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Task 11

1. DHCP (Dynamic Host Configuration Protocol)

Definition: DHCP is a network protocol used to automatically assign IP addresses and other network configuration parameters (like gateway, DNS) to devices on a network. This eliminates the need for manual configuration of devices.

How it works:

1. When a device (client) connects to the network, it sends a **DHCP Discover** request.
2. The DHCP server responds with a **DHCP Offer** containing an IP address and configuration.
3. The client sends a **DHCP Request** to confirm.
4. The server sends an acknowledgment (**DHCP Ack**) finalizing the process.

Example:

- In a school network, a DHCP server assigns:
    - PC1: IP `192.168.1.10`
    - PC2: IP `192.168.1.11`
    - Printer: IP `192.168.1.12`

Without DHCP, these devices would need to be manually configured with IP addresses.

2. VLAN (Virtual Local Area Network)

Definition: VLAN is a logical segmentation of a network into different broadcast domains. It allows devices to be grouped together, even if they are on separate physical switches, improving security and reducing broadcast traffic.

How it works:

- VLANs are configured on a network switch.
- Each port on the switch is assigned to a VLAN.

- Devices in the same VLAN can communicate directly; communication between VLANs requires a router or Layer 3 switch.

Example: A company has three departments: Admin, Finance, and HR. Using VLANs:

- **VLAN 10**: Admin (IP `192.168.1.0/24`)
- **VLAN 20**: Finance (IP `192.168.2.0/24`)
- **VLAN 30**: HR (IP `192.168.3.0/24`)

Admins can only access their VLAN, ensuring data isolation between departments.

3. DNS (Domain Name System)

Definition: DNS translates human-readable domain names (like `www.google.com`) into IP addresses (like `142.250.190.46`), which computers use to locate resources on the internet.

How it works:

1. A user enters a domain name in their browser.
2. The browser sends a query to a DNS server.
3. The DNS server resolves the domain name to its corresponding IP address and sends it back to the browser.

Example:

- User types `www.example.com`.
- DNS resolves `www.example.com` to `93.184.216.34`.
- The browser connects to `93.184.216.34` to load the website.

Example Combined Scenario

Imagine a university:

1. **DHCP**: Automatically assigns IP addresses to students' laptops when they connect to Wi-Fi.
2. **VLAN**: Segments the network into:
    - VLAN 10 for Administration (IP `192.168.1.0/24`)
    - VLAN 20 for Students (IP `192.168.2.0/24`)
    - VLAN 30 for Faculty (IP `192.168.3.0/24`).

3. **DNS**: Resolves domain names like `universityportal.edu` to the web server's IP address (e.g., `192.168.4.10`).

This setup ensures dynamic configuration (DHCP), network isolation (VLAN), and seamless web navigation (DNS).