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DHCP CONFIGURATION LAB

IN CISCO PACKET TRACER

HANDS-ON LAB

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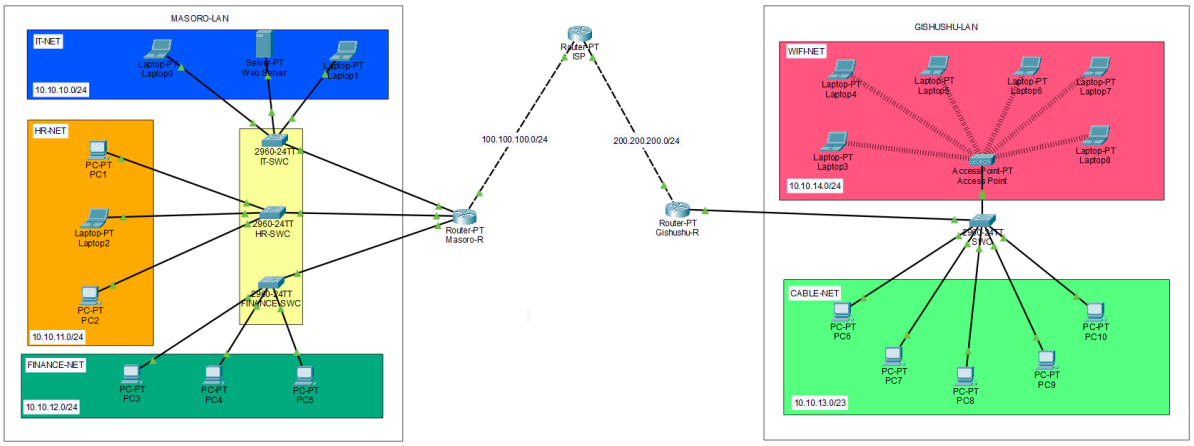
1. Introduction

In this topology, the Dynamic Host Configuration Protocol (DHCP) was implemented to automate the assignment of IP addresses to end devices across all subnets in both the Masoro and Gishushu LANs. Instead of manually configuring IP settings for each host, DHCP allows the routers to dynamically distribute network parameters such as IP addresses, subnet masks, default gateways, and DNS servers to client machines automatically.

2. Network Topology Design



Routers: Used to make connect network and Acts as DHCP server

Switch: Connects multiple end devices

End Devices (Server, PCs/Laptops): Clients used in topology

3. IP Addressing Scheme and DHCP configuration

Step 1: Opened Router in Packet Tracer -> Opened CLI tab

Step 2: Enter Configuration global mode

```
29061> enable
29061# configure terminal
```

Step 3: Excluded IP address

```
29061(config)# ip dhcp excluded-address 10.10.10.10
```

I only had one Static IP address on server, this command ensures that this IP address exclude from DHCP pool

Step 4: Create DHCP Pool

```
29061(config)# ip dhcp pool IT-NET
29061(dhcp-config)# network 10.10.10.0 255.255.255.0
29061(dhcp-config)# default-router 10.10.10.1
29061(dhcp-config)# dns-server 10.10.10.10
```

```
29061> enable
29061# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
29061(config)# ip dhcp excluded-address 10.10.10.10
29061(config)# ip dhcp pool IT-NET
29061(dhcp-config)# network 10.10.10.0 255.255.255.0
29061(dhcp-config)# default-router 10.10.10.1
29061(dhcp-config)# dns-server 10.10.10.10
```

Explanation of commands

enable: this enable enter EXEC mode.

configure terminal: Enter global mode.

ip dhcp excluded-address 10.10.10.10: This tells dhcp pool to exclude that ip address.

ip dhcp pool IT-NET: This name of subnet you want pool address too.

network: Shows range of network and specify subnet mask

default-router: shows the gateway clients will use

dns-server: Sets domain name server

Step 5: Configure router interface

```
29061(config)# interface GigabitEthernet8/0
29061(config-if)# ip address 10.10.10.1 255.255.255.0
29061(config-if)# no shutdown
29061(config-if)# exit
```

