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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).