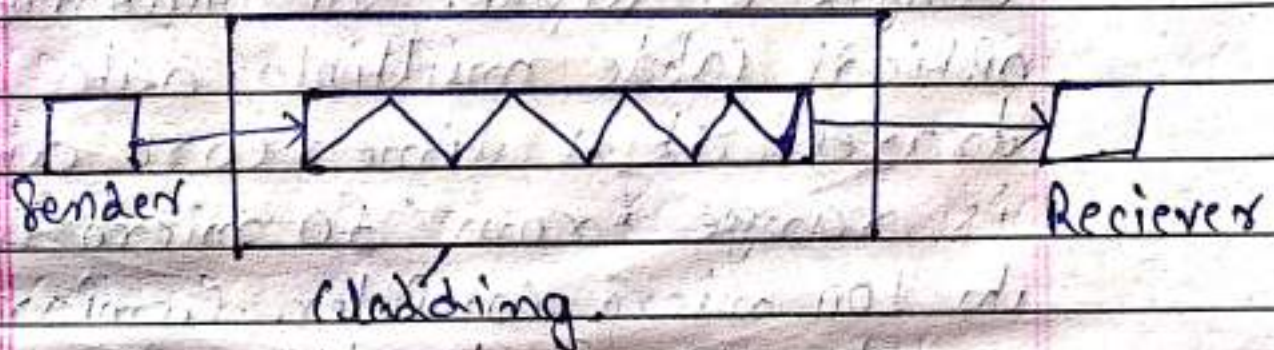
ii) Broad band:-

⇒ It can transmit many signals simultaneously at a time using different frequencies.

Topic:- Optical Fibre Cable:-

⇒ Optical fibre cable is used in high speed and longer distance network. It uses light wave data and control signal transmission. Their light waves are converted into electrical waves using some device within a network. Fibre optical cable is made up of fibres or glass material that is coated with reflecting material known as cladding. Finally, their whole structure is encapsulated into plastic jacket. Fibre or glass is used for travelling data or control signals. It is

used to reflect back to the fibre. The light wave is transmitted through fibre is based on total internal reflection principle as source of light it uses monochromatization and coherent ultra diode ultra transistor responsible for optical signal into electrical signals. The speed of internet services are 100 mbps.



Types of optical fibre/cable

There are two types of optical fibre/cable

- i) Single mode fibre
 - ⇒ Single mode fibre is used for inter building backbone cable, at a distance upto 3km in single mode fibre optical cable transmits single data ray at a time. Single mode fibre will deliver data rates upto 10 Gb/s with a bandwidth 20 GHz. It

Operating wavelength are 1310 nm and 1550 nm. Single mode fibre primary used for full motion video and any application requiring streaming high bandwidth.

(ii) ~~Multi~~ Multi mode fibre:-

⇒ In this case the core diameter relatively large compare to wavelength of light. In multimode fibre optical cable multiple data ray travel at a time. Core diameter is range from 50 micro computer to 100 micro computer. Compare to wavelength of the light out 1 micro meter this means that the light can propagate through the fibre in different ray path modes.

Advantages of optical fibre cable:-

- ⇒ • It operate at high speed.
- It has a large carrying speed.
- It is ~~immune~~ immune interface cause by electromagnetic such as radio, motors or other cables.
- It is cheaper to maintain.

Disadvantages of Optical Fibre Cable:

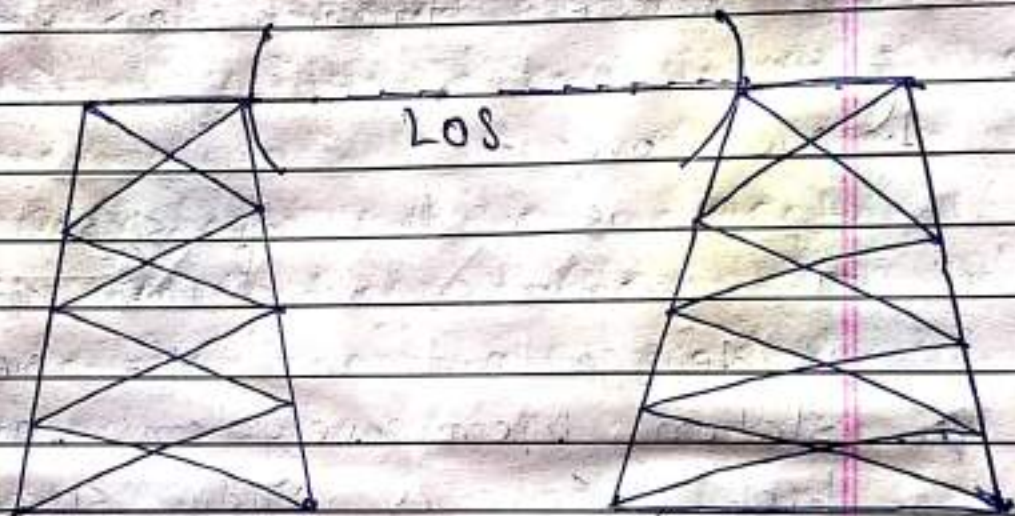
- The cable is more expensive than copper cable.
- It is difficult to install.

Topic:- Unguided or, unbound or, wireless transmission media

1) Microwaves :-

It is a line of sight transmission. The transmission station must be visible content with the receiver station. Microwave systems are used high frequency radio signal to transmit data through space. However, at microwave frequency electromagnetic waves can't pass like tall building or hills. Hence, transfer & receiver of a microwave system mounted on very high tower. Should be in line of sight and power amplification. Microwave system use repeater & interval of about 25km to 30km in b/w transmitting and receiving system. First repeater is placed in line of sight of receiving

station. Data signal are received, amplifier and transmitted by each of these station. Microwave system have speed of 16Gbps & they can support about 2,50,000 voice simultaneously.



Transmitting
End

Receiving
End

Advantage of Microwaves :-

- Microwave spectrum has large bandwidth and hence, large amount of information can be transmitted.
- It has ability to communicate over ocean.
- Microwave communication is in use since earlier days as one of the line

of sight communication in hill station or remote area where other means of wire communication is not possible to be installed. Microwaves communication are perfect for this places.

Disadvantage of Microwaves:-

- Microwave communication is insecure communication.
- Microwave propagation is affected by weather like rains & thunderstorm etc.
- Bandwidth allocation is streamly limited.
- The cost of design, implementation of microwave is high.

