Domain 4

Communication & Network Security

OSI Layers

- In early days of computer, only same vendor machines can communicate
- TCP/IP – OS can communicate to different OS

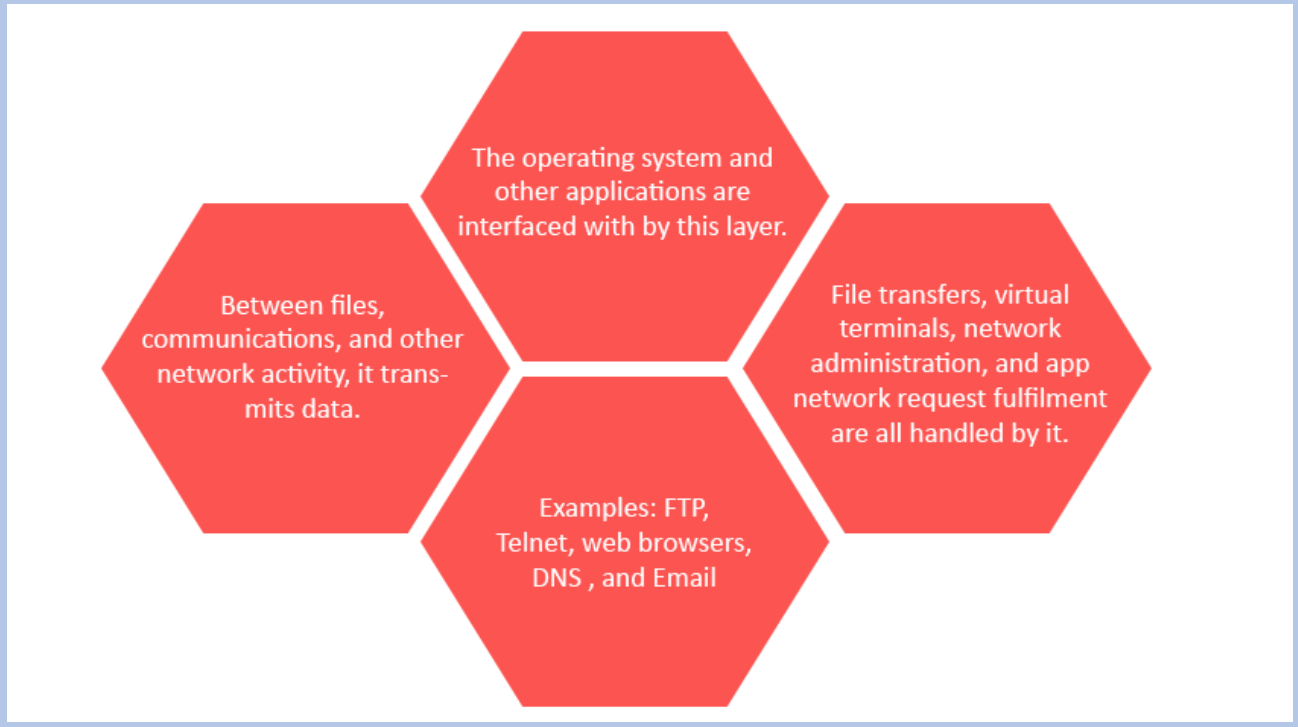
Communication b/w host & remote device

  - Application – Data – HTTP, Telnet, FTP, DNS
  - Presentation – Data – SSL, TSL
  - Session – Data – NetBios, PPTP, PAP
  - Transport – Segments – TCP, UDP
  - Network – Packets – IP, ARP, ICMP, IPSec
  - Data link – Frames – PPP, ATM, Ethernet
  - Physical – Bits – Ethernet, USB

