

## 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