2) Radiowave:-

A radiowave is generated by a transmitter and then detected by a receiver. An antenna allow a radio transmitter to send energy into space & a receiver to pick up

energy from space. Transmitter & receiver are typically designed to operate over a limited range of frequencies. Radiowaves has frequency 10^6 to 10^{12} Hz. Radiowaves include the following types -

- a) Shortwave
- b) Very high frequency, TV & Radio. F.M.
- c) Ultra high frequency, TV & Radio.

Radiowaves are omnidirectional that means they travel in all direction from the source.

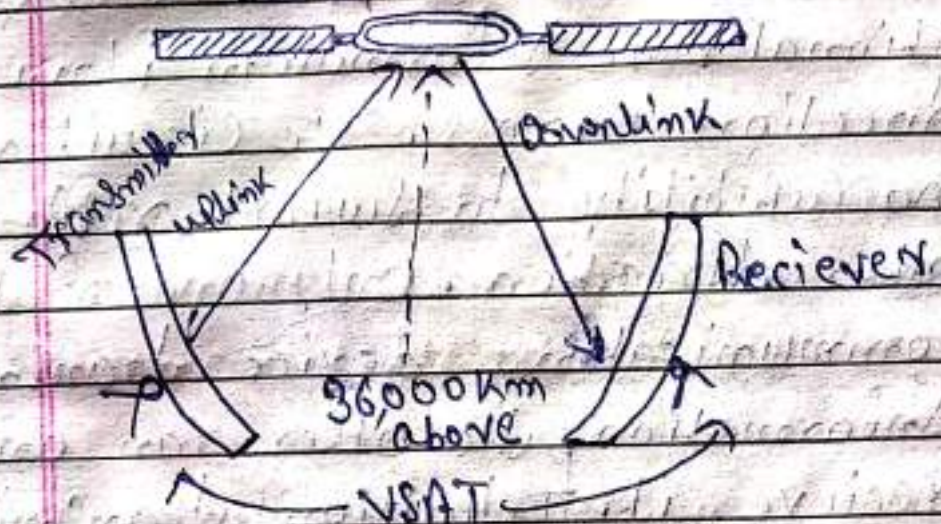
Satellite:

⇒ Satellite transmission is also a kind of line of sight transmission. Satellite is in stationary orbit directly above the equator, which rotate in synchronization to earth hence, look stationary from any point of earth. The orbit are placed 36000km above the earth surface.

The communication is carried through uplink and downlink and are also called earth station because they located

On the earth, uplink transmits the data to the satellite and downlink receives the data from the satellite.

Satellite in space (transponder)



(Very Small Aperture Terminal)

VSAT is a satellite communication that

serves home and business users. A VSAT end user needs a box that interfaces between the user's computer and an outside antenna with a transceiver.

~~Point~~ - Data Transmission Mode.

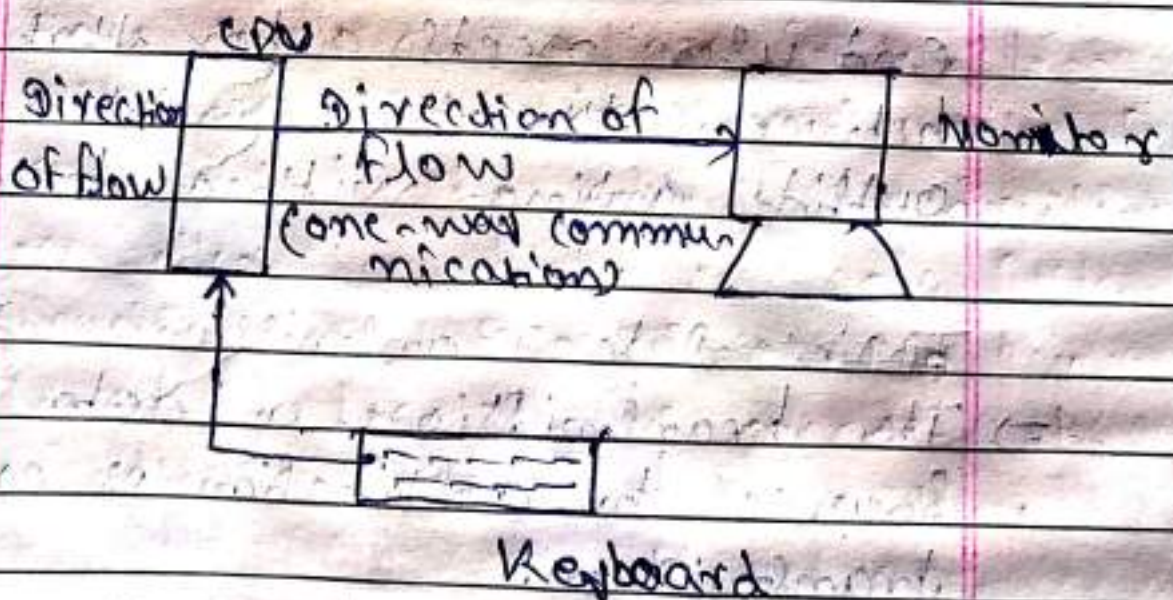
⇒ The transmission of data between source to destination is called data transmission.

Data transmission mode refers to the direction of signal flow between two link devices. There are