- ISO – OSI Model
- Encapsulation
  - Add header in each layer

Application Layer

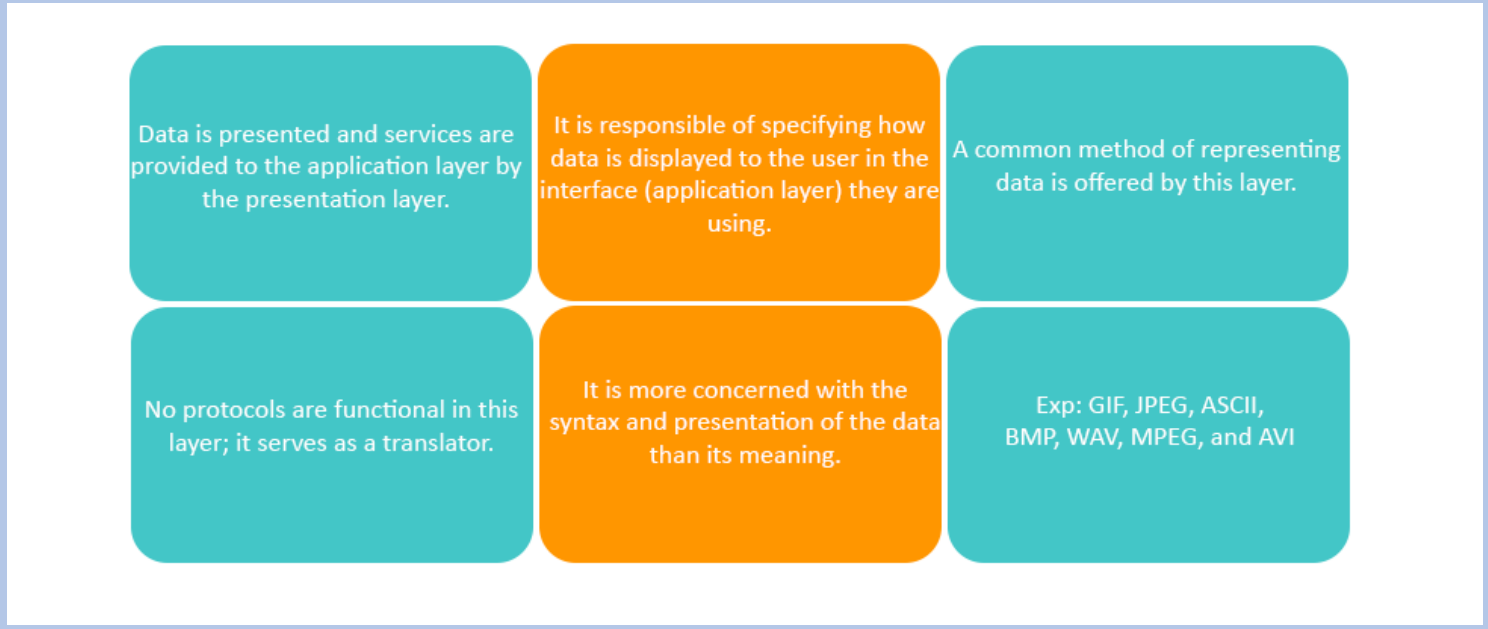
Message created & originated



Presentation Layer

- Compression
- Encryption

Translate the info to understand both parties

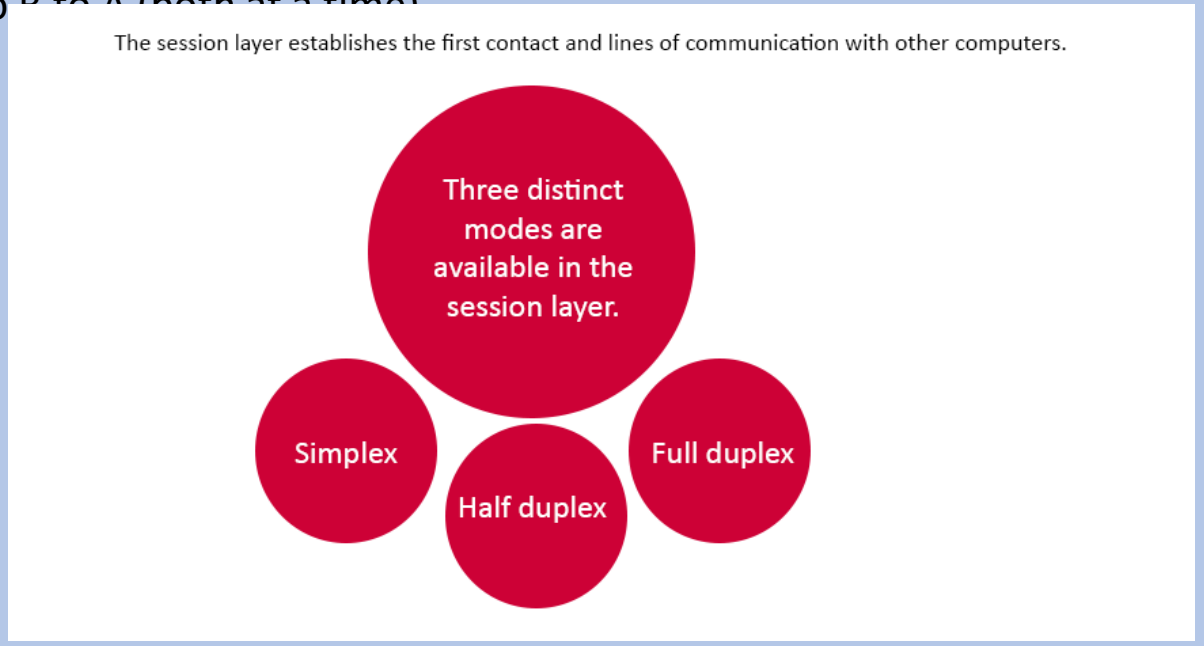


Session Layer

User1 connect to webSite
Every users have different sessions
s/w to s/w communication – Session Layer
h/w to h/w communication – Transport Layer

