1. <u>Introduction</u>

<u>Dynamic Host Configuration Protocol (DHCP)</u> is a network management protocol used in networks to dynamically assign IP addresses & other network configuration information like default gateway, mask, DNS server address etc. DHCP server automatically assigns IP address to various devices in network. This in turn reduces work of Network Administrator to manually assign IP address to various devices. Automatic IP address assignment process undergoes four message exchange. These messages are abbreviated as Discover, Offer, Request & Acknowledgement (DORA). The following table gives the detail of these four messages.

How DHCP server assigns an IP address to a host?

DHCP_DISCOVER: When a new node is connected to the network, it broadcasts the DHCP_DISCOVER message which contains the source address as 0.0.0.0 to every node on the network including the server. DHCP server on receiving the message returns the DHCP_OFFER message to the requested host which contains the server address and new IP address to the node.

DHCP_OFFER: If there are multiple servers on the network, the host receives multiple DHCP_OFFER messages. It is up to the host to select a particular message.

DHCP_REQUEST: The requested host on receiving the offer message, again broadcasts the DHCP _REQUEST message on the network with the address of the server whose offer message is accepted by the host. The server which pertains to that server address sent by the host checks whether the address to be assigned to the node is available in the data storage.

DHCP_ACK: If the address is assigned, it marks the IP address in the storage as unavailable to ensure consistency. Now, the server sends a DHCP_ACK packet to the requested host which contains network information(IP address, subnet mask, gateway address). In case, if the address is assigned to another machine meanwhile, then the server sends the packet DHCP_NAK to the requested host indicating that the IP address is assigned to some other machine.

DHCP_RELEASE: And finally, If the host wants to move to another network or if it has finished its work, it sends the DHCP_RELEASE packet to the server indicating that it wants to disconnect. Then the server marks the IP address as available in the storage so that it can be assigned to other machines.

To configure a host, we require the following things:

Leased IP address – IP address to a host that lasts for a particular duration which goes for a few hours, a few days, or a few weeks.

Subnet Mask – The host can know on which network it is on.

Gateway address – The Gateway is the Internet Service Provider that connects users to the internet. The Gateway address lets the host know where the gateway is to connect to the internet.

DHCP Entities

DHCP server: It automatically provides network information(IP address, subnet mask, gateway address) on lease. Once the duration is expired, that network information can be assigned to another machine.   It also maintains the data storage which stores the available IP addresses.

DHCP client: Any node which requests an IP address allocation to a network is considered a DHCP client.

DHCP Relay Agent: In case, we have only one DHCP server for multiple LAN's then this Agent which presents in every network forwards the DHCP request to the DHCP server. So, using DHCP Relay Agent we can configure multiple LANs with a single server.

2. <u>Idea Of The Project</u>

Configure a Server for Dynamic Host Configuration Protocol (DHCP) to dynamically assign addresses to attached hosts. Simulate a laboratory environment using Cisco Packet Tracer.

3. <u>Methodology</u>

Firstly, Start a Hyper Terminal session.

<u>Step 1</u> Configure the Server
Configure all of the following according to the chart:
• The Pool-Name
• The Default Gateway
• The DNS Server (If applicable)
• The Starting IP address And The Sub-net Mask
• The Maximum Number of Users
<u>Step 2</u> Save the configuration
<u>Step 3</u> Create a static route
<u>Step 4</u> Create a default route
<u>Step 5</u> Create the DHCP address pool
<u>Step 6</u> Excluding addresses from pool
<u>Step 7</u> Verifying DHCP Operation

Report Configuring DHCP service on a generic server in Packet Tracer.

1. Build the network topology for simulating a Laboratory Environment in Packet Tracer using Generic server DHCP topology.