three types of transmission mode-

i) Simplex:-

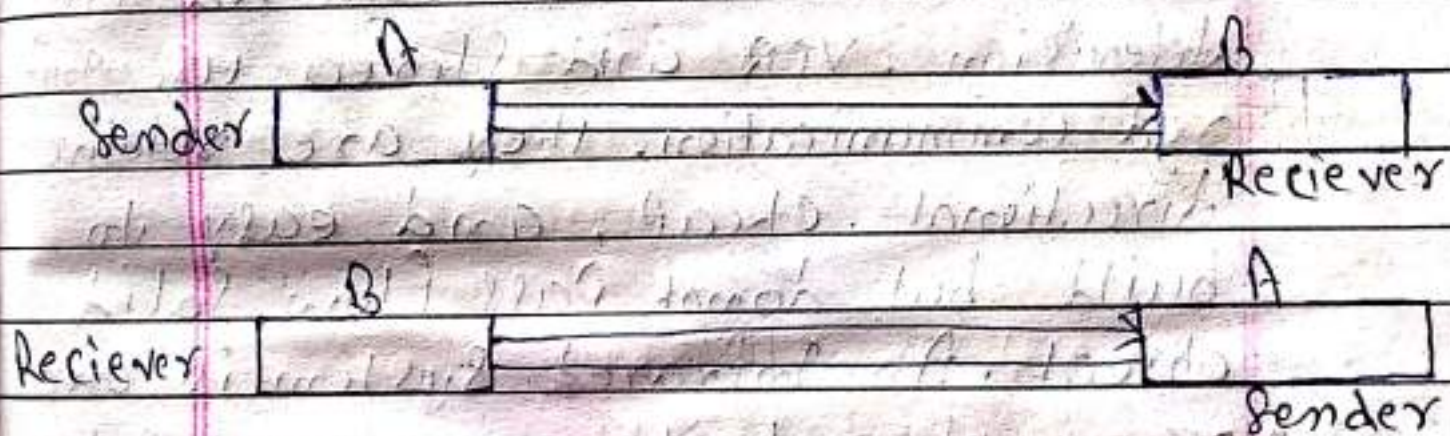
⇒ Simplex transmission is a unidirectional. The information flow in one direction across. The circuit with no capability to support response in other direction. Only one of the communicating device transmits information, the other can only receive it. Television transmission can be considered as an example of simplex mode of transmission where the satellite only transmits the data to the television, vice versa is not possible.



ii) Half Duplex:-

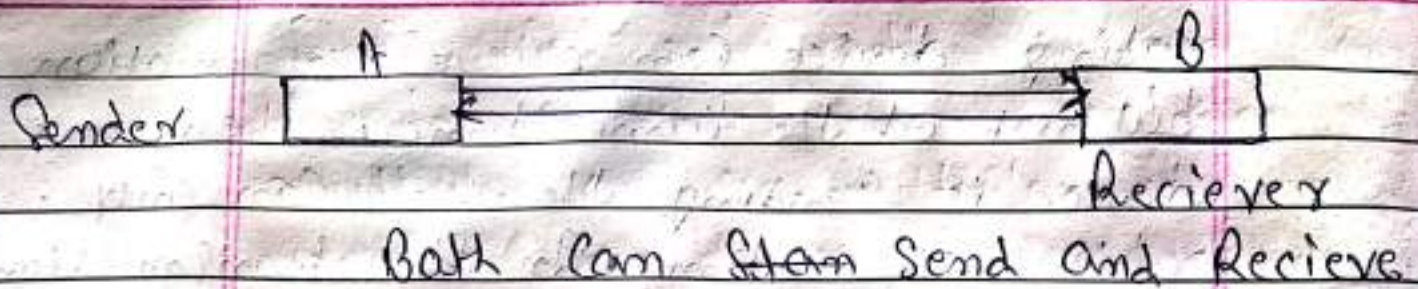
⇒ In half duplex mode, each communi-

ceiving device can receive information but not at the same time. When one device is sending the other can only receive at a time. In this transmission entire capacity of the transmission medium is taken over by the device which is transmitting at that movement. For example, Waki-Taxi is used in half duplex.



iii) Full Duplex:

⇒ Full duplex mode transmission mode also known as the duplex mode allow both communicating device to transmit and receive data simultaneously. A full duplex mode can be compare to a two way road with traffic following in both direction. It A standard voice telephone call is a full duplex call because both parties can talk at the same time and can be heard.



3) Topic:- Infrared:-

⇒ Unguided Infrared and millimeters wave are used for short range communication. The remote control used in television, VCR and Stereo use Infrared communication. They are relatively directional, cheap, and easy to build but do not pass through solid objects. An Infrared system in one room of a building will not interfere with a similar system in adjacent room. Further, security of Infrared system against jamming is better than that of radio system. Precise for this reason, no government licence is needed to operate an Infrared system.

UNIT 6: Transmission & Switching

Topic: Multiplexing

⇒ It is a technique that transmits signal from several sources over a single communication channel. So, in order to minimize the cost of communication, it allows using the high capacity media by more than one channel to make a transmission to other channel. A multiplexer is linked by a demultiplexer through media. Multiplexers accept an N -input signal that transmits the signal of media. A demultiplexer on the other side accepts the signal and then repeats the signal and then sends that signal to the appropriate channel.

Types of Multiplexing:-

i) FDM:- (Frequency Division Multiplexing)

⇒ FDM is concerned with analog signals. It allows transmitting multiple data streams simultaneously over the same channel.

It is used when the bandwidth of the transmission medium between the multiplex or de-multiplex is much greater than the requirement from any one stream being multiplexed. In this technique, signal from each sending device is modulated using carrier wave with different frequencies. These modulated signals are combined into single composite signal and transported over the common medium. One of the most common examples of FDM is radio system.

Advantage of FDM:-

- ⇒ • Large number of signals can be transmitted simultaneously.
- FDM doesn't need synchronization b/w transmitter and receiver for proper information.
- Demodulation of FDM is easy.
- Due to slow narrow band, only a single channel gets affected.
- All the FDM channels get affected due to wide band.

Disadvantage of FDM:-

- ⇒ • The Communication Channel must have a very large band width.
- Large numbers of modulations and filters are required.
- FDM suffer from the Problem of Cross talk.

ii) TDM :- (Time Division Multiplexing)

⇒ TDM is a scheme or method of carrying multiple signal over the same channel and each signal periodically getting the entire bandwidth for a short duration. In this technique divides the main signal into a time slot with each time slot carrying a separate signal. It is used for digital communication and can be applied when the data rate capacity of the transmission need is greater than the data rate required by sending and receiving device. TDM allocates each input channel a period of time or time slot each sending device is assign the transmission path for a pre-define time slot. For example, TV channel and advertising they use entire bandwidth for short

Time. First Program then advertise, again Program, advertise and so on.

Advantage of TDM:-

- ⇒ • Full available channel bandwidth utilize for each channel.
- Inter-modulation distribution is absent.
- TDM Circuit is not very complex.
- The problem of cross talk is not severe.

Disadvantage of TDM:-

- ⇒ • Synchronization is essential for proper operation.
- Due to slow narrow band feeding all the TDM channels may be get wipe out.

Note:- Modulation of the different frequencies of interacting waves called Intermodulation.

Topic:- Switch.