Establish & terminate the session on network

Three types of communication
Simplex – A to B, B not to A (one way)
Half Duplex – A to B, then B to A (one at a time)
Full Duplex – A to B to A (both at a time)

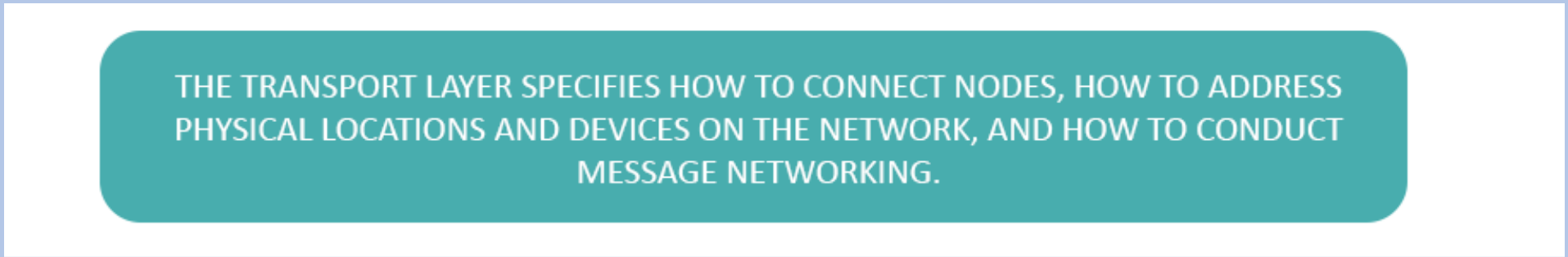


Transport

TCP – Connection oriented
UDP – (User Datagram Protocol) Connectionless communication

TCP – Reliable, slow, flow control

Transmit packets over the network by using TCP or UDP

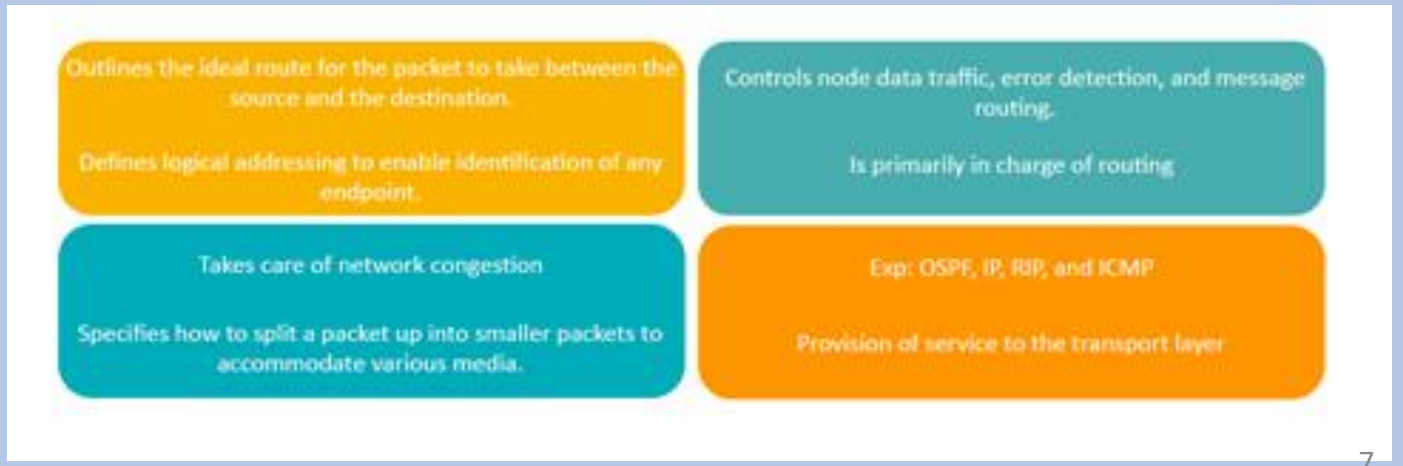


Network Layer

Router connected – forward traffic based on IP address & ports

Data transmit over the network by using logical address

- Header is added during encapsulation
- IP address
  - IPv4 – 32 bits
    - Uni cast (user 1 connects to user 1)
    - Multi cast (user 1 connects to many users)
    - Broad cast (user 1 connects to all users)
  - IPv6 – 128 bits
  - Doesn't support broadcast because they consume lot of bandwidth
    - Uni case
    - Multi cast
    - Any cast



