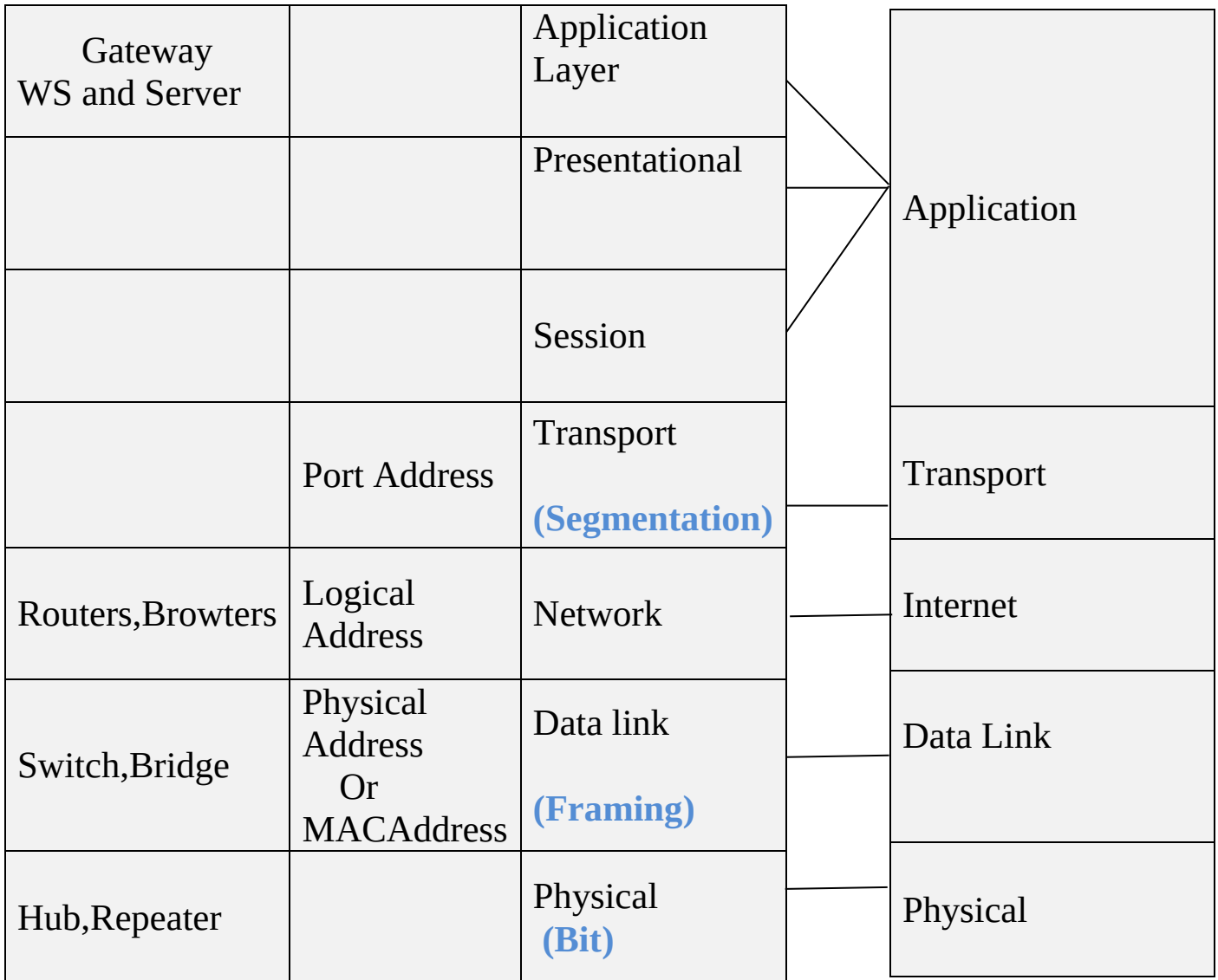


ISO/OSI

<i>Devices</i>	<i>Addresses</i>	<i>Layer</i>
-----------------------	-------------------------	---------------------

TCP/IP

<i>Layer</i>



ISO / OSI International Organization for Standardization / Open Systems Interconnection

