CN

Computer Networks [Connect : wired / wireless]

"Nodes" "Communication"

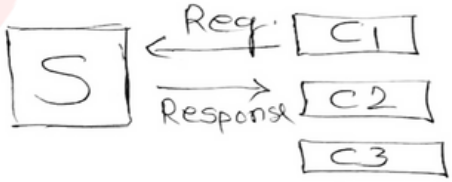
"Digital devices" "Data exchange / transfer / sharing"

"Resource sharing"

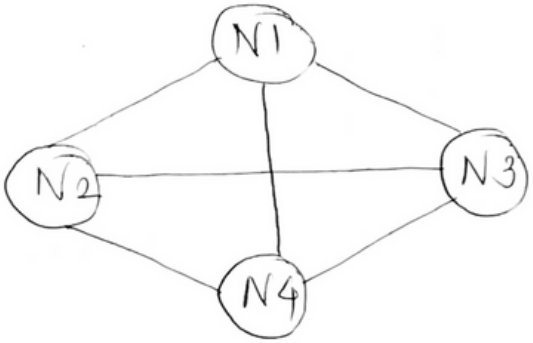
H/W S/W

- Basic Terminologies

* Nodes : Computer, printer, Server, Router, etc.
* Protocol : Set of Rules. (TCP, IP, UDP, FTP, etc)
* IP address : A unique identifier / Number sequence Assigned to every device on n/w.
* DNS : Domain Name system is a protocol To translate Domain Names into IP addresses.
* Client - Server :



* Peer - to - peer :

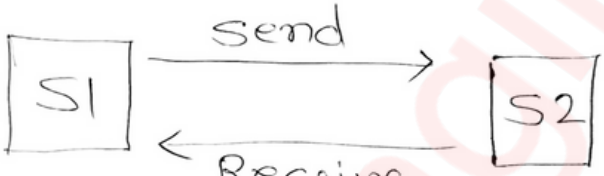


(NO central Server unit)

- Transmission Modes

→ Simplex (one way)

→ Half duplex (Both direction)
But one at a time



(Not at same time)

→ full duplex (Both direction)
At same time

- Connection Types

→ Point-to-Point
(Direct dedicated link betn devices is provided)

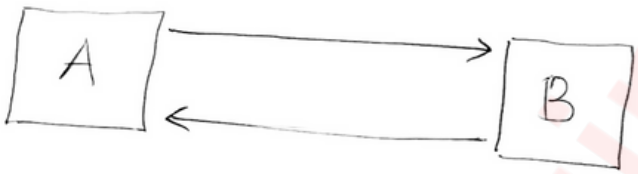
→ Multipoint
[Shared link betn 2 or more devices]
"shared channel"

Topology

↳ Defines the structure.

"how the nodes are connected to each other in a network".

