Module -7: Network fundamental –

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

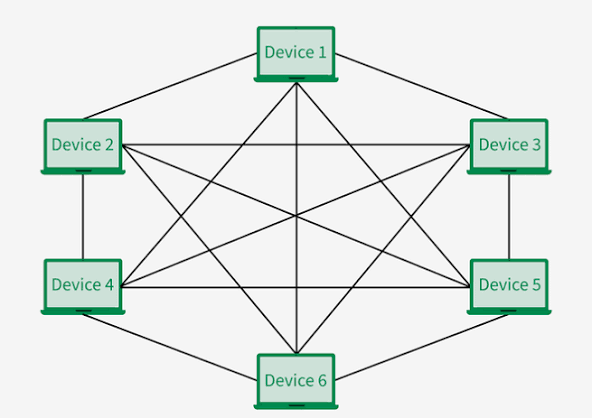
**answers: C. Discover A. Request**

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

**answer:** **B. permit tcp any any eq 80**

3-Explain Network Topologies

Answer: Network topology is the arrangement of nodes (devices) and connections (links) in a communication network. The type of topology affects the network's performance, scalability, and reliability.



Common network topologies

* [**Star**](https://www.google.com/search?q=Star&sca_esv=552fb68e3d08662a&rlz=1C1GCEA_enIN1169IN1169&prmd=ivns&source=lnms&fbs=AIIjpHxU7SXXniUZfeShr2fp4giZ1Y6MJ25_tmWITc7uy4KIeoJTKjrFjVxydQWqI2NcOha3O1YqG67F0QIhAOFN_ob1yXos5K_Qo9Tq-0cVPzex8YVosMX4HbDUrR7LivhWnk0FuAZVXvp62Oi2LViZ2OMmfytS7nNJKwjX-dfWDM13u79Ad-ozOsBhPchmVRVEnbtWFJzd1HixniG-pG3cQciEsrkJqA&sa=X&ved=2ahUKEwjA1qqKy6WQAxXoTWwGHTM-Fa8QgK4QegQIBhAB&biw=1204&bih=572&dpr=1.5&mstk=AUtExfCkNNMPaNVo-BGMvLWnjqVKdSq7Pw-7t9EGvIQCl7dlLqCtp3f6wwKVuxawVoB8HAPFjCWhJfyE0muB3KnAbvCTjTHQpcv5iBvFX0_bODtW3QHLmbypG5i7_SFyEv30Ki0&csui=3)**:** All devices connect to a central hub or switch.
  + **Pros:** Easy to add/remove devices; a single node failure doesn't affect the whole network.
  + **Cons:** If the central hub fails, the entire network goes down.
  + **Best for:** Home and small to medium office networks.
* [**Ring**](https://www.google.com/search?q=Ring&sca_esv=552fb68e3d08662a&rlz=1C1GCEA_enIN1169IN1169&prmd=ivns&source=lnms&fbs=AIIjpHxU7SXXniUZfeShr2fp4giZ1Y6MJ25_tmWITc7uy4KIeoJTKjrFjVxydQWqI2NcOha3O1YqG67F0QIhAOFN_ob1yXos5K_Qo9Tq-0cVPzex8YVosMX4HbDUrR7LivhWnk0FuAZVXvp62Oi2LViZ2OMmfytS7nNJKwjX-dfWDM13u79Ad-ozOsBhPchmVRVEnbtWFJzd1HixniG-pG3cQciEsrkJqA&sa=X&ved=2ahUKEwjA1qqKy6WQAxXoTWwGHTM-Fa8QgK4QegQIBhAG&biw=1204&bih=572&dpr=1.5&mstk=AUtExfCkNNMPaNVo-BGMvLWnjqVKdSq7Pw-7t9EGvIQCl7dlLqCtp3f6wwKVuxawVoB8HAPFjCWhJfyE0muB3KnAbvCTjTHQpcv5iBvFX0_bODtW3QHLmbypG5i7_SFyEv30Ki0&csui=3)**:** Devices are connected in a circular fashion, with data traveling in one direction (or both in dual-ring systems).
  + **Pros:** Cheap and easy to expand; data can flow quickly.
  + **Cons:** A single node failure can disrupt the entire ring.
* [**Bus**](https://www.google.com/search?q=Bus&sca_esv=552fb68e3d08662a&rlz=1C1GCEA_enIN1169IN1169&prmd=ivns&source=lnms&fbs=AIIjpHxU7SXXniUZfeShr2fp4giZ1Y6MJ25_tmWITc7uy4KIeoJTKjrFjVxydQWqI2NcOha3O1YqG67F0QIhAOFN_ob1yXos5K_Qo9Tq-0cVPzex8YVosMX4HbDUrR7LivhWnk0FuAZVXvp62Oi2LViZ2OMmfytS7nNJKwjX-dfWDM13u79Ad-ozOsBhPchmVRVEnbtWFJzd1HixniG-pG3cQciEsrkJqA&sa=X&ved=2ahUKEwjA1qqKy6WQAxXoTWwGHTM-Fa8QgK4QegQIBhAK&biw=1204&bih=572&dpr=1.5&mstk=AUtExfCkNNMPaNVo-BGMvLWnjqVKdSq7Pw-7t9EGvIQCl7dlLqCtp3f6wwKVuxawVoB8HAPFjCWhJfyE0muB3KnAbvCTjTHQpcv5iBvFX0_bODtW3QHLmbypG5i7_SFyEv30Ki0&csui=3)**:** All devices connect to a single, shared communication line or backbone.
  + **Pros:** Simple and cost-effective to install.
  + **Cons:** A break in the main cable can disrupt the entire network; data can be easily intercepted.
* [**Mesh**](https://www.google.com/search?q=Mesh&sca_esv=552fb68e3d08662a&rlz=1C1GCEA_enIN1169IN1169&prmd=ivns&source=lnms&fbs=AIIjpHxU7SXXniUZfeShr2fp4giZ1Y6MJ25_tmWITc7uy4KIeoJTKjrFjVxydQWqI2NcOha3O1YqG67F0QIhAOFN_ob1yXos5K_Qo9Tq-0cVPzex8YVosMX4HbDUrR7LivhWnk0FuAZVXvp62Oi2LViZ2OMmfytS7nNJKwjX-dfWDM13u79Ad-ozOsBhPchmVRVEnbtWFJzd1HixniG-pG3cQciEsrkJqA&sa=X&ved=2ahUKEwjA1qqKy6WQAxXoTWwGHTM-Fa8QgK4QegQIBhAO&biw=1204&bih=572&dpr=1.5&mstk=AUtExfCkNNMPaNVo-BGMvLWnjqVKdSq7Pw-7t9EGvIQCl7dlLqCtp3f6wwKVuxawVoB8HAPFjCWhJfyE0muB3KnAbvCTjTHQpcv5iBvFX0_bODtW3QHLmbypG5i7_SFyEv30Ki0&csui=3)**:** Each device is interconnected with multiple other devices.
  + **Pros:** Highly reliable and redundant because data can take multiple paths; a failure in one link doesn't stop the network.
  + **Cons:** More complex and expensive to set up due to extensive cabling.

