

**COMPUTER NETWORKS LAB**

**LAB 11**

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**1. DHCP (Dynamic Host Configuration Protocol)**

**Definition:**

* DHCP is a protocol used to dynamically assign IP addresses to devices in a network. It eliminates the need for manual IP configuration, reducing administrative overhead.

**How It Works:**

1. When a device connects to the network, it sends a broadcast request for an IP address.
2. The DHCP server responds by offering an available IP address from its pool.
3. The device accepts the IP address and uses it for network communication.

**Example:**

* **Scenario:** A company has a network with 50 devices. Instead of manually assigning IP addresses to each device, a DHCP server is configured to handle this task.
* **Configuration:**
  + Subnet: 192.168.1.0/24
  + DHCP Pool: 192.168.1.100 to 192.168.1.200
* **Commands on a Router:**
* ip dhcp pool OFFICE
* network 192.168.1.0 255.255.255.0
* default-router 192.168.1.1
* dns-server 8.8.8.8
* A device (e.g., a laptop) connects to the network and automatically gets an IP address like 192.168.1.101 from the DHCP server.

**2. VLAN (Virtual Local Area Network)**

**Definition:**

* A VLAN is a logical segmentation of a physical network into multiple smaller networks. It isolates traffic between groups of devices even if they share the same physical switch.

**Why Use VLANs?**

* Improve security by isolating sensitive data.
* Reduce broadcast traffic.
* Organize devices logically rather than physically.

**Example:**

* **Scenario:** A company has three departments: IT, HR, and Sales.
  + IT VLAN: 192.168.10.0/24
  + HR VLAN: 192.168.20.0/24
  + Sales VLAN: 192.168.30.0/24
* **Configuration Commands on a Switch:**
* vlan 10
* name IT
* vlan 20
* name HR
* vlan 30
* name SALES
* interface GigabitEthernet0/1
* switchport mode access
* switchport access vlan 10
* interface GigabitEthernet0/2
* switchport mode access
* switchport access vlan 20
* Devices in the IT VLAN (e.g., IPs 192.168.10.2 and 192.168.10.3) can communicate with each other but not with devices in the HR VLAN (192.168.20.2) unless **Inter-VLAN Routing** is configured.

**3. DNS (Domain Name System)**

**Definition:**

* DNS translates human-readable domain names (e.g., www.google.com) into machine-readable IP addresses (e.g., 142.250.190.14). It simplifies access to network resources.

**Why Use DNS?**

* Memorizing domain names is easier than IP addresses.
* Enables dynamic mapping for load balancing and redundancy.

**How It Works:**

1. A user types www.google.com into a browser.
2. The request is sent to a DNS server.
3. The DNS server resolves the domain name into an IP address and returns it to the browser.
4. The browser uses the IP address to connect to the website.

**Example:**

* **Scenario:** A company sets up a local DNS server to resolve internal resources.
  + **Internal Website:** hr.company.local
  + **Internal IP:** 192.168.20.5
* **Configuration on a Router (DNS Server):**
* ip dns server
* ip host hr.company.local 192.168.20.5
* When a user enters hr.company.local in the browser, the DNS server returns the IP address 192.168.20.5, allowing access to the HR portal.

**Comparison Table**

| **Feature** | **DHCP** | **VLAN** | **DNS** |
| --- | --- | --- | --- |
| **Purpose** | Assign IP addresses dynamically | Logical segmentation of networks | Resolve domain names to IPs |
| **Layer** | Layer 7 (Application) | Layer 2 (Data Link) | Layer 7 (Application) |
| **Key Benefit** | Reduces manual configuration | Improves security and efficiency | Simplifies access to resources |
| **Example** | Assigns IP 192.168.1.101 to a PC | Segments IT and HR traffic | Resolves www.google.com to IP |

**Combined Use Case**

In a corporate network:

1. **DHCP** assigns IP addresses dynamically to devices in each VLAN.
2. **VLANs** segment the network into logical groups (e.g., IT, HR, Sales).
3. **DNS** resolves internal and external domain names for users to access resources seamlessly.