- ⇒ Switch allow different devices on a network to communicate. Switch mean

routing traffic by a setting up temporary connection between two or more network point. This is done by device that located at different location on the network called switch. Switched network some switches are directly connected to communicating device. Other is used for routing or forwarding information. Consider is scenario of small office having four telephone sets used by the four employees for communication. It direct ^{line} where to be used for all the place people. Six duplex lines are required this is called Point-to-Point Connection. Each switch is connected either to be communicating device or to many other switch for forwarding information. Multiple switches are used to complete the connection between any two communication or communicating device at a time.

Types of Switches:-

2) There are three types of switches -

1) Circuit Switch:-

⇒ When a device want to communicate with another device circuit switching technique creates a fixed bandwidth channel

and circuit between the source and the destination. This circuit is reserved exclusively for a particular information flow and no other flow can use it. The path taken by data between the source and destination is determined by circuit on which it is follow and doesn't change during the life time of the connection. The circuit is determined by when the connection is closed. Therefore this method is called circuit switching. A common example of a circuit switch network is public switch telephone network.

ii) Packet Switch:-

2) Packet Switching is introduced the idea of breaking data into packet which are discrete unit of potential variable length block of data. Part from data these packet also contain header with control information like the destination address. These packets are passed by the source point to its local packet switching or exchange the packet contains data and various

Control information. The packet switch network allow any host to send data to any other host without the circuit multiple path between a pair of sender and receiver may exist in a packet switching network.

iii) Message Switch:-

⇒ Message Switching technique is store and forward mechanism. In this mechanism a special device in the network receive the message from a communicating device and store it into its memory. Then, it find a free route and send the stored information to the destination. In this kind of switching it is always delivered to one device where it is stored and rerouted to its destination. Message Switching is complete message is transmitted from device to device through the internetwork that is message is transmitted from the source node to intermediate node. The first electro mechanical telecommunication message switching is used for telegram. The message was punched on paper tape offline and the sending office and then read in

transmitted over a communication line to the next office along the way where it was punched out.

exa

E-mail

Topic:- ISDM

ISDM stand for Integrated Services-digital network is a set of communication standard for simultaneous digital transmission of voice, video, data and other network services over the traditional circuits. The Public Circuit Switch Telephone System was design for analog voice transmission and it is not applicable for modern communication need user demand for an end to end digital services. The primary goal of the integration of telephone voice and non-voice services are —

- i) An interconnected billion of hier telephone that rings ^{hier} to where install
- ii) A telephone with multiple buttons for instant cost set up to arbitrary telephone

anywhere in the world.

- iii) Telephone that display caller telephone number, name and address on a display while ringing.
- iv) It allow the telephone to be connected so that callers database record are display on the screen and the as the calls come in.
- v) Advance non-voice services are remote electricity meter reading online medical smoke alarm that automatically call their hospital, police, wired fire department respectively and give their add to speed of response.

ISDN is a network architecture in which digital technology is used to convey information from multiple networks to the end user. This information is end-to-end digital.

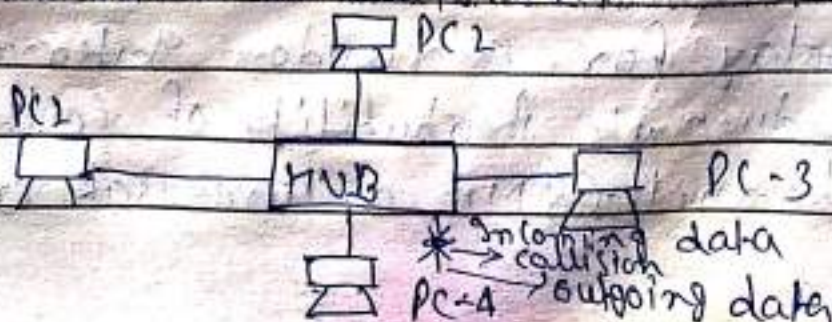
UNIT 1: Broadcast Networks & their Protocols

Topic:- Collision.

⇒ In a half-duplex network a collision is the result of two devices on the same network attempting to transmit data at exactly the same time. The network detects the collision of the two transmitted packets and discards them both.

Topic:- Data Collision.

⇒ A data collision is the result of simultaneous data packet transmission by two or more network devices or nodes. It is called data collision. For example, when a two PC try to send a data to PC 1 via hub through the connected channel to hub, if some other data traffic of some other PC in the network is all coming come in down in the same channel through the hub down to PC 1, then the data meet each other and form a collision.



Topic:- CSMA/CA (Carrier Sense Multiple Access / Collision Avoidance)

2) CSMA is a network protocol that listens or senses network signal on the medium before ~~any~~ transmitting any data. CSMA is implemented in Ethernet network with more than one computer or network devices attached to it. In CSMA/CA, once the channel is clear, a station sends a signal ^{telling} all other station not to transmit and then sends its packet. In Ethernet, the station continues to wait for a time and check to see if the channel is ~~still~~ free. If it is free, the station transmits and wait for an acknowledgement signal that the packet was received. Collision avoidance is used to improve the performance of CSMA by attempting to be less greedy on the channel. If the channel is sensed busy before transmission then the transmission is delay for a random interval. This reduce the probability of collision on channel. CSMA ensure that only one

network mode is transmitted on the network at any one time.

TOPIC:- CSMA/CD (Collision detection)

⇒ It is a set of rules determining how network devices respond when two devices attempt to use a data channel simultaneously. Standard ethernet N/w use CSMA/CD to physically monitor the traffic on the line at a participating station. Collision detection is used to improve CSMA performance by terminating transmission as soon as a collision is detected and reducing the probability of a second collision on a retry method. For collision detection are dependent on the transmitting media. On an electrical bus such as ethernet collision can be detected transmitted data and received data. If they differ it means that another station has also transmitted a signal and is overlapping the first transmitter's signal that is a collision has occurred. The transmission is terminated immediately and a Jam signal is sent. The Jam signal will cause all frame transmitters to back off by random

Intervals, reducing the probability of a collision when the first retry is attempted.

Topic: Ethernet.