Data Link

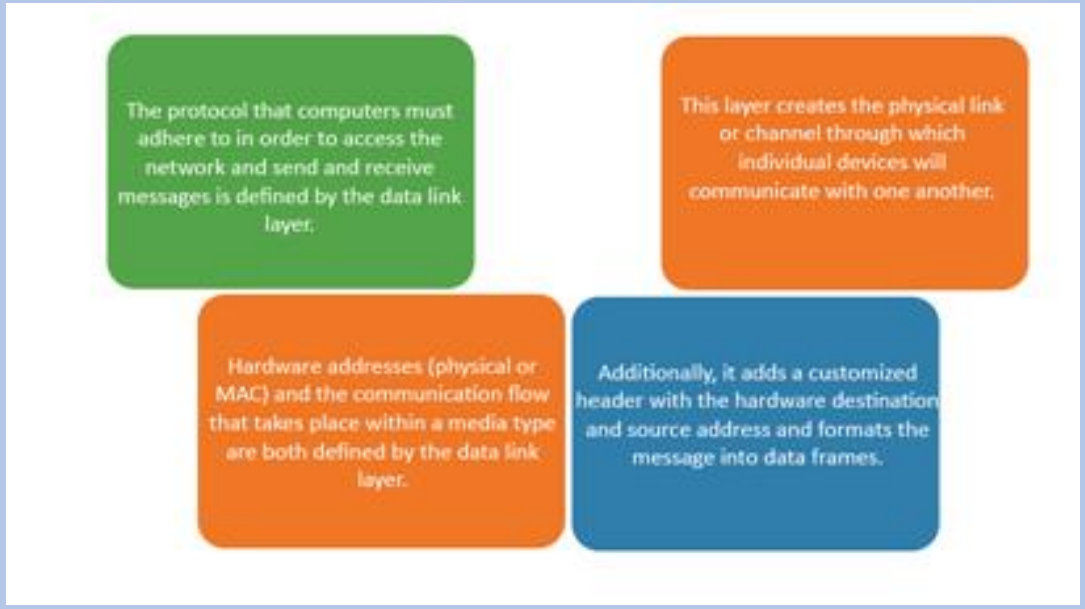
Bridges connected

How connections established over physical layer using MAC

- Add header and trailer in the packet
- Trailer – Check error in the message

- Header – Source MAC/Destination MAC
- FQDN – Fully Qualified Domain Name

- If comp1 wants to connect to comp2, add source/destination MAC
- ARP table – Comp 1 has ARP table