Verification by using the command prompt

Step 1: Open laptop device

Step 2: Navigate to Desktop tab

Step 3: Select command prompt

Step 4: type ipconfig or ipconfig /all

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.....: FE80::260:70FF:FEDB:B5A2
   IPv6 Address.....: ::
   IPv4 Address.....: 10.10.10.3
   Subnet Mask.....: 255.255.255.0
   Default Gateway.....: ::
                                 10.10.10.1

Bluetooth Connection:

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.....: ::
   IPv6 Address.....: ::
   IPv4 Address.....: 0.0.0.0
   Subnet Mask.....: 0.0.0.0
   Default Gateway.....: ::
                                 0.0.0.0
```

4. Verifying DHCP Configuration on Router

Use the following commands commands

```
29061# show running-config | section dhcp
29061# show ip dhcp pool
29061# show ip dhcp binding
```

Explanation of used command

Show running-conf | section dhcp: Shows current configurations

```
29061-R#show running-config | section dhcp
ip dhcp excluded-address 10.10.10.10
ip dhcp pool IT-NET
 network 10.10.10.0 255.255.255.0
 default-router 10.10.10.1
 dns-server 10.10.10.10
ip dhcp pool HR-NET
 network 10.10.11.0 255.255.255.0
 default-router 10.10.11.1
 dns-server 10.10.10.10
ip dhcp pool FINANCE-NET
 network 10.10.12.0 255.255.255.0
 default-router 10.10.12.1
 dns-server 10.10.10.10
```

Show ip dhcp pool: Displays **details for each DHCP pool**

```
29061-R#show ip dhcp pool

Pool IT-NET :
 Utilization mark (high/low)    : 100 / 0
 Subnet size (first/next)       : 0 / 0
 Total addresses                : 254
 Leased addresses               : 1
 Excluded addresses             : 1
 Pending event                  : none

 1 subnet is currently in the pool
 Current index        IP address range                    Leased/Excluded/Total
 10.10.10.1           10.10.10.1       - 10.10.10.254      1    / 1      / 254

Pool HR-NET :
 Utilization mark (high/low)    : 100 / 0
 Subnet size (first/next)       : 0 / 0
 Total addresses                : 254
```

show ip binding: Shows a list of **IP addresses leased to clients**