⇒ Ethernet is the most popular network architecture for LAN. Ethernet was originally developed by Xerox in the 1970s and was proposed as a standard by Xerox, Digital Equipment Corporation and Intel in 1980. A separate standardization council for Ethernet technology was established in 1985 by the IEEE (Institute of Electrical and Electronics Engineers). A system for connecting a number of computer systems to form a LAN, with protocols to control the passing of information and to avoid simultaneous transmission by two or more systems. Ethernet is a link layer protocol in the TCP/IP describing how network devices can format data for transmission to other network devices on the same network segment and how to put that data out on the network connection. It is available in 3 different speeds —

- 1) 10Mbps which is simply called Ethernet.

- ii) 100Mbps which is called fast ethernet.
- iii) 100Mbps or, 1Gb which is an emerging standard called gigabyte ethernet.

Ethernet can be classified into the following category they are —

1) 10 Base 5 (Thick Ethernet):

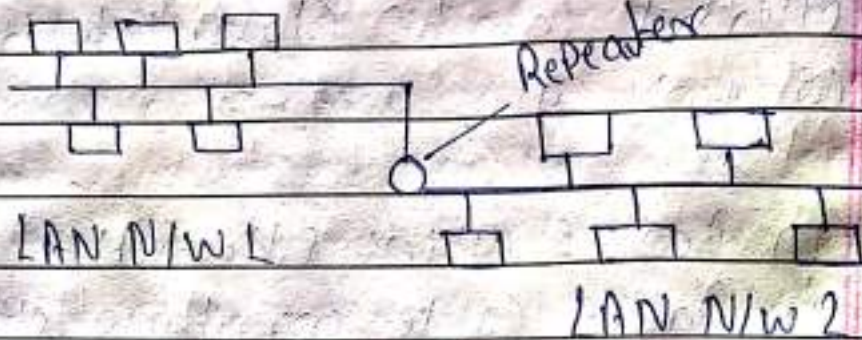
=> 10 Base 5 Cable or, Thick ethernet cable which is the eldest in this category. It is called thicknet because of the use of thick co-axial cable. The cable is marked after each 2 meters. This cable is used in bus topology. These marks are provided for tap point the connection of the cable are made by vampire taping.

Note:

A vampire tap is a device for physically connecting a station, typically a computer network to a network that uses 10 Base 5 cabling.

The cable operates 10Mbps. It can support to a maximum of 500m. These segments are connected by the help of the repeater. Each station connection is to the ethernet

Cable through the transceiver receives Pair which can extract or, intended Signal on a cable in one direction.



2) 10 Base 2 (Thin Ethernet):-

⇒ 10 Base 2 Cable also called thin ethernet

This type of cable usually thin, flexible and bend easily. It also make use of Bus topology. It is also called a coaxial cable that is having a smaller diameter than the 10 Base 5 cable. 10 Base 2 ethernet that used thin co-axial cable

terminated with BNC connector (Bayonet - Neill - Connelman). The ethernet

based on this type of cable is cheaper and easy to install but it can run

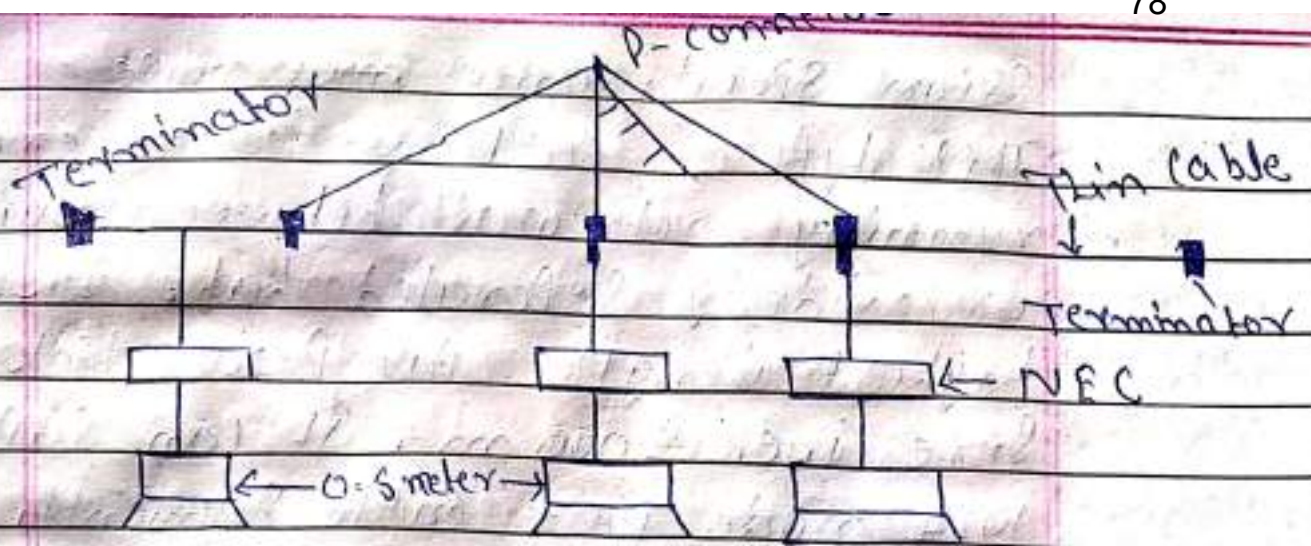
for the 20 meters and it support 20

to 50 node for sequence in both of

this network cable detecting cable

break or, loss connection can be

measure problem.



3) 10 Base T :-

⇒ 10 Base T twisted wire pair cable is most popular among LAN. It make use star topology. In this type of network every station having a link to a central device called hub this is an older technology of connection. It can support 102 nodes per cable segment the maximum length of a segment from hub to station can 150m.

4.) 10 Base F :-

⇒ 10 Base F cable is also known as fibre optical cable. The most efficient and fastest cable in this category of cable for LAN. The fibre optical cable is very expensive compare to above cable but it offer a very high data transmi-

Session Speed and ~~not~~ noise

This type of cabling is referred to running network between buildings or, widely separated hub. It can be highest length LAN per which segment size i.e. 2000 m. It can support 1024 node per cable segment.

Topic :- Token.

⇒ In networking token is a special sense of bits that travel around a token ring network. The token circulate computer attached. In the network can capture it. The token act like a ticket enabling its holder to send a message across the network. There is only one token for each network so, there is no possibility that two computers attempt transmitting at the same time.