2. Configure static IP address on the server.

3. Now configure DHCP service on the generic server.

To do this, click on the server, then click on Services tab. You will pick DHCP on the menu. Then proceed to define the DHCP network parameters as follows:

1. Firstly Set the Pool name, Set the Default Gateway, Set the DNS Server if applicable, Set the Starting IP Address, Set the Sub-net Mask And Set the Maximum Number of users.

2. Click on add then Save.The DHCP entry is included in the list.

3. Here are the configurations on the server:

4. Basic DHCP on a generic server

5. Once you've configured everything, turn ON the DHCP service.

4. Finally, enable DHCP configuration on each PC. The PCs should get automatically configured.

4. **Implementation And Design**

✓ The process goes more smoothly if you configure the routers first, and then the PCs in each subnet.

✓ The specific port on a switch does not matter (until we get to a point in the semester where we are configuring switches)

✓ The specific port on a router does matter. The router configuration in software needs to be consistent with the way the cables are wired in hardware.

✓

Configuration Steps:

1. Configure the **Pool Name** of the Server in DHCP to prevent confusion.

2. Configure the **Pool Name** of the Switches in the network to prevent confusion.

3. Configure **IP addresses** on the server interfaces that are connected to sub-nets.

4. Configure **dynamic routing (RIP)** between sub-nets 1 and 2. After configuration, verify with routing that the route table is as you desire.

5. Configure the **DHCP server** on both networks to provide addresses to their directly connected to the sub-net.

   1. Switch1 should provide addresses to Subnet1

   2. Switch2 should provide addresses to Subnet2

6. Enable the **DHCP client** on the DHCPs Con-fig.

7. Save the configuration on the DHCP_Server via the save command and exit safe mode on the server.

Configuring a DHCP_Server : Interface Ethernet0/0

Pool name	LAB_1
Default Gateway	192.168.1.254
DNS Server	8.8.8.8
Start IP Address	192.168.1.1
Subnet Mask	255.255.255.0
Maximum Number of users	255

Configuring a DHCP_Server : Interface Ethernet0/1

Pool name	LAB_2
Default Gateway	192.168.2.254
DNS Server	8.8.8.8
Start IP Address	192.168.2.1
Subnet Mask	255.255.255.0
Maximum Number of users	255

Configuring a host using DHCP :

Using the DHCP Con-fig all the IP addresses are assigned automatically to all the PCs in both the networks i.e, LAB_1, LAB_2. Each of the Laboratories have 20 PCs and are automatically configured using DHCP protocol and IP addresses are assigned by the server according to starting configuration 192.168.1.1 till the required number of IPs respectively assigned to individual PC. And Similarly the same applies for the other network too. Configuration of different PCs are given below.

5. <u>Observation And Results</u>

The Lab 1 and Lab 2 are successfully configured using the Dynamic Host Configuration Protocol   method i.e, DHCP and Each of the Laboratories have there own networks which is configured using the default gateways i.e, Lab_1 Default Gateway : 192.168.1.254 and Lab_2 Default Gateway : 192.168.2.254. Using the same DHCP technique we can configure many Laboratories in a Single University Campus. The speed of allocating IP addresses is faster with the help of DHCP. Even the Message transfer within the network and between the networks is fast. It even blocks any external connection request unless the request is authorized.

6. <u>Conclusion</u>

This project describes how to set up and install a DHCP (Dynamic Host Configuration Protocol) server for Laboratories. It also demonstrates how to authorise a DHCP server and construct and configure

Laboratories. Users can use as many DHCP servers as they want on a same physical network if the address range is divided into many scopes. When a host is assigned an IP address, the server transmits a packet containing network information (IP address, subnet mask, gateway address) to the requested host. If the address is assigned, the server marks the IP address as available in storage so that it can be issued to other machines. The server also manages the data storage, which contains the list of accessible IP addresses. Configuring a host via the Dynamic Host Configuration Protocol (DHCP) is straightforward and quick. We can configure multiple laboratories on a single university campus using the same technique. DHCP speeds up the process of allocating IP addresses. Message transport within and between networks is also quick.