PW 1: DHCP Lab Exercise Using Cisco Packet Tracer

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Objective

- Understand how the Dynamic Host Configuration Protocol (DHCP) works.
- Configure a Cisco router to serve as a DHCP server.
- Verify that client PCs obtain correct IP configurations dynamically.
- Troubleshoot common DHCP issues.

Lab Topology

Devices Required:

- 1 Cisco Router (e.g., 2901)
- 1 Switch (e.g., 2960)
- 3 PCs

Connections:

- Connect the router's GigabitEthernet0/0 to the switch using a straight-through cable.
- Connect each PC to the switch using straight-through cables.

Network Scheme:

- **Subnet:** 192.168.1.0/24
- **Router's Interface:** 192.168.1.1 (default gateway)
- **DHCP Pool:** Addresses from 192.168.1.2 to 192.168.1.254

Step-by-Step Instructions

Step 1: Set Up the Physical Topology

1. Open Cisco Packet Tracer.
2. Drag and drop one router, one switch, and three PCs onto the workspace.

3. Use the appropriate cables to connect:
    - Router's GigabitEthernet0/0 to any port on the switch.
    - Each PC's FastEthernet port to the switch.

Step 2: Configure the Router's Interface

1. Click on the router and go to the **CLI** tab.
2. Enter the following commands to configure the interface:

```
Router> enable
Router# configure terminal
Router(config)# interface GigabitEthernet0/0
Router(config-if)# ip address 192.168.1.1 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# exit
```

Listing 1: Router Interface Configuration

Step 3: Exclude the Router's IP from the DHCP Pool

1. In the global configuration mode, exclude the router's IP (and any other static addresses you wish to reserve) so that DHCP does not assign it:

```
Router(config)# ip dhcp excluded-address 192.168.1.1
```

Listing 2: Exclude IP Address

Step 4: Create and Configure the DHCP Pool

1. Create a DHCP pool named **LAN**:

```
Router(config)# ip dhcp pool LAN
```

Listing 3: Create DHCP Pool

2. Define the network and subnet mask for the pool:

```
Router(dhcp-config)# network 192.168.1.0 255.255.255.0
```

Listing 4: Define Network and Subnet

3. Set the default gateway (router's interface):

```
Router(dhcp-config)# default-router 192.168.1.1
```

Listing 5: Set Default Gateway

4. (Optional) Specify a DNS server (e.g., Google's public DNS):

```
Router(dhcp-config)# dns-server 8.8.8.8
```

Listing 6: Set DNS Server

5. Exit DHCP configuration mode:

```
Router(dhcp-config)# exit
```

Listing 7: Exit DHCP Configuration

Step 5: Configure the PCs to Use DHCP

1. Click on each PC.
2. Go to the **Desktop** tab and select **IP Configuration**.
3. Choose the **DHCP** option. The PC should automatically receive an IP address from the pool (e.g., 192.168.1.2, 192.168.1.3, etc.).

Step 6: Verify the DHCP Operation

1. On each PC, open the **Command Prompt** (or **Terminal** in Packet Tracer) and type:

```
ping 192.168.1.1
```

Listing 8: Ping the Router

Successful replies confirm that the PC has obtained the correct IP configuration and connectivity with the router.

2. Optionally, return to the router and use the following command to view DHCP bindings:

```
Router# show ip dhcp binding
```

Listing 9: View DHCP Bindings

Step 7: Troubleshooting (if needed)

Issue: A PC does not receive an IP address.
Check:

- Verify that the PC is connected to the switch and that the cable is properly connected.
- Ensure that the router's interface is up (using the `no shutdown` command).
- Confirm that the DHCP pool is correctly configured and that the router is not overloaded with excluded addresses.

Issue: A PC cannot ping the router.
Check:

- Confirm that the PC has the correct IP, subnet mask, and default gateway.
- Verify physical connections in Packet Tracer.

Lab Extension Ideas

- **Static DHCP Reservations:** Configure the router to assign a specific IP to a device based on its MAC address.
- **Multiple DHCP Pools:** Create additional DHCP pools for different subnets on the same router.
- **Advanced Options:** Experiment with setting lease times or adding additional options (e.g., WINS server).

This exercise provides a solid foundation in DHCP configuration using Cisco Packet Tracer. Enjoy exploring and experimenting with DHCP services!