CCNA

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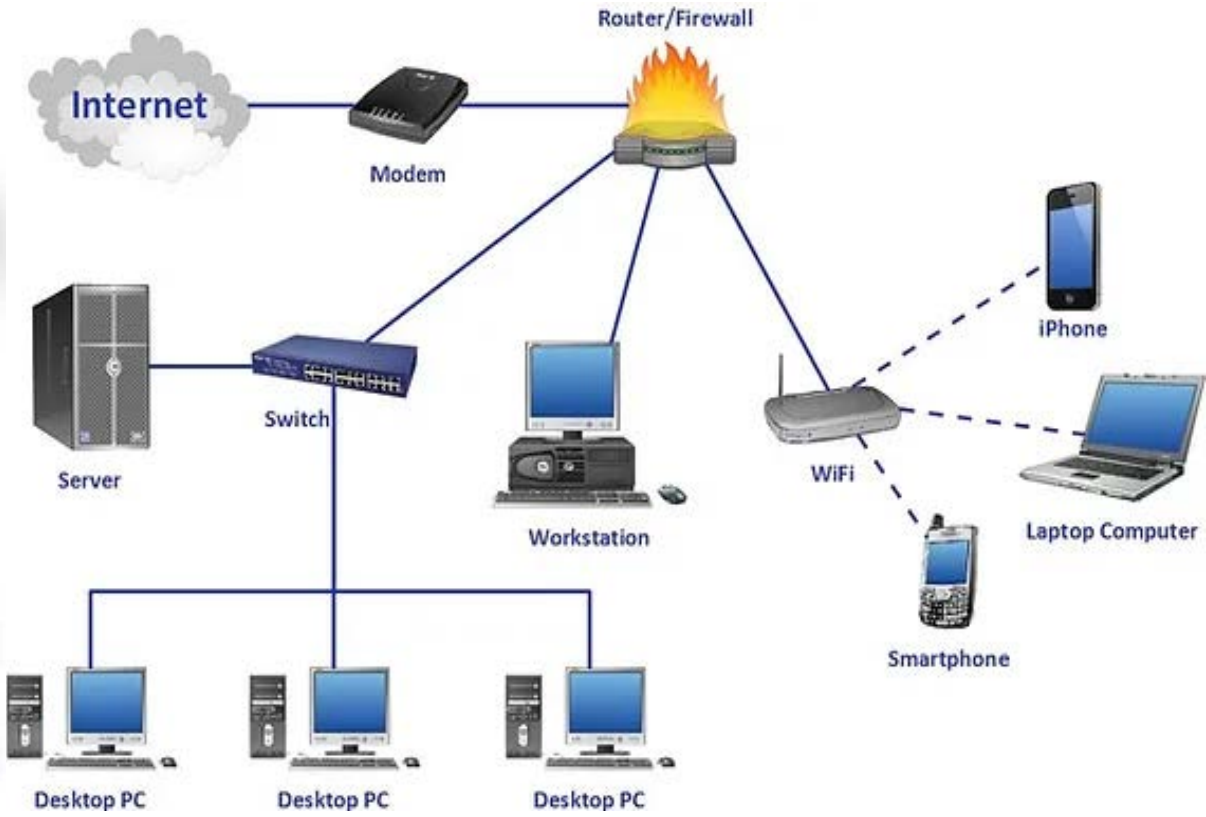
CCNA– Lecture 1

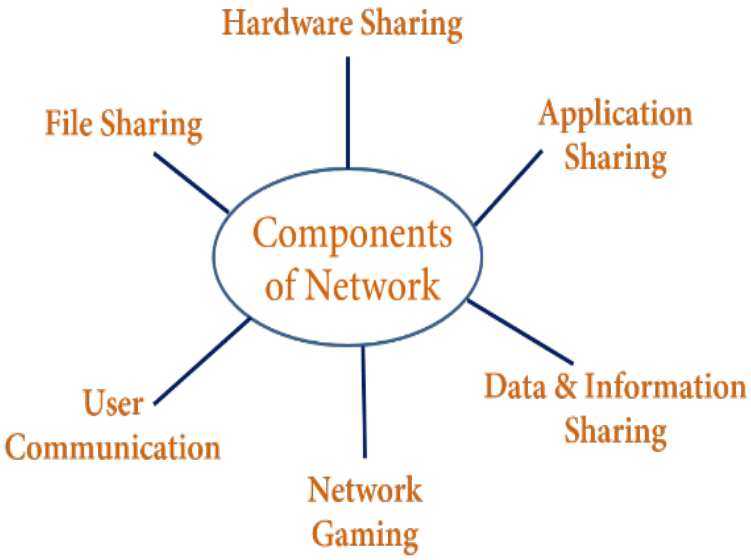
WHAT IS COMPUTER NETWORK?

