DHCP SERVER

A **DHCP server** is a network service that automatically assigns IP addresses and other network configuration settings (such as subnet mask, default gateway, and DNS servers) to devices (clients) on a network. DHCP stands for **Dynamic Host Configuration Protocol**, and its primary purpose is to make network management easier and more efficient.

### ****Key Features of a DHCP Server****

1. **Dynamic IP Address Allocation**:
   * Automatically assigns IP addresses from a predefined range (scope or pool).
   * Reduces manual configuration effort and errors.
2. **Lease Management**:
   * Provides IP addresses for a limited duration (lease time), allowing reuse when devices disconnect or leave the network.
3. **Configuration Distribution**:
   * Supplies additional settings like:
     + Subnet Mask
     + Default Gateway (router)
     + DNS Server
     + Time Server
     + Other options, such as PXE boot information for network booting.
4. **Support for Different Allocation Modes**:
   * **Dynamic Allocation**: IPs are assigned dynamically from a pool and reused when leases expire.
   * **Automatic Allocation**: Assigns the same IP to a device each time it connects (persistent mapping).
   * **Manual Allocation**: Specific IPs are reserved for particular devices (based on MAC address).

### ****How a DHCP Server Works****

1. **Discovery**:
   * A device (client) without an IP address broadcasts a **DHCPDISCOVER** message to find a DHCP server.
2. **Offer**:
   * The DHCP server responds with a **DHCPOFFER**, suggesting an available IP address and other configuration details.
3. **Request**:
   * The client sends a **DHCPREQUEST** to indicate acceptance of the offer.
4. **Acknowledgment**:
   * The DHCP server sends a **DHCPACK** to confirm the lease, completing the process. The client now has an IP address and network settings.

### ****Why Use a DHCP Server?****

* **Simplifies Network Management**:
  + Automatically handles IP allocation and prevents conflicts.
  + No need for manual configuration of each device.
* **Efficient Resource Use**:
  + Reclaims unused IP addresses for new devices.
* **Flexibility**:
  + Adapts to dynamic environments where devices frequently join and leave the network.
* **Scalability**:
  + Supports large networks with hundreds or thousands of devices.

**Subnet**

A **subnet** (short for **subnetwork**) is a smaller, logically defined segment of a larger network. Subnets are used to divide a network into smaller, more manageable sections to improve performance, enhance security, and organize devices more effectively.

It is help to:

1.Efficient IP address management.

2.Segregation of network traffic.

3.Support for multiple network.

4.Network design flexibility.

5.Scalability.

6.Improved security.

7.Efficient resource allocation.

8.Geographical and Logical separation.

How DHCP handles subnets

A DHCP server assigns IP addresses based on the subnet from which the client request originates. To achieve this:

* **Relay Agents:** For devices across different subnets, DHCP relay agents forward requests to the central DHCP server. This ensures the server can handle multiple subnets even if the clients are not directly on the same subnet.
* **Configuration:** The DHCP server is configured with separate scopes or pools for each subnet, defining the IP range, gateway, DNS servers, and other settings specific to that subnet.

By leveraging subnets in a DHCP server, organizations achieve better network organization, efficiency, and reliability.

Subnet 1: 192.168.1.0/24 (256 addresses)

**Netmask**

A **netmask** (or subnet mask) in a DHCP (Dynamic Host Configuration Protocol) server is used to define the size and structure of the subnet in which the DHCP server is assigning IP addresses. It ensures that devices on the network understand their network boundaries and can communicate correctly with other devices.

Reasons for using a netmask in a DHCP server:

1.Defining the subnet

Example:

* IP Address: 192.168.1.10
  + Netmask: 255.255.255.0 (or /24)
    - Network Portion: 192.168.1.0
    - Host Portion: 10

2.Brodcast and Communication boundaries.

3.Preventing Ip address conflicts.

4.Scalable Network management.

5.Efficient use of IP address space.

6.Routing and Gateway configuration.

Example of DHCP scope configuration with netmask:

#### Subnet: 192.168.1.0/24

* **Netmask:** 255.255.255.0
* **Range of IPs:** 192.168.1.1 to 192.168.1.254
* **Default Gateway:** 192.168.1.1

**Range**

A **DHCP (Dynamic Host Configuration Protocol) server** needs a range, called the **DHCP pool** or **scope**, to allocate IP addresses dynamically to devices (clients) on a network.

Here's why this range is necessary:

1.Efficient IP address management.

2.Prevention of IP conflicts.

3.Scalability.

4.Custom configurations.

5.Limited resource allocation.

Example Scenario

In a network with the subnet 192.168.1.0/24:

Total IPs available: 192.168.1.1 to 192.168.1.254 (254 usable addresses).

DHCP range: 192.168.1.100 to 192.168.1.200 (100 IPs).

Reserved addresses:

192.168.1.1: Router.

192.168.1.2 to 192.168.1.10: Servers.

**Default and max lease time**

The **default-lease-time** and **max-lease-time** parameters in a DHCP server configuration determine how long IP addresses are assigned to clients before they must be renewed. Here's what they mean:

**1. default-lease-time 600;**

* **Explanation**: This sets the default lease time to **600 seconds** (10 minutes) for DHCP clients that do not request a specific lease duration.
* **Usage**:
  + Ideal for environments where devices connect briefly, such as public Wi-Fi networks or kiosks.
  + Short lease times free up IP addresses quickly for reuse, which is useful if the network has limited IPs.

**2. max-lease-time 7200;**

* **Explanation**: This sets the maximum lease time to **7200 seconds** (2 hours).
* **Usage**:
  + Even if a client requests a longer lease, the DHCP server will not assign a lease duration longer than 2 hours.
  + Helps ensure that IP addresses are not held for too long, especially in dynamic environments.

**Setup DHCP server to Kali Linux**

**1.Update and upgrade Linux**

sudo apt update

sudo apt upgrade

**2.Install DHCP server**

sudo apt install isc-dhcp-server

**3.Configure the DHCP server**

sudo vim /etc/dhcp/dhcpd.conf

default-lease-time 600;

max-lease-time 7200;

subnet 192.168.8.0 netmask 255.255.255.0 {

range 192.168.8.110 192.168.8.150;

option routers 192.168.8.1;

option domain-name-servers 8.8.8.8, 8.8.4.4;

option domain-name "example.local";

}

authoritative;

**4.Configure the DHCP server interface**

sudo vim /etc/default/isc-dhcp-server

INTERFACESv4="eth0"

**5.Debug**

sudo dhcpd -t

**6.Start and Enable the DHCP server**

sudo systemctl start isc-dhcp-server

sudo systemctl enable isc-dhcp-server

**7.Verify the configuration**

systemctl status isc-dhcp-server