Topic :- Token Bus (802.4)

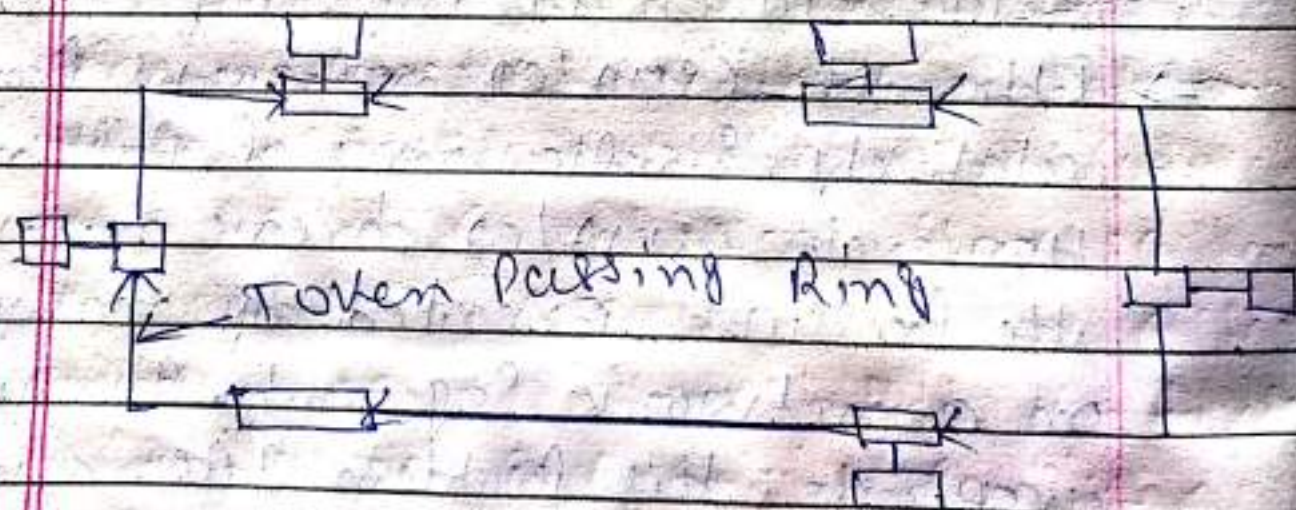
2 A token bus computer network must have processing of a token before it can transmit on the computer network. The IEEE 802.4 committee has defined token bus standard as

Broadband Computer network as applied to ethernet transmission topology. The token bus is a linear or free shape cable to which the stations are attached that token bus topology is well suited to group of users that are separated by some distance. The token transmits frame of data are haled from one station to another following the numeric sequence of station addresses. In token bus each station receive each frame. The station whose address specialized in the frame process it and the other station this is called the frame.

Topic :- Token Passing Ring (802.5).

⇒ Ethernet CSMA/CD networks provide a relatively simple way of passing data. However CSMA/CD break down under the pressure exerted by many computers on a network segment. In order to overcome this problem IBM and IEEE created another networking standard called 802.5. Token ring work very differently from ethernet. In ethernet any computer can transmit data until it sense a collision with

another computer. In token ring network by contrast a single special packet called a token is passed around the network. When a computer has data to transmit it wait until the token is available and then transmits a data packet while simultaneously releasing the token to the next computer in the line. Then the next computer grabs the token if it has data to transmit. Token ring is an IEEE 802.5 Standard whose topology is physically a star but logically a ring.



Topic: Network Device.

⇒ In the small function of network many devices play important roles.

1) Repeater:-

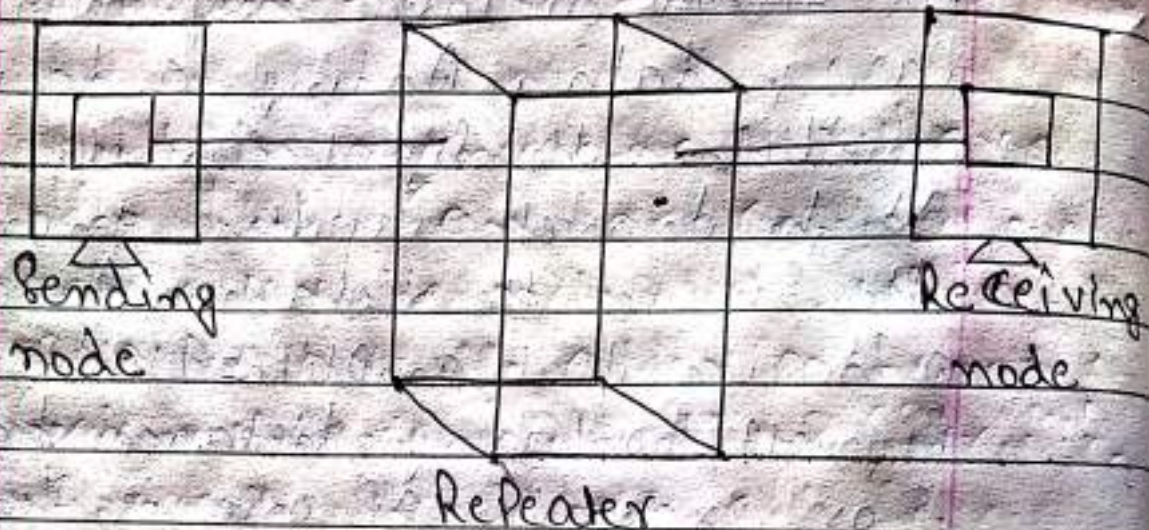
c) All transmission media we weave the electromagnetic waves that travel through the media attenuation therefore limit the distant distance any media can carry data. Adding a device that amplify the signal can flow or allow it to travel further, increasing the size of the network. A repeater is a device that amplify and restore signal for long distance transmission. For example if one is connecting computers that are more than 100m apart using ethernet cable one will need a device that amplify signal to ensure data transmission. Devices that amplify signal in this way are called repeater. It has following two categories —

A) Amplifiers:-

⇒ Amplifiers simply increase the power of the incoming signal that is both signal and the noise. These are able to improve signal to noise in the analog type of system only.

B) Signal Regenerating Repeater:

⇒ Signal Regenerating Repeater creates an exact duplicate of the incoming digital data.