- Computer network is group of devices connected with others through any type of medium (Wired or Wireless)
- The purpose of network connection is to share common resource or to exchange information.

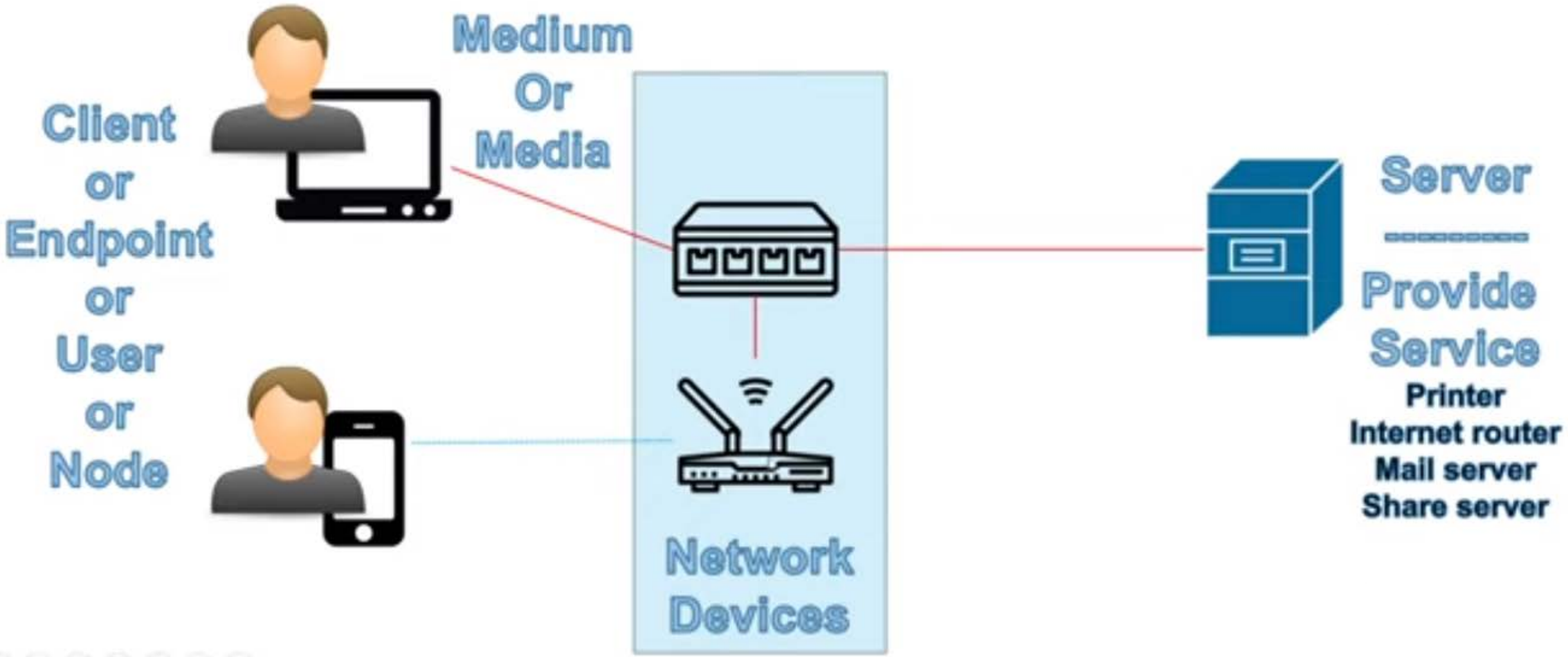


PURPOSE OF NETWORK

- Sharing resource reduce costs (USB printer vs Network printers)
- File sharing
- IPTV and online streaming services
- Access company services (ERP, Mail)
- Online games
- E-Learning



