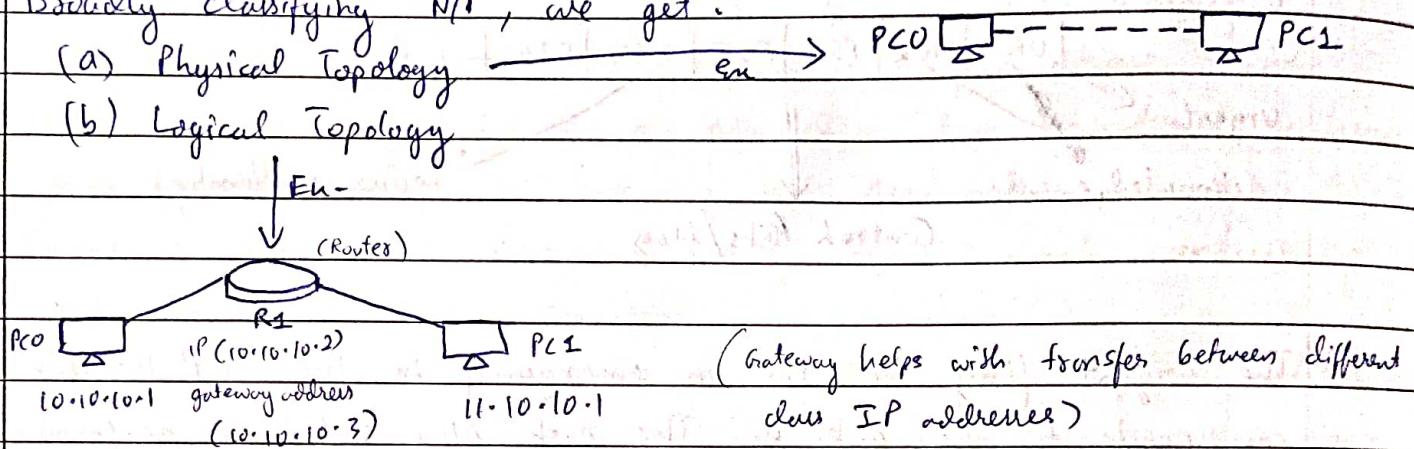


- \*→ Understanding N/w Topologies
  - To understand different N/w types.

⇒ The layout of a network includes different end devices & networking devices, like- router, switch, hub & bridges. The proper placement of these devices in the network network config. for smooth operations called as Network Topology

⇒ Broadly classifying N/T, we get :



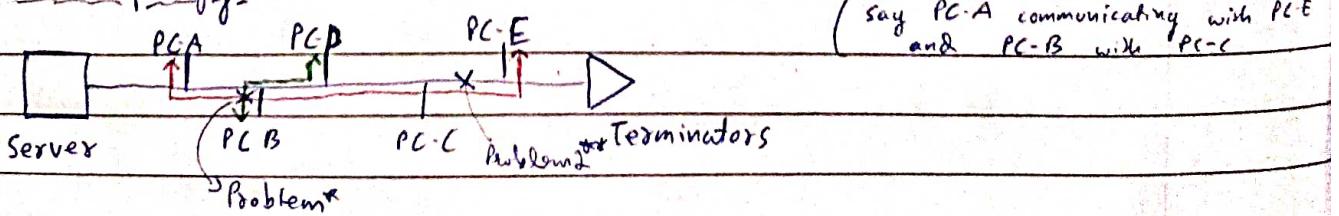
- (a) A Phy. Network Topology contains a high level over-view showing the actual arrangement and placement of the network devices within the network config.

(b) The logical Network Topology is a low level diagram dealing with the technical details of the network, like - IP addressing & gateway addressing. The logical network is responsible for demonstrating the data-flow within the devices.

