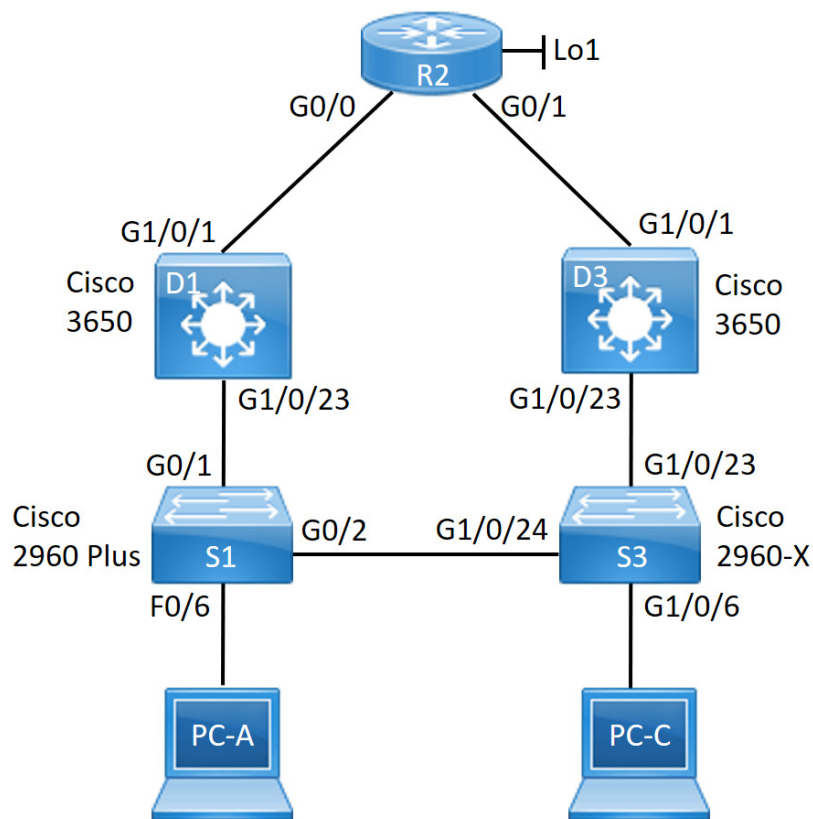


## Lab - Configuring HSRP

### Topology



### Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
D1	VLAN 1	192.168.1.1	255.255.255.0	N/A
	G1/0/1	10.1.1.1	255.255.255.252	N/A
R2	G0/0	10.1.1.2	255.255.255.252	N/A
	G0/1	10.2.2.2	255.255.255.252	N/A
	Lo1	209.165.200.225	255.255.255.224	N/A
D3	VLAN 1	192.168.1.3	255.255.255.0	N/A
	G1/0/1	10.2.2.1	255.255.255.252	N/A
PC-A	NIC	192.168.1.31	255.255.255.0	192.168.1.1
PC-C	NIC	192.168.1.33	255.255.255.0	192.168.1.3

### Objectives

**Part 1: Build the Network and Verify Connectivity**

**Part 2: Configure First Hop Redundancy using HSRP**

### Required Resources

- 1 Router (Cisco 2911 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
- 4 Switches (Cisco 3650 with IOS-XE Release 3.3.5SE and Cisco 2960 with IOS Release 15.0(2) lanbasek9 image or comparable)
- 2 PCs (Windows 10 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 Verify Connectivity

In Part 1, you will set up the network topology and configure basic settings, such as the interface IP addresses and static routing.

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

Attach the devices as shown in the topology diagram, and cable as necessary.

#### Step 2: Configure PC hosts.

#### Step 3: Initialize and reload the router and switches as necessary.

#### Step 4: Configure basic settings for each router.

- Disable DNS lookup.
- Configure the device name as shown in the topology.
- Configure IP addresses for the router as listed in the Addressing Table.

