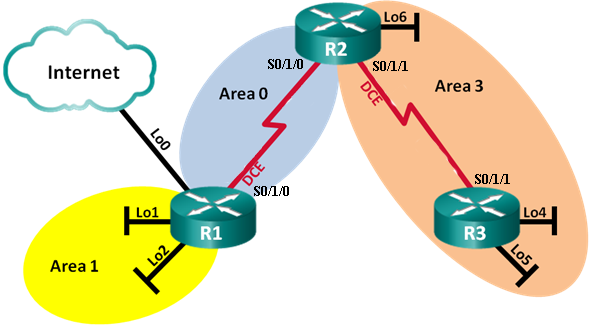
EE3315 Lab 4 – 9.2.2.8 Configuring Multi-area OSPFv2

* Sem B 2021/2022 PT

1. Topology



1. Addressing Table

|  |  |  |  |
| --- | --- | --- | --- |
| Device | Interface | IP Address | Subnet Mask |
| R1 | Lo0 | 209.165.201.225 | 255.255.255.252 |
|  | Lo1 | 192.168.1.2 | 255.255.255.0 |
|  | Lo2 | 192.168.2.2 | 255.255.255.0 |
|  | S0/1/0 (DCE) | 192.168.12.1 | 255.255.255.252 |
| R2 | Lo6 | 192.168.6.2 | 255.255.255.0 |
|  | S0/1/0 | 192.168.12.2 | 255.255.255.252 |
|  | S0/1/1 (DCE) | 192.168.23.1 | 255.255.255.252 |
| R3 | Lo4 | 192.168.4.2 | 255.255.255.0 |
|  | Lo5 | 192.168.5.2 | 255.255.255.0 |
|  | S0/1/1 | 192.168.23.2 | 255.255.255.252 |

1. Objectives

Part 1: Build the Network and Configure Basic Device Settings

Part 2: Configure a Multi-area OSPFv2 Network

1. Background / Scenario

To make OSPF more efficient and scalable, OSPF supports hierarchical routing using the concept of areas. An OSPF area is a group of routers that share the same link-state information in their link-state databases (LSDBs). When a large OSPF area is divided into smaller areas, it is called multi-area OSPF. Multi-area OSPF is useful in larger network deployments to reduce processing and memory overhead.

In the lab, you will configure a multi-area OSPFv2 network.

**Note**: Make sure that the routers have been erased and have no startup configurations. If you are unsure, contact your instructor.

1. Required Resources

* 3 Routers (Cisco ISR4321 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
* Console cables to configure the Cisco IOS devices via the console ports
* Serial cables as shown in the topology

1. Build the Network and Configure Basic Device Settings

In Part 1, you will set up the network topology and configure basic settings on the routers.

* 1. Open the template file and cable the network as shown in the topology. The video file is for reference only. Please follow the lab sheet.
  2. Configure basic settings for each router.
     1. Configure device name, as shown in the topology.
     2. Configure the IP addresses listed in the Addressing Table for all interfaces. DCE interfaces should be configured with a clock rate of 125000. Bandwidth should be set to ***125 Kb/s*** on all serial interfaces.
     3. Copy the running configuration to the startup configuration.
  3. Verify Layer 3 connectivity.

Use the **show ip interface brief** command to verify that the IP addressing is correct and that the interfaces are active. Verify that each router can ping their neighbor’s serial interface.

1. Configure a Multi-area OSPFv2 Network

In Part 2, you will configure a multi-area OSPFv2 network with a process ID of 1. All LAN loopback interfaces should be passive.

* 1. Identify the OSPF router types in the topology.

Identify the Backbone router(s): \_\_\_\_\_\_\_\_\_\_\_\_\_R1 and R2\_\_\_\_\_\_\_\_\_

Identify the Autonomous System Boundary Router(s) (ASBR): \_\_\_\_\_\_R1\_\_\_\_\_\_\_\_\_\_\_\_

Identify the Area Border Router(s) (ABR): \_\_\_\_\_\_\_R1 and R2\_\_\_\_\_\_\_\_\_\_\_\_\_

Identify the Internal router(s): \_\_\_\_\_\_\_\_\_\_\_\_\_R3\_\_\_\_\_\_\_\_\_\_

* 1. Configure OSPF on R1.
     1. Configure a router ID of 1.1.1.1 with OSPF process ID of 1.

R1(config)# router ospf 1

R1(config-router)# router-id 1.1.1.1

* + 1. Add the networks for R1 to OSPF.

R1(config-router)# **network** **192.168.1.0 0.0.0.255 area 1**

R1(config-router)# **network 192.168.2.0 0.0.0.255 area 1**

R1(config-router)# **network 192.168.12.0 0.0.0.3 area 0**

* + 1. Set LAN loopback interfaces, Lo1 and Lo2, as passive.

R1(config-router)# passive-interface Lo1

R1(config-router)# passive-interface Lo2

* + 1. Create a default route to the Internet using exit interface Lo0.

R1(config)# ip route 0.0.0.0 0.0.0.0 Lo0

**Note**: You may see the “%Default route without gateway, if not a point-to-point interface, may impact performance” message. This is normal behavior if using a Loopback interface to simulate a default route.

* + 1. Configure OSPF to propagate the routes throughout the OSPF areas.
  1. Configure OSPF on R2.
     1. Configure a router ID of 2.2.2.2 with OSPF process ID of 1.