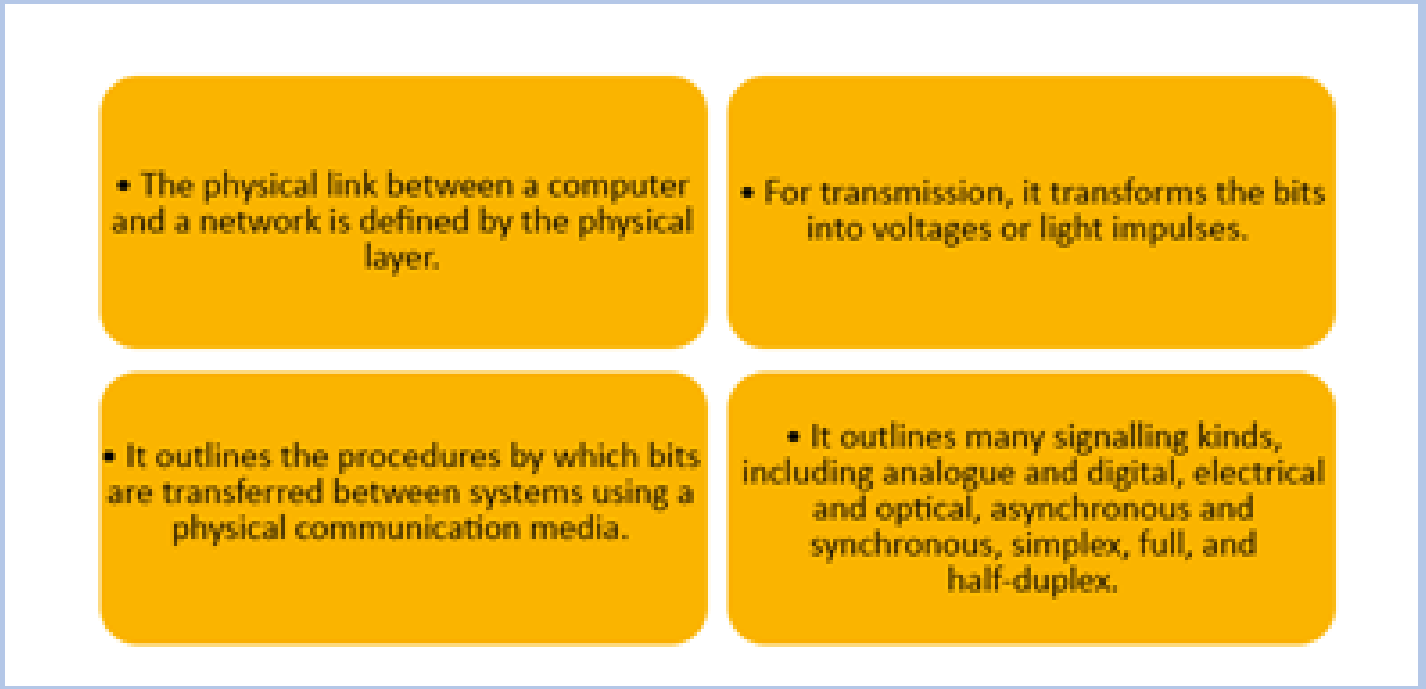
Physical Layer

- Wired or wireless connectivity

Repeaters – Receive signals and retransmit

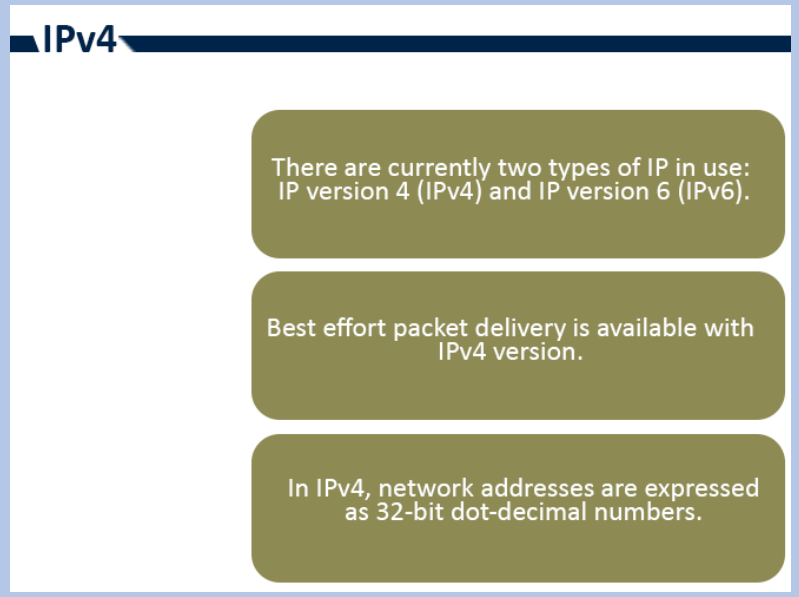
Hubs – Same like repeaters but have two ports

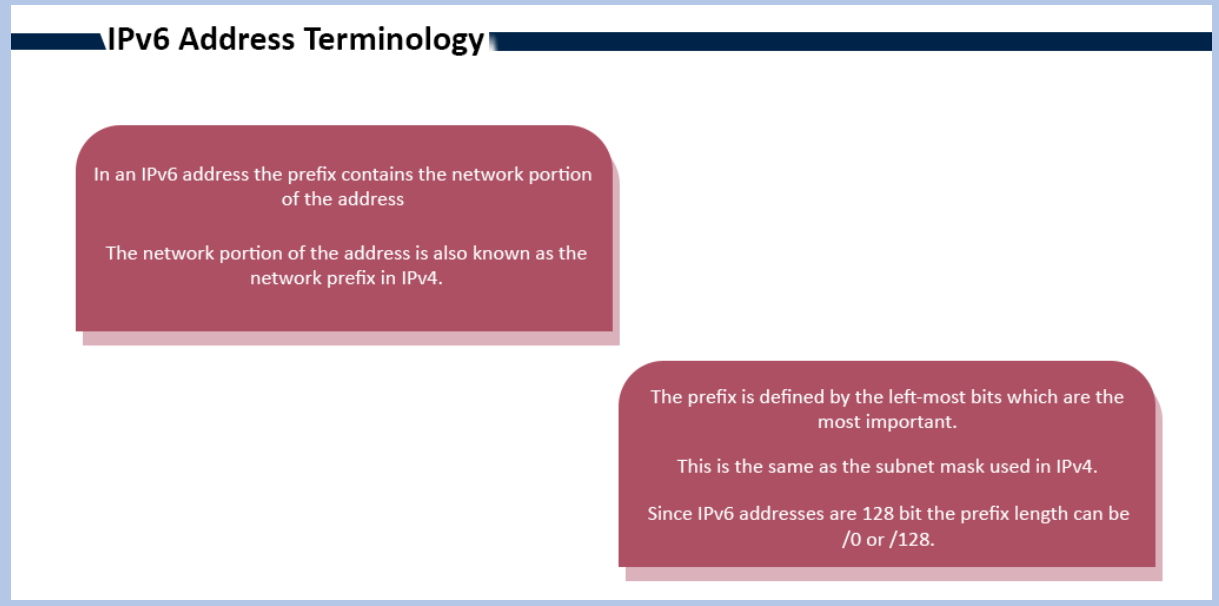
Show actual network cables carry Data on network