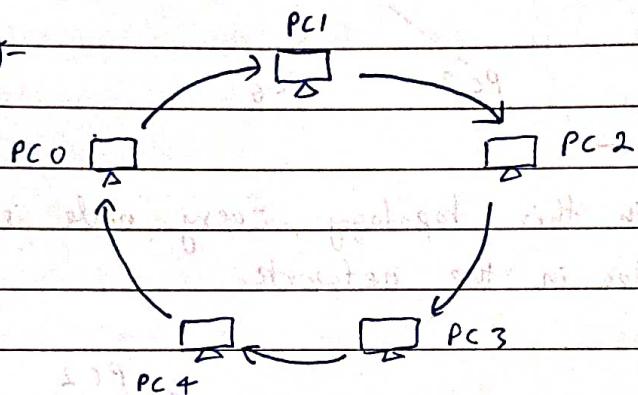
$\Rightarrow$  Types of N/W Topology

Network Topology gives a physical layout & logical configuration of the Network Devices.

### (a) Bus / line Topology

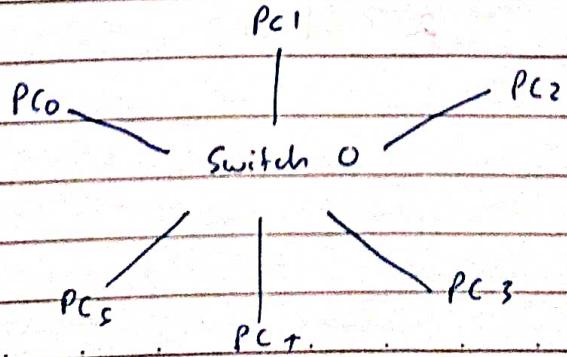


- ↳ The bus topology is very old and no longer used in modern network. There is a single line of communication for all the connected devices. & a terminator to stop the message flow further.
- ↳ Due to single comm. pathway, when more than one device attempt to access the network\* and send message, it causes Network Failure. Also any fault in the comm. line will cause the complete network to go down due to absence of alternative pathways. \*\* Hence, this topology isn't fault tolerant.

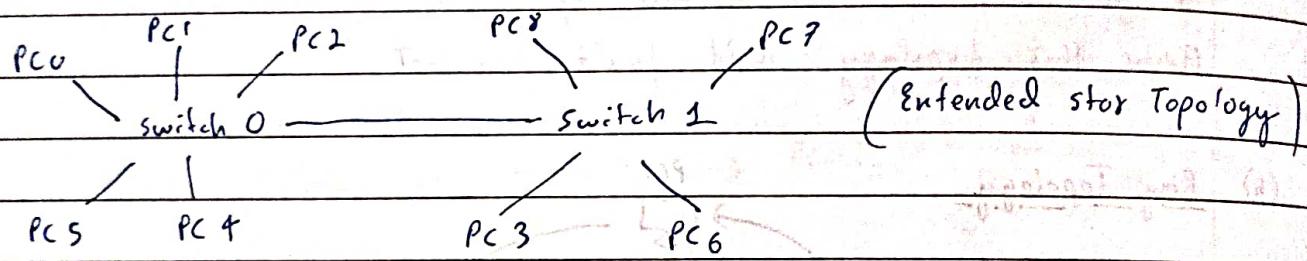
(b) Ring Topology-

- ↳ It is a bus topology in a closed-loop format allowing either clockwise or anti-clockwise communication. Sending and receiving data in every direction occurs with the help of a Token to prevent alternative data-flow.

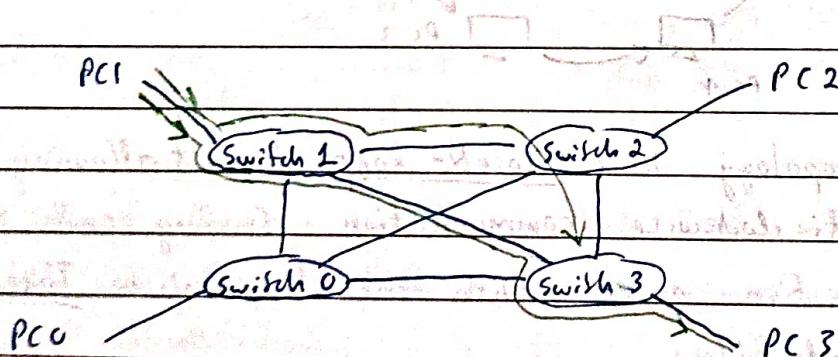
- ↳ This network has a drawback bcoz comm. is uni-directional & if fault happens in any one of the PCs, the whole network goes down. Hence, this system is 'not fault tolerant' and 'not Scalable'.

