Lab 2 - Configuring Basic DHCPv4 on a Router
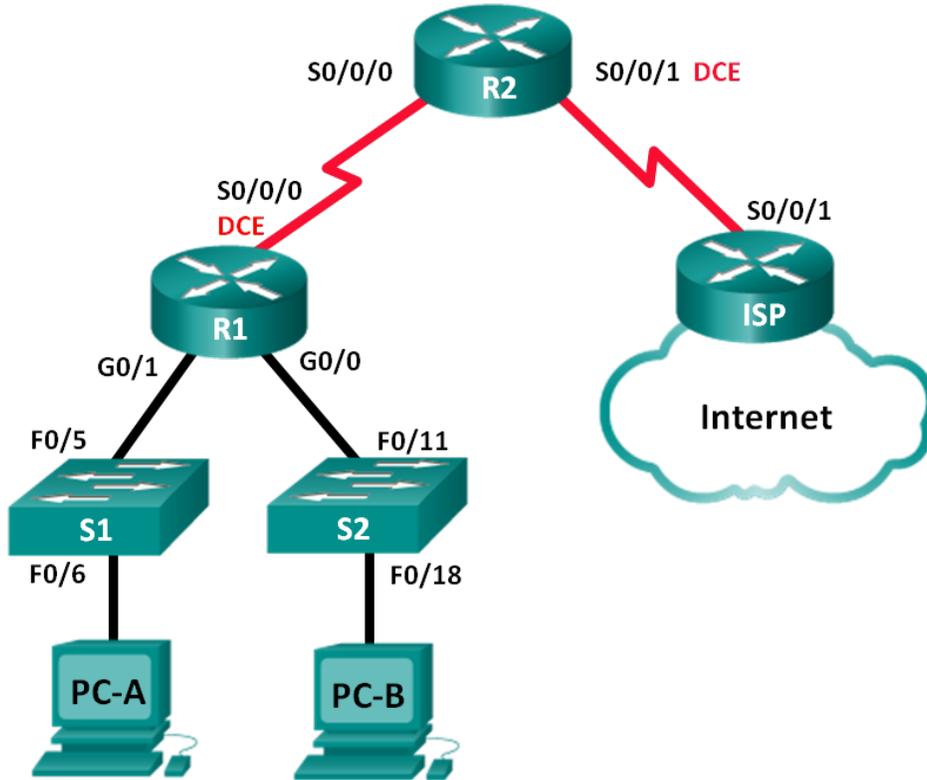
Topology

Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0	192.168.0.1	255.255.255.0	N/A
	G0/1	192.168.1.1	255.255.255.0	N/A
	S0/0/0 (DCE)	192.168.2.253	255.255.255.252	N/A
R2	S0/0/0	192.168.2.254	255.255.255.252	N/A
	S0/0/1 (DCE)	209.165.200.226	255.255.255.224	N/A
ISP	S0/0/1	209.165.200.225	255.255.255.224	N/A
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: Configure a DHCPv4 Server and a DHCP Relay Agent

Background / Scenario

The Dynamic Host Configuration Protocol (DHCP) is a network protocol that lets 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 default gateways. 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. Your job is to configure the R2 router to assign IPv4 addresses on two different subnets connected to router R1.

Note: This lab provides minimal assistance with the actual commands necessary to configure DHCP. However, the required commands are provided in Appendix A. Test your knowledge by trying to configure the devices without referring to the appendix.

Note: The routers used with CCNA hands-on labs are Cisco 1941 Integrated Services Routers (ISRs). The switches used are Cisco Catalyst 2960s. 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.

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. Console into the router and enter global configuration mode.

b. Copy the following basic configuration and paste it to the running-configuration on the router.

```
no ip domain-lookup
service password-encryption
enable secret class
banner motd #
Unauthorized access is strictly prohibited. #
line con 0
password cisco
login
logging synchronous
line vty 0 4
password cisco
login
```

c. Configure the host name as shown in the topology.

d. Configure the IPv4 addresses on the router as shown in the topology.

1) Go to G0/0 and set ip address to 192.168.0.1 with sm: 255.255.255.0 etc etc

e. Add serial interfaces and set the DCE serial interfaces with a clock rate of 128000.

Step 4: Configure dynamic, default, and static routing on the routers.

    a. Configure RIPv2 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)# network 192.168.2.252
R1(config-router)# no auto-summary
```

    b. Configure RIPv2 and a default route to the ISP on R2.