TCP/IP Transmission Control Protocol/Internet Protocol

About PDU: PDU is the unit of communication

Application, Presentational, Sessional Message

Transport, Network Datagram or Segment

DataLink Frame

Physical Bit



Packet is the general
term used for all
E. g
Datalink Layer packet
is Frame

About Addresses

Port Address: Process to Process

Logical Address: Actual sender and receiver

Physical Address: Hop to Hop (Link To Link)



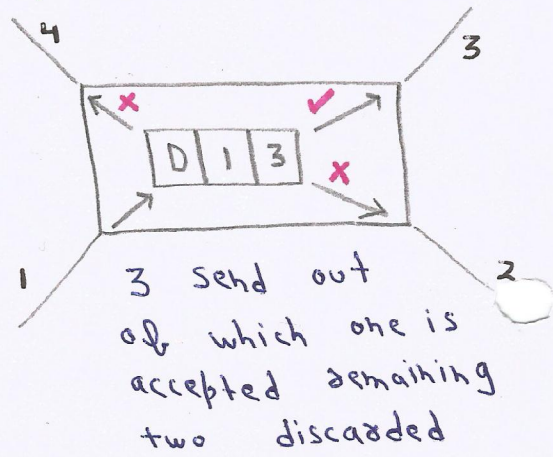
Network Devices

Workstations (client) Servers

Any client can act as server depending upon software installed in it. That is the difference b/w client and server is only in terms of software.

Hub

- > Hub is used to connect workstations and servers.
- > Pure hardware device, therefore it is broadcasting device due to which n/w traffic is high, performance is low. Hence it is called passive device.
- > Cost is low

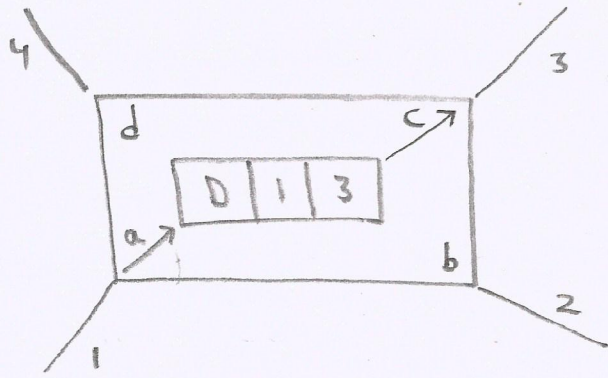


Switch

- > Like hub it is also used to connect workstations and servers.
- > It is an active device with software (look up table) therefore it is a unicasting device due to which n/w traffic is low, performance is high.
- > Cost is high than Hub

1	a
2	b
3	c
4	d

(lookup table)



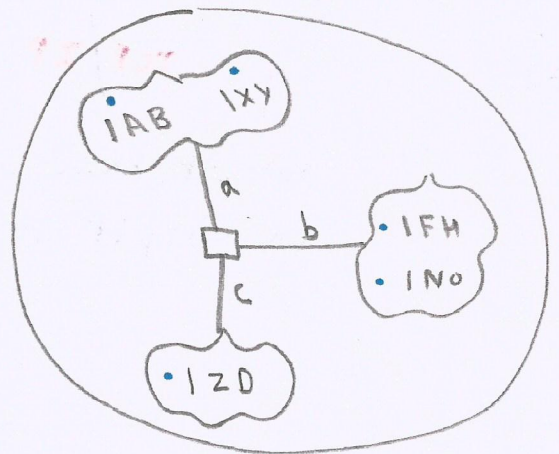
Bridge

It is used to connect multiple LAN / multiple subnets together

Its design criteria is filtering and forwarding

It is having s/w (lookup table)