NETWORK ELEMENTS

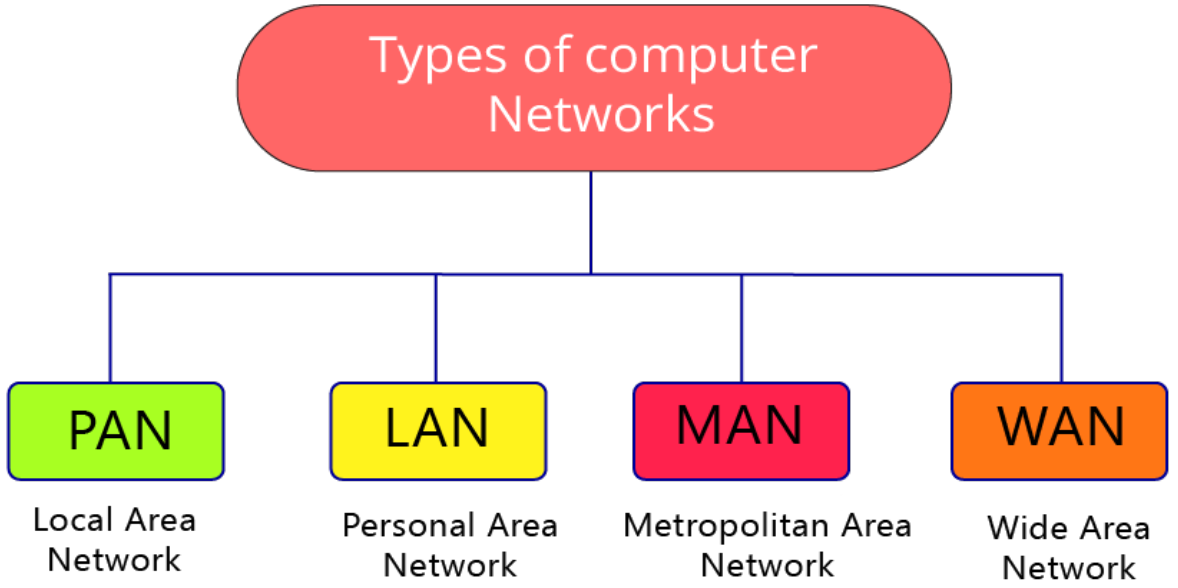


NETWORK ELEMENTS RECAP

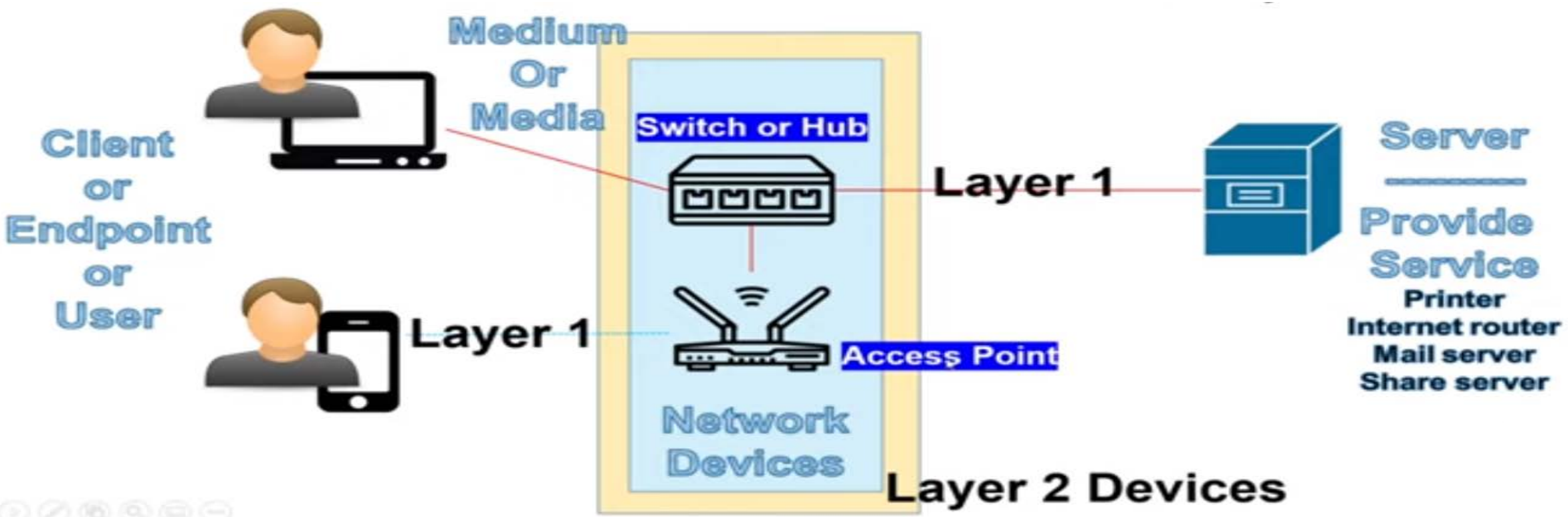
- Clients [AKA Endpoints or users or nodes]
- Servers [Offer service to clients]
- Media or Medium [Cables, or WiFi Signal connect clients and servers to others or to network devices]
- Network devices [Devices provide easy way to connect multiple clients to same server]
- Medias are plugged in NIC (Network interface cards) on clients and servers.

