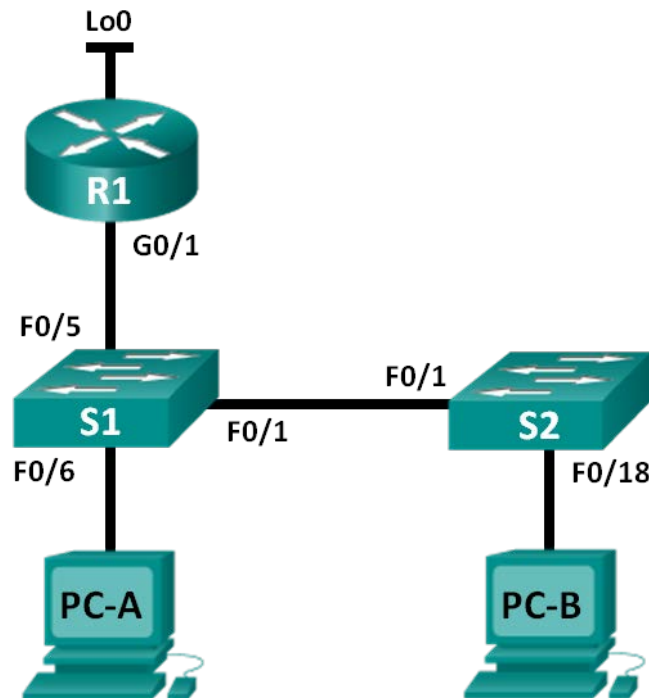


## Lab – Configuring Basic DHCPv4 on a Switch Topology



### Addressing Table

Device	Interface	IP Address	Subnet Mask
R1	G0/1	192.168.1.10	255.255.255.0
	Lo0	209.165.200.225	255.255.255.224
S1	VLAN 1	192.168.1.1	255.255.255.0
	VLAN 2	192.168.2.1	255.255.255.0

### Objectives

#### Part 1: Build the Network and Configure Basic Device Settings

#### Part 2: Change the SDM Preference

- Set the SDM preference to lanbase-routing on S1.

#### Part 3: Configure DHCPv4

- Configure DHCPv4 for VLAN 1.
- Verify DHCPv4 and connectivity.

#### Part 4: Configure DHCP for Multiple VLANs

- Assign ports to VLAN 2.

- Configure DHCPv4 for VLAN 2.
- Verify DHCPv4 and connectivity.

### Part 5: Enable IP Routing

- Enable IP routing on the switch.
- Create static routes.

## Background / Scenario

A Cisco 2960 switch can function as a DHCPv4 server. The Cisco DHCPv4 server assigns and manages IPv4 addresses from identified address pools that are associated with specific VLANs and switch virtual interfaces (SVIs). The Cisco 2960 switch can also function as a Layer 3 device and route between VLANs and a limited number of static routes. In this lab, you will configure DHCPv4 for both single and multiple VLANs on a Cisco 2960 switch, enable routing on the switch to allow for communication between VLANs, and add static routes to allow for communication between all hosts.

**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) 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 router and switches have been erased and have no startup configurations. If you are unsure, contact your instructor.

## Required Resources

- 1 Router (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 cables as shown in the topology

## Part 1: Build the Network and Configure Basic Device Settings

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

**Step 2: Initialize and reload the router and switches.**

**Step 3: Configure basic setting on devices.**

- 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. Console into the switches and enter global configuration mode.
- d. Copy the following basic configuration and paste it to the running-configuration on the switches.

```
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 15
password cisco
login
exit
```

- e. Assign device names as shown in the topology.
- f. Configure the IP addresses on R1 G0/1 and Lo0 interfaces, according to the Addressing Table.
- g. Configure the IP addresses on S1 VLAN 1 and VLAN 2 interfaces, according to the Addressing Table.
- h. Save the running configuration to the startup configuration file.

## Part 2: Change the SDM Preference

The Cisco Switch Database Manager (SDM) provides multiple templates for the Cisco 2960 switch. The templates can be enabled to support specific roles depending on how the switch is used in the network. In this lab, the sdm lanbase-routing template is enabled to allow the switch to route between VLANs and to support static routing.