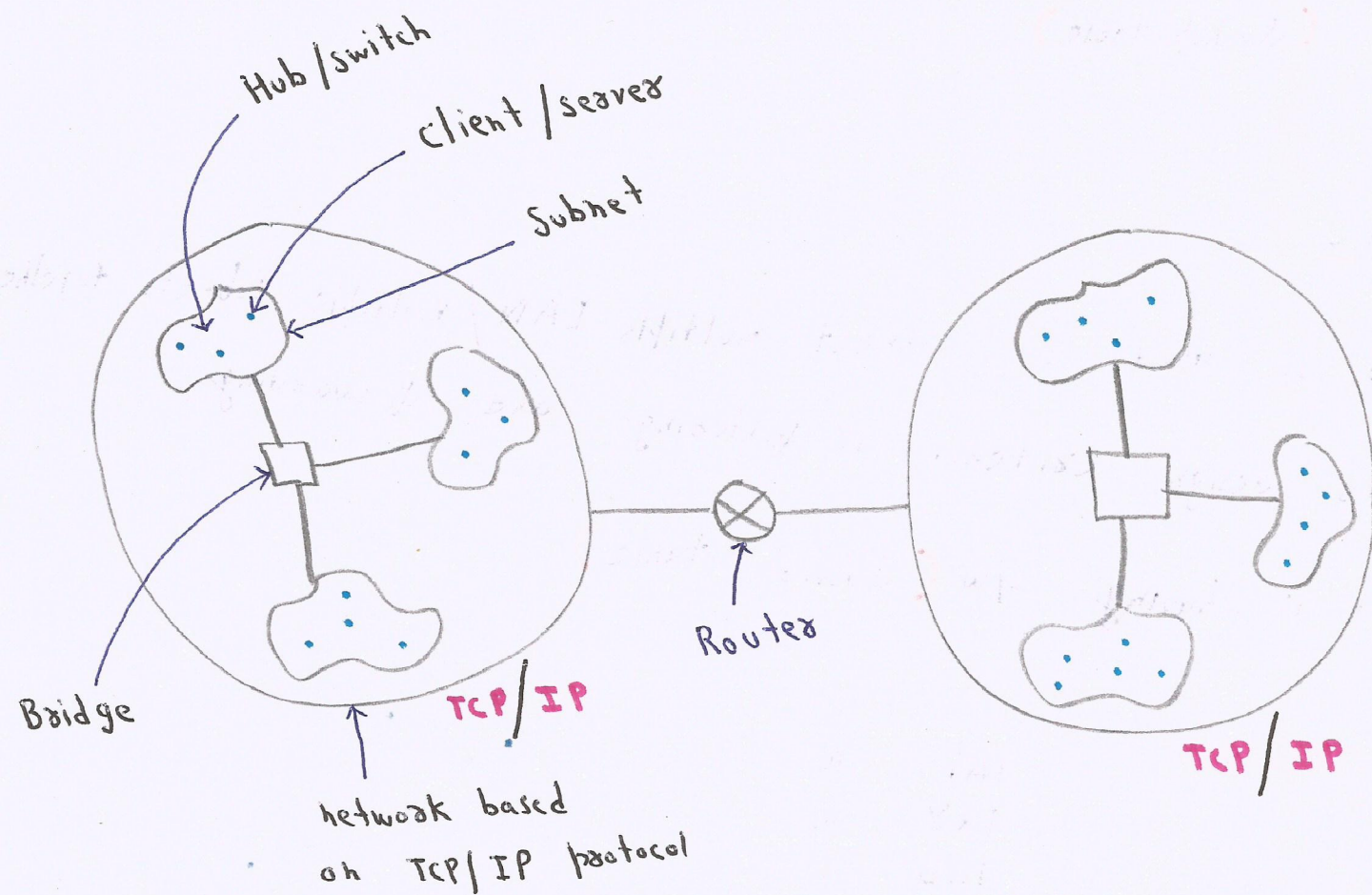
IAB	a
IXY	a
IZD	c
IFH	b
INo	b



Router

Used to connect different similar n/w

different n/w working
on same protocol



This router is having 2 logical addresses. 1 from
1 n/w and other from other n/w.

Brouter (Bridge + Router)

Having capability of both

bridge, router i.e. can be used as bridge or router.

Gateway - Used to connect different dissimilar n/w

different n/w working
on distinct protocol

That is why gateway is also known as protocol
converter

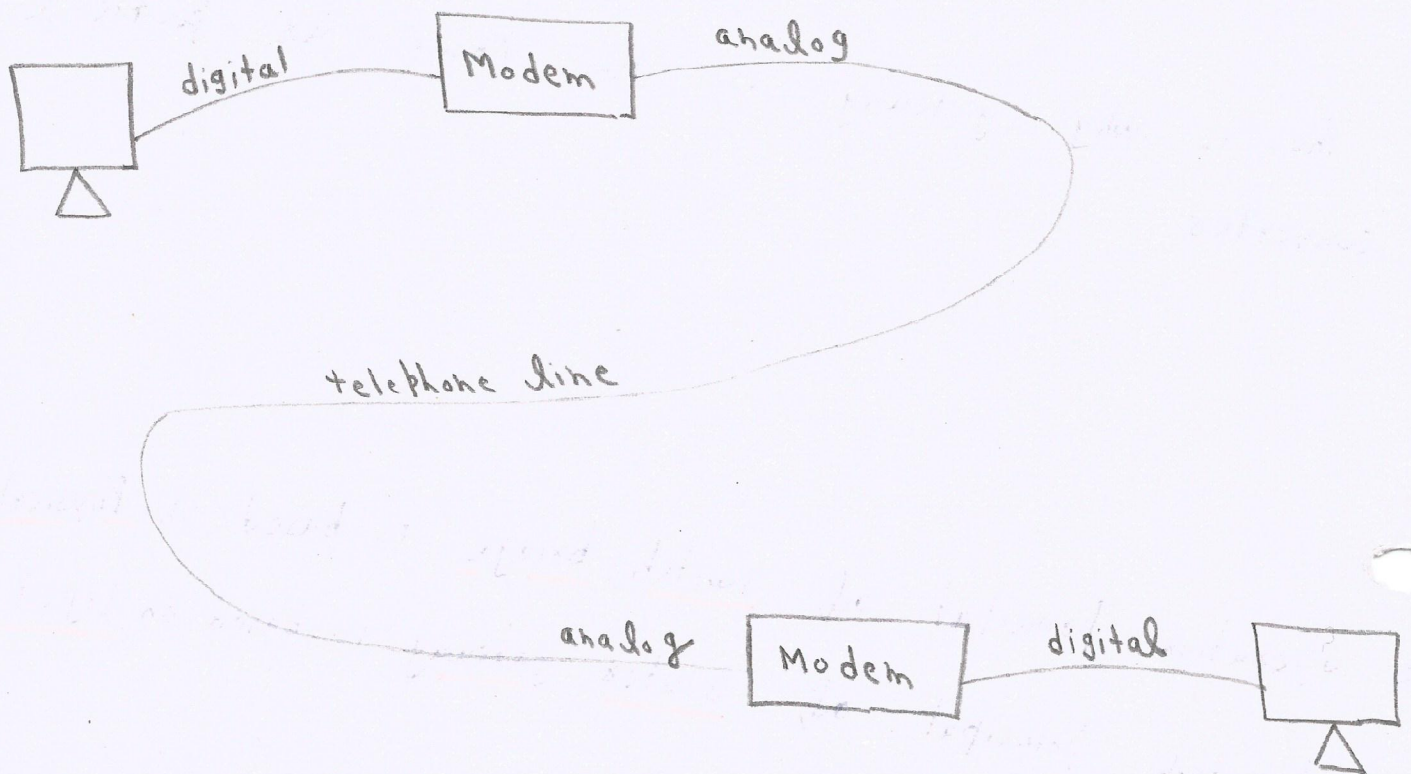
* The operation principal of switch, bridge is based on Physical Address

The operation principal of router, gateway is based on Logical Address

Modem

Modem is a device that makes it possible for computers to communicate over a telephone line.

Computers cannot simply connected to each other because computers communicate with digital signals whereas telephone line can send only analog waves.



Transmission Mode

Simplex

Half Duplex

Full Duplex

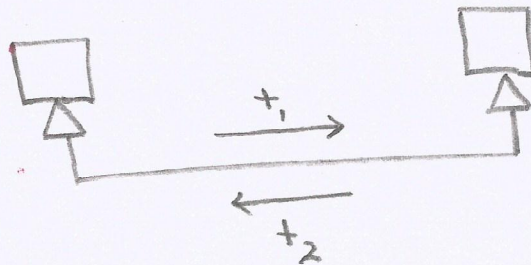
Simplex

The communication is only in one direction



Half Duplex

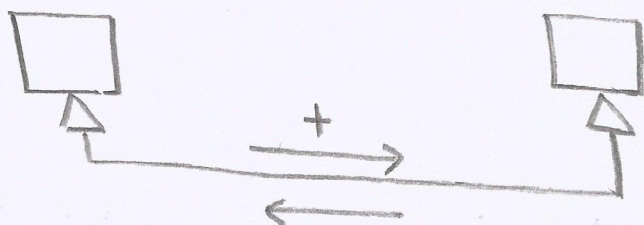
Each station can both transmit and receive data but not at same time



e.g walkie-talkie

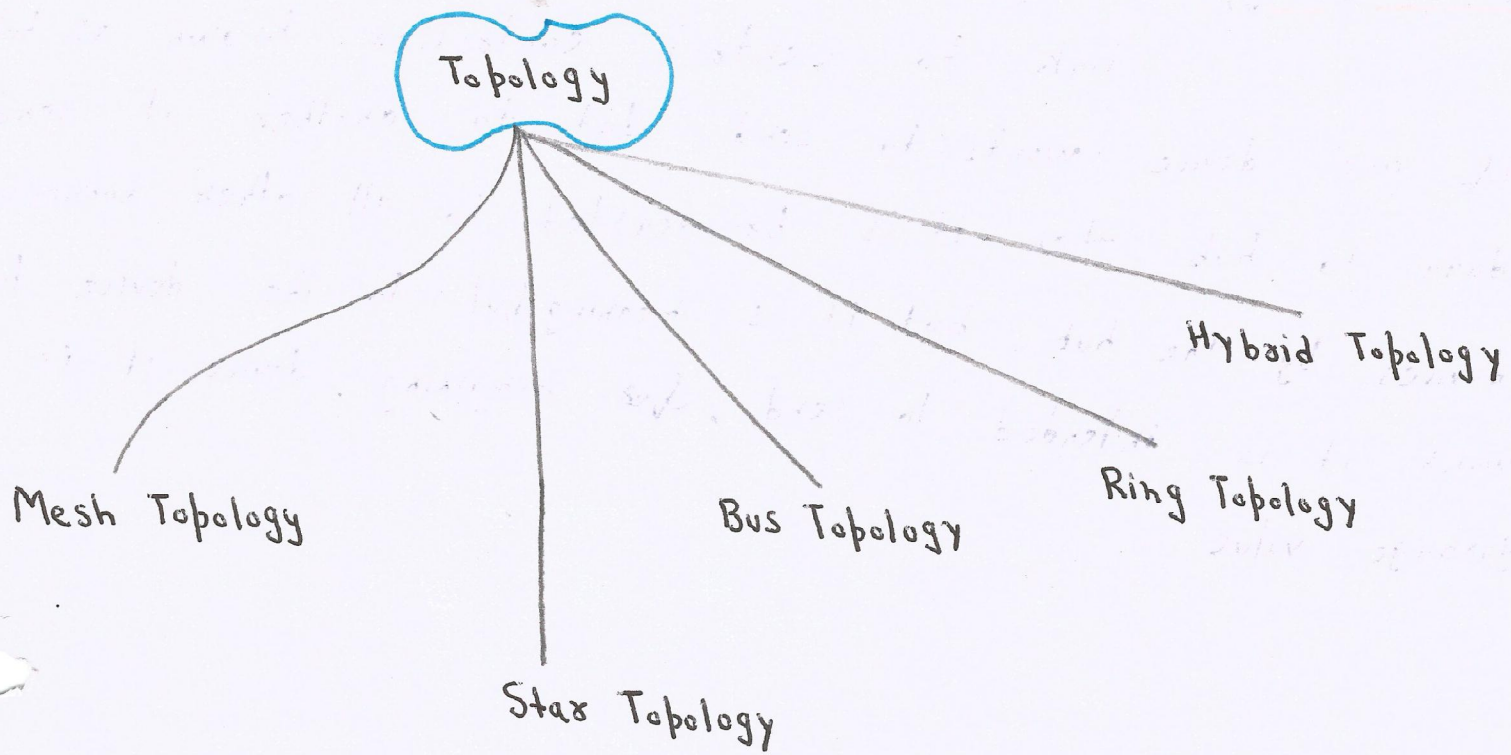
Full Duplex

Each station can both transmit and receive data at same time.



e.g telephone

All computer cables are Full Duplex but they can be used as Simplex, Half Duplex, Full Duplex depending upon requirement



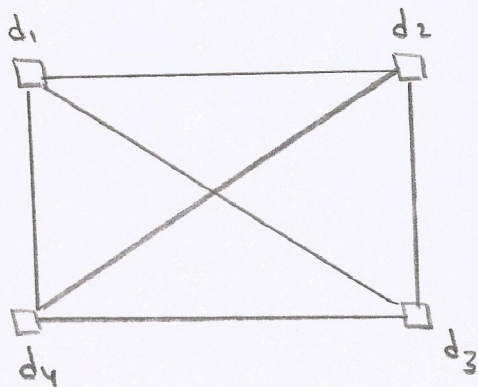
Mesh Topology.

