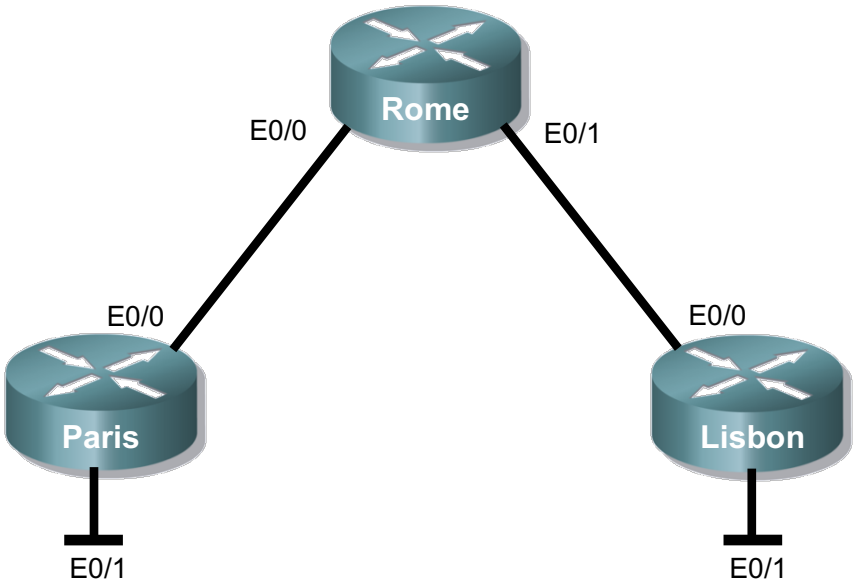
Lab - Configuring Basic Single-Area OSPFv2

Topology



Addressing Table

Device	Interface	IP Address	Subnet Mask
Paris	E0/0	192.168.12.1	255.255.255.0
	E0/1	192.168.1.1	255.255.255.0
Rome	E0/0	192.168.12.2	255.255.255.0
	E0/1	192.168.23.2	255.255.255.0
Lisbon	E0/0	192.168.23.3	255.255.255.0
	E0/1	192.168.3.3	255.255.255.0

Objectives

Part 1: Configure Basic Device Settings

Part 2: Configure and Verify OSPF Routing

Part 3: Change Router ID Assignments

Part 4: Configure OSPF Passive Interfaces

Background / Scenario

Open Shortest Path First (OSPF) is a link-state routing protocol for IP networks. OSPFv2 is defined for IPv4 networks, and OSPFv3 is defined for IPv6 networks. OSPF detects changes in the topology, such as link failures, and converges on a new loop-free routing structure very quickly. It computes each route using Dijkstra's algorithm, a shortest path first algorithm.

In this lab, you will configure the network topology with OSPFv2 routing, change the router ID assignments, adjust OSPF metrics, and use a number of CLI commands to display and verify OSPF routing information.

Required Resources

- 3 Routers (Cisco 4321 with Cisco IOS Release 15.2(4)M3 universal image or comparable)

Part 1: Configure Basic Device Settings

Step 1: Login to the 3 routers assigned to you by your instructor.

a. Use a terminal emulation program (e.g. Putty) to login to the router assigned to you by your instructor.

Step 2: Configure basic settings for each router.

a. Disable DNS lookup.

b. Configure device name as shown in the topology.

c. Configure a message of the day (MOTD) banner to warn users that unauthorized access is prohibited.

d. Configure the IP address listed in the Addressing Table for all interfaces.

Step 3: Test connectivity.

The routers should be able to ping their adjacent routers. Verify and troubleshoot if necessary.

Part 2: Configure and Verify OSPF Routing

In Part 2, you will configure OSPFv2 routing on all routers in the network and then verify that routing tables are updated correctly.

Step 1: Configure OSPF on Paris.

a. Use the **router ospf** command in global configuration mode to enable OSPF on Paris.

```
Paris(config)# router ospf 1
```

Note: The OSPF process id is kept locally and has no meaning to other routers on the network.

b. Configure the **network** statements for the networks on Paris. Use an area ID of 0.

```
Paris(config-router)# network 192.168.1.0 0.0.0.255 area 0
Paris(config-router)# network 192.168.12.0 0.0.0.255 area 0
```

Step 2: Configure OSPF on Rome and Lisbon.

Use the **router ospf** command and add the **network** statements for the networks on Rome and Lisbon. Neighbor adjacency messages display on Paris when OSPF routing is configured on Rome.

Step 3: Verify OSPF neighbors and routing information.

a. Issue the **show ip ospf neighbor** command to verify that each router lists the other routers in the network as neighbors.

```
Paris# show ip ospf neighbor
```

b. Issue the **show ip route** command to verify that all networks display in the routing table on all routers.

```
Paris# show ip route
```

What command would you use to only see the OSPF routes in the routing table?