**4 – Explain TCP/IP Networking Model**

The **TCP/IP model** (also known as the Internet Protocol Suite) is a 4-layer networking model used to enable communication over the internet and other computer networks.

**🔹 Layers of the TCP/IP Model:**

| **Layer** | **Function** | **Protocols** |
| --- | --- | --- |
| **4. Application** | Interfaces with user apps, provides network services | HTTP, FTP, DNS, SMTP, DHCP |
| **3. Transport** | Manages end-to-end communication, error checking | TCP (reliable), UDP (faster, no guarantee) |
| **2. Internet** | Handles logical addressing and routing | IP, ICMP, ARP |
| **1. Network Access (Link)** | Deals with physical transmission over media | Ethernet, Wi-Fi, MAC addresses |

**5 – Explain LAN and WAN Network**

**🔹 LAN (Local Area Network)**

* **Definition:** A network that connects computers within a **limited area** (e.g., home, office).
* **Characteristics:**
  + High speed
  + Private ownership
  + Low latency
  + Common technologies: Ethernet, Wi-Fi
* **Example:** Your home Wi-Fi network.

**🔹 WAN (Wide Area Network)**

* **Definition:** A network that spans **large geographical areas**, connecting multiple LANs.
* **Characteristics:**
  + Slower than LAN
  + Public or leased infrastructure
  + Can use various technologies (e.g., MPLS, leased lines)
* **Example:** The Internet or a bank's inter-branch connection.

**6 – Explain Operation of Switch**

A **network switch** is a device that connects devices within a LAN and intelligently forwards data to the correct destination.

**🔹 How It Works:**

1. **Learns MAC addresses**: The switch builds a MAC address table by examining incoming frames.
2. **Forwards frames**: Sends frames only to the port where the destination device is connected.
3. **Improves efficiency**: Unlike hubs, switches reduce collisions and allow full-duplex communication.
4. **Layer 2 operation**: Operates mainly at **Layer 2 (Data Link Layer)** of the OSI model.

**7 – Describe the Purpose and Functions of Various Network Devices**

| **Device** | **Purpose** | **Key Functions** |
| --- | --- | --- |
| **Router** | Connects different networks | Routes data between LANs and the Internet |
| **Switch** | Connects devices in a LAN | Forwards data using MAC addresses |
| **Hub** | Basic network connector | Broadcasts data to all ports (inefficient) |
| **Access Point (AP)** | Wireless connection point | Connects wireless devices to wired LAN |
| **Firewall** | Security | Filters traffic based on rules |
| **Modem** | Modulates/Demodulates | Converts digital to analog for Internet access over phone/cable lines |

**8 – Make List of Appropriate Media, Cables, Ports, and Connectors to Connect Switches**

**🔹 Media Types:**

* **Copper (Ethernet – UTP/STP)**
* **Fiber optic (single-mode/multi-mode)**

**🔹 Cables:**

* **Ethernet Cables:**
  + Cat5e, Cat6, Cat6a, Cat7
* **Fiber Cables:**
  + SC, LC, ST connectors

**🔹 Ports and Connectors:**

| **Use** | **Cable** | **Connector** | **Port** |
| --- | --- | --- | --- |
| Switch to PC | Cat5e/Cat6 | RJ45 | Ethernet Port |
| Switch to Switch (short distance) | Cat6/Crossover (older) | RJ45 | Ethernet |
| Long distance (core switches) | Fiber optic | LC/SC | SFP/SFP+ Port |

**9 – Define Network Devices and Hosts**

**🔹 Network Devices:**

Hardware used to **build, manage, or secure networks**.

Examples:

* **Router**: Directs traffic between networks.
* **Switch**: Connects devices in a LAN.
* **Firewall**: Protects network by filtering traffic.
* **Modem**: Connects to ISP.

**🔹 Hosts:**

Any device that can **send or receive data** on a network.

Examples:

* Computers
* Phones
* Servers
* Printers
* IoT devices

🧠 Hosts have **IP addresses** and **MAC addresses** to communicate over network.