

## **Networking - Basics**

### **Network Types**

1. Personal area networks (PAN)
2. Local area networks (LAN)
3. Metropolitan area networks (MAN)
4. Wide area networks (WAN)

### **Network Topologies**

1. Bus
2. Ring
3. Mesh
4. Star

### **Network Standard**

Network standards are designed to ensure that hardware and software made by different vendors work seamlessly together.

### **Media Access Control (MAC) Address**

- Unique identifier assigned to every network-enabled device at the time of manufacture.
- Referred to as the burned-in address, the Ethernet hardware address, or a physical address.
- Has a standard composition of six hexadecimal numbers separated by a colon or dash, for example, AA-6A-BA-2B-68-C1.
- The first three numbers of the MAC address define the manufacturer's organizationally unique identifier (OUI). The remaining three numbers uniquely identify the device.

### **Network Devices**

- Repeaters
- Hubs
- Bridges
- Switches
- Routers

Nearly all of these devices depend on a media access control or an Internet Protocol (IP) address to deliver data on the network

### **Repeater:**

- Regenerates Signal
- Doesn't modify or interpret data packets
- Doesn't amplify the signal. Instead, it regenerates the data packet at the original strength, bit by bit.

### **Hub:**

- It does not filter data.
- When a data packet comes from one device, it broadcast to multiple devices connected on this hub.
- They allow multiple Ethernet-based network-enabled devices to communicate with each other.
- It does not read MAC address of network devices. So, it shares signal with all devices connected with hub which is security concern.

### **Switches:**

- Able to read MAC address
- Filter data based on MAC address
- Data is being sent only to matching MAC address device.
- Reduces security concerns compare to Hub.

### **Router:**

- Both Hub and Switch used to create LAN network, does not connect Internet. So, Router comes into picture.
- Used for routing data from one network to another based on IP.
- When data with IP comes to router which matches IP of data packet with intended network. If it matches, it sends data. Otherwise, it routes to another different network.

NOTE:

Hubs & Switches are used to create networks whereas Routers are used to connect to networks.

### **Network Address**

1. Media Access Control (MAC) address that identifies the network interface on the hardware level.
2. Internet Protocol (IP) address that identifies the network interface on a software level.

### **Routing**

Routing, in the context of networks, refers to the mechanism used to make sure that data packets follow the correct delivery path between the sending and receiving device on a network.

### **Subnet**

A subnet defines one or more logical networks within the class A, B, or C network. Without subnets, you're restricted to a single network in each of the class A, B, or C networks. Subnets allow multiple subnetworks to exist within one network.

### **Classless Interdomain Routing (CIDR) notation**

- Common way to define the subnet and the routing prefix is to use the Classless Interdomain Routing (CIDR) notation.
- CIDR applies to the IP address as the number of bits you want to allocate to your subnet.
- Using CIDR notation, at the end of the IP address, add a "/" and then the number of bits.

- For example, 198.51.100.0/24 is the same as using the dotted-decimal format subnet mask 255.255.255.0. It offers an address range of 198.51.100.0 to 198.51.100.255.
- Each segment in the IP is 8 bits. So, in a 32 bits IP address, you'll have 8+8+8+8=32 bits.
- As a bit is 0 and 1, basically it's 2. So 8 bits on one segment is  $2^8$  which is 255 (starting is 0 ).

## DNS

The Domain Name System is a decentralized lookup service that translates a human-readable domain name or URL into the IP address of the server that's hosting the site or service.

## Network Client

A network client is a lightweight computer or device that can't run programs on its own. This type of client is typically used to access and interact with a mainframe computer / Server. This server is located elsewhere and is accessed through a network.

## Firewall

A network firewall is a security appliance that blocks or remedy unauthorized access into your network. Network firewalls also monitor and make logs of all traffic across your network.

## Authentication Vs Authorization

Authentication	Authorization
Confirms whether the user or client is who they claim to be.	Confirms whether the user or client can perform an action against a resource or service.
Asks for credentials like username or password.	Checks permissions attached to the account in the background, and sometimes indicates which permission you need.
Must happen before authorization.	Happens after successful authentication.
For example, an HR member signs in to the HR app.	The HR member attempts to delete a user from the wrong department by accident. The action is denied because they don't have the right permissions for that department.

## OSI & TCP/IP Model

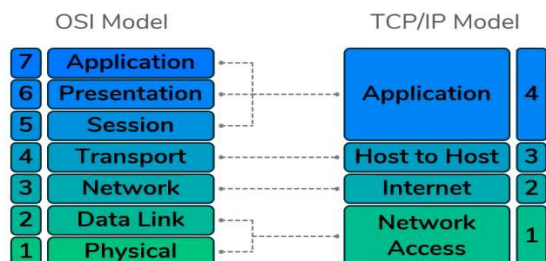
<b>A</b> pplication (7)	SMTP, FTP, Telnet
<b>P</b> resentation (6)	Format Data, Encryption
<b>S</b> ession (5)	Start & Stop Sessions
<b>T</b> ransport (4)	TCP, UDP, Port Numbers
<b>N</b> etwork (3)	IP Address, Routers
<b>D</b> ata Link (2)	MAC Address, Switches
<b>P</b> hysical (1)	Cable, Network Interface Cards, Hubs

# OSI Model

## • Layer 5, 6, 7 – Session, Presentation, Application

- Distinction between these layers is somewhat vague
- Other Networking Models combine these into one layer

7	Application
6	Presentation
5	Session
4	Transport
3	Network
2	Data Link
1	Physical



# OSI Model

- Network Devices operate at specific layers
- Network Protocols operate at specific layers
- **Neither of these are strict rules** – exceptions exist
- **OSI Model is simply a model** – not rigid rules everything adheres to
  - Conceptualization of what is required for data to flow through the Internet

			7	Application			
			6	Presentation			
			5	Session			
			4	Transport	Service to Service	TCP/UDP Ports	
			3	Network	End to End	IP Addresses	Routers, Hosts
			2	Data Link	Hop to Hop	MAC Addresses	Switches
			1	Physical	Transporting Bits		Cables, WiFi, Hubs
				OSI Model	Function	Addressing	Devices

Segment	DATA	TCP					
Packet	DATA	TCP	IP				
Frame	DATA	TCP	IP	L2			
Bits	1010101010101010101010101						