#### Step 5: Configure basic settings for each layer-3 switch.

- Disable DNS lookup.
- Configure the device name as shown in the topology.
- For switch D1, configure G1/0/1 as a routed port. Then assign G1/0/1 and interface VLAN 1 with IP addresses as listed in the Addressing Table.
- Similarly for switch D3, configure G1/0/1 as a routed port. Then assign G1/0/1 and interface VLAN 1 with IP addresses as listed in the Addressing Table.
- Remember to enable ip routing and both D1 and D3.

#### Step 6: Configure basic settings for each layer-2 switch.

- Disable DNS lookup.
- Configure the device name as shown in the topology.
- On both switches S1 and S3, leave all interfaces to default VLAN 1.

### Step 7: Verify connectivity between PC-A and PC-C.

Ping from PC-A to PC-C. Were the ping results successful? \_\_\_\_\_

If the pings are not successful, troubleshoot the basic device configurations before continuing.

**Note:** It may be necessary to disable the PC firewall to successfully ping between PCs.

### Step 8: Configure routing.

- Configure a default static route on D1 to R2.
- Configure a default static route on D3 to R2.
- On R2, configure a standard static route to PC-A / PC-C subnet via D1.
- In addition, configure on R2 a floating static route to PC-A / PC-C subnet via D3.

### Step 9: Verify connectivity.

- From PC-A, you should be able to ping every interface on D1, R2, D3, and PC-C. Were all pings successful? \_\_\_\_\_

If the pings are not successful, troubleshoot the basic device configurations before continuing.

- From PC-C, you should be able to ping every interface on D3, R2, D1, and PC-A. Were all pings successful? \_\_\_\_\_

If the pings are not successful, troubleshoot the basic device configurations before continuing.

## Part 2: Configure First Hop Redundancy Using HSRP

Even though the topology has been designed with some redundancy (two layer-3 switches and two switches on the same LAN network), both PC-A and PC-C are configured with only one gateway address. PC-A is using D1 and PC-C is using D3. If either of these default gateways or the interfaces on the default gateways went down, the PC would lose its connection to the Internet.

In Part 2, you will test how the network behaves both before and after configuring HSRP. To do this, you will determine the path that packets take to the loopback address on R2.

### Step 1: Determine the path for Internet traffic for PC-A and PC-C.

- From a command prompt on PC-A, issue a **tracert** command to the 209.165.200.225 loopback address of R2.

```
C:\ tracert 209.165.200.225
```

```
Tracing route to 209.165.200.225 over a maximum of 30 hops
```

```
 1      1 ms      1 ms      1 ms  192.168.1.1
 2     13 ms     13 ms     13 ms  209.165.200.225
```

```
Trace complete.
```

What path did the packets take from PC-A to 209.165.200.225?

\_\_\_\_\_

- From a command prompt on PC-C, issue a **tracert** command to the 209.165.200.225 loopback address of R2.

What path did the packets take from PC-C to 209.165.200.225?

\_\_\_\_\_

### Step 2: Start a ping session on PC-A, and break the connection between S1 and D1.

- a. From a command prompt on PC-A, issue a **ping -t** command to the **209.165.200.225** address on R2. Make sure you leave the command prompt window open.

**Note:** The pings continue until you press **Ctrl+C**, or until you close the command prompt window.

```
C:\ ping -t 209.165.200.225
Pinging 209.165.200.225 with 32 bytes of data:
Reply from 209.165.200.225: bytes=32 time=9ms TTL=254
Reply from 209.165.200.225: bytes=32 time=9ms TTL=254
Reply from 209.165.200.225: bytes=32 time=9ms TTL=254
<output omitted>
```

- b. As the ping continues, disconnect the Ethernet cables from D1 interfaces G1/0/1 and G1/0/23 to simulate the failure of D1.

What happened to the ping traffic?

- 
- c. Would the results be the same if you repeat Steps 2a and 2b on PC-C by disconnecting the Ethernet cables from D3 interfaces G1/0/1 and G1/0/23?

- 
- d. Reconnect the Ethernet cables on D1 and D3. Reissue pings to 209.165.200.225 from both PC-A and PC-C to make sure connectivity is re-established.