- IP Address

- Class A ------
- Class B
- Class C
- Class D





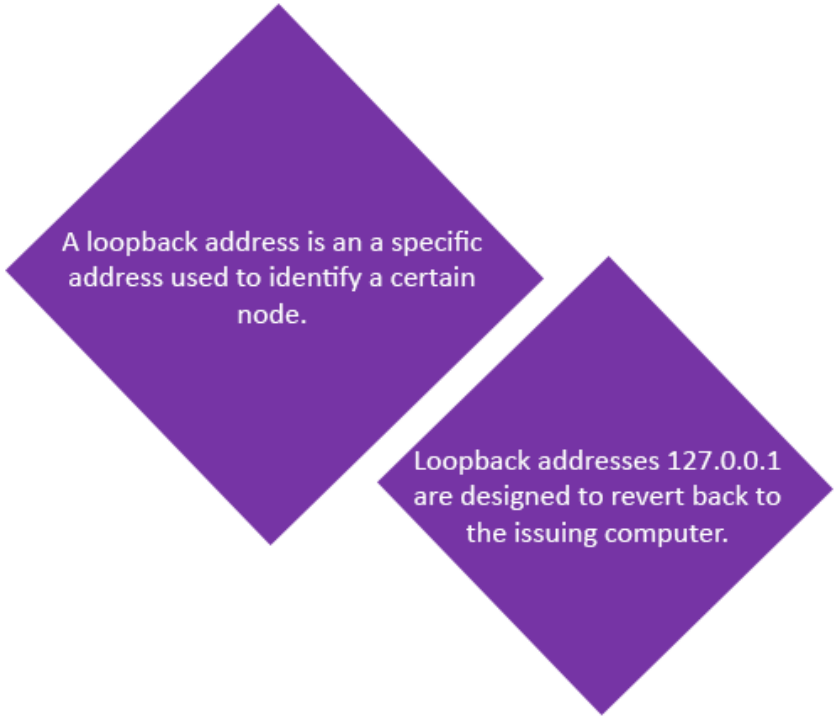
Loopback Address

Some network addresses are for specific use and are not available for general use.

A private address is used by private networks to grant access to a guest machine.

Organizations are advised to assign private IP addresses to nodes in their internal networks.

The following address blocks are assigned to private networks.



Software Defined Network (SDN)

Router connect two networks

When communication transmit through router or switch they decide where packets have to go

Decision comes from central point
SDN used in cloud and IT environment

Software connects through API
Software defined Wide Area Network (SD-WAN)

* Software defined networking enables network administrators to programmatically configure control and manage network behavior dynamically through open interfaces and abstracted lower level functionality.

* The objective SDN is to separate the control layer which are the network of services data transmission management from the infrastructure layer which includes hardware and hardware based settings.

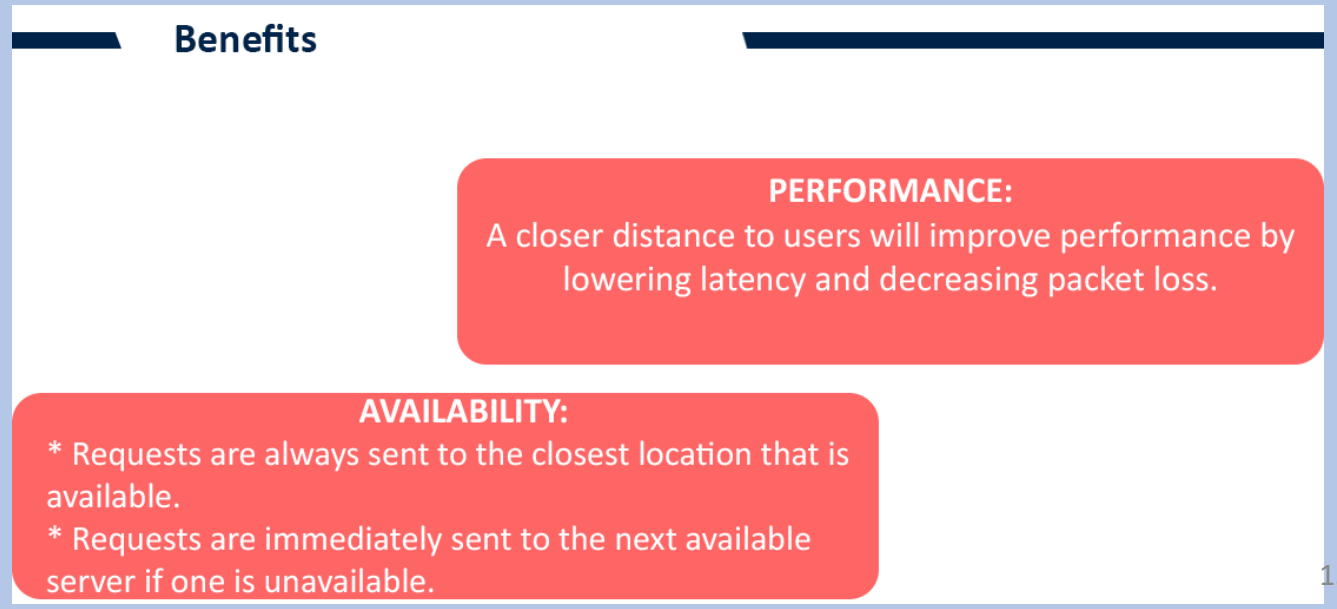
Content Delivery Network (CDN)