### Step 1: Display the SDM preference on S1.

On S1, issue the **show sdm prefer** command in privileged EXEC mode. If the template has not been changed from the factory default, it should still be the **default** template. The **default** template does not support static routing. If IPv6 addressing has been enabled, the template will be **dual-ipv4-and-ipv6 default**.

```
S1# show sdm prefer
The current template is "default" template.
The selected template optimizes the resources in
the switch to support this level of features for
0 routed interfaces and 255 VLANs.
```

```
number of unicast mac addresses:      8K
number of IPv4 IGMP groups:           0.25K
number of IPv4/MAC qos aces:          0.125k
number of IPv4/MAC security aces:     0.375k
```

What is the current template?

### Step 2: Change the SDM Preference on S1.

- a. Set the SDM preference to **lanbase-routing**. (If lanbase-routing is the current template, please proceed to Part 3.) From global configuration mode, issue the **sdm prefer lanbase-routing** command.

```
S1(config)# sdm prefer lanbase-routing
```

Changes to the running SDM preferences have been stored, but cannot take effect until the next reload.

Use 'show sdm prefer' to see what SDM preference is currently active.

Which template will be available after reload?

- b. The switch must be reloaded for the template to be enabled.

```
S1# reload
```

System configuration has been modified. Save? [yes/no]: **no**

Proceed with reload? [confirm]

**Note:** The new template will be used after reboot even if the running configuration has not been saved. To save the running configuration, answer **yes** to save the modified system configuration.

### Step 3: Verify the lanbase-routing template is loaded.

Issue the **show sdm prefer** command to verify that the lanbase-routing template has been loaded on S1.

```
S1# show sdm prefer
```

The current template is "lanbase-routing" template.

The selected template optimizes the resources in the switch to support this level of features for 0 routed interfaces and 255 VLANs.

```
number of unicast mac addresses:      4K
number of IPv4 IGMP groups + multicast routes:  0.25K
number of IPv4 unicast routes:         0.75K
  number of directly-connected IPv4 hosts:      0.75K
  number of indirect IPv4 routes:              16
number of IPv6 multicast groups:        0.375k
number of directly-connected IPv6 addresses: 0.75K
  number of indirect IPv6 unicast routes:       16
number of IPv4 policy based routing aces:    0
number of IPv4/MAC qos aces:               0.125k
number of IPv4/MAC security aces:          0.375k
number of IPv6 policy based routing aces:    0
number of IPv6 qos aces:                   0.375k
number of IPv6 security aces:              127
```

## Part 3: Configure DHCPv4

In Part 3, you will configure DHCPv4 for VLAN 1, check IP settings on host computers to validate DHCP functionality, and verify connectivity for all devices in VLAN 1.

### Step 1: Configure DHCP for VLAN 1.

- a. Exclude the first 10 valid host addresses from network 192.168.1.0/24. Write the command you used in the space provided.
- b. Create a DHCP pool named **DHCP1**. Write the command you used in the space provided.
- c. Assign the network 192.168.1.0/24 for available addresses. Write the command you used in the space provided.
- d. Assign the default gateway as 192.168.1.1. Write the command you used in the space provided.
- e. Assign the DNS server as 192.168.1.9. Write the command you used in the space provided.
- f. Assign a lease time of 3 days. Write the command you used in the space provided.
- g. Save the running configuration to the startup configuration file.

### Step 2: Verify DHCP and connectivity.

- a. On PC-A and PC-B, open the command prompt and issue the **ipconfig** command. If IP information is not present, or if it is incomplete, issue the **ipconfig /release** command, followed by the **ipconfig /renew** command.

For PC-A, list the following:

IP Address:

Subnet Mask:

Default Gateway:

For PC-B, list the following:

IP Address:

Subnet Mask:

Default Gateway:

- b. Test connectivity by pinging from PC-A to the default gateway, PC-B, and R1.

From PC-A, is it possible to ping the VLAN 1 default gateway?

From PC-A, is it possible to ping PC-B?

From PC-A, is it possible to ping R1 G0/1?

If the answer is no to any of these questions, troubleshoot the configurations and correct the error.

## Part 4: Configure DHCPv4 for Multiple VLANs

In Part 4, you will assign PC-A to a port accessing VLAN 2, configure DHCPv4 for VLAN 2, renew the IP configuration of PC-A to validate DHCPv4, and verify connectivity within the VLAN.

