Lab 8.1.4.4 - Troubleshooting DHCPv4

Topology
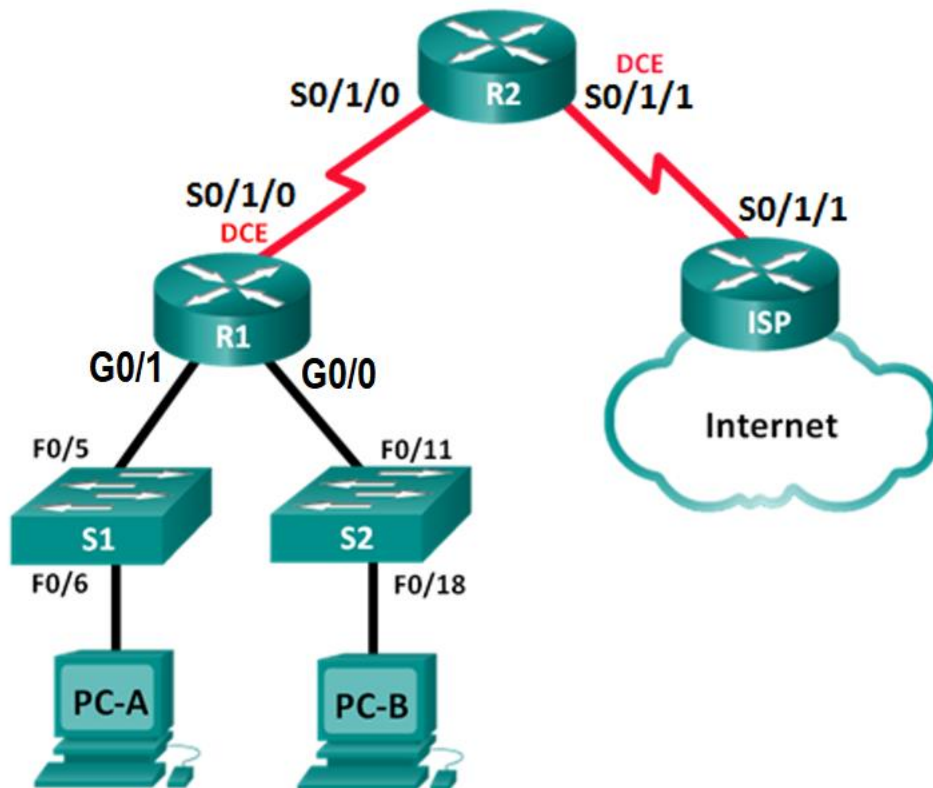
Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0	192.168.0.1	255.255.255.128	N/A
	G0/1	192.168.1.1	255.255.255.0	N/A
	S0/1/0 (DCE)	192.168.0.253	255.255.255.252	N/A
R2	S0/1/0	192.168.0.254	255.255.255.252	N/A
	S0/1/1 (DCE)	209.165.200.226	255.255.255.252	N/A
ISP	S0/1/1	209.165.200.225	255.255.255.252	N/A
S1	VLAN 1	192.168.1.2	255.255.255.0	192.168.1.1
S2	VLAN 1	192.168.0.2	255.255.255.128	192.168.0.1
PC-A	NIC	DHCP	DHCP	DHCP
PC-B	NIC	DHCP	DHCP	DHCP

Objectives

Part 1: Build the Network and Configure Basic Device Settings

Part 2: Troubleshoot DHCPv4 Issues

Background / Scenario

The Dynamic Host Configuration Protocol (DHCP) is a network protocol that lets the network administrators manage and automate the assignment of IP addresses. Without DHCP, the administrator must manually assign and configure IP addresses, preferred DNS servers, and the default gateway. As the network grows in size, this becomes an administrative problem when devices are moved from one internal network to another.

In this scenario, the company has grown in size, and the network administrators can no longer assign IP addresses to devices manually. The R2 router has been configured as a DHCP server to assign IP addresses to the host devices on router R1 LANs. Several errors in the configuration have resulted in connectivity issues. You are asked to troubleshoot and correct the configuration errors and document your work.

Ensure that the network supports the following:

1) The router R2 should function as the DHCP server for the 192.168.0.0/25 and 192.168.1.0/24 networks connected to R1.

2) All PCs connected to S1 and S2 should receive an IP address in the correct network via DHCP.

Note: The routers used with CCNA hands-on labs are Cisco 1941 Integrated Services Routers (ISRs) with Cisco IOS Release 15.2(4)M3 (universalk9 image). The switches used are Cisco Catalyst 2960s with Cisco IOS Release 15.0(2) (lanbasek9 image). Other routers, switches and Cisco IOS versions can be used. Depending on the model and Cisco IOS version, the commands available and output produced might vary from what is shown in the labs. Refer to the Router Interface Summary Table at the end of this lab for the correct interface identifiers.

