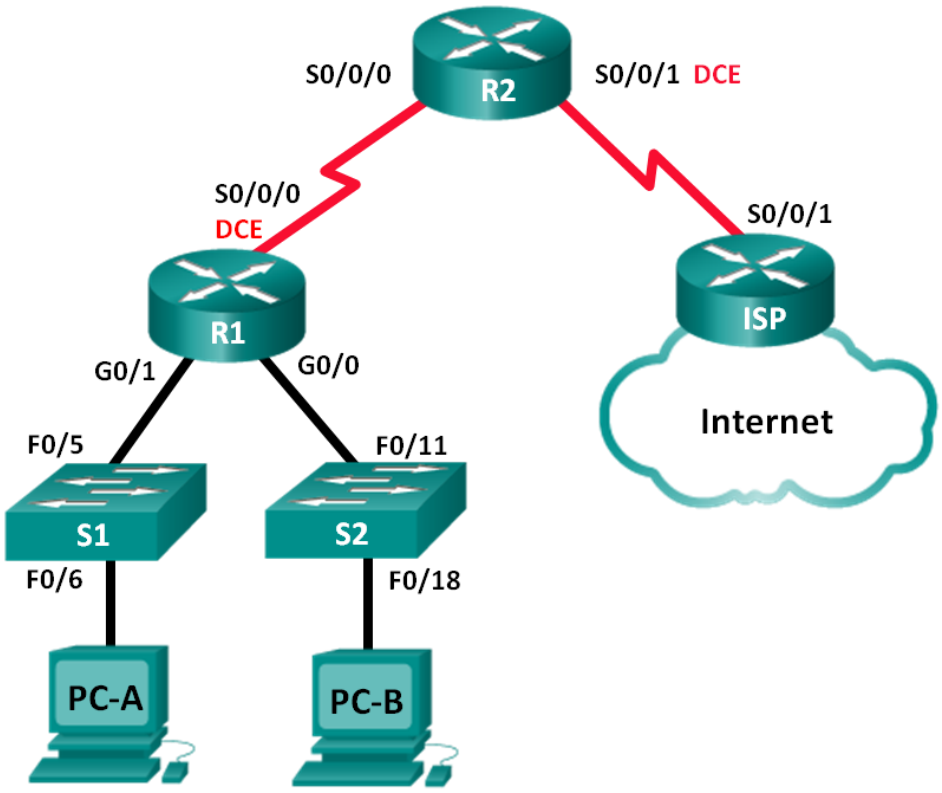
Lab 9 - Configuring Basic DHCPv4 on a Router

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)	a) _____	255.255.255.252	N/A
R2	S0/0/0	192.168.2.254	b) _____	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: 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 0: Complete the Addressing Table

In Part 0, you must complete the above Addressing Table (yellow cells) using appropriate IP addresses and subnet masks.

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 0: Packet Tracer File Configuration

For labs that use a Packet Tracer file, you must set the user profile and verify the completion percentage and assessment items according to the lab slide.

Note: The user profile cannot be changed later, otherwise the activity progress will be reset.

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.

e. 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
R1(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
```

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: Exclude IP Addresses on router R2.

On R2, you will 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.

a. Configure Excluding IP Addresses for G0/0 LAN.

```
R2(config)# ip dhcp excluded-address 192.168.0.1 192.168.0.9
```

b. Configure Excluding IP Addresses for G0/1 LAN.

Use the **ip dhcp excluded-address** command to configure excluding IP Addresses for G0/1 LAN.

Step 2: Create DHCP address pools on 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 each DHCP address pool to include a default gateway, and a DNS server (209.165.200.225).

a. Create a DHCP address pool for G0/0 LAN.

```
R2(config)# ip dhcp pool R1G0
R2(dhcp-config)# network 192.168.0.0 255.255.255.0
```

b. Configure a default gateway to the DHCP address pool for G0/0 LAN.

```
R2(dhcp-config)# default-router 192.168.0.1
```

c. Configure a DNS server to the DHCP address pool for G0/0 LAN.

```
R2(dhcp-config)# dns-server 209.165.200.225
```

d. Create a DHCP address pool and configure a default gateway and a DNS server for G0/1 LAN.

Use the **ip dhcp pool, network, default-router and dns-server** command to configure a DHCP address pool, a default gateway and a DNS server for G0/1 LAN.

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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Step 3: Configure R1 as a DHCP relay agent.

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

a. Configure IP helper addresses for G0/0 LAN.

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

b. Configure IP helper addresses for G0/1 LAN.

Use the **ip helper-address** command to configure IP helper addresses for G0/1 LAN.

Step 4: 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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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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Router Interface Summary Table

Router Interface Summary				
Router Model	**Ethernet Interface #1**	**Ethernet Interface #2**	**Serial Interface #1**	**Serial Interface #2**
1800	Fast Ethernet 0/0 (F0/0)	Fast Ethernet 0/1 (F0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
1900	Gigabit Ethernet 0/0 (G0/0)	Gigabit Ethernet 0/1 (G0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2801	Fast Ethernet 0/0 (F0/0)	Fast Ethernet 0/1 (F0/1)	Serial 0/1/0 (S0/1/0)	Serial 0/1/1 (S0/1/1)
2811	Fast Ethernet 0/0 (F0/0)	Fast Ethernet 0/1 (F0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2900	Gigabit Ethernet 0/0 (G0/0)	Gigabit Ethernet 0/1 (G0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)

Note: To find out how the router is configured, look at the interfaces to identify the type of router and how many interfaces the router has. There is no way to effectively list all the combinations of configurations for each router class. This table includes identifiers for the possible combinations of Ethernet and Serial interfaces in the device. The table does not include any other type of interface, even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface.