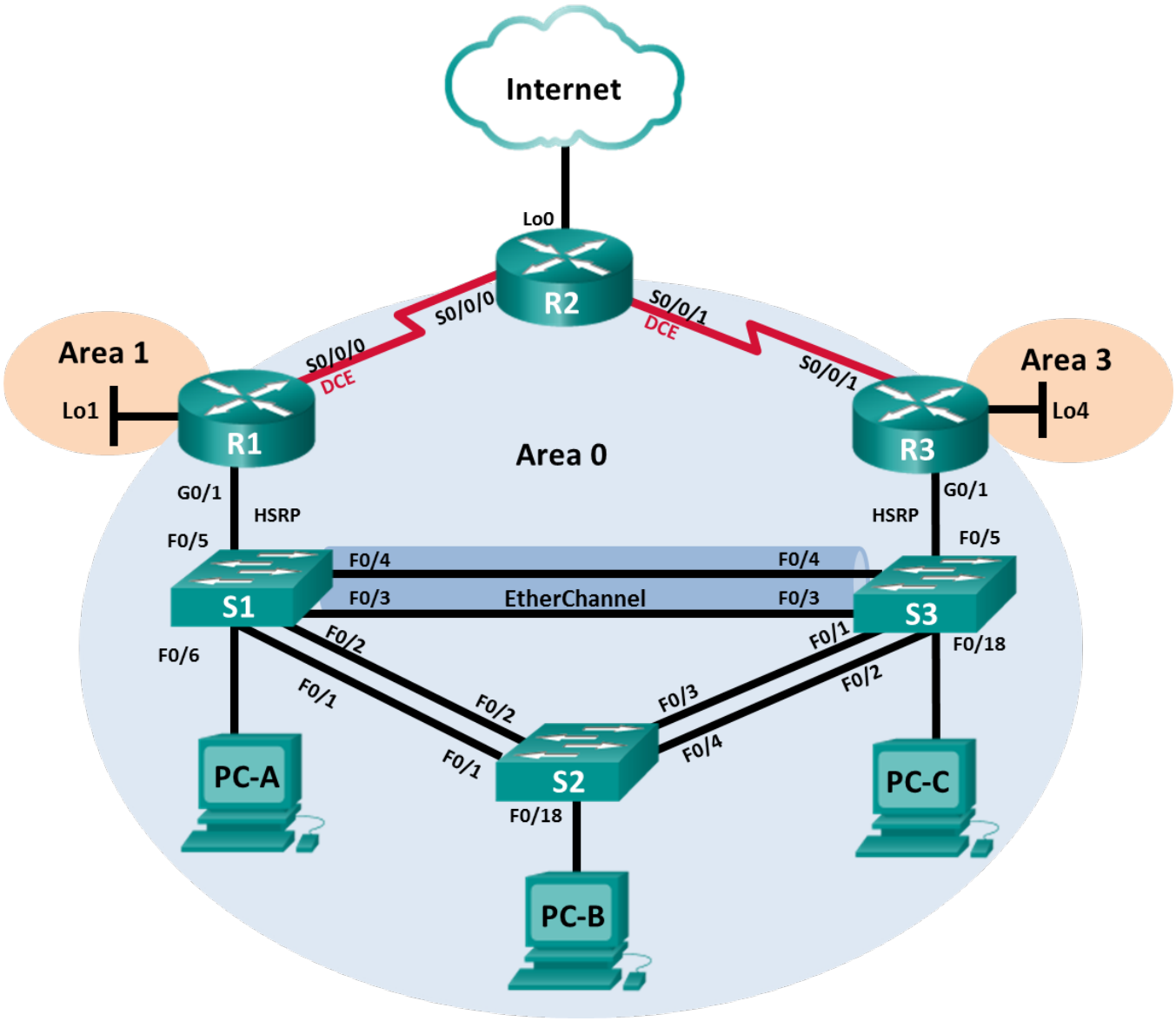
CCNA: Scaling Networks

Case Study (OSPF)

Topology



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/1	172.27.0.1	255.255.255.0	N/A
	S0/0/0	172.27.123.1	255.255.255.252	N/A
	Lo1	172.27.1.1	255.255.255.0	N/A
R2	S0/0/0	172.27.123.2	255.255.255.252	N/A
	S0/0/1	172.27.123.5	255.255.255.252	N/A
	Lo0	209.165.200.225	255.255.255.248	N/A
R3	G0/1	172.27.0.3	255.255.255.0	N/A
	S0/0/1	172.27.123.6	255.255.255.252	N/A
	Lo4	172.27.4.1	255.255.255.0	N/A
S1	VLAN 1	172.27.0.11	255.255.255.0	172.27.0.2
S2	VLAN 1	172.27.0.12	255.255.255.0	172.27.0.2
S3	VLAN 1	172.27.0.13	255.255.255.0	172.27.0.2
PC-A	NIC	172.27.0.21	255.255.255.0	172.27.0.2
PC-B	NIC	172.27.0.22	255.255.255.0	172.27.0.2
PC-C	NIC	172.27.0.23	255.255.255.0	172.27.0.2

Assessment Objectives

Part 1: Initialize Devices (10 points, 5 minutes)

Part 2: Configure Device Basic Settings (51 points, 30 minutes)

Part 3: Configure LAN Redundancy and Link Aggregation (28 points, 25 minutes)

Part 4: Configure OSPFv2 Dynamic Routing Protocol (51 points, 30 minutes)

Part 5: Verify Network Connectivity and HSRP Configuration (10 points, 20 minutes)

Scenario

In this Skills Assessment (SA), you will create a small network. You must connect the network devices, and configure those devices to support IPv4 connectivity, LAN redundancy, and link aggregation. You will then configure OSPFv2 and HSRP on the network and verify connectivity.

Required Resources

- 3 Routers (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
- 3 Switches (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
- 3 PCs (Windows with terminal emulation program, such as Tera Term)
- Console cable to configure the Cisco IOS devices via the console ports
- Ethernet and Serial cables as shown in the topology

Step 1:Configure Device Basic Settings

Total points: 51

Step 1: Configure R1.

Configuration tasks for R1 include the following:

Configuration Item or Task	Specification	Points
Disable DNS lookup		(1/2 point)
Router name	R1	(1/2 point)
Encrypted privileged EXEC password	class	(1/2 point)
Console access password	cisco	(1/2 point)
Telnet access password	cisco	(1/2 point)
Encrypt the plaintext passwords.		(1/2 point)
MOTD banner	Unauthorized Access is Prohibited!	(1 point)
Interface G0/1	Set the description Set the Layer 3 IPv4 address. Refer to the Addressing Table for IPv4 address information. Activate Interface	(1 point)
Interface S0/0/0	Set the description Set the Layer 3 IPv4 address. Refer to the Addressing Table for IPv4 address information. Set a clocking rate of 128000. Activate Interface	(1 point)
Interface Loopback 1 (LAN)	Set the Layer 3 IPv4 address. Refer to the Addressing Table for IPv4 address information.	(1 point)

Step 2: Configure R2.

Configuration tasks for R2 include the following:

Configuration Item or Task	Specification	Points
Disable DNS lookup		(1/2 point)
Router name	R2	(1/2 point)
Encrypted privileged EXEC password	class	(1/2 point)
Console access password	cisco	(1/2 point)
Telnet access password	cisco	(1/2 point)
Encrypt the plaintext passwords.		(1/2 point)
MOTD banner	Unauthorized Access is Prohibited!	(1/2 point)
Interface S0/0/0	Set the description Set the Layer 3 IPv4 address. Refer to the Addressing Table for IPv4 address information. Activate Interface	(1 point)
Interface S0/0/1	Set the description Set the Layer 3 IPv4 address. Refer to the Addressing Table for IPv4 address information. Set a clocking rate of 128000. Activate Interface	(1 point)
Interface Loopback 0 (Simulated Internet connection)	Set the description. Set the Layer 3 IPv4 address to 209.165.200.225/29.	(1 point)
Default route	Configure a default route out Lo0.	(1/2 point)

Step 3: Configure R3.

Configuration tasks for R3 include the following:

Configuration Item or Task	Specification	Points
Disable DNS lookup		(1/2 point)
Router name	R3	(1/2 point)
Encrypted privileged EXEC password	class	(1/2 point)
Console access password	cisco	(1/2 point)
Telnet access password	cisco	(1/2 point)
Encrypt the plaintext passwords.		(1/2 point)
MOTD banner	Unauthorized Access is Prohibited!	(1 point)
Interface G0/1	Set the description Set the Layer 3 IPv4 address. Refer to the Addressing Table for IPv4 address information. Activate Interface	(1 point)
Interface S0/0/1	Set the description Set the Layer 3 IPv4 address. Refer to the Addressing Table for IPv4 address information. Activate Interface	(1 point)
Interface Loopback 4 (LAN)	Set the Layer 3 IPv4 address. Refer to the Addressing Table for IPv4 address information.	(1 point)

Step 4: Configure S1.

Configuration tasks for S1 include the following:

Configuration Item or Task	Specification	Points
Disable DNS lookup		(1/2 point)
Switch name	S1	(1/2 point)
Encrypted privileged EXEC password	class	(1/2 point)
Console access password	cisco	(1/2 point)
Telnet access password	cisco	(1/2 point)
Encrypt the plaintext passwords.		(1/2 point)
MOTD banner	Unauthorized Access is Prohibited!	(1/2 point)
Assign an IPv4 address to the default SVI.	Refer to the Addressing Table for IPv4 address information.	(1 point)
Assign the default-gateway.	Refer to the Addressing Table.	(1 point)
Force trunking on interfaces connected to S2 and S3.	Use VLAN 1 as the native VLAN.	(2 points)
Disable the Dynamic Trunking Protocol (DTP) on all other ports.	Make sure ports are configured as access swtichports.	(1 point)
Shutdown all unused ports.		(1 point)

Step 5: Configure S2.

