

Module 7 :- Network fundamental

1. Which of the following messages in the DHCP process are broadcasted? (Choose two)

- A. Request**
- B. Offer**
- C. Discover**
- D. Acknowledge**

Ans :- A. Request

C. Discover

2. Which command would you use to ensure that an ACL does not block web-based TCP traffic?

- A. permit any**
- B. permit tcp any any eq 80**
- C. permit tcp any eq 80**
- D. permit any any eq tcp**

Ans :- B. permit tcp any any eq 80

3. Explain Network Topologies.

Ans :- Types of Network Topologies

1. Bus Topology

- All devices are connected to a single backbone cable.
- Data is sent along the cable and received by all devices.

Advantages:

- Easy to install
- Low cost

Disadvantages:

- Backbone failure brings down the whole network
- Performance decreases with more devices

2. Star Topology

- All devices connect to a central hub or switch.
- Most commonly used topology today.

Advantages:

- Easy to troubleshoot
- Failure of one device doesn't affect others

Disadvantages:

- Central device failure affects the whole network

- Higher cable cost

3. Ring Topology

- Each device is connected to two others, forming a ring.
- Data travels in one direction (or both in dual-ring).

Advantages:

- No data collision
- Predictable performance

Disadvantages:

- Failure of one node can break the network
- Difficult to reconfigure

4. Mesh Topology

- Devices are interconnected with multiple paths.
- Can be full mesh or partial mesh.

Advantages:

- Very reliable
- High fault tolerance

Disadvantages:

- Expensive
- Complex to install and manage

5. Tree Topology

- Combination of star and bus topologies.
- Devices are arranged in hierarchical levels.

Advantages:

- Easy to expand
- Good for large networks

Disadvantages:

- Backbone failure affects many nodes
- Complex configuration

6. Hybrid Topology

- Combination of two or more topologies (e.g., star + mesh).

Advantages:

- Flexible and scalable
- Reliable

Disadvantages:

- Complex design
- Higher cost

4-Explain TCP/IP Networking Model

Ans :- Layers of TCP/IP Model

1. Application Layer

- Provides network services directly to user applications.
- Combines the Application, Presentation, and Session layers of the OSI model.

Functions:

- Data formatting
- Application-to-application communication

Protocols:

- HTTP / HTTPS
- FTP
- SMTP
- POP3 / IMAP
- DNS
- Telnet, SSH

2. Transport Layer

- Ensures end-to-end communication between devices.
- Responsible for reliability, flow control, and error handling.

Protocols:

- TCP (Transmission Control Protocol) – Reliable, connection-oriented
- UDP (User Datagram Protocol) – Fast, connectionless, unreliable

Key Functions:

- Segmentation & reassembly
- Port addressing
- Flow control

3. Internet Layer

- Responsible for logical addressing and routing of data packets.
- Determines the best path to the destination.

Protocols:

- IP (IPv4, IPv6)
- ICMP
- ARP

- RIP, OSPF (routing support)

Devices:

- Routers

4. Network Access Layer

- Defines how data is physically transmitted over the network.
- Combines Data Link and Physical layers of OSI model.

Functions:

- Framing
- MAC addressing
- Error detection
- Physical transmission

Technologies:

- Ethernet
- Wi-Fi
- ARP
- Frame Relay

5. Explain LAN and WAN Network

Ans :-

1. LAN (Local Area Network)

A LAN is a network that covers a small geographic area, such as:

- Home
- School
- Office
- Building or campus

Characteristics:

- High data transfer speed
- Low latency
- Privately owned
- Low cost

Technologies Used:

- Ethernet
- Wi-Fi

Devices Used:

- Switches

- Access Points
- Computers
- Printers

Examples:

- Office network
- College computer lab
- Home Wi-Fi network

Advantages:

- Fast communication
- Easy management
- Secure (private network)

Disadvantages:

- Limited distance
- Not suitable for large areas

2. WAN (Wide Area Network)

A WAN covers a large geographical area, such as:

- Cities
- Countries
- Continents

Characteristics:

- Slower than LAN
- Higher latency
- Expensive
- Uses public or private telecom infrastructure

Technologies Used:

- MPLS
- Leased lines
- Satellite
- Fiber optics
- Internet

Devices Used:

- Routers
- Modems

Examples:

- Internet
- Bank networks
- Multinational company networks

Advantages:

- Connects distant locations
- Supports global communication

Disadvantages:

- Expensive
- Complex to manage
- Lower speed compared to LAN

6. Explain Operation of Switch

Ans :- Operation of a Network Switch

A network switch is a Layer 2 device (Data Link layer) used in LANs to connect multiple devices and forward data efficiently using MAC addresses.

