

# Computer Networks

## Computer Network

- An interconnection of two or more computers for sharing of resources is called network.

### \* Types of networks

- 1) LAN : Local Area Network
- 2) WAN : Wide Area Network
- 3) MAN : Metropolitan Area Network.

Intranet :- Communication happens within the networks

### \* Types of Network devices:

- 1) Hub : A device that connects multiple computers in a network , the hubs can be active or passive , An active hub strengthens and regenerates the incoming signals before sending the data on it's destination ,

Passive hubs do nothing with the signals

- 2) Repeater : A small device that connects two segments of networks which amplifies or strengthens the weakened digital signals and sends them on their path.

3) Bridge : A device that connects multiple similar kind of networks, It manages the network traffic by filtering the packets.

4) Router :- It is a network device used to connect the nodes across ~~the~~ an internet work for best path for sending data.

5) Gateway : A device used to connects the dissimilar networks, A gateway handles conversion of messages, addresses and protocol to deliver a message from one network to another.

6. Server : It is a high speed computer system controls all the computers connected to the network, All applications and data created by all the users are stored ~~in~~ in the server. system.

• Protocols :- It is a set of rules between sender and receiver to achieve communication using suitable medium.

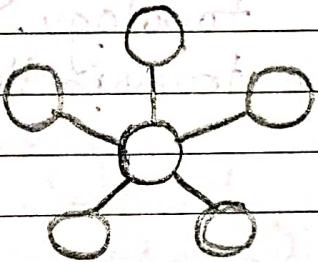
### \* Network Topology

A geometrical arrangement of computers and other devices in a network is called topology, the different network topologies are :

- 1) Star topology
- 2) Ring topology
- 3) Bus topology
- 4) Tree topology
- 5) Mesh topology
- 6) Hybrid topology.

### 1. Star topology

In this device, Each device is connected to a central hub or switch, which acts as a communication centre for the network.



#### Advantages

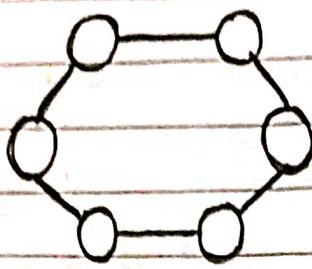
- Easy to connect or disconnect the computers.
- The failure of a particular node does not stop working of entire network.
- Easy to detect and solve the hardware problems.

### 2. Ring topology

The computers are connected in circular path and allows the data transfer in only one direction. A failure in any cable or device breaks the loop and causes entire network down.

#### Advantages

- It is easy to install and reconfigure.
- It reduces the burden of server.

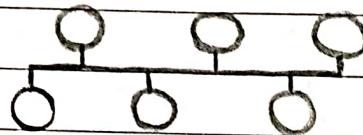


### 3 Bus topology

- The bus networks use a common backbone to connect all devices, all devices are connected to a single cable.

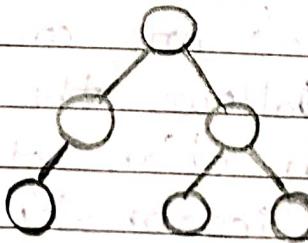
### Advantages

- Requires less cable length than a star topology.
- Data can be transmitted in both direction



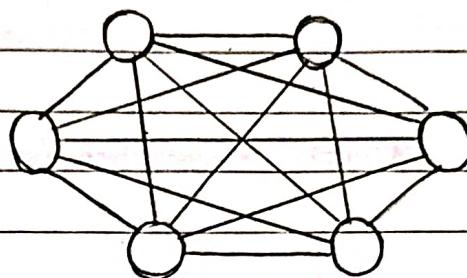
### 4 Tree topology

- The tree topologies integrate multiple star topologies together onto a bus. In its simplest form only hub devices connect directly to the bus and each hub functions as the "root" of a tree of devices.



## 5 Mesh topology.

- In this topology, each device is connected to every other device on the network. This provides redundancy and ensures that if one connection fails there are other paths for data to travel.