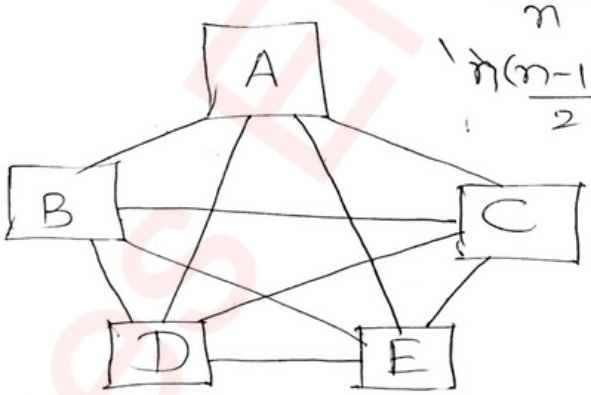
① Point-to-Point Topology



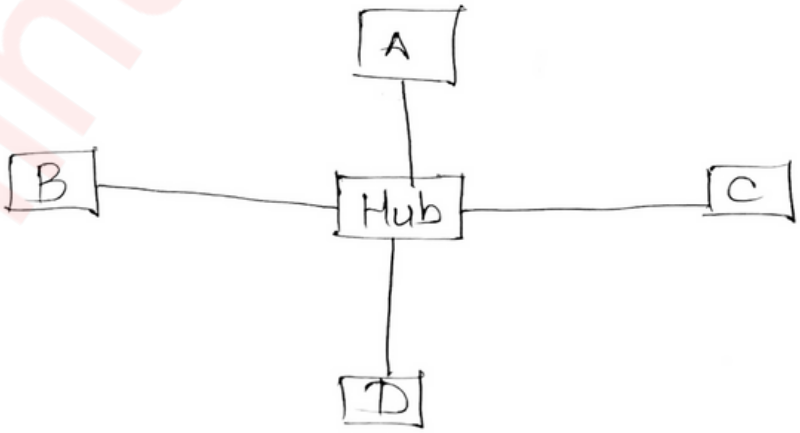
② Mesh Topology

'n' devices

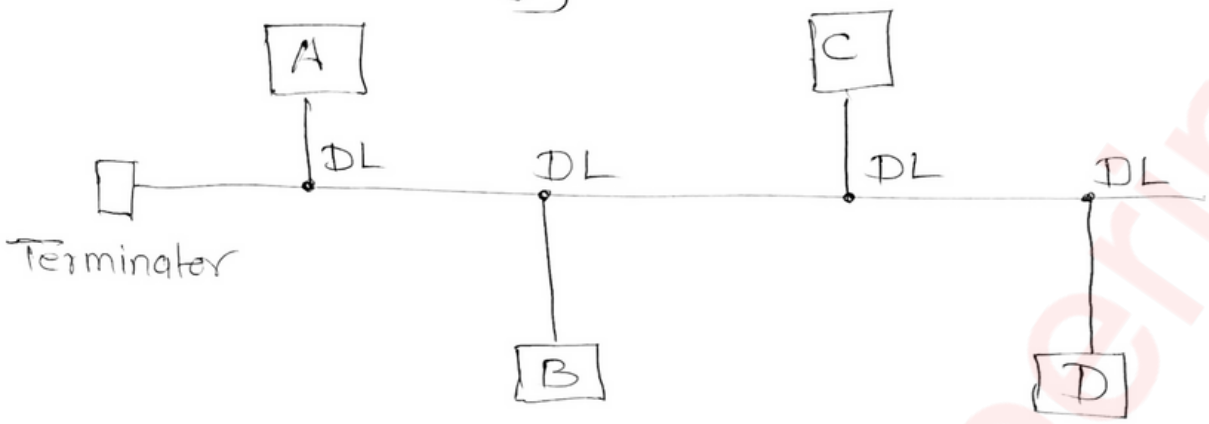
'$\frac{n(n-1)}{2}$' Links



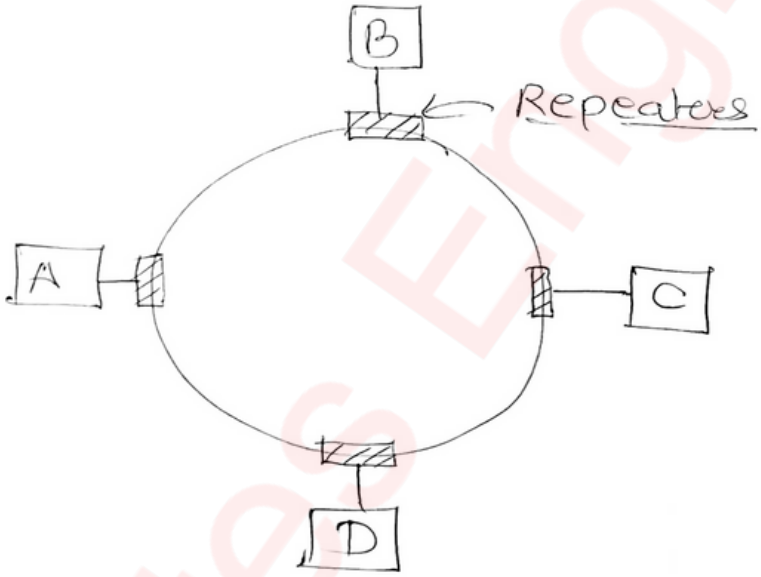
③ Star Topology



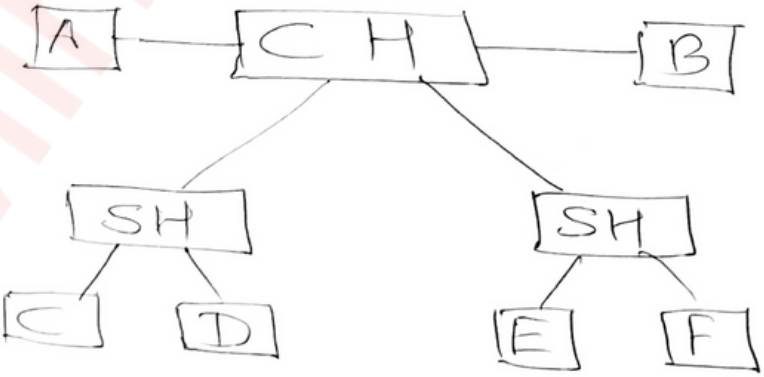
④ Bus Topology



⑤ Ring Topology



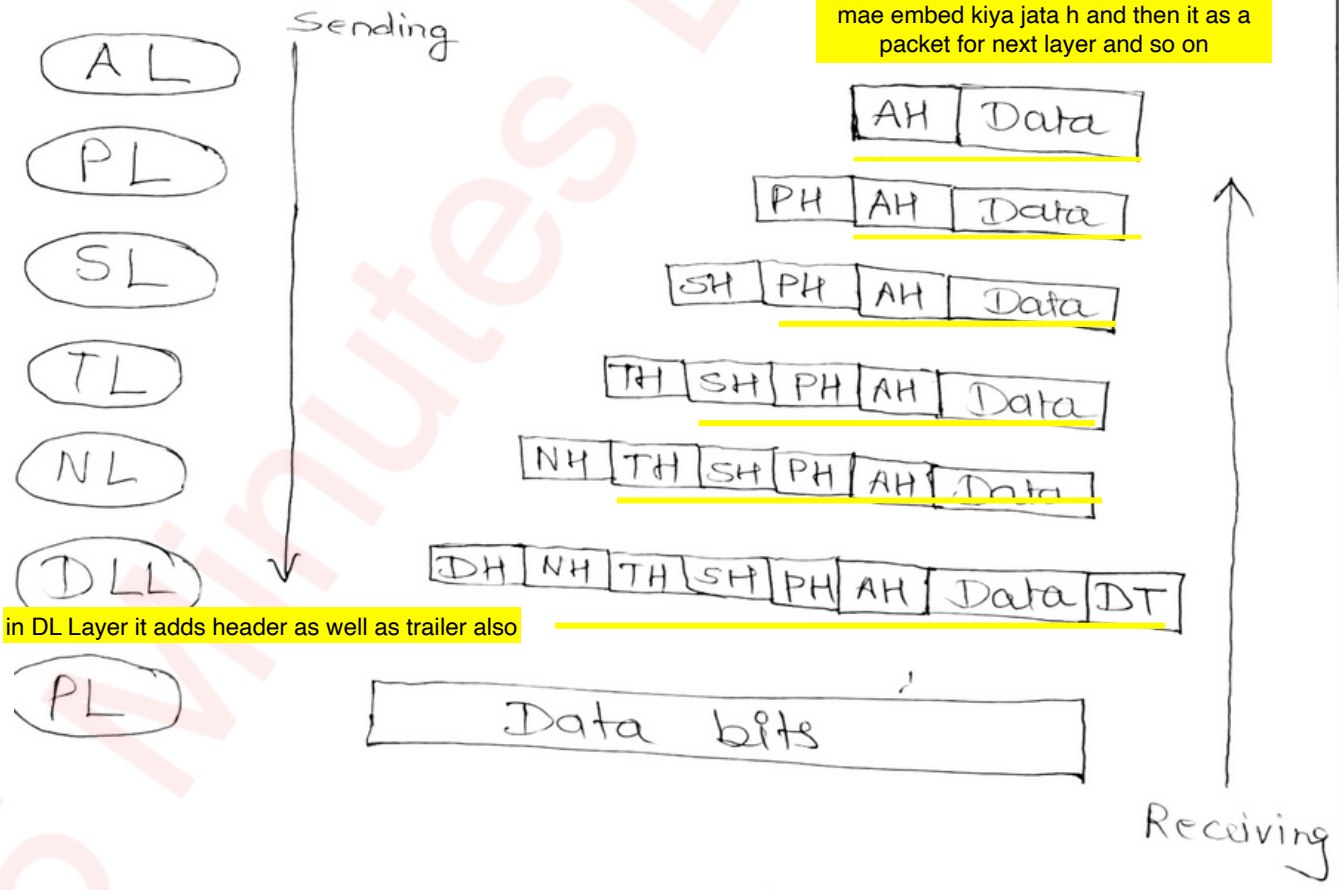
⑥ Tree Topology



Types of CN

PAN	LAN	CAN	MAN	WAN
Personal	Local	Campus	Metro-politan	Wide
100 m	2 km	5 km	5 - 50 km	>50 km
Home/ Room	office	College/ University	City	Countries/ States
EH Speed	VH Speed	High Speed	Avg Speed	Low speed