R2(config)# router ospf 1

R2(config-router)# router-id 2.2.2.2

* + 1. Add the networks for R2 to OSPF. Add the networks to the correct area. Write the commands used in the space below.

\_\_\_\_\_network 192.168.1.0 0.0.0.255 area 1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_ network 192.168.2.0 0.0.0.255 area 1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_ network 192.168.12.0 0.0.0.255 area 0\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + 1. Set all LAN loopback interfaces as passive.
  1. Configure OSPF on R3.
     1. Configure a router ID of 3.3.3.3 with OSPF process ID of 1.
     2. Add the networks for R3 to OSPF. Write the commands used in the space below.

\_\_\_\_\_network 192.168.12.0 0.0.0.3 area 0\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_network 192.168.23.0 0.0.0.255 area 3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_network 192.168.6.0 0.0.0.255 area 3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + 1. Set all LAN loopback interfaces as passive.
  1. Verify that OSPF settings are correct and adjacencies have been established between routers.
     1. Issue the **show ip protocols** command to verify OSPF settings on each router. Use this command to identify the OSPF router types and to determine the networks assigned to each area.

R1# **show ip protocols**

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "ospf 1"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 1.1.1.1

It is an area border

Number of areas in this router is 2. 2 normal 0 stub 0 nssa

Maximum path: 4

Routing for Networks:

192.168.1.0 0.0.0.255 area 1

192.168.2.0 0.0.0.255 area 1

192.168.12.0 0.0.0.3 area 0

Passive Interface(s):

Loopback1

Loopback2

Routing Information Sources:

Gateway Distance Last Update

1.1.1.1 110 00:01:45

2.2.2.2 110 00:01:45

Distance: (default is 110)

R2# **show ip protocols**

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "ospf 1"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 2.2.2.2

It is an area border router

Number of areas in this router is 2. 2 normal 0 stub 0 nssa

Maximum path: 4

Routing for Networks:

192.168.6.0 0.0.0.255 area 3

192.168.12.0 0.0.0.3 area 0

192.168.23.0 0.0.0.3 area 3

Passive Interface(s):

Loopback6

Routing Information Sources:

Gateway Distance Last Update

3.3.3.3 110 00:01:20

2.2.2.2 110 00:10:12

1.1.1.1 110 00:10:12

Distance: (default is 110)

R3# **show ip protocols**

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "ospf 1"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 3.3.3.3

Number of areas in this router is 1. 1 normal 0 stub 0 nssa

Maximum path: 4

Routing for Networks:

192.168.4.0 0.0.0.255 area 3

192.168.5.0 0.0.0.255 area 3

192.168.23.0 0.0.0.3 area 3

Passive Interface(s):

Loopback4

Loopback5

Routing Information Sources:

Gateway Distance Last Update

1.1.1.1 110 00:07:46

2.2.2.2 110 00:07:46

3.3.3.3 110 00:07:46

Distance: (default is 110)

What is the OSPF router type for each router?

R1: \_ABR and ASBR\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

R2: \_ABR\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

R3: \_None\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + 1. Issue the **show ip ospf neighbor** command to verify that OSPF adjacencies have been established between routers.

R1# **show ip ospf neighbor**

Neighbor ID Pri State Dead Time Address Interface

2.2.2.2 0 FULL/ - 00:00:34 192.168.12.2 Serial0/1/0

R2# **show ip ospf neighbor**

Neighbor ID Pri State Dead Time Address Interface

1.1.1.1 0 FULL/ - 00:00:36 192.168.12.1 Serial0/1/0

3.3.3.3 0 FULL/ - 00:00:36 192.168.23.2 Serial0/1/1

R3# **show ip ospf neighbor**

Neighbor ID Pri State Dead Time Address Interface

2.2.2.2 0 FULL/ - 00:00:38 192.168.23.1 Serial0/1/1

* + 1. Issue the **show ip ospf interface**  command to display a summary of interface route costs.

R1# **show ip ospf interface**

Interface PID Area IP Address/Mask Cost State Nbrs F/C

Se0/1/0 1 0 192.168.12.1/30 64 P2P 1/1

Lo1 1 1 192.168.1.1/24 1 LOOP 0/0

Lo2 1 1 192.168.2.1/24 1 LOOP 0/0

R2# **show ip ospf interface**

Interface PID Area IP Address/Mask Cost State Nbrs F/C

Se0/1/0 1 0 192.168.12.2/30 64 P2P 1/1

Lo6 1 3 192.168.6.1/24 1 LOOP 0/0

Se0/1/1 1 3 192.168.23.1/30 64 P2P 1/1

R3# **show ip ospf interface**

Interface PID Area IP Address/Mask Cost State Nbrs F/C

Lo4 1 3 192.168.4.1/24 1 LOOP 0/0

Lo5 1 3 192.168.5.1/24 1 LOOP 0/0

Se0/1/1 1 3 192.168.23.2/30 64 P2P 1/1

1. Reflection

What are three advantages for designing a network with multi-area OSPF?

\_Smaller routing tables, reduced update overhead, and less calculation work done for SPF\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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\*\* All interface can ping each other. If not, troubleshoot.

\*\* Save the .pkt file and upload to Canvas.

**\*\* Fill in the answers and submit the lab sheet (.docx) to Canvas. Remember to zip the**

**two files.**