Every device has dedicated (point to point) link to every other device.

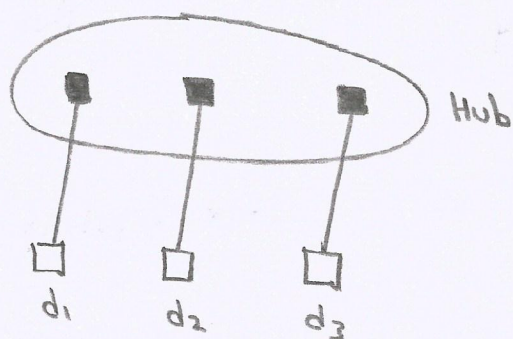
n devices

 $n(n-1)$ simplex links

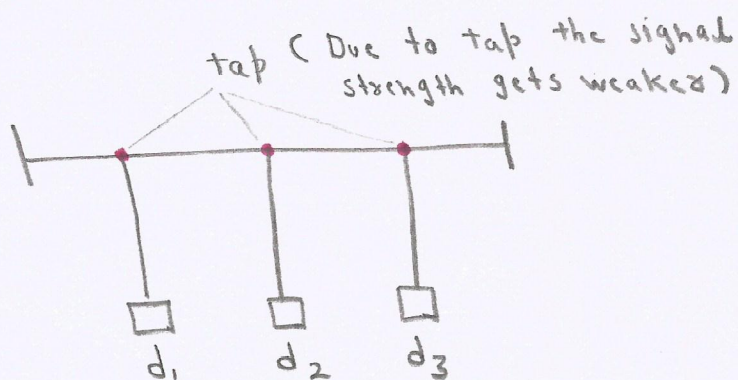
 $\frac{n(n-1)}{2}$ duplex links



Star Topology. Every device has dedicated (point to point) link to central controller known as hub. If one device wants to send data to another it sends data to hub then it is broadcasted to all other connected devices by the hub, but it is meaningful to the device to which it is intended to send, for remaining devices it is garbage value.



Bus Topology - In Bus Topology multipoint connection is there. A signal travels in both directions ^{आर} _{तब तक चलता रहता है जब तक उसे destination न मिल जाए} या end of cable न मिल जाए _{tab (Due to tap the signal}

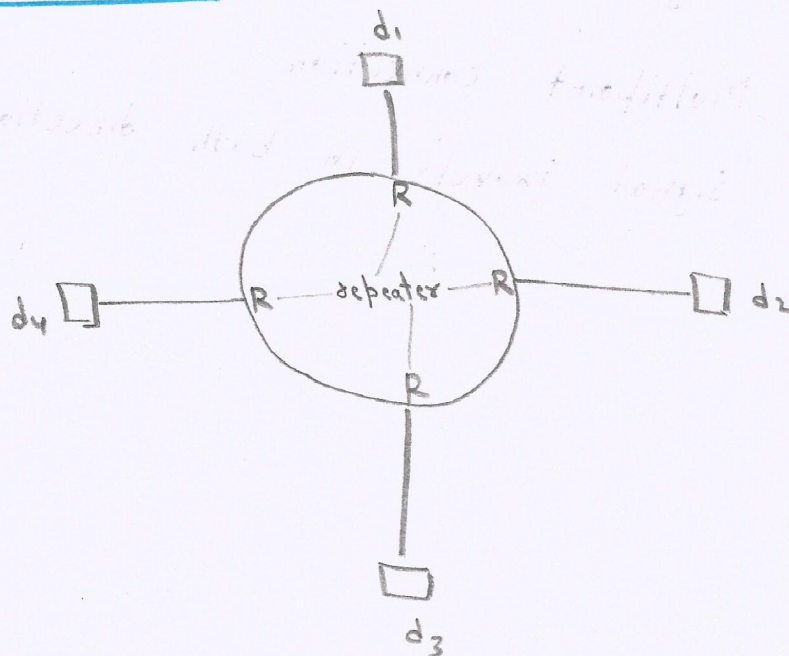


Ring Topology

In ring topology dedicated (point to point) connection is there b/w two devices.

