EX.NO:05(A)

Date:

DHCP Relay Configuration | IP Helper Address

Aim:

To configure DHCP relay (IP Helper Address) on a router so that hosts in different VLANs/subnets can obtain IP addresses dynamically from a centralized DHCP server.

Theory:

- DHCP uses **broadcast messages** to discover a DHCP server (Discover/Offer/Request/Ack).
- Broadcasts do **not cross routers**, so hosts in different VLANs cannot reach a central DHCP server directly.
- To solve this, we configure the router interface with **IP helper-address <DHCP-server-IP>**.
- The router will **relay** DHCP broadcast requests from clients to the DHCP server as **unicast** messages.
- The DHCP server then responds, and the router forwards the reply back to the clients.

Required Equipment:

1. Cisco Router (2811)
2. Cisco Switch (2960)
3. DHCP Server (Packet Tracer Server)
4. End Devices – PCs / IP Phones
5. Copper Straight-through cables
6. Cisco Packet Tracer software

Procedure:

Step 1: Build the Topology

- Connect **Router ↔ Switch ↔ PCs/Phones**.
- Connect **Server** to the switch (this will act as DHCP server).
- Assign PCs/Phones to VLANs (optional, if using VLAN-based DHCP).

Step 2: Configure the DHCP Server

On **Server1**:

1. Go to **Desktop → IP Configuration**
    - IP: 192.168.10.10
    - Subnet: 255.255.255.0
    - Gateway: 192.168.10.1
2. Go to **Services → DHCP**
    - Enable DHCP
    - Pool Name: VLAN10
    - Default Gateway: 192.168.10.1
    - Start IP: 192.168.10.100
    - Subnet Mask: 255.255.255.0
    - DNS Server: (optional)

Step 3: Configure Router Interfaces

Example for two VLANs:

```
Router> enable
Router# configure terminal
!
! Configure VLAN 10 sub-interface
Router(config)# interface g0/0.10
Router(config-subif)# encapsulation dot1Q 10
Router(config-subif)# ip address 192.168.10.1 255.255.255.0
Router(config-subif)# ip helper-address 192.168.10.10
!
! Configure VLAN 20 sub-interface
Router(config)# interface g0/0.20
Router(config-subif)# encapsulation dot1Q 20
Router(config-subif)# ip address 192.168.20.1 255.255.255.0
Router(config-subif)# ip helper-address 192.168.10.10
!
Router(config)# exit
```

Router(config)# interface g0/0

Router(config-if)# no shutdown

- ip helper-address 192.168.10.10 → tells the router to forward DHCP requests to the DHCP server.

Step 4: Configure Switch Ports

Switch> enable

Switch# configure terminal

Switch(config)# interface fa0/1

Switch(config-if)# switchport mode access

Switch(config-if)# switchport access vlan 10

!

Switch(config)# interface fa0/2

Switch(config-if)# switchport mode access

Switch(config-if)# switchport access vlan 20

Step 5: Configure Clients (PCs / IP Phones)

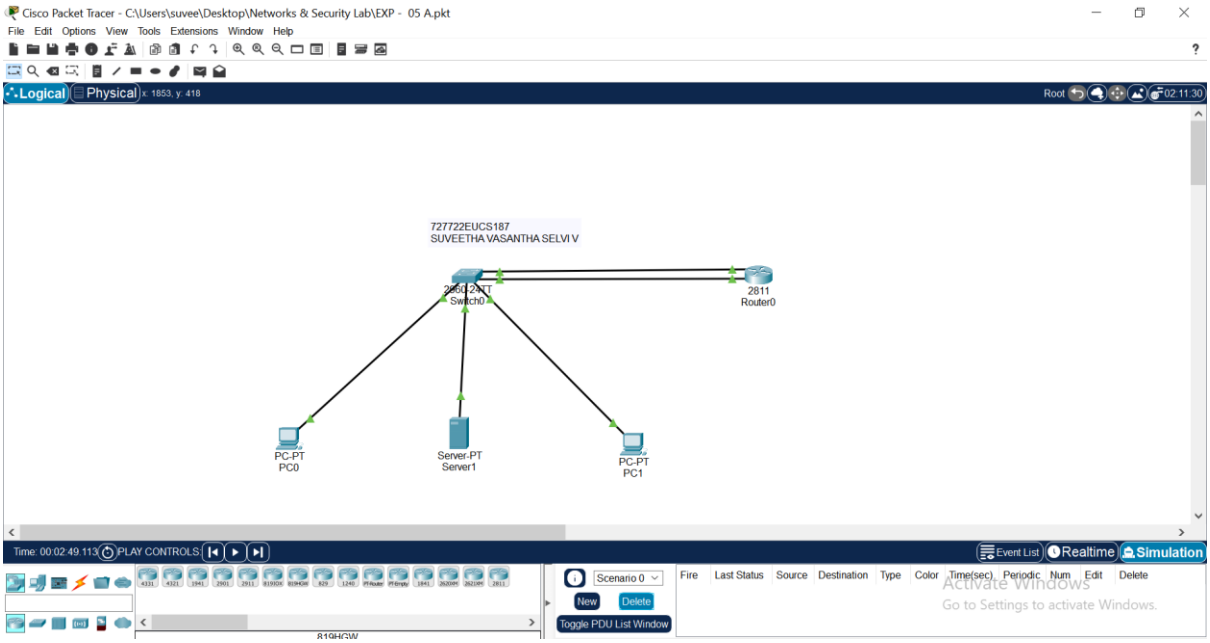
- On PC0 / PC1 / IP Phone:
    - Go to Desktop → IP Configuration
    - Select **DHCP**
    - The device should automatically receive IP, Subnet, Gateway from the DHCP server.

Testing:

1. On PC0 (VLAN 10), check ipconfig → should get an IP from 192.168.10.100+ range.
2. On PC1 (VLAN 20), check → should get an IP from 192.168.20.100+.
3. Ping the router gateway and server → should succeed.
4. Cross-VLAN communication works if Router-on-a-Stick is enabled.

Model Output:

DHCP Relay Configuration | IP Helper Address



Result:

DHCP relay was successfully configured using **IP Helper Address**, enabling clients in different VLANs/subnets to obtain IP addresses dynamically from a centralized DHCP server.