Private	Private	Private	Private/ Public	Private/ Public

OSI Model



(1) Physical Layer

- Data is sequence of 0s & 1s
- Encoding : Bits $\longleftrightarrow$ signals
- Data Transfer Rate.
- Connection type. (Line configuration
- Topology
- Transmission Mode

(2) DLL (Data Link Layer)

- framing (divide data into frames)
- Physical Addressing (MAC Address)
- Access Control
- flow Control
- Error Control.

③ Network Layer (Source → destination Data packet)

- Logical Addressing (IP address)
- Routing
- Packetizing

④ Transport Layer

- Port Addressing (Process to Process Delivery)
- Segmentation (segments)
- Congestion Control.
- flow Control
- Error Control

⑤ Session Layer

- Session mgmt
- Dialog Control
- Synchronization (checkpoints)

(6) Presentation Layer

- Translation
- Encryption & Decryption
  - PT → CT (sending)
  - CT → PT (Receiving)
- Compression

(7) Application Layer

- Protocols
  - HTTP
  - FTP
  - POP
  - SMTP

Transmission Media

→ Physical Path betn (T) & (R) (channel)

→ Types

→ Guided Media (wired) (Cables)

10 Mbps (BW)
Baseband
T = 100 M wire length.

(10 Base T)
(100 Base T) → Twisted pair cable

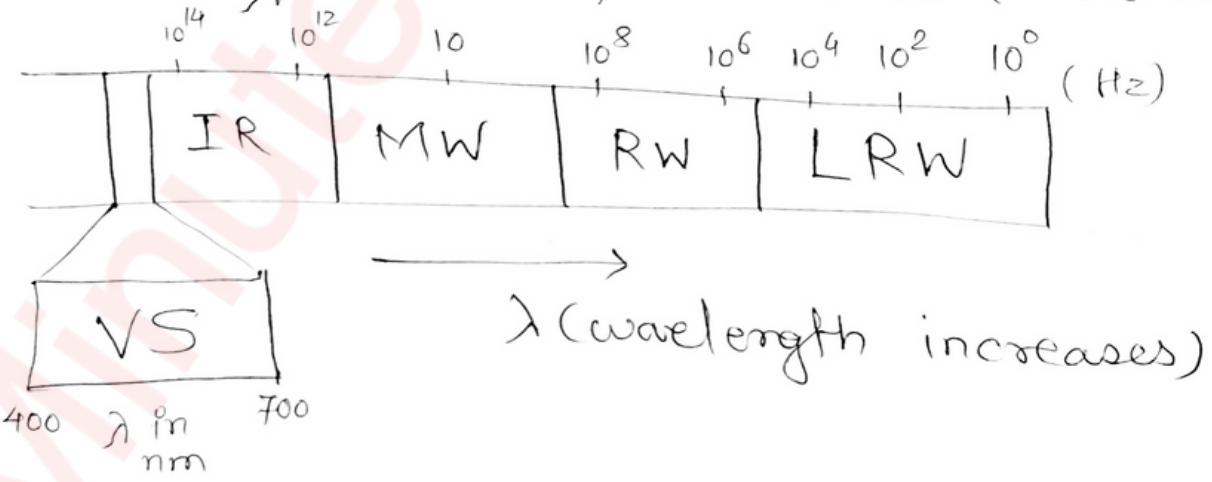
(10 Base 2)
(10 Base 5) → Coaxial cable

→ Optical fiber cable
(100 Base FX) 2 km Full duplex

→ Unguided Media (wireless)

