

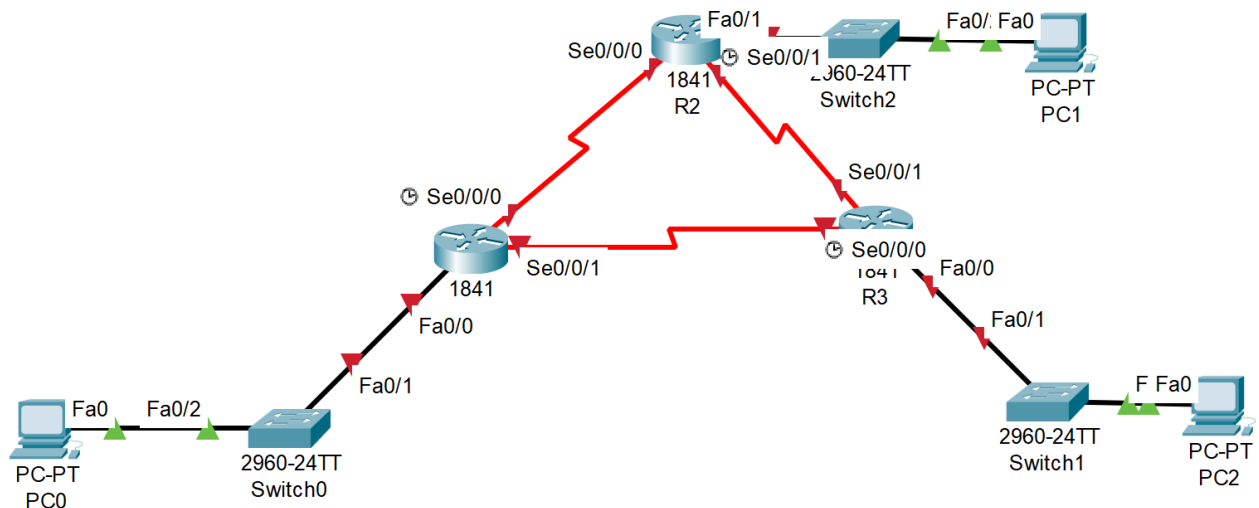
Lab 10 Walkthrough: OSPF Configuration and Verification

This document provides a concise, step-by-step guide for the basic OSPF lab, focusing on the essential commands needed to complete each task.

1. Learning Objectives

- Cable a network according to the Topology Diagram.
- Erase the startup configuration and reload a router to the default state.
- Perform basic configuration tasks on a router.
- Configure and activate interfaces.
- Configure OSPF routing on all routers.
- Configure OSPF router IDs.
- Verify OSPF routing using show commands.
- Configure a static default route.
- Propagate default route to OSPF neighbors.
- Configure OSPF Hello and Dead Timers.
- Configure OSPF on a Multiaccess network.
- Configure OSPF priority.
- Understand the OSPF election process.

2. Topology Diagram and Addressing



This table summarizes the IP addressing and interface information for all devices in the lab.

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	172.16.1.17	255.255.255.240	N/A
	S0/0/0	192.168.10.1	255.255.255.252	N/A
	S0/0/1	192.168.10.5	255.255.255.252	N/A
R2	Fa0/0	10.10.10.1	255.255.255.0	N/A
	S0/0/0	192.168.10.2	255.255.255.252	N/A
	S0/0/1	192.168.10.9	255.255.255.252	N/A
R3	Fa0/0	172.16.1.33	255.255.255.248	N/A
	S0/0/0	192.168.10.6	255.255.255.252	N/A
	S0/0/1	192.168.10.10	255.255.255.252	N/A
PC0	NIC	172.16.1.20	255.255.255.240	172.16.1.17
PC1	NIC	10.10.10.10	255.255.255.0	10.10.10.1
PC2	NIC	172.16.1.35	255.255.255.248	172.16.1.33

3. Basic Router Configuration

On R1, R2, and R3, perform the following initial setup:

```
Router>enable
Router#configure terminal
Router(config)#hostname R1
R1(config)#no ip domain-lookup
R1(config)#enable secret class
R1(config)#line con 0
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#line vty 0 4
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#exit
R1#copy running-config startup-config
```

Note: Repeat these commands for R2 and R3, changing the hostname accordingly.

4. Configure and Activate Interfaces

Use the IP addresses from the topology table to configure the interfaces on each router and PC.