## \* Data Communication.

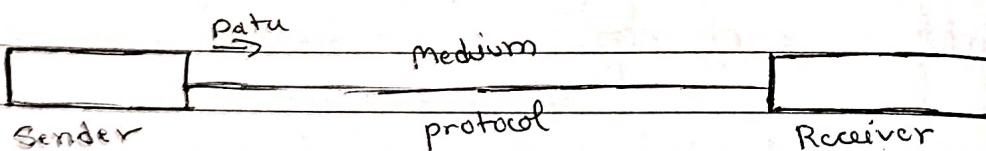
- Data communication refers to the process of exchanging digital data between two or more devices or systems, some of key characteristics of data communication are.

### \* Characteristics

1. Speed : Data communication must be fast enough to ensure that data is transmitted and received in timely manner
2. Accuracy : Data communication must be accurate with minimal errors or data loss during transmission.
3. Security : Data communication must be secure, with encryption and other security measures in place to prevent unauthorised access or interception of data.
4. Reliability : Data communication must be reliable, with a high level of availability & minimal downtime.

5. Cost effectiveness : Data communication must be cost effective, with efficient use of resources and minimal overhead costs.
6. Jitter : It's a delay in the communication. It's also refer to the variation of packet arrival time & it uneven delaying in delivery of Audio or video package.

#### \* Components of Data communication.



Data communication involves the transmission of digital data b/w two or more devices or systems.

##### 1. Sender:

The sender is the device or system that initiates the transmission of data, it converts the data into a form suitable for transmission and sends it over the communication channel.

##### 2. Receiver:

The receiver is the device or system that receives the transmitted data & converts it back into its original form.

##### 3. Transmission Medium :

The transmission medium is the physical path or channel over which data is transmitted between the Sender and Receiver, it can be wired or wireless may include cables, fibre

\* Types of connection

- 1) Point to point connection
- 2) Multi Point connection.

optic lines or radio waves.

b) Protocol :

A protocol is a set of rules and procedures that govern the transmission of data over a communication channel.

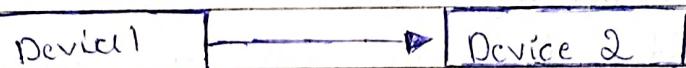
\* Data Flow / Communication modes.

- The Transmission mode defines the direction of the flow of information between two communication devices i.e. it tells the direction of signal flows between the two devices.

There are three types.

i) Simplex mode.

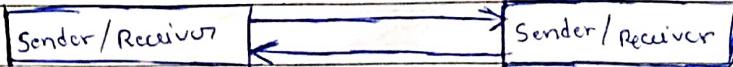
The data transfer takes place from one sender to one receiver through the communication system. the communication is unidirectional.



ex:- Radio & television broadcasting.

ii) Half Duplex mode

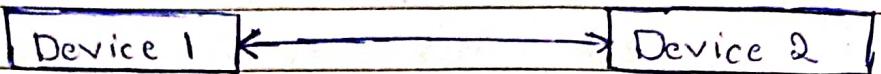
A half duplex system can transmit data in both directions alternatively, this means one device is sending the other can only receive the data & vice-versa.



ex:- Walkie talkie & ham radio

### 3. Full duplex :

A full duplex system can transmit data simultaneously in both directions on transmission path.



### \* Switching Techniques & its types.

- A technique of change over the path to send the data packets towards the destination is called switching technique.

#### i) Circuit switching

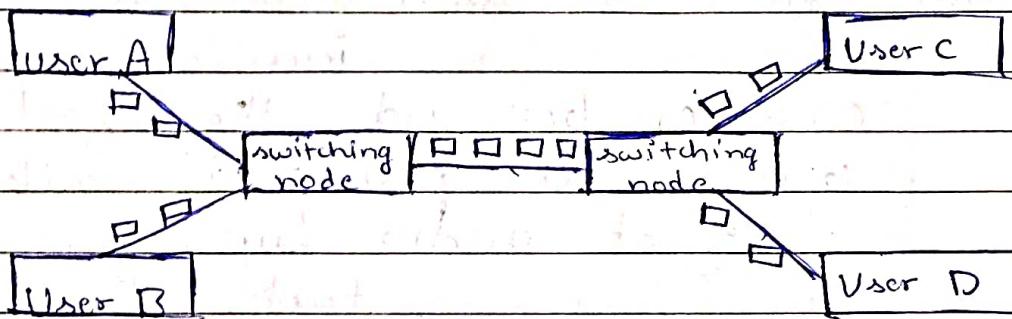
A circuit switching is generally used in the public networks, it came into existence for handling voice traffic in addition to digital data.