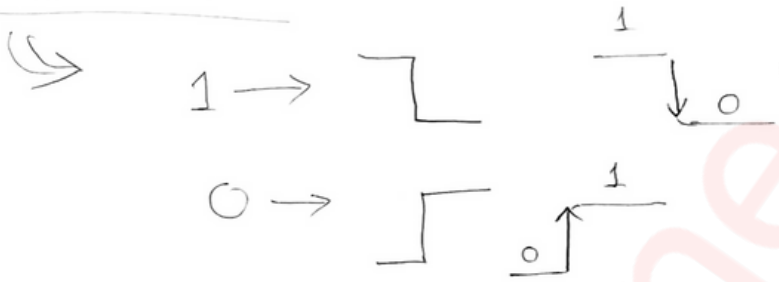
→ Radio waves (3 kHz – 1 GHz)
→ Microwaves (1 GHz – 300 GHz)
→ Infrared waves (300 GHz – 400 THz)

$f \propto \frac{1}{\lambda}$

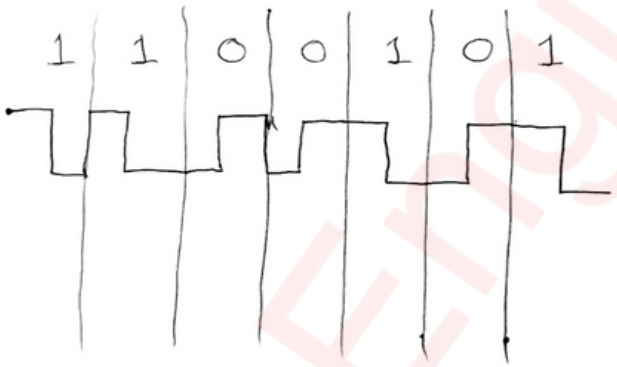


- Encoding (Manchester Encoding) & (Differential Manchester Encoding)

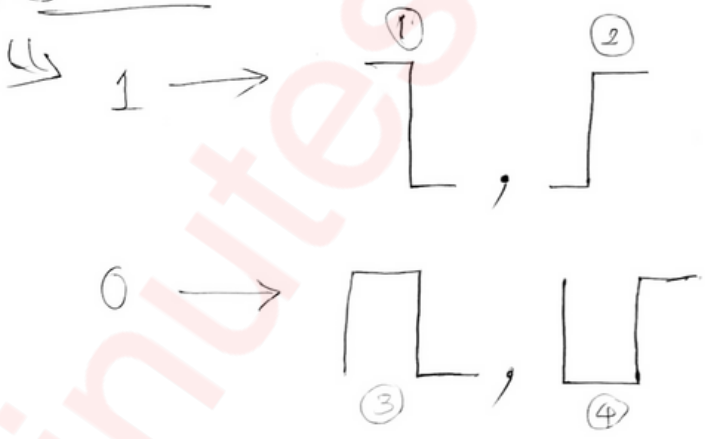
a) Manchester E'

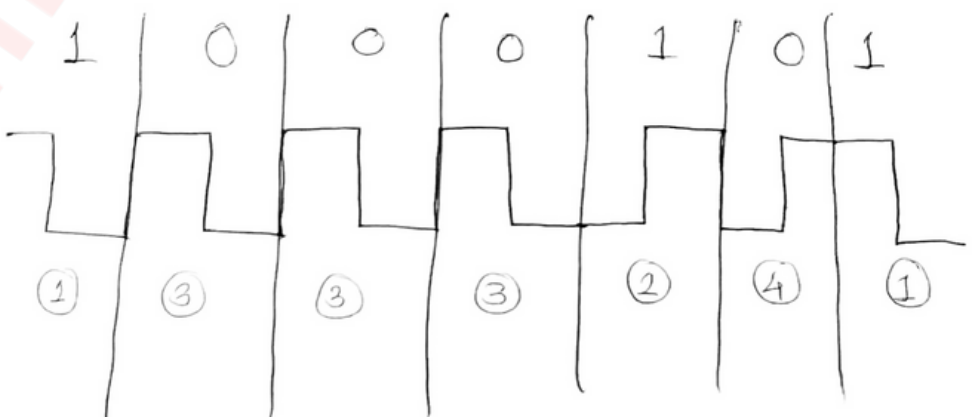


eg:



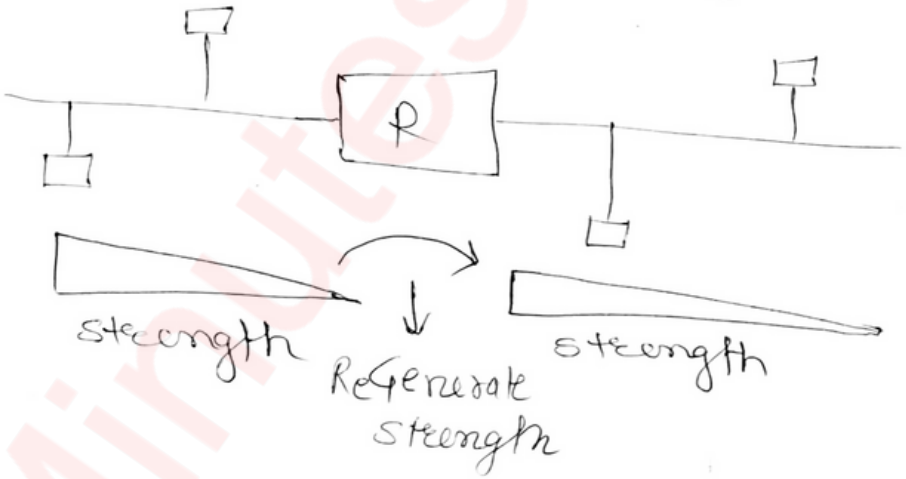
b) DME





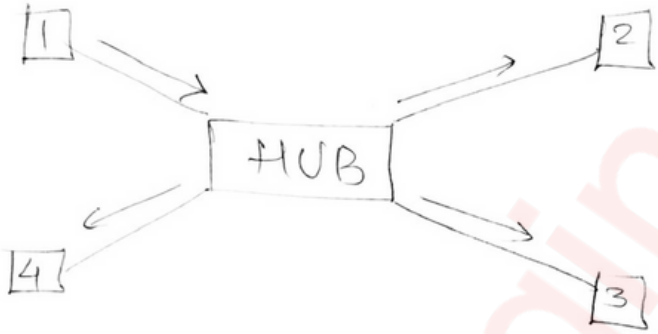
- Devices in CN
  - Cables
  - Repeaters
  - Hubs
  - Bridges
  - Switches
  - Routers

* Repeaters :
  - Pure H/W
  - NO filtering
  - forwording
  - 2 port Devic



⇒ Collision Domain ⇒ 'n' (no. of devices).

* Hub
  - Pure H/W
  - Multiport Repeater
  - Forwarding
  - NO filtering (Broadcast)

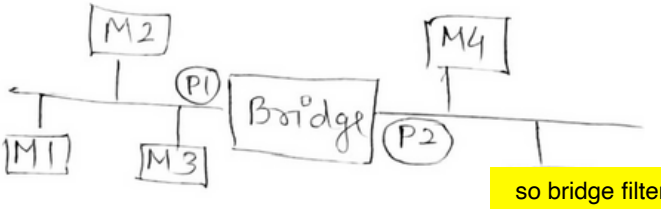


=> Collision Domain = n

* Bridges
  - H/W, S/W [store & forward]
  - Connect 2 LANS
  - forwarding.
  - filtering
  - Physical & DLL (MAC address)

static

MAC	PORT
M1	P1
M2	P1
M3	P1
M4	P2
M5	P2

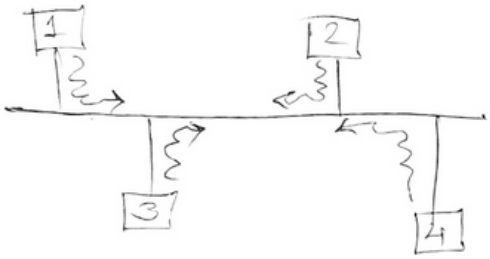


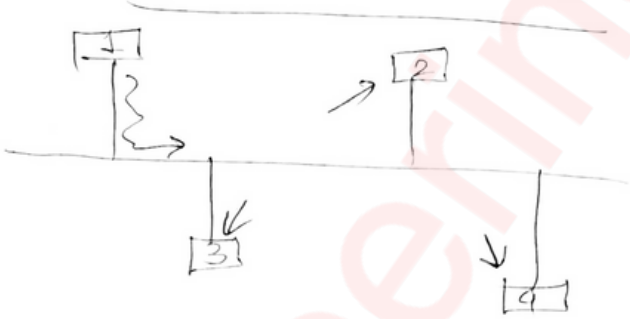
MAC(S)	MAC(D)

