*Assignment*

*Module -7: Network fundamental*

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

*ANS. Request, Offer*

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

*ANS. permit tcp any any eq 80.*

*3-Explain Network Topologies.*

*ANS. Network topologies refer to the physical or logical arrangement of devices and connections in a network. There are several types of network topologies, each with its own characteristics and uses.*

*1. Bus Topology:*

*- Devices are connected in a single cable (bus) that connects all devices to each other.*

*- Data travels through the bus in a single direction.*

*- If a device is malfunctioning, the entire network can be affected.*

*- Example: Ethernet networks.*

*2. Star Topology:*

*- All devices are connected to a central hub or switch.*

*- Each device has a direct connection to the central hub/switch.*

*- Data travels through the central hub/switch.*

*- If the central hub/switch fails, the entire network becomes inaccessible.*

*- Example: Wireless networks (Wi-Fi).*

*3. Ring Topology:*

*- Devices are connected in a circular fashion, with each device having a connection to the next and previous device.*

*- Data travels in a single direction around the ring.*

*- If a device is malfunctioning, it can impact the network as it only affects the devices directly connected to it.*

*- Example: Token ring networks.*

*4. Mesh Topology:*

*- Each device is connected to every other device in the network.*

*- Data can travel through any path between devices.*

*- Each device acts as a repeater, rebroadcasting data to other devices.*

*- Provides redundancy and fault tolerance.*

*- Example: Wireless mesh networks (802.11s).*

*5. Tree Topology:*

*- Devices are connected in a hierarchical manner, with a central hub or switch at the top.*

*- Devices are connected to the central hub/switch, and then to secondary hubs or switches.*

*- Data travels from the central hub/switch to the secondary hubs/switches.*

*- Provides a centralized management and fault tolerance.*

*- Example: Local area networks (LANs).*

*6. Hybrid Topology:*

*- Combination of multiple topologies, often used in large-scale networks.*

*- Devices are connected to multiple central hubs or switches.*

*- Provides flexibility and redundancy.*

*- Example: Wide area networks (WANs) that use both star and mesh topologies.*

*4-Explain TCP/IP Networking Model.*

*ANS. The TCP/IP (Transmission Control Protocol/Internet Protocol) networking model is a set of standard protocols used to interconnect network devices on the internet. It consists of four layers:*

*1. Application Layer:*

*- Provides services for network application programs, such as file transfer, email, web browsing, etc.*

*- Uses protocols like HTTP, FTP, SMTP, etc.*

*2. Transport Layer:*

*- Responsible for reliable transmission of data between end-systems.*

*- Uses protocols like TCP (Transmission Control Protocol) and UDP (User Datagram Protocol).*

*- TCP ensures data is delivered correctly and in the correct order, while UDP provides fast, unreliable delivery.*

*3. Internet Layer:*

*- Handles addressing, routing, and packet forwarding*

*- Uses protocols like IP (Internet Protocol) and ICMP (Internet Control Message Protocol).*

*- IP assigns unique addresses to network devices and routes data based on IP addresses.*

*4. Network Access Layer:*

*- Handles the physical transmission of data over the network.*

*- Uses protocols like Ethernet, Wi-Fi, or other network interface card (NIC) protocols.*

*The TCP/IP model allows for standardization and interoperability between different network devices and operating systems. It also enables the creation of complex network architectures that can handle diverse communication requirements.*

*5-Explain LAN and WAN Network.*

*ANS. LAN (Local Area Network) and WAN (Wide Area Network) are two types of computer networks:*

*1. LAN (Local Area Network):*

*- Refers to a network that connects devices within a limited geographic area, such as a home, office, or campus.*

*- Uses Ethernet or other local area network (LAN) technologies to connect devices.*

*- Examples include Ethernet cables, Wi-Fi, and optical fiber.*

*2. WAN (Wide Area Network):*

*- Refers to a network that connects devices across a larger geographic area, such as a city, state, or country.*

*- Uses leased lines or other wide area network (WAN) technologies to connect devices.*

*- Examples include satellite links, DSL (Digital Subscriber Line), and leased lines.*

*LANs are typically used for local communication, while WANs are used for communication between geographically dispersed networks. LANs are typically smaller in size and faster than WANs, but require a physical connection to a central hub or switch. WANs are typically larger in size and slower than LANs, but can provide long-distance communication between geographically dispersed networks.*

*Both LANs and WANs use protocols like TCP/IP to ensure reliable and efficient communication between devices.*

*6.Explain Operation of Switch.*

*ANS. The operation of a network switch involves forwarding data packets between devices on a local area network (LAN) based on MAC (Media Access Control) addresses. Here’s a breakdown of how switches work:*

*1. Basic Functionality*

*- Data Frame Reception: When a device (like a computer or printer) sends data, it is encapsulated in a frame, which includes source and destination MAC addresses.*

*- Frame Forwarding: The switch receives the frame and examines the destination MAC address to determine where to send it.*

*2. MAC Address Table (Forwarding Table)*

*- Learning: When a switch receives a frame, it learns the source MAC address and associates it with the port on which the frame was received. This information is stored in the MAC address table (also called the forwarding table).*

*- Forwarding: When the switch receives a frame destined for a particular MAC address, it checks its MAC address table. If the address is found, the switch forwards the frame to the corresponding port.*

*3. Frame Filtering*

*- If the destination MAC address is not in the MAC address table, the switch will broadcast the frame to all ports (except the one it came from). This process helps in discovering devices on the network.*