Note: Make sure that the routers and switches have been erased and have no startup configurations. If you are unsure, contact your instructor.

Required Resources

- 3 Routers (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)

- 2 Switches (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
- 2 PCs (Windows 7, Vista, or XP with terminal emulation program, such as Tera Term)
- Console cables to configure the Cisco IOS devices via the console ports
- Ethernet and serial cables as shown in the topology

Part 1: Build the Network and Configure Basic Device Settings

In Part 1, you will set up the network topology and configure the routers and switches with basic settings, such as passwords and IP addresses. You will also configure the IP settings for the PCs in the topology.

Step 1: Cable the network as shown in the topology.

Step 2: Initialize and reload the routers and switches.

Step 3: Configure basic settings for each router.

a. Disable DNS lookup.

b. Configure device name as shown in the topology.

c. Assign **class** as the privileged EXEC password.

d. Assign **cisco** as the console and vty passwords.

e. Configure **logging synchronous** to prevent console messages from interrupting command entry.

f. Configure the IP addresses for all the router interfaces.

g. Set clock rate to **125000** for all DCE router interfaces.

h. Configure RIP for R1.

```
R1(config)# router rip
R1(config-router)# version 2
R1(config-router)# network 192.168.0.0
R1(config-router)# network 192.168.1.0
R1(config-router)# no auto-summary
R1(config-router)# exit
```

i. Configure RIP and a static default route on R2.

```
R2(config)# router rip
R2(config-router)# version 2
R2(config-router)# network 192.168.0.0
R2(config-router)# default-information originate
R2(config-router)# no auto-summary
R2(config-router)# exit
R2(config)# ip route 0.0.0.0 0.0.0.0 209.165.200.225
```

j. Configure a summary static route on ISP to the networks on R1 and R2 routers.

```
ISP(config)# ip route 192.168.0.0 255.255.254.0 209.165.200.226
```

Step 4: Verify network connectivity between the routers.

If any pings between the routers fail, correct the errors before proceeding to the next step. Use **show ip route** and **show ip interface brief** to locate possible issues.

Step 5:   Configure basic settings for each switch.

    a.   Disable DNS lookup.

    b.   Configure device name as shown in the topology.

    c.   Configure the IP address for the VLAN 1 interface and the default gateway for each switch.

    d.   Assign **class** as the privileged EXEC mode password.

    e.   Assign **cisco** as the console and vty passwords.

    f.   Configure **logging synchronous** for the console line.

Step 6:   Verify the hosts are configured for DHCP.

Step 7:   Load the initial DHCP configuration for R1 and R2.

Router R1

```
interface GigabitEthernet0/1
 ip helper-address 192.168.0.253
```

Router R2

```
ip dhcp excluded-address 192.168.11.1 192.168.11.9
ip dhcp excluded-address 192.168.0.1 192.168.0.9
ip dhcp pool R1G1
 network 192.168.1.0 255.255.255.0
 default-router 192.168.1.1
ip dhcp pool R1G0
 network 192.168.0.0 255.255.255.128
 default-router 192.168.11.1
```

Part 2:   Troubleshoot DHCPv4 Issues

After configuring routers R1 and R2 with DHCPv4 settings, several errors in the DHCP configurations were introduced and resulted in connectivity issues. R2 is configured as a DHCP server. For both pools of DHCP addresses, the first nine addresses are reserved for the routers and switches. R1 relays the DHCP information to all the R1 LANs. Currently, PC-A and PC-B have no access to the network. Use the **show** commands and all information provided to determine and correct the network connectivity issues.

Step 1:   Record IP settings for PC-A and PC-B.

    a.   For PC-A and PC-B, at the command prompt, enter **ipconfig /all** to display the IP and MAC addresses.

    b.   Record the IP and MAC addresses in the table below. The MAC address can be used to determine which PC is involved in the debug message.

	IP Address/Subnet Mask	**MAC Address**
PC-A		
PC-B		

Step 2:   Troubleshoot DHCP issues on routers R1, R2 and R3.

Router R1 is a DHCP relay agent for all the R1 LANs. In this step, only the DHCP process for the 192.168.1.0/24 network will be examined. The first nine addresses are reserved for other network devices, such as routers, switches, and servers.

Use all provided information, such as the addressing table and the DHCP configuration to correct any connectivity problem.

At the end of this practice all connections must work properly and, all pings will succeed.

Reflection

What are the benefits of using DHCP?

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