NETWORK TYPES

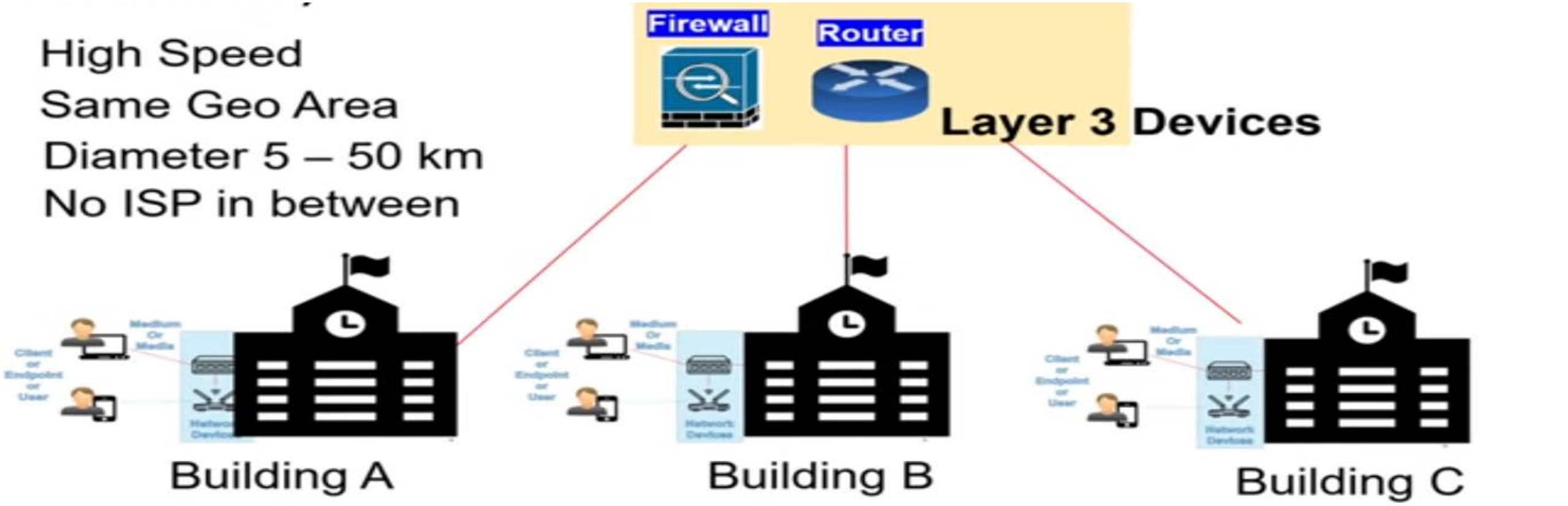
- Local Area Network - LAN
- Campus Area Network – CAN or Metropolitan Area Network - MAN
- Wide Area Network - WAN
- Personal Area Network - PAN



