Packet Tracer Single Area OSPFv2

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Purpose

The purpose of this lab is to set up single area OSPFv2 on 7 networks. I learned how to advertise networks using OSPFv2. I also reviewed old concepts such as setting up networks and increased my troubleshooting skill throughout the lab.

Background Information

This lab’s major focus was on OSPF or Open Shortest Path First. OSPF uses cost to find out which path is shortest. Cost is calculated by taking the reference bandwidth (standard is 100 mbps) divided by the speed of the interface bandwidth. OSPF was created in 1980 based on the link-state algorithm and IS-IS protocol. OSPFv2 was created in 1998 for IPv4. OSPF is commonly used now is businesses after replacing its predecessor RIP (Routing Information Protocol) because OSPF works much faster, uses less bandwidth and work better with larger networks. While OSPF uses cost to detect which path is shortest, RIP used hops to detect which path is shortest. OSPF is also more effective than EIGRP (Enhanced Interior Gateway Routing Protocol) on ring topologies, data centers whereas EIGRP is better on Hub and Spoke topologies. OSPF is better for larger networks with various vendors and EIGRP is better on networks with smaller networks.

Lab Summary

In packet tracer, I set up a topology with 4 routers interconnected through serial cables and 4 pc, one connected to each router via ethernet. Then I set IP Addresses on g0/0/0 and the serials ports for a total of 7 networks; 4 on Gigabit Ethernet and 3 on serial interfaces. On each DCE serial interface I set a clock rate. Using the previously set up networks, I set up OSPF on all the routers for each of the directly connected networks to advertise the networks in order to ping across the networks.

Lab Commands

Router OSPF: Starts configuration of OSPF

Network area: Used on the OSPF interface to set up the networks advertised with OSPF

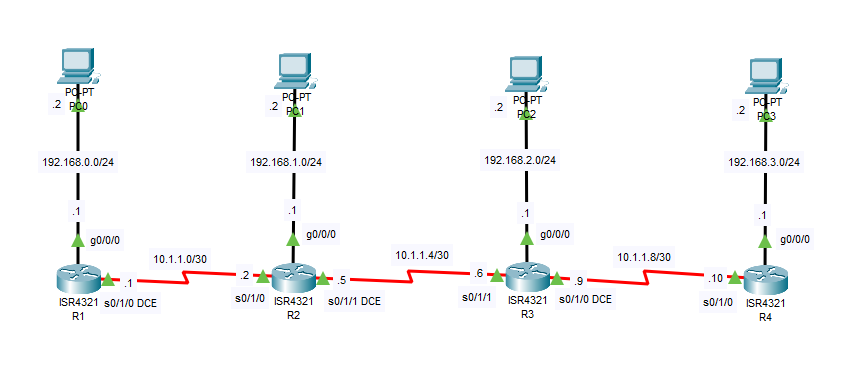
Clock rate: Used to set a clock rate on a DCE interface

Show ip ospf interface: Shows OSPF on a given interface

Show ip route: Shows the routes that go out of the device

Interface: Allows you to configure a specific interface

Network Diagram



Configuration

Router 1

**show run**

interface GigabitEthernet0/0/0

ip address 192.168.0.1 255.255.255.0

duplex auto

speed auto

!

interface Serial0/1/0

ip address 10.1.1.1 255.255.255.252

clock rate 128000

!

interface Serial0/1/1

no ip address

clock rate 2000000

shutdown

!

interface Vlan1

no ip address

shutdown

!

router ospf 10

log-adjacency-changes

network 10.1.1.0 0.0.0.3 area 10

network 192.168.0.0 0.0.0.255 area 10

**show ip route**

10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks

C 10.1.1.0/30 is directly connected, Serial0/1/0

L 10.1.1.1/32 is directly connected, Serial0/1/0

O 10.1.1.4/30 [110/128] via 10.1.1.2, 01:14:16, Serial0/1/0

O 10.1.1.8/30 [110/192] via 10.1.1.2, 01:06:25, Serial0/1/0

192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.0.0/24 is directly connected, GigabitEthernet0/0/0

L 192.168.0.1/32 is directly connected, GigabitEthernet0/0/0

O 192.168.1.0/24 [110/65] via 10.1.1.2, 01:14:16, Serial0/1/0

O 192.168.2.0/24 [110/129] via 10.1.1.2, 01:14:16, Serial0/1/0

O 192.168.3.0/24 [110/193] via 10.1.1.2, 01:06:15, Serial0/1/0

**show ip protocols**

Routing Protocol is "ospf 10"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 192.168.0.1

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

Maximum path: 4

Routing for Networks:

10.1.1.0 0.0.0.3 area 10

192.168.0.0 0.0.0.255 area 10

Routing Information Sources:

Gateway Distance Last Update

192.168.0.1 110 00:23:05

192.168.1.1 110 00:21:07

192.168.2.1 110 00:13:11

192.168.3.1 110 00:13:11

Distance: (default is 110)