```
29061-R#show ip dhcp binding
IP address       Client-ID/              Lease expiration        Type
                 Hardware address
10.10.10.2       0060.70DB.B5A2            --                    Automatic
10.10.10.3       00D0.FF4B.ED55            --                    Automatic
10.10.11.2       0000.0C35.C617            --                    Automatic
10.10.11.3       000C.8514.5900            --                    Automatic
10.10.11.4       0002.4AB6.BD01            --                    Automatic
10.10.12.2       0010.119A.2DD8            --                    Automatic
10.10.12.3       000A.F3E6.AA00            --                    Automatic
10.10.12.4       000D.BD20.A664            --                    Automatic
```

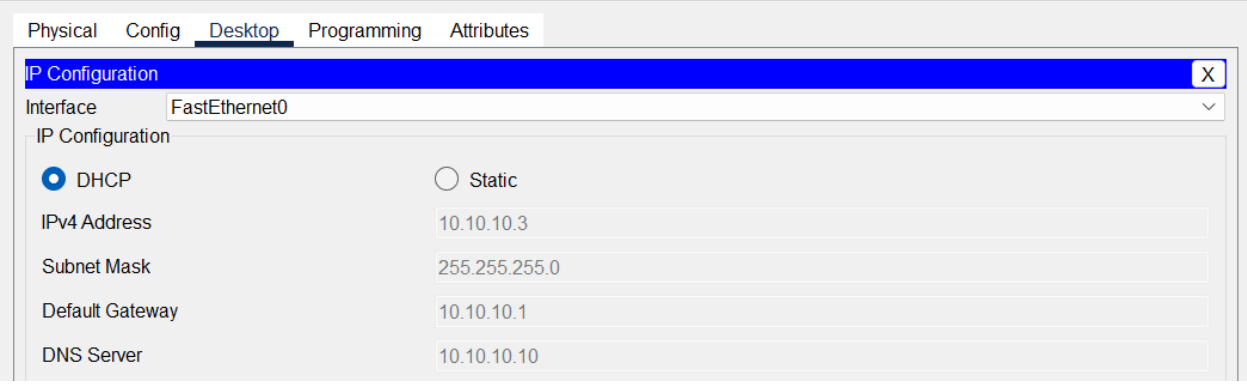
On Clients laptops to get IP address Dynamically

Step 1: Open laptop device

Step 2: Navigate to Desktop tab

Step 3: Select IP configuration

Step 4: Select DHCP



5. Encountered Challenges

In the **Gishushu LAN**, I initially struggled with assigning IP addresses to **WIFI-NET (10.10.14.0/24)** and **CABLE-NET (10.10.13.0/24)** because both networks were connected to the **same switch**, which in turn had only **one physical link to the router**. At first, I tried assigning only one IP address to the router port, but this did not allow both networks to communicate properly.

Later, I discovered the concept of **Router-on-a-Stick**, which allows a single physical router port to handle multiple IP subnets by creating **sub-interfaces**, each assigned to a specific VLAN. I configured the switch port connecting to the router in **trunk mode**, enabling it to carry traffic for multiple VLANs simultaneously. I then applied **NAT** on these sub-interfaces to allow the devices in both VLANs to access external networks.

Using this method, a single router port was able to serve multiple IP flows corresponding to their respective VLANs, resolving the connectivity issue and reinforcing my understanding of **inter-VLAN routing** and VLAN tagging.

I corrected by following these steps

Step 1: Configure sub-Interface

```
29061(config)# interface g8/0.13
29061(config-subif)# encapsulation dot1Q 13
29061(config-subif)# ip address 10.10.13.1 255.255.255.0
29061(config-subif)# ip nat inside
29061(config-subif)# exit
```

```
29061(config)# interface g8/0.14
29061(config-subif)# encapsulation dot1Q 14
29061(config-subif)# ip address 10.10.14.1 255.255.255.0
29061(config-subif)# ip nat inside
29061(config-subif)# exit
```

Explanation of used Commands

Interface g8/0.13: creates a sub-interface .13 on physical interface g8/0

Interface g8/0.14: creates a sub-interface .14 on physical interface g8/0

encapsulation dot1Q: Assigns VLA 13 to this sub-interface using 802.1Q trunking.

Ip address 10.10.13.1 255.255.255.0: Assigns IP address for CABLE-NET (VLAN 13)

Ip nat inside: Marks sub-interface as inside for NAT

exit: Exit from sub-interface

Step 2: Switch port Trunking

```
29061-S4(config)# interface g0/1
29061-S4(config-if)# switchport mode trunk
29061-S4(config-if)# switchport trunk allowed vlan 13,14
```

Explanation of used commands

Interface g0/1: entering the port connected to router

switchport mode trunk: Configure the switch port connectivity to router as trunk.

switchport trunk allowed vlan 13,14: Restrict the trunk to only VLAN 13 and VLAN 14

Summary

During the activity, the following tasks were successfully completed:

1. **IP Addressing & Subnetting**:
    a. Masoro LAN: IT-NET (10.10.10.0/24), HR-NET (10.10.11.0/24), FINANCE-NET (10.10.12.0/24)
    b. Gishushu LAN: CABLE-NET (10.10.13.0/24), WIFI-NET (10.10.14.0/24)
    c. All subnets configured with mask 255.255.255.0, DNS server 10.10.10.10.

2. **DHCP Configuration**:
    a. Created pools for each subnet.
    b. Excluded critical IPs (like the DNS server).
    c. Configured default gateways and DNS settings for automated client IP assignment.

END.