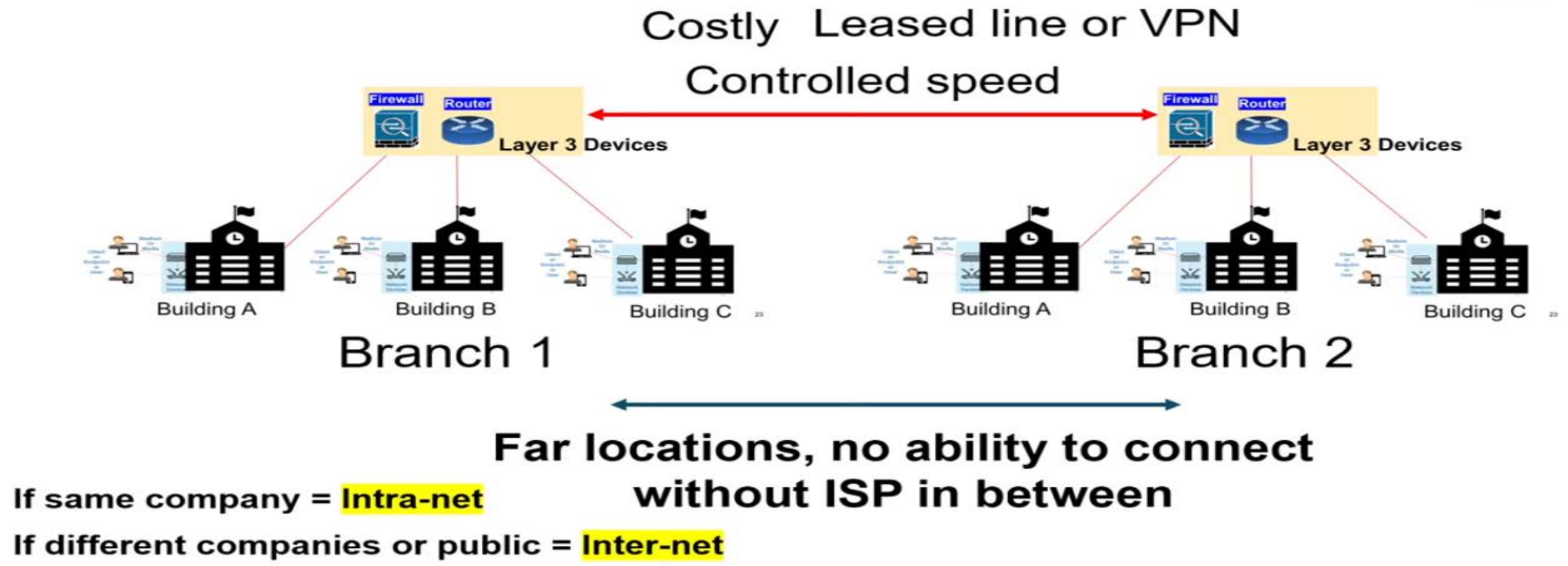
A local area network (LAN) is a collection of devices connected together in one physical location, such as a building, office, or home. A LAN can be small or large, ranging from a home network with one user to an enterprise network with thousands of users and devices in an office or school.



A campus area network (CAN) is a computer network that spans a limited geographic area. CANs interconnect multiple local area networks (LAN) within an educational or corporate campus. Most CANs connect to the public Internet.



Wide-area network (WAN) is a collection of local-area networks (LANs) or other networks that communicate with one another. A WAN is essentially a network of networks, with the Internet the world's largest WAN.



PAN (BLUETOOTH HEADSET, CORDLESS MOUSE OR KEYBOARD)

A personal area network (PAN) is a small network that interconnects technology devices within a limited range of just a few meters. This type of network is designed to enable devices in a small office or home office (SOHO) environment to communicate and share resources, data and applications either wired or wirelessly.