**show ip ospf int s0/1/0**

Serial0/1/0 is up, line protocol is up

Internet address is 10.1.1.1/30, Area 10

Process ID 10, Router ID 192.168.0.1, 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

Hello due in 00:00:08

Index 2/2, 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 192.168.1.1

Suppress hello for 0 neighbor(s)

**show ip ospf neighbor**

Neighbor ID Pri State Dead Time Address Interface

192.168.1.1 0 FULL/ - 00:00:37 10.1.1.2 Serial0/1/0

Router 2

**show run**

interface GigabitEthernet0/0/0

ip address 192.168.1.1 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/0/1

no ip address

duplex auto

speed auto

shutdown

!

interface Serial0/1/0

ip address 10.1.1.2 255.255.255.252

!

interface Serial0/1/1

ip address 10.1.1.5 255.255.255.252

clock rate 128000

!

interface Vlan1

no ip address

shutdown

!

router ospf 10

log-adjacency-changes

network 10.1.1.0 0.0.0.3 area 10

network 192.168.1.0 0.0.0.255 area 10

network 10.1.1.4 0.0.0.3 area 10

**show ip route**

10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks

C 10.1.1.0/30 is directly connected, Serial0/1/0

L 10.1.1.2/32 is directly connected, Serial0/1/0

C 10.1.1.4/30 is directly connected, Serial0/1/1

L 10.1.1.5/32 is directly connected, Serial0/1/1

O 10.1.1.8/30 [110/128] via 10.1.1.6, 01:23:43, Serial0/1/1

O 192.168.0.0/24 [110/65] via 10.1.1.1, 01:23:43, Serial0/1/0

192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.1.0/24 is directly connected, GigabitEthernet0/0/0

L 192.168.1.1/32 is directly connected, GigabitEthernet0/0/0

O 192.168.2.0/24 [110/65] via 10.1.1.6, 01:23:43, Serial0/1/1

O 192.168.3.0/24 [110/129] via 10.1.1.6, 01:23:33, Serial0/1/1

**show ip protocols**

Routing Protocol is "ospf 10"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 192.168.1.1

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

Maximum path: 4

Routing for Networks:

10.1.1.0 0.0.0.3 area 10

192.168.1.0 0.0.0.255 area 10

10.1.1.4 0.0.0.3 area 10

Routing Information Sources:

Gateway Distance Last Update

192.168.0.1 110 00:24:07

192.168.1.1 110 00:24:06

192.168.2.1 110 00:24:05

192.168.3.1 110 00:24:06

Distance: (default is 110)

**show ip ospf int s0/1/0**

Serial0/1/0 is up, line protocol is up

Internet address is 10.1.1.2/30, Area 10

Process ID 10, Router ID 192.168.1.1, 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

Hello due in 00:00:07

Index 3/3, 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 192.168.0.1

Suppress hello for 0 neighbor(s)

**show ip ospf int s0/1/1**

Serial0/1/1 is up, line protocol is up

Internet address is 10.1.1.5/30, Area 10

Process ID 10, Router ID 192.168.1.1, 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

Hello due in 00:00:09

Index 2/2, 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 192.168.2.1

Suppress hello for 0 neighbor(s)

**show ip ospf neighbor**

Neighbor ID Pri State Dead Time Address Interface

192.168.2.1 0 FULL/ - 00:00:35 10.1.1.6 Serial0/1/1

192.168.0.1 0 FULL/ - 00:00:35 10.1.1.1 Serial0/1/0

Router 3

**show run**

interface GigabitEthernet0/0/0

ip address 192.168.2.1 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/0/1

no ip address

duplex auto

speed auto

shutdown

!

interface Serial0/1/0

ip address 10.1.1.9 255.255.255.252

clock rate 128000

!

interface Serial0/1/1

ip address 10.1.1.6 255.255.255.252

!

interface Vlan1

no ip address

shutdown

!

router ospf 10

log-adjacency-changes

network 192.168.2.0 0.0.0.255 area 10

network 10.1.1.4 0.0.0.3 area 10

network 10.1.1.8 0.0.0.3 area 10

**show ip route**

10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks

O 10.1.1.0/30 [110/128] via 10.1.1.5, 01:29:35, Serial0/1/1

C 10.1.1.4/30 is directly connected, Serial0/1/1

L 10.1.1.6/32 is directly connected, Serial0/1/1

C 10.1.1.8/30 is directly connected, Serial0/1/0

L 10.1.1.9/32 is directly connected, Serial0/1/0

O 192.168.0.0/24 [110/129] via 10.1.1.5, 01:29:35, Serial0/1/1

O 192.168.1.0/24 [110/65] via 10.1.1.5, 01:29:35, Serial0/1/1

192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.2.0/24 is directly connected, GigabitEthernet0/0/0