On R1:

```
R1(config)#interface fa0/0
R1(config-if)#ip address 172.16.1.17 255.255.255.240
R1(config-if)#no shutdown
R1(config-if)#interface s0/0/0
R1(config-if)#ip address 192.168.10.1 255.255.255.252
R1(config-if)#no shutdown
R1(config-if)#interface s0/0/1
R1(config-if)#ip address 192.168.10.5 255.255.255.252
R1(config-if)#no shutdown
R1(config-if)#end
R1#
```

Note: Repeat for R2 and R3 using the addresses from the topology table.

After configuring the interfaces, save your work:

```
R1#copy running-config startup-config
```

5. Configure OSPF on All Routers

Enable the OSPF process and announce the directly connected networks. Use Process ID **1** and Area **0** for all networks.

On R1:

```
R1(config)#router ospf 1
R1(config-router)#network 172.16.1.16 0.0.0.15 area 0
R1(config-router)#network 192.168.10.0 0.0.0.3 area 0
R1(config-router)#network 192.168.10.4 0.0.0.3 area 0
R1(config-router)#end
```

On R2:

On R3:

Note: You should see OSPF adjacency messages appear on the console as neighbors are discovered.

6. OSPF Router ID Configuration

OSPF elects a Router ID based on a specific hierarchy:

1. The manually configured `router-id` command.
2. The highest loopback interface IP address.
3. The highest active physical interface IP address.

To change the router ID to a loopback address, configure the loopback and reload the router or reset the OSPF process.

On R1:

```
R1(config)#interface loopback 0
R1(config-if)#ip address 10.1.1.1 255.255.255.255
R1(config-if)#end
R1#copy running-config startup-config
R1#reload
```

After the reload, verify the new router ID. You can also manually set the Router ID using the `router-id` command, which is a common practice.

```
R1(config)#router ospf 1
R1(config-router)#router-id 10.4.4.4
R1(config-router)#end
R1#clear ip ospf process
```

7. Verify OSPF Operation

Use these commands to verify that OSPF is working correctly and that all routers have full adjacency and are learning routes.

```
show ip ospf neighbor
show ip protocols
show ip route
```

8. OSPF Cost & Reference Bandwidth

By default, OSPF's cost calculation assumes a reference bandwidth of `100 Mbps`. For slower serial links, this can lead to incorrect path costs. You can fix this by changing the interface bandwidth or directly setting the OSPF cost.

Change Reference Bandwidth on ALL Routers:

```
R1(config)#router ospf 1
R1(config-router)#auto-cost reference-bandwidth 10000
```

This command changes the reference bandwidth to `10000 Mbps` (10 Gbps), which affects cost calculations for all interfaces.

Change OSPF Cost on R3's Serial Links:

```
R3(config)#interface serial0/0/0
R3(config-if)#ip ospf cost 1562
R3(config-if)#interface serial0/0/1
R3(config-if)#ip ospf cost 1562
R3(config-if)#end
```

9. Redistribute a Default Route

This task simulates providing Internet access to the OSPF domain. A static default route is created on R1 and then redistributed to its OSPF neighbors.

On R1:

```
R1(config)#interface loopback1
R1(config-if)#ip address 172.30.1.1 255.255.255.252
R1(config-if)#end
R1(config)#ip route 0.0.0.0 0.0.0.0 loopback1
R1(config)#router ospf 1
R1(config-router)#default-information originate
R1(config-router)#end
```

Now, check the routing table on R2 to see the redistributed default route, which will be marked with O*E2.

10. OSPF Timers

OSPF neighbors must have matching Hello and Dead timers to maintain adjacency.

On R1, change the timers on s0/0/0:

```
R1(config)#interface serial0/0/0
R1(config-if)#ip ospf hello-interval 5
R1(config-if)#ip ospf dead-interval 20
R1(config-if)#end
```

After these changes, you will see the adjacency with R2 go down.

On R2, change the timers on s0/0/0 to match R1:

```
R2(config)#interface serial0/0/0
R2(config-if)#ip ospf hello-interval 5
R2(config-if)#ip ospf dead-interval 20
R2(config-if)#end
```

The adjacency will now be restored.

11. Document & Clean Up

After completing the lab, save the configurations and document your work.

```
R1#show running-config
R1#show ip route
R1#show ip interface brief
R1#show ip protocols
```