A signal is

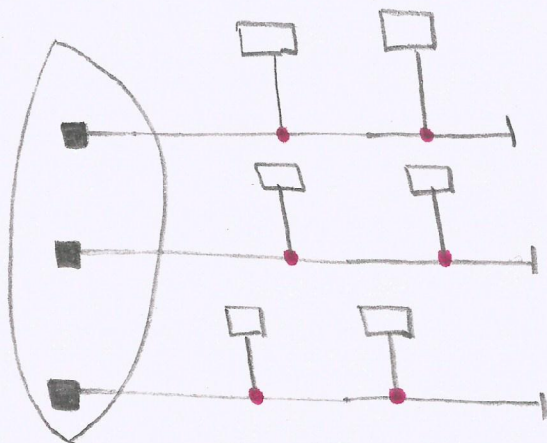
passed in a ring in one direction. Each device in a ring has repeater.



Also known as tree topology.

Hybrid Topology

(star + bus)



Functions Performed by layers

Physical Layer	Data Link Layer	Network Layer	Transport Layer	Session Layer	Presentation Layer	Application Layer
Physical Characteristics Of Medium	Physical Addressing	Logical Addressing	Port Addressing	Synchronization Points/Check Points	Encoding	User Interface Design
Representation Of bits	Framing	Routing	Segmentation		Encryption	Maintaining Harmony Among Protocols
Transmission Rate or Data Rate	<u>Hop-to-Hop</u> Flow Control, Error Control, Access Control	Congestion Control	<u>End-to-end</u> Flow Control, Error Control, Connection Control		Compression	
Synchronisation Of bits						
Topology						
Transmission Mode						
Link Configuration						

Physical Layer

Link Configuration

Point to Point
Multipoint

Physical Characteristics of Medium

Whether the medium is

Copper : Electrical

Fibre Optics : Light

Electromagnetic

Transmission Rate Or Data Rate

The number of bits sent each second is defined by Physical Layer

Representation of bits

The data consists of stream of bits (0s and 1s) in physical layer

To transit they must be encoded to electrical signals.
light
electromagnetic

Synchronization of bits

The sender and Receiver not only must use the same data rate but clocks of sender and receiver must also be synchronized.

Data Link Layer, Transport Layer

Segmentation And Framing

Transport layer divides message into 64 kB segments to transfer through WAN. This is called Segmentation.

fixed size, this is known as optimum size of segment

If the outgoing link capacity is less than the size of segment then datalink layer will divide the segment into smaller units known as frames. This is called framing.