(c) Star Topology-

- ↳ It is the most common network topology where hosts are connected to a single networking device like switch. Switches control the operation of the total network, & even if one host fails, the system remains fault tolerant.
- ↳ Its advantage is 'Centralized Management of the Resources' as all the traffic has to pass through the central networking device.

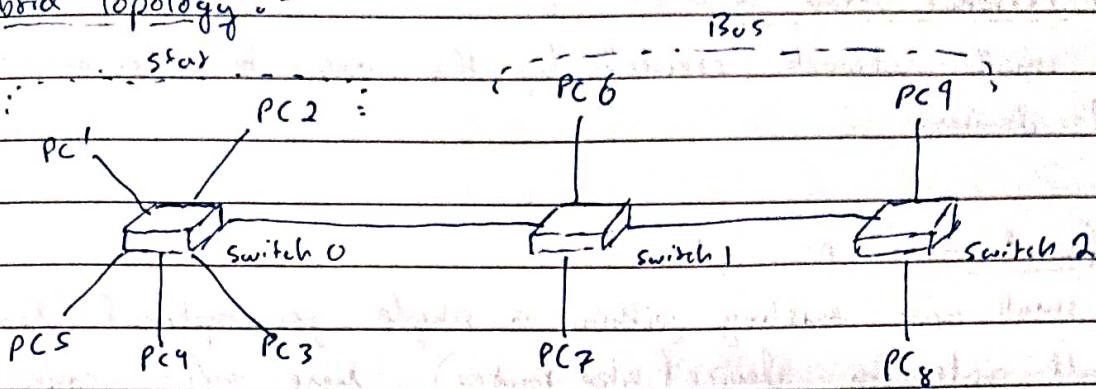


- (d) Mesh Topology - in this topology, every node is directly connected to all other nodes in the network.



- ↳ There exists many alternative pathways for communication. Making the network reliable & fault tolerant.
- ↳ This network is also scalable, & with 'n' no. of nodes in the network, the total no. of interconnections is given by:

$$\frac{N(N-1)}{2}$$

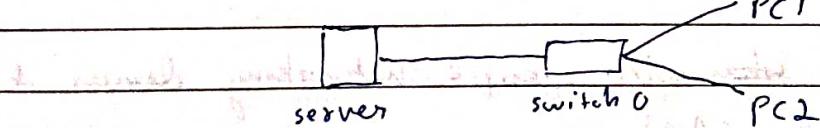
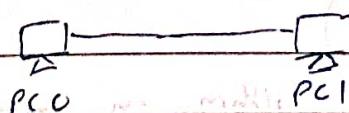
(e) Hybrid Topology :-

- ↳ This topology is a combination of 1 or more existing topologies creating a unified network.
- ↳ It has advantage over other topologies because of better scalability & fault tolerance capacity.
- ⇒ Hub & Spoke Technology  
This is designed to provide a centralised controlling unit, in a network called as 'Hub' and the peripheral unit called as 'spoke'. A star topology can be taken as an example.

(a) Types of Network

In a specific topology, there can be different networks :-

- (a) Client - Server Network
  - ↳ it contains dedicated devices like server controlling the resource sharing operation among the connected PCs.

(b) Peer to Peer N/w

- ↳ Here, there is no centralized management of the resources & the computer systems are logically interconnected.

(c) PAN (Personal Area N/w):

it is a small network created by the user to interconnect their personal devices.

(d) LAN (Local Area N/w):

it is a small n/w existing within a single geographical location. w/o a default gateway device (like router), these n/w's cannot communicate among each other.

(e) MAN (Metropolitian Area N/w):

(f) WAN (Wide Area N/w) :- (Eg. Internet, cell n/w)

↳ is responsible for interconnecting different LAN across a geographical distance. WAN connection is established because of presence of ISP (Internet Service Provider).

(g) Wireless LAN

WLAN is possible on small networks using wireless routers, which acts as an access point that is a layer 2 device providing a wireless network to establish connection. The wireless router uses a unique Internet protocol.

(h) Campus Area N/w

This type of network when with specific networking devices & limited functionality is called CAN.