*4. Collision Domain Management*

*- Each port on a switch represents a separate collision domain, meaning that devices connected to different ports can transmit simultaneously without collisions, unlike a hub which creates a single collision domain.*

*5. Full-Duplex Communication*

*- Switches generally support full-duplex communication, allowing simultaneous data transmission and reception between devices, further enhancing performance.*

*6. VLAN Support: - Many switches support Virtual Local Area Networks (VLANs), allowing network segmentation for better organization and security. VLANs can isolate traffic within the same physical switch.*

*7. Quality of Service (QoS)*

*- Switches can implement QoS policies to prioritize certain types of traffic, such as voice or video, ensuring better performance for critical applications.*

*8. Switching Methods*

*- Store-and-Forward: The switch receives the entire frame before forwarding it, allowing error checking.*

*- Cut-Through: The switch starts forwarding the frame as soon as it reads the destination address, which reduces latency.*

*- Fragment Free: A hybrid approach that checks the first 64 bytes of the frame before forwarding, striking a balance between speed and error handling.*

*7-Describe the purpose and functions of various network devices*

*ANS. Network devices have a important role in the functioning of computer networks. They serve different purposes and perform specific functions based on their roles in the networks Some most common network devices and their functions are stated below :-*

*1. Routers - By using routing tables to find best path for data transmission based on IP address they forward packets between different networks.*

*2. Switches :- It is used to connect multiple devices within a single network. Switches learn and store the MAC addresses of connected devices and forward data packets based on their destination MAC address.*

*3. Access points:- These are used to provide wireless connection to devices. APs provide wireless access to devices, allowing them to connect to the internet or other networks wirelessly.*

*4. Hubs :- Hubs are older network devices that connect multiple devices using a single data link. They do not have any intelligence or filtering capabilities, and all data is broadcast to all connected devices and also this is not recommended for modern networks due to their limited functions.*

*5. Bridges are similar to hubs but they connect multiple devices using a single data link and they can also filter and forward data based on MAC addresses, making them more efficient than hubs.*

*6. Firewalls:- Firewalls are network security devices that monitor and control incoming and outgoing network traffic because they filter and block traffic based on predefined rules, protect against viruses and malware, and enforce security policies.*

*7. Load Balancer:- They are used to distribute network traffic evenly among multiple servers to improve performance and availability. It can handle high traffic loads and provide fault tolerance by redirecting traffic to healthy servers when one becomes unavailable.*

*8. Proxies :- These are intermediary servers that sit between clients and servers. They are used for various purposes such as caching, security, and content filtering*

*8-Make list of the appropriate media, cables, ports, and connectors to 8- 8-connect switches to other.*

*ANS. To connect multiple 8-port switches together, you'll need appropriate media, cables, ports, and connectors. Here’s a list:*

*1. Media Types*

*- Copper Cable: Most commonly used for short distances.*

*- Fiber Optic Cable: Used for longer distances or higher bandwidth requirements.*

*2. Cables*

*- Ethernet Cables (Copper):*

*- Category 5e (Cat 5e): Supports speeds up to 1 Gbps for short distances (up to 100 meters).*

*- Category 6 (Cat 6): Supports speeds up to 10 Gbps for short distances (up to 55 meters).*

*- Category 6a (Cat 6a): Supports speeds up to 10 Gbps for longer distances (up to 100 meters).*

*- Fiber Optic Cables:*

*- Single-Mode Fiber (SMF) Ideal for long distances (over 1 km).*

*- Multi-Mode Fiber (MMF): Suitable for shorter distances (up to 300 meters for 10 Gbps).*

*3. Ports*

*- Ethernet Ports:*

*- Standard RJ-45 ports for copper Ethernet cables.*

*- Fiber Ports:*

*- SC, LC, or ST connectors for fiber optic cables (depending on the switch's specifications).*

*4. Connectors*

*- RJ-45 Connectors: Used for terminating Ethernet cables (Cat 5e, Cat 6, etc.).*

*- Fiber Optic Connectors: Depending on the fiber type used:*

*- SC (Subscriber Connector): Common for single-mode and multi-mode fiber.*

*- LC (Lucent Connector): Compact and widely used in high-density applications.*

*- ST (Straight Tip): Typically used in older networks.*

*5. Additional Considerations*

*- Patch Panels: For organized management of multiple cable connections, especially in larger setups.*

*- Network Switches: Ensure all switches have compatible ports (RJ-45 for copper or SFP for fiber).*

*- Power over Ethernet : If powering devices like IP cameras or phones, ensure your switches support PoE.*

*9-Define Network devices and hosts.*

*ANS. Network devices and hosts are two important components of a computer network.*

*Network devices:*

*- Network devices are hardware components that allows communication between computers and other devices in a network and it operate at different layers of the OSI model.*

*- They include routers, switches, access points, hubs, bridges, firewalls, load balancers, and proxies.*

*Hosts:*

*- Hosts are end-user devices that are connected to a network, such as computers, servers, smartphones, and IoT devices. It provide the user a interface for accessing network resources and applications.*

*- Hosts can be categorized as clients or servers, depending on their role in the network.*

*- Clients request and receive data from servers, while servers provide services to clients.*

*Network devices and hosts work together to allow communication and resource sharing within a network. The network devices make possible the transmission of data between hosts, while hosts provide the end-user interface and serve as the source or destination of data.*