Source Destination

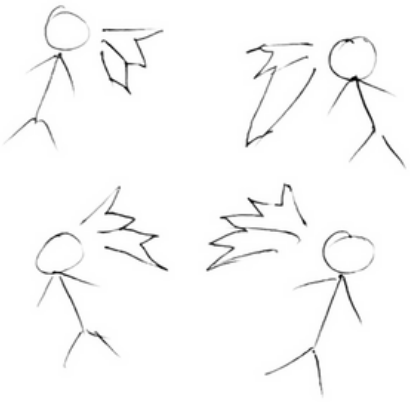
so bridge filter and do not forward msg to another side

° Collision Domain Vs Broadcast Domain

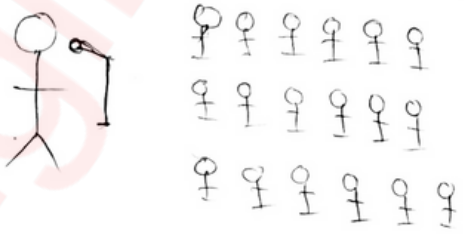




"Collision"

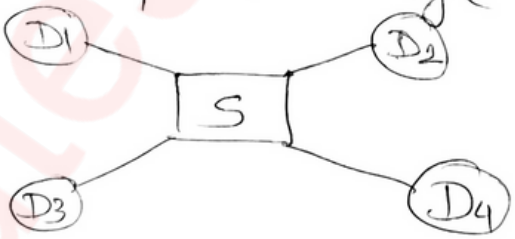


"Broadcast"
(Every m/c, device receive it)



* Switch:

→ Multiport Bridge



→ Collision Domain is '0'

→ full duplex Links

→ Low Traffic.

* Routers
  - PL, DLL, NL
  - IP address
  - Connect 2 N/Ws.
  - forwarding
  - filtering
  - Routing (Routing Table)
  - flooding

- Switching: Transfer of data packets from one device to other in n/w.

Types
- Message switching
- Circuit switching
- Packet switching.

* Message switching
  - Message / Data block is forwarded across entire n/w.
  - Hop by Hop delivery
  - High delay
  - High Traffic

- **Circuit Switching** (Physical Layer)

① { Connection setup (Dedicated path)

② { → Transmission time + Propagation Delay

③ { Tear Down.

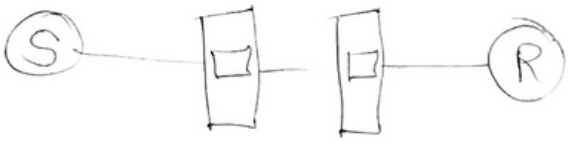
⇒ Inorder Transmission
⇒ Resources get reserved. (cannot be used by other)
⇒ No store & forward
Low Delay

- **Packet switching** (DLL & NL)
  - → Data is divided into packets
  - → store & forward
  - → High Efficiency
  - → Time = Transmission Time (T_t) + Propagation Time (PD)
  - → NO Reservation
  - → High Delay

$T_t = \frac{\text{Length}}{BW}$

$T_p = \frac{d}{v}$ (v: velocity)

Virtual Circuit



1) BW, CPU, Buffer

Reservation.

2) Path is same (for all packet)

3) Inorder

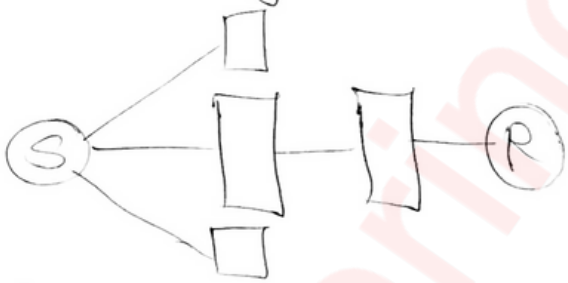
4) Connection oriented

5) setup & teardown phase.

6) Costly

7) Reliable ↑↑

Datagram



1) NO Reservation

2) May or May Not

3) out of order

4) Connection less

5) NO such phase

6) less Costly

7) Less Reliable. ↓