(i) Storage Area N/w (SAN)

It is a dedicated network within an organisation's data center for physically implementing multiple storage as file servers. SAN utilises the concept of RAID (Redundant Array of Independent Disks) to avoid data redundancy.

(j) Software defined WAN (SDW):

in SDW, a controller is present like a brain of the network and the inherent software will allow the network to find out the most economical path of communication and hence improve the network.

=> Multiprotocol Label Switching (MPLS)

it is a service provider technology that allows organisation to interconnect their branch office over large geographical distance. They are the concept of DSL (digital subscriber line) or Metro E (Metro Ethernet) for network implementation.

- \* → Types of Connections
- Ethernet Standards
- Virtualization of N/w

28/9/24

### Types of Connections

→ wired

→ wireless

Wired:

- ↳ Primarily the wired connectors in any networking configuration are of two types → Copper Wire Connection (I)
  - ↳ Fiber-Optic Cable Connection (II)

(I) 2 classifications of Copper cables used within a network are :-

- (a) Unshielded Twisted Pair (UTP)
- (b) Shielded Twisted Pair (STP)

(a) UTP → cables are very commonly used & are unshielded because the physical cable doesn't contain a protective coating to prevent the conductors from absorbing EMI (electromagnetic interference) from outside.

→ Inside UTP cable, there are 8 individual wires with unique colors twisted in pair. This twisting reduces the message corruption to a certain extent.

(b) STP → cable has a foil coating around the twisted pair which helps in preventing EMI from entering.

→ The shielding is made up of a protective material prepared using PVC (PolyVinyl Chloride).

↳ According to TIA (Telecommunication Industry Association), there is a cabling standard used by Networking professionals to define the category of cable.

↳ Cables are characterised as category (CAT) followed by a number

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depicting the speed, bandwidth & maximum length for data transmission

Ex: CAT 3 → it supports data speed: 10Mbps with max distance: 100m.

CAT 5 → 100Mbps over 100m

CAT 5e → 1Gbps over 100m

CAT 6 → Speed = 1 Gbps, max dist = 100m

CAT 7 → Speed = 10 Gbps, max dist = 100m

CAT 8 → Speed = 40 Gbps, max dist = 30m

↳ The end of the twisted cable are terminated by different types of RJ (Registered Jack) connectors (CAT 3 uses RJ 11). Cabling Terminations standards as specified by TIA are given by TIA 568A or TIA 568B standard.

↳ Along with UTP & STP, there exists, another type of copper cable with the foil coating around copper core, called as Co-axial cable.

(b)

### (c) Co-axial Cable

→ It uses RJ59 termination standard.

→ There are 5 layers defined from outer to inner as Protective coating → Braided Shielding → Foil Shielding → Dielectric Insulator → Copper conductor. protective Braided Foil Dielectric Copper  
coating → shielding → shielding → Insulator → conductor  
(outer) (T.S.P.) (innermost)

→ Types of connectors used in coaxial cable are :-

(a) F-pin connector

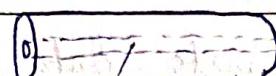
(b) T-Type II

(c) BNC (Bayonet Neill Concelman Connector)

## II Fiber Optic Cable

↳ FO cable has replaced the copper wire in modern network because these cable transmit data using light pulses transmitting inside a

thin core of glass, surrounded by a protective material called cladding.



glass and cladding.

The information transmission happens mainly by the principle of (TIR) (Total Internal Reflection) which prevent data loss.

- ↳ Advantages of FO over Copper wire - although these cables are made up of glass and expensive, still they provide "More Throughput Compared to Cu Cable".
- FO cables are immune to EMI.
- it can transmit data over longer distance compared to Cu cables.
- ↳ There are 2 categories of FO cables:
  - (a) Single mode fiber (SMF) → constructed to transmit a single mode of light to fiber whereas
  - (b) Multi-mode fiber (MMF) → has larger diameter allowing multiple modes of light to propagate through fiber.
- ↳ Types of connectors for FO cable:
  - (a) Lucent Connector
  - (b) Straight Tip Connector
  - (c) Subscriber Connectors
  - (d) Mechanical Transfer Registered Jack (MTRJ)