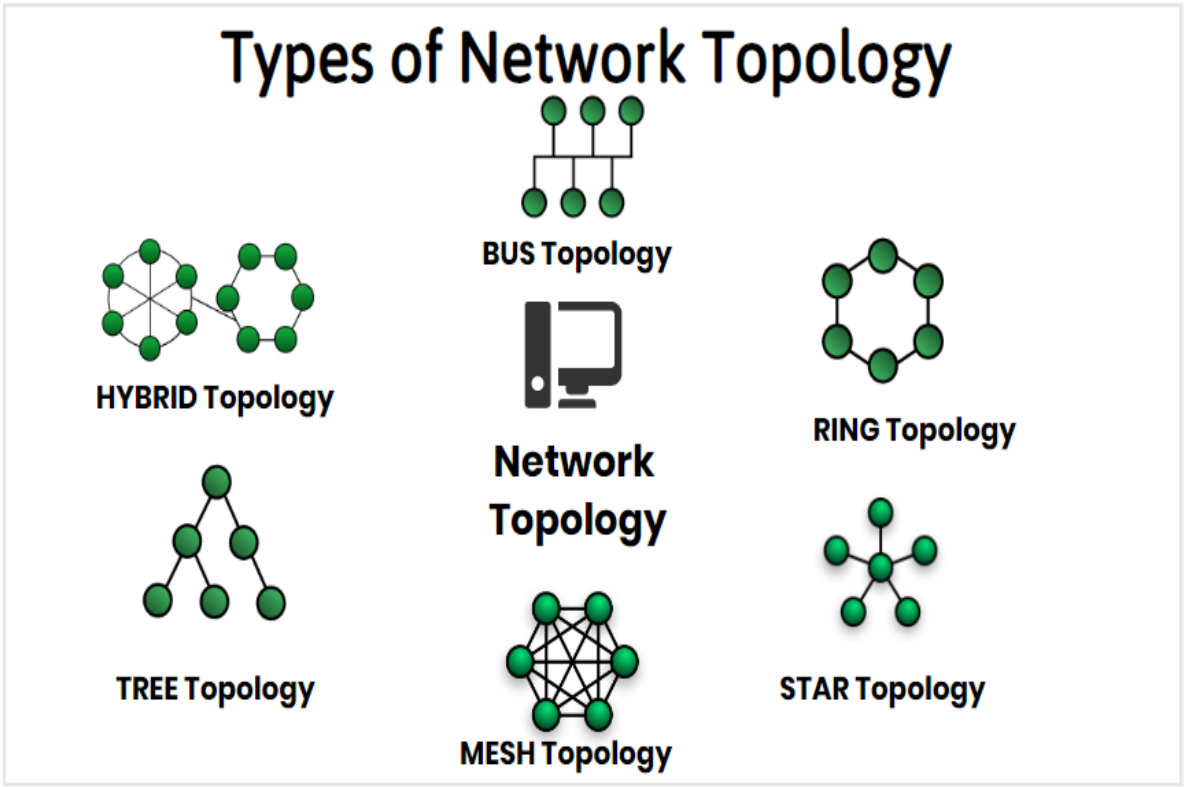
Limited speed

NETWORK TYPES SUMMARY

Network Type	Speed	Range	Example
LAN	Very High	Hundred of meters	Office, Building network
CAN	High	As far as owned media can reach	Large factory, or group of connected buildings
WAN	Limited	As far as SP can connect you to branches	Branch connections
PAN	Limited	10 meters	Smart devices, Bluetooth headset

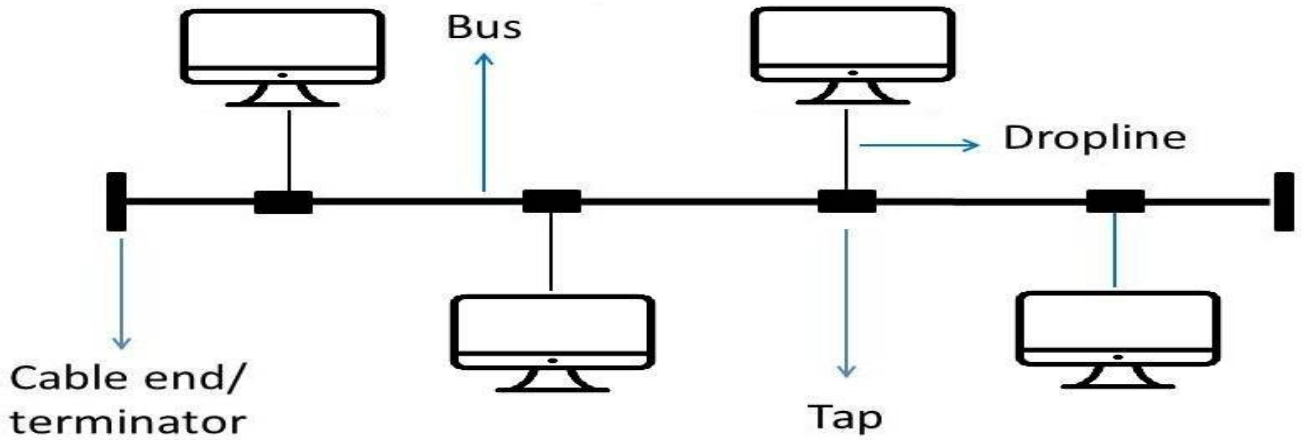
Network topology is the arrangement of the elements (links, nodes, etc.) of a communication network. Network topology can be used to define or describe the arrangement of various types of telecommunication networks

