Lab 17: Configuring OSPF on Point-to-Point Networks

Lab Objective:

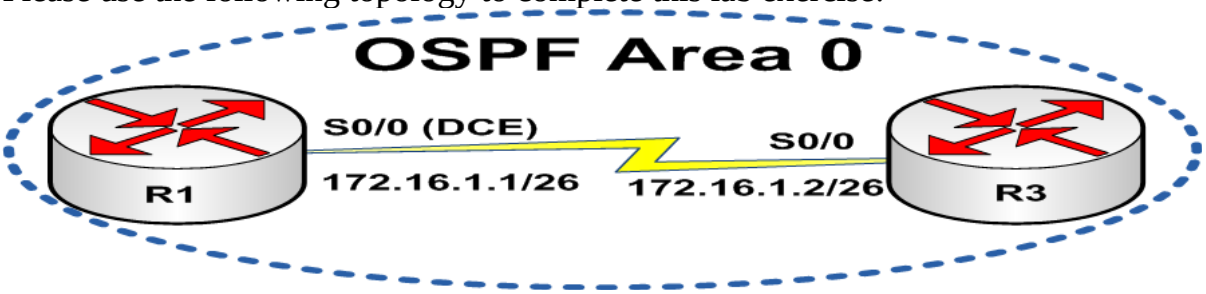
The objective of this lab exercise is for you to learn and understand how to enable OSPF on point-to-point network types. These include HDLC and PPP.

Lab Purpose:

Enabling OSPF on point-to-point network types is a fundamental skill. OSPF is the most popular Interior Gateway Protocol (IGP) and it is imperative to understand how OSPF adjacencies are established on point-to-point network types. OSPF uses the concept of Areas. In order for two OSPF-enabled routers to establish an adjacency, they must reside in the same OSPF Area. Unlike EIGRP which uses Autonomous System Numbers, OSPF is enabled using a locally significant Process ID. As a Cisco engineer, as well as in the Cisco CCNA exam, you will be expected to know how to enable OSPF on point-to-point network types.

Lab Topology:

Please use the following topology to complete this lab exercise:



Task 1:

Configure the hostnames on routers R1 and R3 as illustrated in the topology.

Task 2:

Configure R1 S0/0 which is a DCE to provide a clock rate of 768Kbps to R3. Enable PPP on the link between R1 and R3 configure the IP addresses illustrated in the topology.

Task 3:

Enable OSPF in Area 0 between R1 and R3. For R1, use an OSPF Process ID of 1. For R3 use an OSPF Process ID of 3. Verify your OSPF adjacency has formed between R1 and R3. Also verify that the default network type for the PPP link between R1 and R3 is point-to-point.

SOLUTION:

Task 2:

R1#**conf t**
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#**int s0/0**
R1(config-if)#**clock rate 768000**
R1(config-if)#**encapsulation ppp**
R1(config-if)#**ip address 172.16.1.1 255.255.255.192**
R1(config-if)#**no shut**
R1(config-if)#**end**
R1#
R3#**conf t**
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#**int s0/0**
R3(config-if)#**ip address 172.16.1.2 255.255.255.192**
R3(config-if)#**encap ppp**

R3(config-if)#**no shutdown**
R3(config-if)#**^Z**
R3#
R1#**ping 172.16.1.2**
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms
R3#**ping 172.16.1.1**
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/8 ms

Task 3:

NOTE: Unlike EIGRP configuration where wildcard masks following network statements are optional, in OSPF you MUST use a wildcard mask with your network statements. To determine the wildcard mask, you can simply subtract the network mask for the network on which you want to enable OSPF from the Broadcast mask. This concept is illustrated in the subtraction table shown below:

Broadcast Mask	255	255	255	255
[minus] **Subnet Mask**	255	255	255	192
[equals] **Wildcard Mask**	0	0	0	63

In our example, the subnet mask of the 172.16.1.0/26 subnet is 255.255.255.192. If this is subtracted from the Broadcast mask of 255.255.255.255 the result is 0.0.0.63, which is the wildcard mask we use to enable OSPF for this subnet. Take some time to practice configuring wildcard masks for different subnets.

R1#**conf t**
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#**router ospf 1**
R1(config-router)#**network 172.16.1.0 0.0.0.63 area 0**
R1(config-router)#**end**
R1#
R3#**conf t**
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#**router ospf 3**
R3(config-router)#**network 172.16.1.0 0.0.0.63 area 0**
R3(config-router)#**^Z**
R3#
R1#**show ip ospf neighbor**
Neighbor ID Pri State Dead Time Address Interface
172.16.1.2 0 FULL/ - 00:00:36 172.16.1.2 Serial0/0
R1#**show ip ospf interface serial 0/0**
Serial0/0 is up, line protocol is up
Internet Address 172.16.1.1/26, Area 0
Process ID 1, Router ID 172.16.1.1, Network Type POINT_TO_POINT, Cost: 64
Transmit Delay is 1 sec, State POINT_TO_POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

oob-resync timeout 40
Hello due in 00:00:06
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 172.16.1.2
Suppress hello for 0 neighbor(s)

NOTE: When verifying OSPF adjacencies, always ensure that neighbors are in the FULL state for point-to-point networks. If they are in any other state, you will need to perform some troubleshooting to identify the root cause of the issue. Take a moment to look at the detail contained in the output of the show ip ospf interface serial 0/0 command. From this output, we can determine that the OSPF network type is point-to-point: Network Type POINT_TO_POINT; the interface has an OSPF metric, or cost of 64: Cost: 64; and at the very botton, there is one OSPF neighbor with which an OSPF adjacency has been created via this interface as depicted in the line Adjacent with neighbor 172.16.1.2.