Configuration tasks for S2 include the following:

Configuration Item or Task	Specification	Points
Disable DNS lookup		(1/2 point)
Switch name	S2	(1/2 point)
Encrypted privileged exec password	class	(1/2 point)
Console access password	cisco	(1/2 point)
Telnet access password	cisco	(1/2 point)
Encrypt the plaintext passwords.		(1/2 point)
MOTD banner	Unauthorized Access is Prohibited!	(1/2 point)
Assign an IPv4 address to the default SVI.	Refer to the Addressing Table for IPv4 address information.	(1 point)
Assign the default-gateway.	Refer to the Addressing Table.	(1 point)
Force trunking on interfaces connected to S1 and S3.	Use VLAN 1 as the native VLAN.	(2 points)
Disable the Dynamic Trunking Protocol (DTP) on all other ports.	Make sure ports are configured as access switch ports.	(1 point)
Shutdown all unused ports.		(1 point)

Step 6: Configure S3.

Configuration tasks for S3 include the following:

Configuration Item or Task	Specification	Points
Disable DNS lookup		(1/2 point)
Switch name	S3	(1/2 point)
Encrypted privileged EXEC password	class	(1/2 point)
Console access password	cisco	(1/2 point)
Telnet access password	cisco	(1/2 point)
Encrypt the plaintext passwords.		(1/2 point)
MOTD banner	Unauthorized Access is Prohibited!	(1/2 point)
Assign an IPv4 address to the default SVI.	Refer to the Addressing Table for IPv4 address information.	(1 point)
Assign the default-gateway.	Refer to the Addressing Table.	(1 point)
Force trunking on interfaces connected to S1 and S2.	Use VLAN 1 as the native VLAN.	(2 points)
Disable the Dynamic Trunking Protocol (DTP) on all other ports.	Make sure ports are configured as access switch ports.	(1 point)
Shutdown all unused ports.		(1 point)

Step 7: Configure IPv4 addresses on PCs.

Configuration Item or Task	Specification	Points
Configure static IPv4 address information on PC-A	Refer to Addressing Table for IPv4 address information.	(1/2 point)
Configure static IPv4 address information on PC-B	Refer to Addressing Table for IPv4 address information.	(1/2 point)
Configure static IPv4 address information on PC-C	Refer to Addressing Table for IPv4 address information.	(1/2 point)

Instructor Sign-off Part 2: _____

Points: _____ of 51

Deliverable/s:

Configuration Item or Task	Specification	IOS Commands

Step 2:Configure LAN Redundancy and Link Aggregation

Total points: 28

Step 1: Configure Spanning Tree on S1.

Configuration tasks for S1 include the following:

Configuration Item or Task	Specification	Points
Configure Rapid PVST+.		(2 points)
Configure as primary root bridge for VLAN 1.		(2 points)
Configure PortFast and BPDU Guard on the interface connected to PC-A.		(2 points)

Step 2: Configure Spanning Tree on S2.

Configuration tasks for S2 include the following:

Configuration Item or Task	Specification	Points
Configure Rapid PVST+.		(2 points)
Configure PortFast and BPDU Guard on the interface connected to PC-B.		(2 points)

Step 3: Configure Spanning Tree on S3.

Configuration tasks for S3 include the following:

Configuration Item or Task	Specification	Points
Configure Rapid PVST+.		(2 points)
Configure as secondary root bridge for VLAN 1.		(2 points)
Configure PortFast and BPDU Guard on the interface connected to PC-C.		(2 points)

Step 4: Configure HSRP on R1.

Configuration tasks for R1 include the following:

Configuration Item or Task	Specification	Points
Configure the HSRP virtual IP address on interface G0/1.	Group: 1 Virtual IP address: 172.27.0.2	(2 points)
Make this the primary HSRP router.		(2 points)
Configure so this router becomes the primary HSRP router on a reboot.		(2 points)

Step 5: Configure HSRP on R3.

Configuration tasks for R3 include the following:

Configuration Item or Task	Specification	Points
Configure the HSRP virtual IP address on interface G0/1.	Group: 1 Virtual IP address: 172.27.0.2	(2 points)

Step 6: Configure an LACP EtherChannel between S1 and S3.