How a Switch Works (Step-by-Step)

1. Learning (MAC Address Learning)

- When a frame enters a switch port, the switch:
 - Reads the source MAC address
 - Stores it in the MAC address table with the incoming port number

Example:

MAC A → Port 1

2. Forwarding / Filtering

- The switch checks the destination MAC address:
 - If found in MAC table → forwards frame only to that port (forwarding)
 - If not found → sends frame out all ports except the incoming one (flooding)
 - If destination is on same port → frame is dropped (filtering)

3. Frame Flooding

- Happens when:
 - Destination MAC is unknown
 - Frame is broadcast (FF:FF:FF:FF:FF:FF)
- Switch sends the frame to all ports except source

4. Updating the MAC Table

- MAC table entries are dynamic
- Entries are removed after a timeout if not used

7. Describe the purpose and functions of various network devices

Ans :- Purpose and Functions of Various Network Devices

Network devices are used to connect, manage, secure, and optimize communication between computers and networks.

1. Hub

Purpose: Basic connectivity

Function:

- Works at OSI Layer 1 (Physical layer)
- Broadcasts data to all ports
- No traffic filtering or security

2. Switch

Purpose: Efficient LAN communication

Function:

- Works at OSI Layer 2
- Forwards data using MAC addresses
- Reduces collisions
- Supports VLANs and port security

3. Router

Purpose: Connect different networks

Function:

- Works at OSI Layer 3
- Routes data using IP addresses
- Selects best path
- Connects LAN to WAN/Internet

4. Bridge

Purpose: Segment a LAN

Function:

- Layer 2 device
- Filters traffic using MAC addresses
- Reduces network congestion

5. Modem

Purpose: Internet access

Function:

- Converts digital ↔ analog signals
- Connects home/office network to ISP

6. Repeater

Purpose: Extend network distance

Function:

- Regenerates weak signals
- Works at Layer 1

7. Access Point (AP)

Purpose: Wireless connectivity

Function:

- Connects wireless devices to wired LAN
- Uses Wi-Fi standards (802.11)

8. Firewall

Purpose: Network security

Function:

- Monitors and filters traffic
- Blocks unauthorized access
- Can be hardware or software

9. Gateway

Purpose: Protocol conversion

Function:

- Connects networks using different protocols
- Acts as an entry/exit point

10. NIC (Network Interface Card)

Purpose: Device network access

Function:

- Provides MAC address
- Enables wired or wireless communication

7. Make list of the appropriate media, cables, ports, and connectors to connect switches to other

Ans :-

1. Switch to Computer / Server

- Media: Copper
- Cable: Ethernet (Straight-through)
- Ports: Switch Ethernet port ↔ NIC Ethernet port
- Connector: RJ-45

2. Switch to Switch

a) Same type connection

- Media: Copper or Fiber
- Cable:

- Ethernet Crossover cable (older switches)
- Ethernet Straight-through (modern switches with Auto-MDIX)
 - Ports: Ethernet ports
 - Connector: RJ-45

b) High-speed / Long distance

- Media: Fiber optic
- Cable: Fiber patch cable
- Ports: SFP / SFP+ ports
- Connector: LC / SC

3. Switch to Router

- Media: Copper
- Cable: Ethernet Straight-through
- Ports: Switch Ethernet ↔ Router Ethernet
- Connector: RJ-45

4. Switch to Access Point (AP)

- Media: Copper
- Cable: Ethernet Straight-through (PoE supported)
- Ports: Switch Ethernet ↔ AP Ethernet
- Connector: RJ-45

5. Switch to Modem

- Media: Copper
- Cable: Ethernet Straight-through
- Ports: Switch Ethernet ↔ Modem Ethernet
- Connector: RJ-45

6. Switch to Firewall

- Media: Copper or Fiber
- Cable: Ethernet or Fiber cable
- Ports: Ethernet / SFP
- Connector: RJ-45 / LC

7. Switch to Patch Panel

- Media: Copper
- Cable: Ethernet Straight-through
- Ports: Switch Ethernet ↔ Patch panel port
- Connector: RJ-45

8. Switch to Console (Management)

- Media: Copper
- Cable: Console (Rollover) cable
- Ports: Console port ↔ PC Serial / USB
- Connector: RJ-45 ↔ DB-9 / USB

9. Define Network devices and hosts

Ans :-

1. Network Devices

Definition:

Network devices are hardware components used to connect, control, manage, and secure communication between different devices and networks.

Purpose:

- Enable data transmission
- Control traffic flow
- Improve performance
- Provide security

Examples of Network Devices:

- Hub – broadcasts data to all ports
- Switch – forwards data using MAC addresses
- Router – routes data using IP addresses
- Bridge – connects LAN segments
- Access Point – provides wireless access
- Modem – connects to ISP
- Firewall – secures the network

2. Hosts

Definition:

A host is any device connected to a network that sends or receives data and has a unique IP address.

Purpose:

- Generate data
- Consume network services

Examples of Hosts:

- Desktop computers
- Laptops

- Servers
- Smartphones
- Printers
- IP cameras