```
R2(config)# router rip
R2(config-router)# version 2
R2(config-router)# network 192.168.2.252
R2(config-router)# default-information originate
R2(config-router)# exit
R2(config)# ip route 0.0.0.0 0.0.0.0 209.165.200.225
```

```
The above configuration in b) firstly sets up rip version 2 for the network
192.168.2.0. Then using the line default-information originate command, it
tells the router if the IPv4 routing table has a default route in it,
advertise a default route with RIP.
```

```
IOS allows the configuration of a static default route by using special
values for the subnet and mask fields in the ip route command: 0.0.0.0
0.0.0.0. For example the command ip route 0.0.0.0 0.0.0.0 209.165.200.225
creates a static default route on R2 – a route that matches all IP packets
and sends those packets out to the next hop of the ISP router.
```

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

```
ISP(config)# ip route 192.168.0.0 255.255.252.0 209.165.200.226
```

    d. Copy the running configuration to the startup configuration.

Step 5: Verify network connectivity between the routers.

If any pings between 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 6: Verify the host PCs are configured for DHCP.

Part 2: Configure a DHCPv4 Server and a DHCP Relay Agent

To automatically assign address information on the network, you will configure R2 as a DHCPv4 server and R1 as a DHCP relay agent.

Step 1: Configure DHCPv4 server settings on router R2.

On R2, you will configure a DHCP address pool for each of the R1 LANs. Use the pool name **R1G0** for the G0/0 LAN and **R1G1** for the G0/1 LAN. You will also configure the addresses to be excluded from the

address pools. Best practice dictates that excluded addresses be configured first, to guarantee that they are not accidentally leased to other devices.

Exclude the first 9 addresses in each R1 LAN starting with .1. All other addresses should be available in the DHCP address pool. Make sure that each DHCP address pool includes a default gateway, the domain **ccna-lab.com**, a DNS server (209.165.200.225), and a lease time of 2 days.

Step 2: Configure R1 as a DHCP relay agent.

Configure IP helper addresses on R1 to forward all DHCP requests to the R2 DHCP server.

Router R1

```
R1(config)# interface g0/0
R1(config-if)# ip helper-address 192.168.2.254
R1(config-if)# exit
R1(config-if)# interface g0/1
R1(config-if)# ip helper-address 192.168.2.254
```

Router R2

```
R2(config)# ip dhcp excluded-address 192.168.0.1 192.168.0.9
R2(config)# ip dhcp excluded-address 192.168.1.1 192.168.1.9
R2(config)# ip dhcp pool R1G1
R2(dhcp-config)# network 192.168.1.0 255.255.255.0
R2(dhcp-config)# default-router 192.168.1.1
R2(dhcp-config)# dns-server 209.165.200.225

***Unfortunately, the below tasks will not work in PT 6.2. Skip these.
R2(dhcp-config)# domain-name ccna-lab.com
R2(dhcp-config)# lease 2
***

Continue…

R2(dhcp-config)# exit
R2(config)# ip dhcp pool R1G0
R2(dhcp-config)# network 192.168.0.0 255.255.255.0
R2(dhcp-config)# default-router 192.168.0.1
R2(dhcp-config)# dns-server 209.165.200.225
R2(dhcp-config)# domain-name ccna-lab.com
R2(dhcp-config)# lease 2
```

On PC-A or PC-B, open a command prompt and enter the **ipconfig /all** command. Did either of the host PCs receive an IP address from the DHCP server? Why?

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On the lines below, write the commands necessary to configure R1 as a DHCP relay agent for the R1 LANs.

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Step 3:   Record IP settings for PC-A and PC-B.

On PC-A and PC-B, issue the **ipconfig /all** command to verify that the PCs have received IP address information from the DHCP server on R2. Record the IP and MAC address for each PC.

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Based on the DHCP pool that was configured on R2, what are the first available IP addresses that PC-A and PC-B can lease?

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Step 4:   Verify DHCP services and address leases on R2.

a.   On R2, enter the **show ip dhcp binding** command to view DHCP address leases.

Along with the IP addresses that were leased, what other piece of useful client identification information is in the output?

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b.   On R1, enter the **show run interface** command for interfaces G0/0 and G0/1 to view the DHCP relay configuration in the running configuration.

Reflection

What do you think is the benefit of using DHCP relay agents instead of multiple routers acting as DHCP servers?

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Reference: Modified from Cisco Networking Academy site