L 192.168.2.1/32 is directly connected, GigabitEthernet0/0/0

O 192.168.3.0/24 [110/65] via 10.1.1.10, 01:29:35, Serial0/1/0

**show ip protocols**

Routing Protocol is "ospf 10"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 192.168.2.1

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

Maximum path: 4

Routing for Networks:

192.168.2.0 0.0.0.255 area 10

10.1.1.4 0.0.0.3 area 10

10.1.1.8 0.0.0.3 area 10

Routing Information Sources:

Gateway Distance Last Update

192.168.0.1 110 00:29:58

192.168.1.1 110 00:29:58

192.168.2.1 110 00:29:56

192.168.3.1 110 00:29:57

Distance: (default is 110)

**show ip ospf int s0/1/0**

Serial0/1/0 is up, line protocol is up

Internet address is 10.1.1.9/30, Area 10

Process ID 10, Router ID 192.168.2.1, 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

Hello due in 00:00:04

Index 3/3, 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 192.168.3.1

Suppress hello for 0 neighbor(s)

**show ip ospf int s0/1/1**

Serial0/1/1 is up, line protocol is up

Internet address is 10.1.1.6/30, Area 10

Process ID 10, Router ID 192.168.2.1, 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

Hello due in 00:00:07

Index 2/2, 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 192.168.1.1

Suppress hello for 0 neighbor(s)

**show ip ospf neighbor**

Neighbor ID Pri State Dead Time Address Interface

192.168.1.1 0 FULL/ - 00:00:33 10.1.1.5 Serial0/1/1

192.168.3.1 0 FULL/ - 00:00:33 10.1.1.10 Serial0/1/0

Router 4

**show run**

interface GigabitEthernet0/0/0

ip address 192.168.3.1 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/0/1

no ip address

duplex auto

speed auto

shutdown

!

interface Serial0/1/0

ip address 10.1.1.10 255.255.255.252

!

interface Serial0/1/1

no ip address

clock rate 2000000

shutdown

!

interface Vlan1

no ip address

shutdown

!

router ospf 10

log-adjacency-changes

network 192.168.3.0 0.0.0.255 area 10

network 10.1.1.8 0.0.0.3 area 10

**show ip route**

10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks

O 10.1.1.0/30 [110/192] via 10.1.1.9, 01:32:55, Serial0/1/0

O 10.1.1.4/30 [110/128] via 10.1.1.9, 01:32:55, Serial0/1/0

C 10.1.1.8/30 is directly connected, Serial0/1/0

L 10.1.1.10/32 is directly connected, Serial0/1/0

O 192.168.0.0/24 [110/193] via 10.1.1.9, 01:32:55, Serial0/1/0

O 192.168.1.0/24 [110/129] via 10.1.1.9, 01:32:55, Serial0/1/0

O 192.168.2.0/24 [110/65] via 10.1.1.9, 01:32:55, Serial0/1/0

192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.3.0/24 is directly connected, GigabitEthernet0/0/0

L 192.168.3.1/32 is directly connected, GigabitEthernet0/0/0

**show ip protocols**

Routing Protocol is "ospf 10"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 192.168.3.1

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

Maximum path: 4

Routing for Networks:

192.168.3.0 0.0.0.255 area 10

10.1.1.8 0.0.0.3 area 10

Routing Information Sources:

Gateway Distance Last Update

192.168.0.1 110 00:03:15

192.168.1.1 110 00:03:15

192.168.2.1 110 00:03:14

192.168.3.1 110 00:03:14

Distance: (default is 110)

**show ip ospf int s0/1/0**

Serial0/1/0 is up, line protocol is up

Internet address is 10.1.1.10/30, Area 10

Process ID 10, Router ID 192.168.3.1, 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

Hello due in 00:00:08

Index 2/2, 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 192.168.2.1

Suppress hello for 0 neighbor(s)

**show ip ospf neighbor**

Neighbor ID Pri State Dead Time Address Interface

192.168.2.1 0 FULL/ - 00:00:38 10.1.1.9 Serial0/1/0

Problems

The first problem I faced was that I forgot to do a no shut on s0/1/0 on R1. This resulted in R1 not being able to connect to R2. I added no shut on the interface and was then able to establish a connection with the other router.

Another problem I had was that I used the wrong ip address on s0/1/0 on R4 This resulted in OSPF being unable to advertise the network correctly which resulted in pings not responding. Once I changed the IP address the routers established a connection and the pings went through.

I was able to solve each mistake using the **show ip interface brief** command to see if the interface was on or off and what IP addresses are set to which interfaces.

Conclusion

In this lab I learned how to set up OSPFv2 across 7 different networks. This lab taught me how to set up OSPF and reminded me on show to set up networks. I ran into minor difficulties with the serial interfaces, but they were easily troubleshooted. Overall, this lab retaught me important troubleshooting skills as well as OSPF and Networks.