- Bus topology
- Ring Topology
- Double Ring Topology
- Star Topology
- Tree Topology
- Partial Mesh Topology
- Full Mesh Topology



BUS TOPOLOGY

- Single cable connect all clients but terminated.
- Only one client can send traffic in time – very high delay.
- Not complex in troubleshooting, very cheap.
- Unreliable, if any device in path got defected, all down.
- No Security at all, traffic reach all clients in the path.



Disadvantages of Bus Topology

- Bus topology is not good for large networks.
- Identification of problems becomes difficult if the whole network goes down.
- Troubleshooting individual device issues is very hard.
- Need terminators are required at both ends of the main cable.
- Additional devices slow the network down.
- If the main cable is damaged, the whole network fails or splits into two.
- Packet loss is high.

Collision

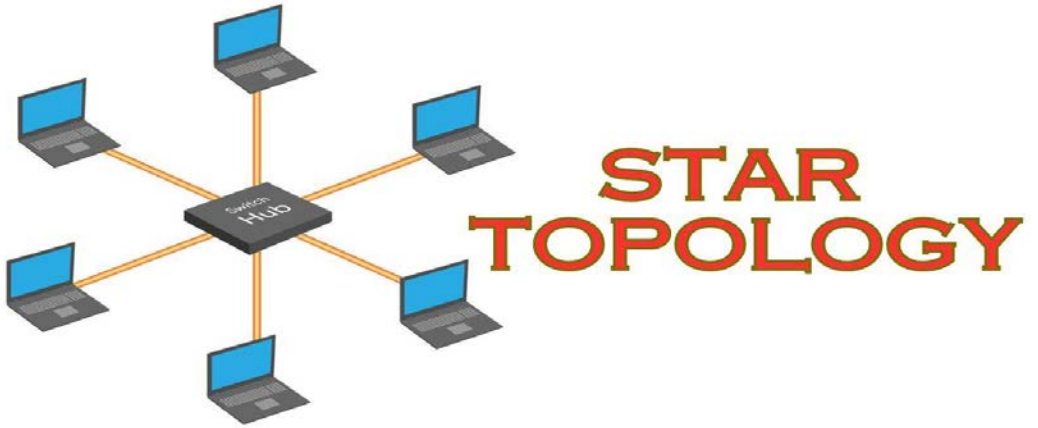
- In physical network media, traffic is formed as electrical signals.
- What will happen if two electric signal sourced from two different sources and met in opposite direction?
- When collision happens, network traffic stopped.
- That's why CSMA-CD (Collision detection) came to the scene.
- Clients NIC sends traffic, if collision detected transmission stopped, then client wait for period called "Random backoff timer" before re-transmit.

Ring topology is a type of network configuration where devices are connected in a circular manner, forming a closed loop. In this setup, each device is connected to exactly two other devices, creating a continuous pathway for data transmission.

- Single cable connect all clients, in circle form.
- Only one client can send traffic in time – very high delay.
- Not complex in troubleshooting, very cheap.
- Unreliable, if any device in path got defected.
- No Security at all, traffic reach all clients in the path.