Topic 1- Hub & Concentrators:

⇒ Intelligent LAN Concentrators which are called Concentrators. Hubs are used to connect network nodes to network backbone. nodes are connected to HUBS in a Physical Star fashion, whether they are used for a star topology or a ring topology network. A simple network might consist of just a hub or two smaller networks usually don't require a network backbone. Hubs are virtually any network media type with the higher unit using replaceable modules.

to support multiple media types.

The Properties or Advantages of Hub's -

i) Hubs echo all data from each Port to all the other Ports on the Hub.

Although hubs are wired in a star fashion. They actually perform electrically more like a bus topology segment in this respect. ~~bus topology segment~~ Because of this echoing no filtering or logic occurs to prevent collisions b/w packets being transmitted by any one of the connected nodes.

ii) Hubs can automatically partition a problematic node from the other nodes in effect, shutting down that node. Such partitioning occurs if a cable short is detected or if the hub Port is receiving excessive packets that are flooding the network or if some other serious problem is detected for a given Port of the hub.

Features of HUB:-

=> Hubs are becoming much more ~~combi~~ sophisticated. They often have a number of advance built-in features -

i) Built-in management where the hub can be control managed over the network, using SNMP or the other network management protocols & software.

ii) Auto sensing of different connection speeds. e.g. Ethernet hubs can be automatically detect & run each node at either 10 Mbps (10BASE-T) or, 100 Mbps are common.

iii) High speed uplinks that connect the hub to a backbone. These usually operate at a ten times the basic speed of the hub.

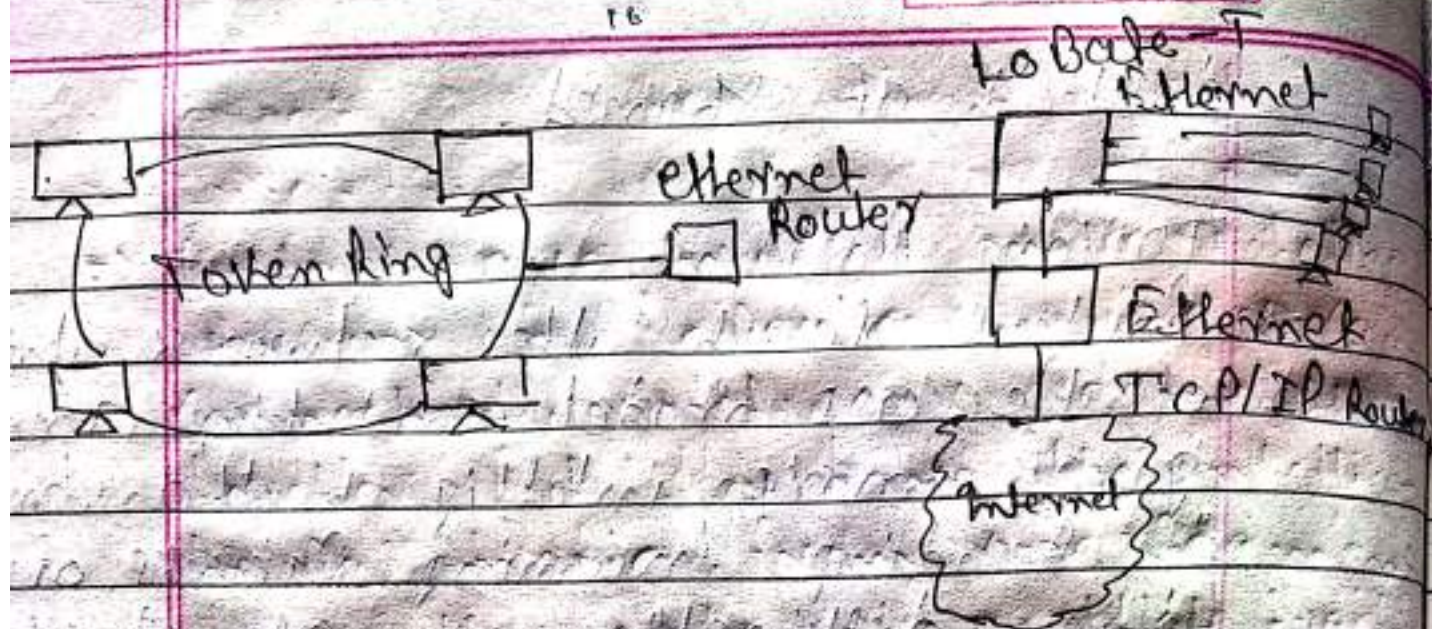
iv) Built-in switching where nodes on the HUB can be switched.

instead of shared.

Topic: Routers.

→ Routers operate at the network layer of the OSI model and they are given more intelligent than bridges in sending incoming packets off to their destination. Because routers operate at the network layer, a connection across a router requires only that the higher layers use the same protocol. The router can translate to anyone of the protocols at the layer 3 through to any other protocol at layer 3 through 3. Router can connect both similar and dissimilar networks. They are often used in WAN links.

Routers actually become a node on a network and they have their own network address. They can perform other tricks to maximize network bandwidth & dynamically adjust to changing problems or traffic patterns on a network.