Configuration tasks include the following:

Configuration Item or Task	Specification	Points
On S1, configure an LACP EtherChannel on interfaces connected to S3.	Use group 1 and enable LACP unconditionally.	(2 points)
On S3, configure an LACP EtherChannel on interfaces connected to S1.	Use group 1 and enable LACP only if a LACP device is detected.	(2 points)

Instructor Sign-off Part 3: _____

Points: _____ of 28

Deliverable/s:

Configuration Item or Task	Specification	IOS Commands

Step 3:Configure OSPFv2 Dynamic Routing Protocol

Total points: 51

Step 1: Configure OSPFv2 on R1.

Configuration tasks for R1 include the following:

Configuration Item or Task	Specification	Points
OSPF Process ID	1	(1 point)
Router ID	1.1.1.1	(2 points)
Advertise directly connected networks.	Use classless network addresses. Assign S0/0/0 and G0/1 interfaces to Area 0. Assign Loopback interfaces to Area 1.	(5 points)
Set all LAN interfaces as passive.		(2 points)
Change the default cost reference bandwidth to support Gigabit interface calculations.	1000	(2 points)
Set the bandwidth on S0/0/0.	128 Kb/s	(2 points)
Adjust the metric cost of S0/0/0.	Cost: 7500	(2 points)

Step 2: Configure OSPFv2 on R2.

Configuration tasks for R2 include the following:

Configuration Item or Task	Specification	Points
OSPF Process ID	1	(1 point)
Router ID	2.2.2.2	(2 points)
Advertise directly connected networks.	Use classless network addresses. All connected networks should be assigned to Area 0 except the Lo0 network.	(4 points)
Propagate the default route to all other OSPF routers.		(2 points)
Change the default cost reference bandwidth to allow for Gigabit interfaces.	1000	(2 points)
Set the bandwidth on all serial interfaces.	128 Kb/s	(2 points)
Adjust the metric cost of S0/0/0.	Cost: 7500	(2 points)

Step 3: Configure OSPFv2 on R3.

Configuration tasks for R3 include the following:

Configuration Item or Task	Specification	Points
OSPF Process ID	1	(1 point)
Router ID	3.3.3.3	(2 points)
Advertise directly connected networks.	Use classless network addresses Assign S0/0/1 and G0/1 interfaces to Area 0 Assign Loopback interfaces to Area 3	(5 points)
Set all LAN interfaces as passive.		(2 points)
Change the default cost reference bandwidth to support Gigabit interface calculations.	1000	(2 points)
Set the serial interface bandwidth.	128 Kb/s	(2 points)

Step 4: Verify network connectivity.

Verify that OSPF is functioning as expected. Enter the appropriate CLI command to discover the following information:

Question	Response	Points
What command will display all connected OSPFv2 routers?		(1 point)
What command displays a summary list of OSPF interfaces that includes a column for the cost of each interface?		(1 point)
What command displays the OSPF Process ID, Router ID, Routing Networks, and Passive Interfaces configured on a router?		(1 point)
What command displays only OSPF routes?		(1 point)
What command displays detailed information about the OSPF interfaces, including the authentication method?		(1 point)
What command displays the OSPF section of the running-configuration?		(1 point)

Instructor Sign-off Part 4: _____

Points: _____ of 51

Deliverable/s:

Configuration Item or Task	Specification	IOS Commands

Step 4:Verify Network Connectivity and HSRP Configuration

Total points: 10

Time: 20 minutes

Use the listed commands to verify that network is working as expected.

Step 1: Verify end-to-end connectivity.

Take corrective action if results are other than expected.

From	Command	To	Expected Results	Points
PC-A	ping	PC-C	Ping should be successful.	(1 point)
PC-B	ping	PC-A	Ping should be successful.	(1 point)
PC-B	ping	PC-C	Ping should be successful.	(1 point)
PC-B	ping	Default Gateway	Ping should be successful.	(1 point)
PC-B	ping	209.165.200.225	Ping should be successful.	(1 point)
PC-B	tracert	209.165.200.225	Trace should route through R1.	(1 point)

Note: It may be necessary to disable the PC firewall for pings to be successful.

Step 2: Verify HSRP is working as expected.

Issue the **shutdown** command on R1 G0/1, and then re-issue the following commands to verify that HSRP is working as expected:

From	Command	To	Expected Results	Points
PC-B	ping	172.27.0.1	Ping should **not** be successful.	(1 point)
PC-B	ping	Default Gateway	Ping should be successful.	(1 point)
PC-B	ping	209.165.200.225	Ping should be successful.	(1 point)
PC-B	tracert	209.165.200.225	Trace should route through R3.	(1 point)

Note: Wait a few seconds before testing after shutting down the interface on R1.

Instructor Sign-off Part 5: _____

Points: _____ **of 10**

Deliverable/s:

Configuration Item or Task	Specification	IOS Commands

Results and Discussions:

From	Command	To	Expected Results	Actual Results	Analysis

Visualizations:

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 (S0/0/1)
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.