### Step 3: Configure HSRP on D1 and D3.

In this step, you will configure HSRP and change the default gateway address on PC-A and PC-C to the virtual IP address for HSRP. D1 becomes the active router via configuration of the HSRP priority command.

- a. Configure HSRP on D1.

```
D1(config)# interface vlan 1
D1(config-if)# standby version 2
D1(config-if)# standby 1 ip 192.168.1.254
D1(config-if)# standby 1 priority 150
D1(config-if)# standby 1 preempt
```

- b. Configure HSRP on D3.

```
D3(config)# interface vlan 1
D3(config-if)# standby version 2
D3(config-if)# standby 1 ip 192.168.1.254
```

- c. Verify HSRP by issuing the **show standby** command on D1 and D3.

```
D1# show standby
Vlan1 - Group 1 (version 2)
  State is Active
    2 state changes, last state change 00:00:30
  Virtual IP address is 192.168.1.254
  Active virtual MAC address is 0000.0c9f.f001
    Local virtual MAC address is 0000.0c9f.f001 (v2 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.696 secs
```

## Lab – Configuring HSRP

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```
Preemption enabled
Active router is local
Standby router is 192.168.1.3, priority 100 (expires in 11.120 sec)
Priority 150 (configured 150)
Group name is "hsrp-Vl1-1" (default)
```

D3# **show standby**

```
Vlan1 - Group 1 (version 2)
State is Standby
  1 state change, last state change 00:02:29
Virtual IP address is 192.168.1.254
Active virtual MAC address is 0000.0c9f.f001 (MAC Not In Use)
  Local virtual MAC address is 0000.0c9f.f001 (v2 default)
Hello time 3 sec, hold time 10 sec
  Next hello sent in 0.720 secs
Preemption disabled
Active router is 192.168.1.1, priority 150 (expires in 10.128 sec)
  MAC address is d48c.b5ce.a0c1
Standby router is local
Priority 100 (default 100)
Group name is "hsrp-Vl1-1" (default)
```

Using the output shown above, answer the following questions:

Which router is the active router? \_\_\_\_\_

What is the MAC address for the virtual IP address? \_\_\_\_\_

What is the IP address and priority of the standby router?

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- d. Use the **show standby brief** command on D1 and D3 to view an HSRP status summary. Sample output is shown below.

D1# **show standby brief**

```
          P indicates configured to preempt.
          |
Interface  Grp  Pri P State  Active          Standby          Virtual IP
Vl1        1   150 P Active  local          192.168.1.3      192.168.1.254
```

D3# **show standby brief**

```
          P indicates configured to preempt.
          |
Interface  Grp  Pri P State  Active          Standby          Virtual IP
Vl1        1   100 Standby 192.168.1.1    local          192.168.1.254
```

- e. Change the default gateway address for PC-A and PC-C. Which address should you use?
- 
- f. Verify the new settings. Issue a ping from both PC-A and PC-C to the loopback address of R2. Are the pings successful? \_\_\_\_\_

### Step 4: Start a ping session on PC-A and break the connection between the switch that is connected to the Active HSRP router (D1).

- From a command prompt on PC-A, issue a **ping -t** command to the 209.165.200.225 address on R2. Ensure that you leave the command prompt window open.
- As the ping continues, disconnect the Ethernet cables from D1 interfaces G1/0/1 and G1/0/23. What happened to the ping traffic?

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### Step 5: Verify HSRP settings on D1 and D3.

- Issue the **show standby brief** command on D1 and D3.

Which router is the active router? \_\_\_\_\_

Reconnect the cables to D1 interfaces G1/0/1 and G1/0/23. Now which router is the active router? Explain.

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### Step 6: Change HSRP priorities.

- Change the HSRP priority to 200 on D3. Which is the active router? \_\_\_\_\_
  - Issue the command to change the active router to D3 with the new priority. What command did you use?
- 
- Use a **show** command to verify that D3 is the active router.

### Reflection

Why would there be a need for redundancy in a LAN?

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