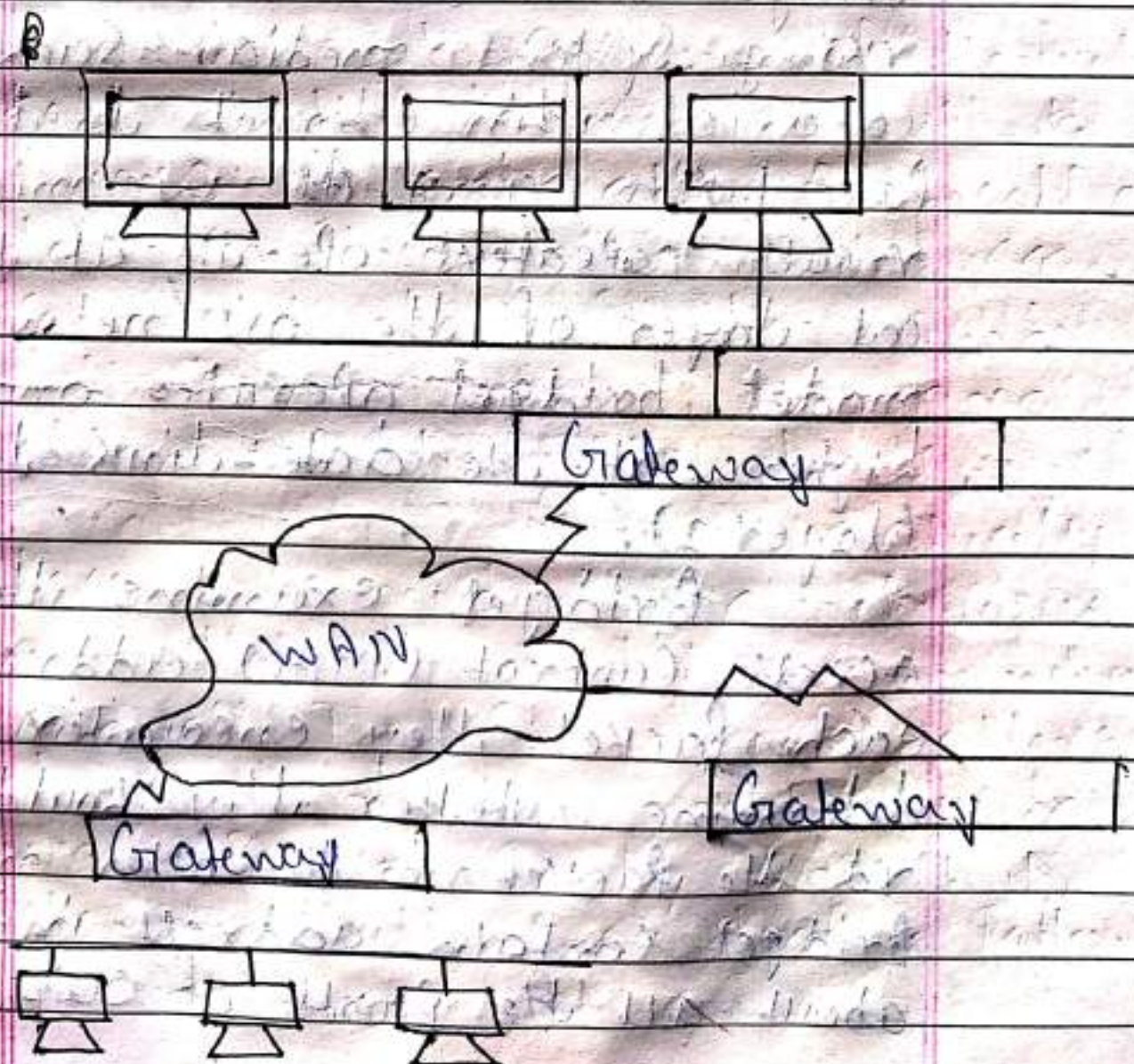


Topic: Gateway

⇒ Gateways are application specific interfaces that link all seven layers of the OSI model when they are dissimilar at any or all levels. For instance if we need to connect a network that uses one of the OSI models to one using IBM's Systems Network Architecture model (SNA), use a gateway. Gateways can also translate from Ethernet to token ring although similar similar solutions than gateway exists if we need such a translation because gateways must translate so much they tend to be slower than other solutions, particularly under heavy

load.

The Primary use for gateways today is for handling e-mail. POP3 & SMTP are two examples of protocols that are handled by gateways. Most e-mail systems that can connect to disparate systems either use a computer set up as a gateway for that chore or let the e-mail server handle the gateway chores itself.



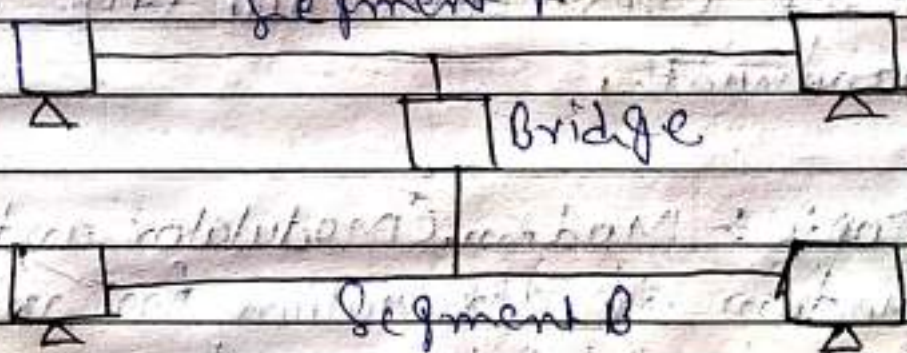
B

Topic: Bridges

⇒ Bridges are much more intelligent version of Repeater. Bridges can connect two network segments together but they have the intelligence to pass traffic from one segment to another only when that traffic is destined for the other segment. Bridges are used to segment networks into smaller pieces. Some bridges can span different networking system media. Such as co-axial, thin ethernet, twisted pair, token ring. As we might recall repeaters operate at the Physical layer of the OSI/networking model, bridges operate one layer higher, at the data-link layer (layer 2).

Bridges examine the media access control (MAC) address of each packet they encounter to determine whether they should forward the packet to the other network. Bridges contain address information about all the parts of our country.

network through either a static routing table. If we should use bridge only in smaller networks, or in case where we would otherwise use a repeater, but would benefit from keeping traffic on one segment from being transmitted on the other segment unnecessarily. Often routers or switches offered solutions that perform better and create fewer problems. So examine these other options before choosing a bridge.



Bridge operates in the following means:-

- i) A bridge receives all the signal from both Segment A & B.
- ii) The bridge reads the address and discards all the signal from Segment A that need not to cross the bridge.

Topic :- FDDI (Fiber distributed data interface)

⇒ FDDI is another ring based network and unlike token ring, it is implemented without hub although you can use device called connector. FDDI uses fiber optic cable to implement very fast & reliable network. It is a high performance fibre optic token ring LAN running at 100 mbps over distances up to 200km with up to one 1000 stations connected. FDDI is a set of ANSI and ISO (American national standard institute). It can be used in the same way as any of the other LANs but with 9M high bandwidth.

Topic :- Modem (modulator and demodulator)

⇒ Modem is abbreviation for modulator and demodulator. Modems are used for data transfer from one computer network to another computer network through telephone lines. The computer network works in digital mode while analog technology is used for carry messages across phone lines. Modulator converts from digital mode to

Analog mode at the transmitting end and demodulator convert the same from analog to digital at receiving end. The process of converting analog signals of one computer network into digital signals of another computer network is called modem. So, they can be processed by a receiving computer is referred to as digitizing.