Frames

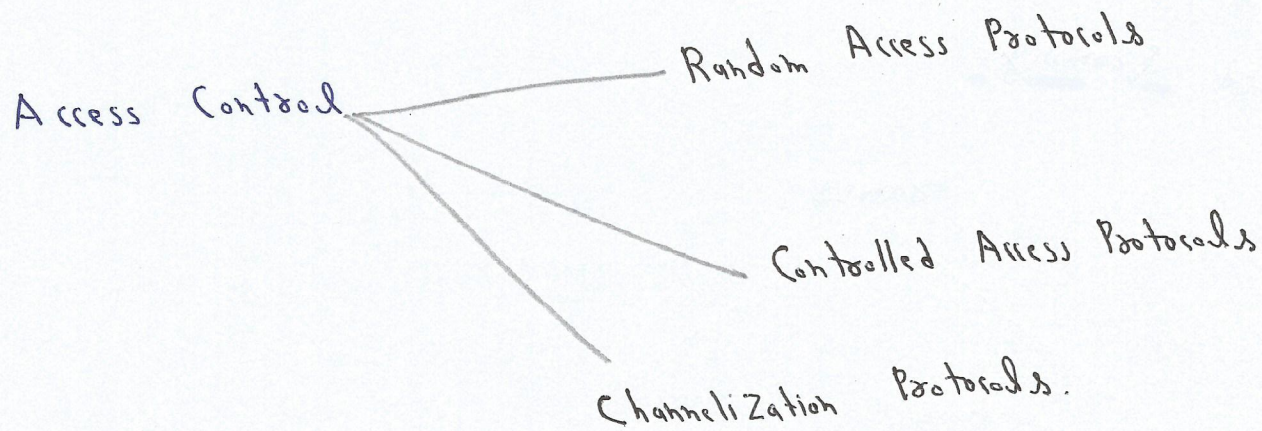
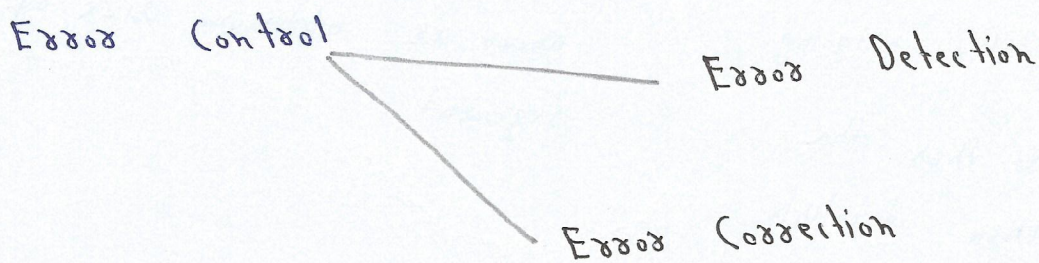
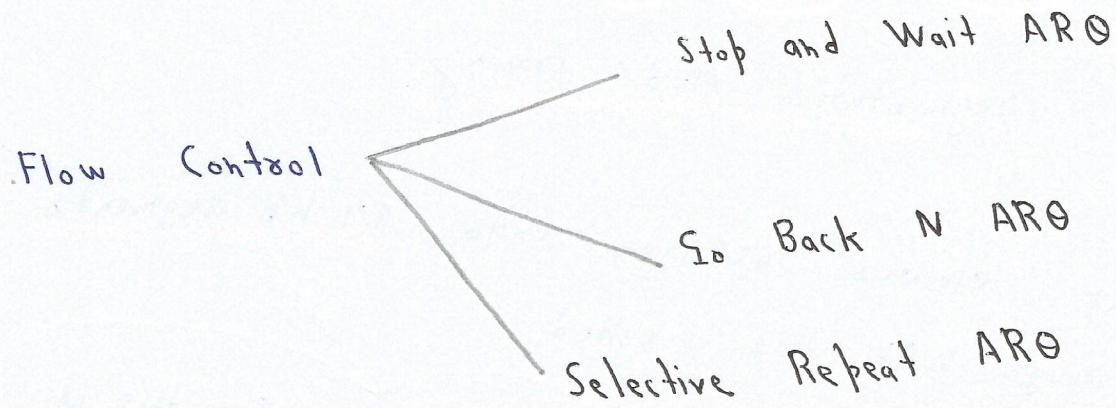
Variable Size Frame

We have to define the starting, end of frame

e.g Bit stuffing, Byte stuffing

Fixed Size Frame

No need to define boundaries of frames.



Flow Control, Error Control is done by Data Link Layer but if some error or some flow problem gets occurred in message in Network layer then it will not be detected by Data Link Layer.

Hence Flow Control, Error Control is also there in Transport layer.

Session Layer

Synchronization Point

or

Check Point

The session layer allows to add check point to message.

If system is sending a file of 2000 pages, it is advisable to insert checkpoint after every 100 pages, to assure that 100 pages unit is received accurately. If crash happens

during transmission of page 523 the only pages need to resent after recovery are 501 to 523.

Presentation Layer

Encoding:- Different system in world uses different methodology to represent alphabets, numerical values, special characters. It is called encoding. Therefore to have uniform communication we need web services, where communication is taking place independent of language, coding system ---

Compression:- To reduce h/w traffic.

Algo 1

More compression (50%.)
But during decompression (95%.) data I'm able to get

Algo 2

Less compression (20%.)
But during decompression (99.99%.) data I'm able to get

So Algo 1 is used for Multimedia compression
Algo 2 is used for Data compression

Encryption:- To provide security in internet system we use encryption methods.

Application Layer

Maintaining Harmony Among Protocols:-

Application Layer is a protocol rich layer. So harmony must be maintained among protocol. i.e. when we are switching from one thing to other the protocol also gets switched accordingly.

User Interface Design

The user interacts with Application Layer, so the kind of interface which user reqd is given by Application Layer.