Features of circuit switching packet

- The end to end communication is established as an user makes a call.
- After the successful connection establishment the information is forwarded continuously over the provided link.
- A dedicated path is established across sender and receiver which is maintained for the entire duration of conversation.

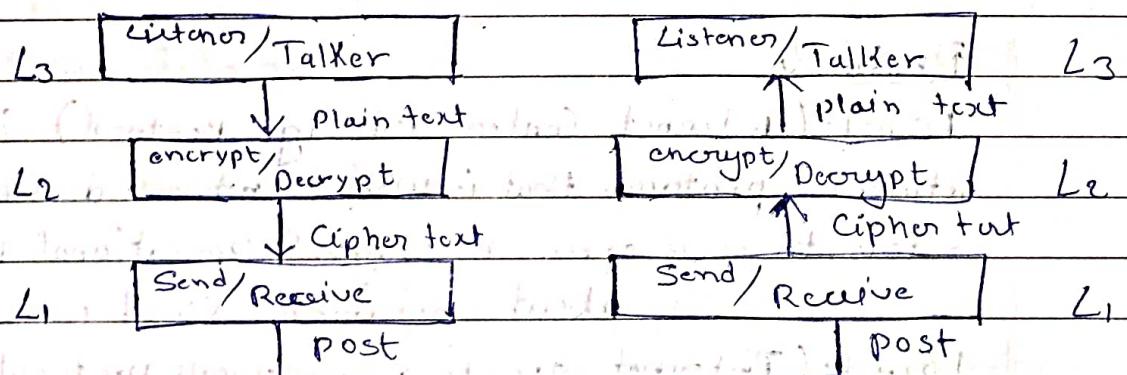
## Q. Packet switching.

In packet switching, messages are broken up into smaller segments called packets and each of which includes a header with source, destination and intermediate node address information, individual packets in packet switching take different routes to reach their respective destination.



## \* Protocol layering

→ 3 layer protocol



## Principles of protocol layering

- It dictates that, if we want Bi-directional communication, we need to make each layer so that it is able to confirm two opposite tasks.

ex:- in layer 3, if one person talking the opposite will be listening, in layer 2 if one person is encrypting the opposite side person will decrypting it.

2. It states that, in protocol layering the objects under each layer at both sites should be identical.  
ex:- on other sides the object under each layer at both sites should be identical.

ex:- on both sides the object under layer 3 is plain text similarly the object under layer 2 is cipher text.

ARP :- Address Resolution protocol (DNS  $\rightarrow$  IP)

RARP :- Reverse Address resolution protocol

### Protocols

ICMP (Internet Control Message Protocol), it is a network protocol that is used by network devices, such as routers, to send error messages & operational information about network conditions.

IGMP (Internet group management protocol), it is a communication protocol used by hosts & adjacent routers to establish multicast group memberships on an IP network.

SMTP (Simple Mail transfer protocol), it is a protocol used for sending & receiving email messages over the internet. SMTP is the standard protocol used by email clients and servers to exchange email messages.

FTP :- FTP used to transfer files b/w computers on a network. Many FTP sites are heavily used and require several attempts before connect.

HTTP :- It is an application level protocol used in internet, it allows the messages to be in the format of MIME (multi purpose internet mail ext.)

SNMP :-(Simple Network management protocol) it is a protocol used for managing & monitoring network devices such as routers, switches, servers.

TCP :- It is a transport layer protocol used in computer networking to ensure reliable transmission of data between applications over a network.

UDP (User Datagram Protocol) it is a connectionless protocol which means that it does not establish a dedicated end to end connection before transmitting data. instead it sends data packets, called ~~data~~ datagrams directly to the destination IP addresses without checking whether the destination host is available or not.

Telnet :- Telnet is a network protocol used on the internet to provide a bi-directional interactive text-oriented communication facility using a virtual terminal connection.

DNS :-

## Address

there are 4 types

- 1) Physical Addresses
- 2) Logical Addresses
- 3) Port addresses
- 4) Specific Addresses

Physical Addresses comes under the physical ~~address~~ layer (e.g. Data link layer)

Logical Addresses comes under the Network layer

Port addresses comes under of Transport layer

Specific addresses comes under in Application layer