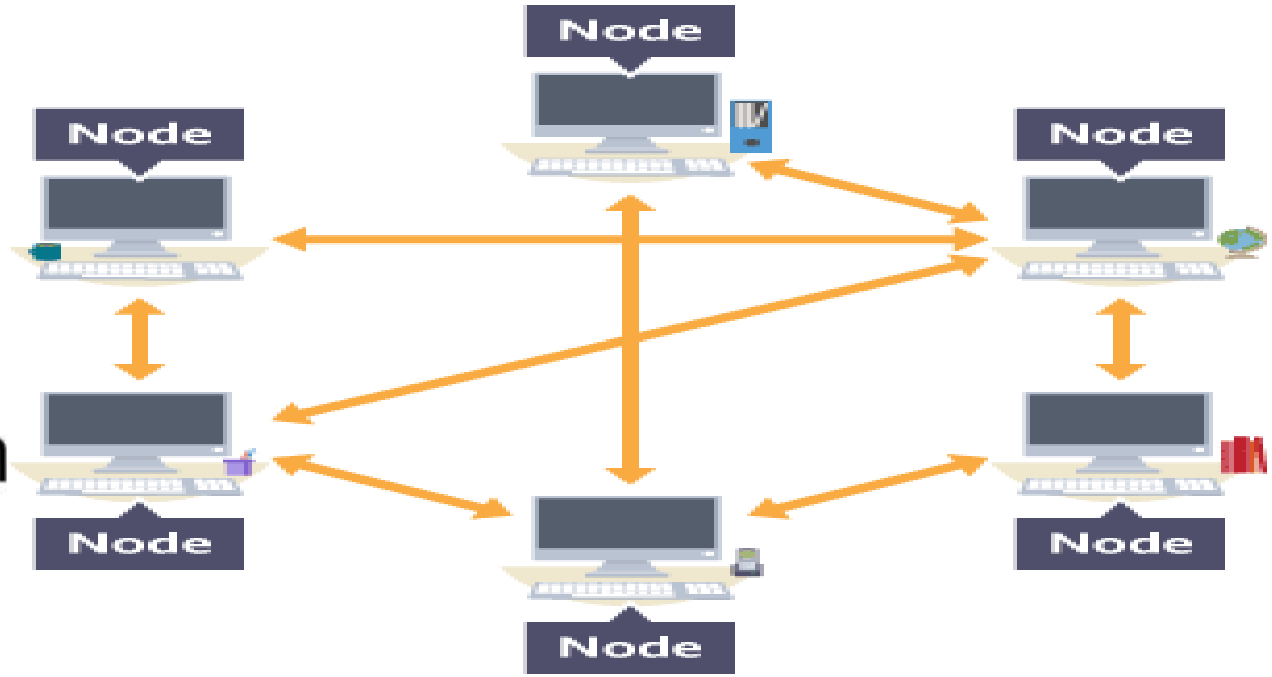
STAR TOPOLOGY

- All clients connected through common device.
- Support many clients to send and receive at same time.
- Average complexity in troubleshooting, higher cost.
- Reliability can be achieved.
- Secure if the common device (switch) is secure.
- Tree is group of stars



MESH TOPOLOGY (FULLY/PARTIAL CONNECTED)

- Clients are cross connected with each others.
- Support many clients to send and receive at same time.
- Very complex in troubleshooting, very costly (NIC, Cable)
- Very reliable
- Very secure**
- Unusual in physical network
- Wireless is example for mesh



TOPOLOGIES SUMMARY

Network Topology	Delay	Reliability	Complexity	Security	Cost
BUS	Very High	Very Low	Very low	Very low	Very Low
RING	High	Low	Very low	Low	Very Low
STAR	Low	High	High	Average	High
MESH	Very Low	Very High	Very High	Very High	Very High

WHAT MAKES OSI MODEL

Away	7	Application	Present data in form understood by human
Pizza	6	Presentation	Encode data, decrypt or encrypt it, convert data to binary format.
Sausage	5	Session	Track connection, keep ports open if “browser tab” or application is still working.
Throw	4	Transport	Consolidate or divide data to pieces to allow it travel through network or help in reliable delivery.
Not	3	Network	Decide which path data will take to reach destination
Do	2	Data Link	Decide which format data would be when traverse physical medium (TP = Electric, FC = Light, Wifi = SS)
Please	1	Physical	Mediums such as Cables, and WiFi Signal. data represented in electric signals or light pulses or spread spectrum