An extensive, geographically dispersed network of specialised servers known as a content delivery network (CDN) is used to speed up the distribution of web content and rich media to inter-net-connected devices.

- When users far from server, the communication will be delayed
- To minimize communication time delays, deploy content in each country
- The users can directly connect nearby content and can increase the process speed
- If content not available, they can forward to nearest content

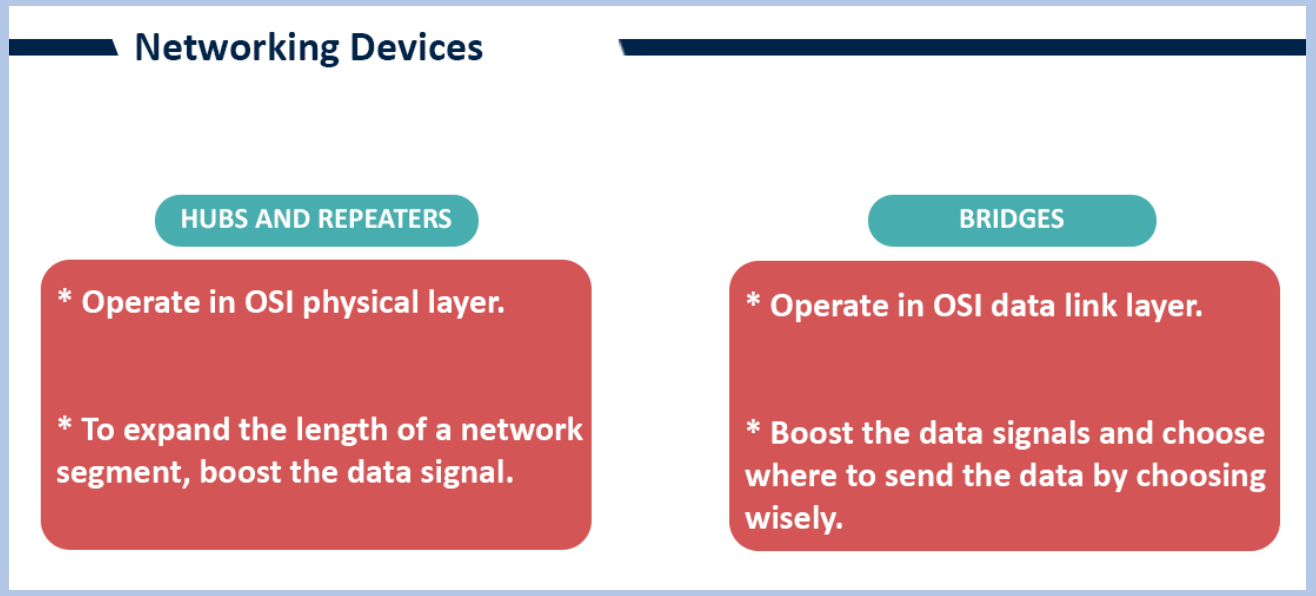
Advantages:

- Good performance
- Availability
- Security



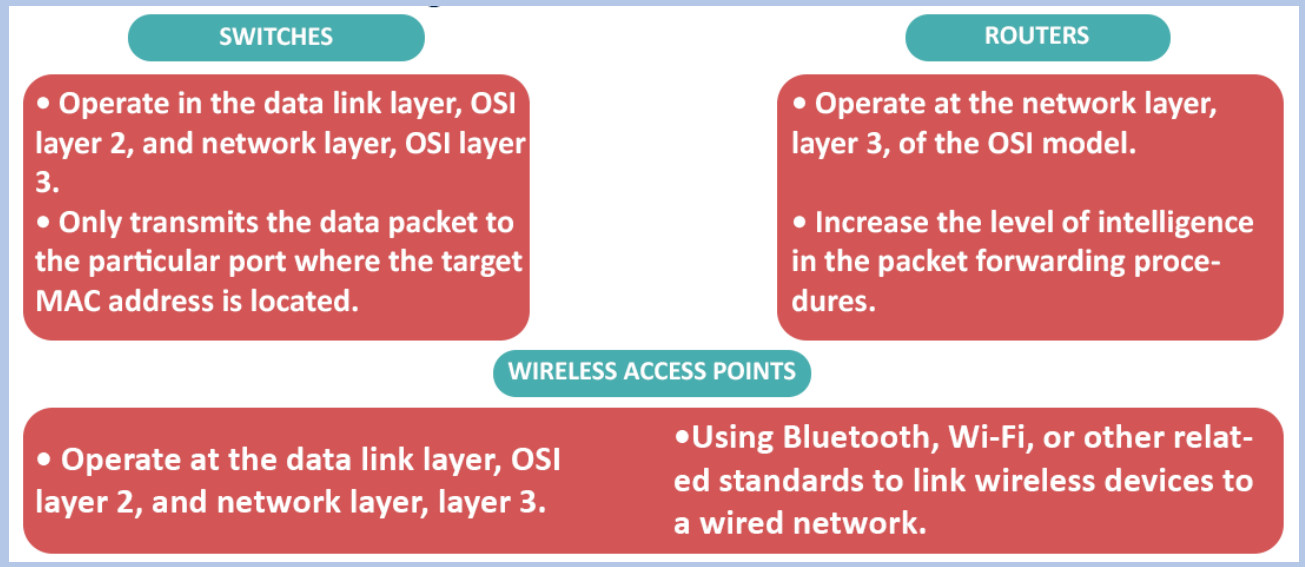
Hub

- Layer 2 – communicate to multiple machines
- Layer 3 – enable routing (IP address)



Bridge

- Connect two different networks through MAC



Router

– Connect two different networks

Transmission Media

Transmission media is used for transmitting data from a source to destination.

Following are the classes and types of transmission media:

- Unshielded twisted pair
- Shielded twisted pair
- Coaxial cable
- Fiber-optic cable

Category 1: Used for telephone communications and not suitable for transmitting data.

Category 2: Specified in the EIA or TIA-586 standard to be capable of handling data rates of up to 4 million bits per second (Mbps).

Category 3: Used in 10Base-T networks and specified to be capable of handling data rates of up to 10 Mbps.

Category 4: Used in Token Ring networks and able to transmit data at speeds of up to 16 Mbps.

Coaxial Cable Box

Coaxial cable box consists of a hollow outer cylindrical conductor.

It is expensive and resistant to Electromagnetic Interference (EMI).

Two types of coaxial cables are currently used in LAN: 50-ohm cable and 75-ohm cable.

Coax can come in two types for LANS: thinnet and thicknet.

There are two common types of coaxial cable transmission methods: baseband and broadband.

Fiber-Optic Cable Box

Fiber-optic cable box is a physical medium that can conduct modulated light transmission.

There are two types of light sources:

- Light-Emitting Diodes (LEDs)
- Diode lasers

There are two types of optical fibers:

- Multimode fiber
- Single-mode fiber

Fiber Optic Cable
Data transmitted in the form of light waves
LED – 10-20km
Laser – 100km

Coaxial cable
10Base2 (200m)
10Base5 (500m)

Endpoint Security

`The technique of protecting user endpoints, such as desktops, laptops, and mobile devices, from cyberattacks is known as endpoint security.

* Platform for centralized endpoint management.
* Advanced antivirus and anti-malware security.
* Proactive web security to guarantee secure Internet browsing.
* To stop data exfiltration, use data classification and data loss prevention.
* A built-in firewall to block hostile network attacks.
* phishing and social engineering email gateway protection.
* Administrators can immediately isolate affected devices with the help of insightful and practical threat forensics.
* Protection against unintended or malicious activities by insiders.

Unified Endpoint Management (UEM) is a method for connecting and coordinating the security and control of mobile devices, such as laptops, tablets, and smartphones, from a single interface.

Virtual Private Network (VPN)

Any traffic keep confidential over the internet

Virtual Private Network

It is a private network that links users or remote locations via a public network, typically the Internet.

VPN Tunnel

* It refers to the link that connects the user and the VPN server.
* Each data packet is contained in an outer packet that is encrypted to keep it safe, a procedure known as encapsulation.
* The data is protected during the transmission by this outer packet.
*To obtain the data of the inner packet, the outer packet is removed at the VPN server.