_____

Step 4: Verify OSPF protocol settings.

The **show ip protocols** command is a quick way to verify vital OSPF configuration information. This information includes the OSPF process ID, the router ID, networks the router is advertising, the neighbors the router is receiving updates from, and the default administrative distance, which is 110 for OSPF.

```
Paris# show ip protocols
```

Step 5: Verify OSPF process information.

Use the **show ip ospf** command to examine the OSPF process ID and router ID. This command displays the OSPF area information, as well as the last time the SPF algorithm was calculated.

```
Paris# show ip ospf
```

Step 6: Verify OSPF interface settings.

a. Issue the **show ip ospf interface brief** command to display a summary of OSPF-enabled interfaces.

```
Paris# show ip ospf interface brief
```

b. For a more detailed list of every OSPF-enabled interface, issue the **show ip ospf interface** command.

```
Paris# show ip ospf interface
```

Step 7: Verify end-to-end connectivity.

Each router should be able to ping the other routers in the topology. Verify and troubleshoot if necessary.

Part 3: Change Router ID Assignments

The OSPF router ID is used to uniquely identify the router in the OSPF routing domain. Cisco routers derive the router ID in one of three ways and with the following precedence:

1) IP address configured with the OSPF **router-id** command, if present
2) Highest IP address of any of the router's loopback addresses, if present

3) Highest active IP address on any of the router's physical interfaces

Because no router IDs or loopback interfaces have been configured on the three routers, the router ID for each router is determined by the highest IP address of any active interface.

In Part 3, you will use the **router-id** command to change the OSPF router ID.

Step 1: Change the router ID on Paris using the router-id command.

The preferred method for setting the router ID is with the **router-id** command.

a. Issue the **router-id 1.1.1.1** command on Paris to reassign the router ID. Notice the informational message that appears when issuing the **router-id** command.

```
Paris(config)# router ospf 1
Paris(config-router)# router-id 1.1.1.1
Reload or use "clear ip ospf process" command, for this to take effect
Paris(config)# end
```

b. You will receive an informational message telling you that you must either reload the router or use the **clear ip ospf process** command for the change to take effect. Issue the **clear ip ospf process** command on all three routers. Type **yes** to reply to the reset verification message, and press ENTER.

c. Set the router ID for Rome to **2.2.2.2** and the router ID for Lisbon to **3.3.3.3**. Then use **clear ip ospf process** command to reset ospf routing process.

d. Issue the **show ip protocols** command to verify that the router ID changed on Paris.

```
Paris# show ip protocols
```

e. Issue the **show ip ospf neighbor** command on Paris to verify that new router IDs.

```
Paris# show ip ospf neighbor
```

Part 4: Configure OSPF Passive Interfaces

The **passive-interface** command prevents routing updates from being sent through the specified router interface. This is commonly done to reduce traffic on the LANs as they do not need to receive dynamic routing protocol communication. In Part 4, you will use the **passive-interface** command to configure a single interface as passive.

Step 1: Configure a passive interface.

a. Issue the **show ip ospf interface e0/1** command on Paris. Notice the timer indicating when the next Hello packet is expected. Hello packets are sent every 10 seconds and are used between OSPF routers to verify that their neighbors are up.

```
Paris# show ip ospf interface e0/1
Ethernet0/1 is up, line protocol is up
  Internet Address 192.168.1.1/24, Area 0, Attached via Network Statement
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0           1         no          no            Base
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.1.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:02
```

```
  Supports Link-local Signaling (LLS)
  Cisco NSF helper support enabled
  IETF NSF helper support enabled
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 0, maximum is 0
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
```

b. Issue the **passive-interface** command to change the G0/0/1 interface on Paris to passive.

```
Paris(config)# router ospf 1
Paris(config-router)# passive-interface e0/1
```

c. Re-issue the **show ip ospf interface gig 0/0/1** command to verify that G0/0/1 is now passive.

```
Paris# show ip ospf interface gig e0/1
Ethernet0/1 is up, line protocol is up
  Internet Address 192.168.1.1/24, Area 0, Attached via Network Statement
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0           1         no          no            Base
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.1.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    No Hellos (Passive interface)
  Supports Link-local Signaling (LLS)
  Cisco NSF helper support enabled
  IETF NSF helper support enabled
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 0, maximum is 0
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
```

d. Issue the **show ip route** command on Rome and Lisbon to verify that a route to the 192.168.1.0/24 network is still available.

```
Rome# show ip route
```

Step 2: Ask the instructor to reload the devices before continuing to the next lab exercise.