### Step 1: Assign a port to VLAN 2.

Place port F0/6 into VLAN 2. Write the command you used in the space provided.

### Step 2: Configure DHCPv4 for VLAN 2

- a. Exclude the first 10 valid host addresses from network 192.168.2.0. Write the command you used in the space provided.
- b. Create a DHCP pool named **DHCP2**. Write the command you used in the space provided.
- c. Assign the network 192.168.2.0/24 for available addresses. Write the command you used in the space provided.
- d. Assign the default gateway as 192.168.2.1. Write the command you used in the space provided.
- e. Assign the DNS server as 192.168.2.9. Write the command you used in the space provided.
- f. Assign a lease time of 3 days. Write the command you used in the space provided.
- g. Save the running configuration to the startup configuration file.

### Step 3: Verify DHCPv4 and connectivity.

- a. On PC-A, open the command prompt and issue the **ipconfig /release** command, followed by **ipconfig /renew** command.

For PC-A, list the following:

IP Address:

Subnet Mask:

Default Gateway:

2 default gateway and PC-B.

From PC-A, is it possible to ping the default gateway?

From PC-A, is it possible to ping PC-B?

Were these pings successful? Why?

Test connectivity by pinging from PC-A to the VLAN

- b. Issue the **show ip route** command on S1.

What was the result of this command?

### Part 5: Enable IP Routing

In Part 5, you will enable IP routing on the switch, which will allow for inter-VLAN communication. For all networks to communicate, static routes on S1 and R1 must be implemented.

#### Step 1: Enable IP routing on S1.

- a. From global configuration mode, use the **ip routing** command to enable routing on S1.  
`S1(config)# ip routing`
- b. Verify inter-VLAN connectivity.  
From PC-A, is it possible to ping PC-B?  
What function is the switch performing?
- c. View the routing table information for S1.  
What route information is contained in the output of this command?
- d. View the routing table information for R1.  
What route information is contained in the output of this command?
- e. From PC-A, is it possible to ping R1?  
From PC-A, is it possible to ping Lo0?  
Consider the routing table of the two devices, what must be added to communicate between all networks?

#### Step 2: Assign static routes.

Enabling IP routing allows the switch to route between VLANs assigned on the switch. For all VLANs to communicate with the router, static routes must be added to the routing table of both the switch and the router.

- a. On S1, create a default static route to R1. Write the command you used in the space provided.
- b. On R1, create a static route to VLAN 2. Write the command you used in the space provided.
- c. View the routing table information for S1.  
How is the default static route represented?

- d. View the routing table information for R1.

How is the static route represented?

- e. From PC-A, is it possible to ping R1?

From PC-A, is it possible to ping Lo0?

### Reflection

1. In configuring DHCPv4, why would you exclude the static addresses prior to setting up the DHCPv4 pool?
2. If multiple DHCPv4 pools are present, how does the switch assign the IP information to hosts?
3. Besides switching, what functions can the Cisco 2960 switch perform?

### 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.

## Appendix A: Configuration Commands

### Configure DHCPv4

```
S1(config)# ip dhcp excluded-address 192.168.1.1 192.168.1.10
S1(config)# ip dhcp pool DHCP1
```



```
S1(dhcp-config)# network 192.168.1.0 255.255.255.0
S1(dhcp-config)# default-router 192.168.1.1
S1(dhcp-config)# dns-server 192.168.1.9
S1(dhcp-config)# lease 3
```

### Configure DHCPv4 for Multiple VLANs

```
S1(config)# interface f0/6
S1(config-if)# switchport access vlan 2
S1(config)# ip dhcp excluded-address 192.168.2.1 192.168.2.10
S1(config)# ip dhcp pool DHCP2
S1(dhcp-config)# network 192.168.2.0 255.255.255.0
S1(dhcp-config)# default-router 192.168.2.1
S1(dhcp-config)# dns-server 192.168.2.9
S1(dhcp-config)# lease 3
```

### Enable IP Routing

```
S1(config)# ip routing
S1(config)# ip route 0.0.0.0 0.0.0.0 192.168.1.10
R1(config)# ip route 192.168.2.0 255.255.255.0 g0/1
```