Packet Tracer Multi Area OSPFv3

Alen Ovalles

Purpose

The purpose of this lab is to remember and learn how to do multi area OSPF in ipv6 through multiple networks, this time with two different areas. Understanding the function of a border router and each link-local between areas and serial interfaces. Again, to get us back to be familiar with troubleshooting problems with the given topology.

Background

Open Shortest Path First (OSPF) can be used in a single area OSPF or multi area OSPF with OSPFv2 for ipv4 and OPSFv3 or ipv6. Developed by the Internet Engineering Task Force (IETF) to become the replacement of RIP, as an independent vendor and became the most used routing protocol by enterprise networks now a days. Based on Dijkstra’s algorithm which generates link-state packets with local info for each router. Each router exchanges local and external link state info allowing it to create the shortest path possible to a selected destination. Some advantages to use OSPF verse RIP or EIGRP are it provides shortest path routing with fast to fault discovery and rerouting. OSPF uses hello packets to verify router connection with each other and is the highest performance open standard routing protocol to operate with large networks. Unlike RIP which is limited to have a maximum hop count of 15 hops but with a higher administrative distance of 120. Some disadvantages of OSPF are it consumes a higher processing and memory than RIP and consumes a large amount of bandwidth at the start of link-state packet flooding. In some cases, EIGRP could be better on a network as its main selling point is how easy to configure it is over OSPF, with a faster converge and additional back up routes. Although, the major downside with using EIGRP is it can be only used on cisco networks and not any other vendors. With topologies with multiple areas, the border router is the middle router that has both areas on it, not getting OI routes but only O routes. The border routers are on the edge of a network connected to another area network, allowing devices in one area to communicate with other devices on different area network.

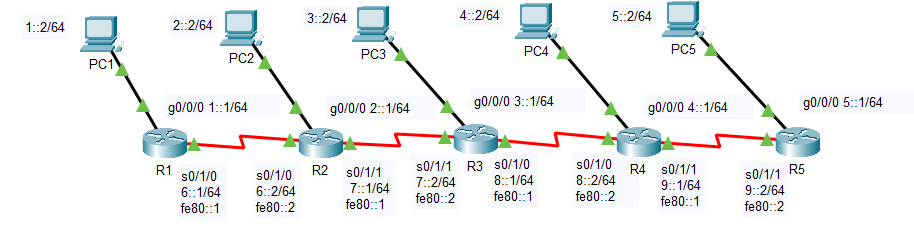
Lab Summary

In Packet Tracer, I set up two local area networks using 5 routers and 5 PCs as end devices, creating a different LAN with each connect. There was a total of 9 networks with 5 of them between the PC’s Fa0/0 interface and the router’s G0/0/0 interface, with the PC’s being ::2/64 and routers being ::1/64. The other 4 networks are ::6/64, ::7/64, ::8/64 and ::9/64 used on the serial interfaces between routers. Routers 1, 2, and 3 are on the area 0 while routers 4 and 5 are on area 1. The link locals for the serial interfaces on the left are fe80::1, while the right serial interfaces are fe80::2. Each PC is label with its respected network, and between each router is the network for the serial interfaces. Each router was given the network address that they were connected to allow OSPF to run and router-id from router 1 with 1.1.1.1. and so on.

Lab Commands

* **ipv6 router ospf [process-id]** – Create an OSPF routing process and enter router configuration mode
* **router-id** – Assigns the router with an OSPF ID
* **ipv6 ospf [process-id] area [area #]** – Allows OPSFv3 to function on set interface and assigns area network it’s on
* **show run** – Shows the configuration of the router
* **ping [ipv6 address] –** Checks the connection between devices
* **show ipv6 route** – Shows current router’s routing table for OSPFv3
* **show ipv6 protocol** – Shows the areas OSPF is configured the device with router-id and networks
* **show ipv6 ospf interface –** Shows the ospf configuration of the interfaces on the router
* **ipv6 unicast-routing** – enables ipv6 on the router
* **clock rate** – Allows routers to be synchronized with each other on the same rate

Network Diagram with IP’s



Configurations

PC1

C:\>**ping 2::2**

Pinging 2::2 with 32 bytes of data:

Reply from 2::2: bytes=32 time=60ms TTL=126

Reply from 2::2: bytes=32 time=1ms TTL=126

Reply from 2::2: bytes=32 time=1ms TTL=126

Reply from 2::2: bytes=32 time=1ms TTL=126

Ping statistics for 2::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 60ms, Average = 15ms

C:\>**ping 3::2**

Pinging 3::2 with 32 bytes of data:

Reply from 3::2: bytes=32 time=18ms TTL=125

Reply from 3::2: bytes=32 time=2ms TTL=125

Reply from 3::2: bytes=32 time=22ms TTL=125

Reply from 3::2: bytes=32 time=6ms TTL=125

Ping statistics for 3::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 2ms, Maximum = 22ms, Average = 12ms

C:\>**ping 4::2**

Pinging 4::2 with 32 bytes of data:

Reply from 4::2: bytes=32 time=57ms TTL=124

Reply from 4::2: bytes=32 time=11ms TTL=124

Reply from 4::2: bytes=32 time=13ms TTL=124

Reply from 4::2: bytes=32 time=13ms TTL=124

Ping statistics for 4::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 11ms, Maximum = 57ms, Average = 23ms

C:\>**ping 5::2**

Pinging 5::2 with 32 bytes of data:

Reply from 5::2: bytes=32 time=49ms TTL=123

Reply from 5::2: bytes=32 time=16ms TTL=123

Reply from 5::2: bytes=32 time=12ms TTL=123

Reply from 5::2: bytes=32 time=15ms TTL=123

Ping statistics for 5::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 12ms, Maximum = 49ms, Average = 23ms

PC2

C:\>**ping 1::2**

Pinging 1::2 with 32 bytes of data:

Reply from 1::2: bytes=32 time=1ms TTL=126

Reply from 1::2: bytes=32 time=10ms TTL=126

Reply from 1::2: bytes=32 time=10ms TTL=126

Reply from 1::2: bytes=32 time=14ms TTL=126

Ping statistics for 1::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 14ms, Average = 8ms

C:\>**ping 3::2**

Pinging 3::2 with 32 bytes of data:

Reply from 3::2: bytes=32 time=2ms TTL=126

Reply from 3::2: bytes=32 time=3ms TTL=126

Reply from 3::2: bytes=32 time=10ms TTL=126

Reply from 3::2: bytes=32 time=11ms TTL=126

Ping statistics for 3::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 2ms, Maximum = 11ms, Average = 6ms

C:\>**ping 4::2**

Pinging 4::2 with 32 bytes of data:

Reply from 4::2: bytes=32 time=11ms TTL=125

Reply from 4::2: bytes=32 time=10ms TTL=125

Reply from 4::2: bytes=32 time=6ms TTL=125

Reply from 4::2: bytes=32 time=6ms TTL=125

Ping statistics for 4::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 6ms, Maximum = 11ms, Average = 8ms

C:\>**ping 5::2**

Pinging 5::2 with 32 bytes of data:

Reply from 5::2: bytes=32 time=5ms TTL=124

Reply from 5::2: bytes=32 time=5ms TTL=124

Reply from 5::2: bytes=32 time=12ms TTL=124

Reply from 5::2: bytes=32 time=7ms TTL=124

Ping statistics for 5::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 5ms, Maximum = 12ms, Average = 7ms

PC3

C:\>**ping 1::2**

Pinging 1::2 with 32 bytes of data:

Reply from 1::2: bytes=32 time=3ms TTL=125

Reply from 1::2: bytes=32 time=10ms TTL=125

Reply from 1::2: bytes=32 time=4ms TTL=125

Reply from 1::2: bytes=32 time=12ms TTL=125

Ping statistics for 1::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 3ms, Maximum = 12ms, Average = 7ms

C:\>**ping 2::2**

Pinging 2::2 with 32 bytes of data:

Reply from 2::2: bytes=32 time=4ms TTL=126

Reply from 2::2: bytes=32 time=5ms TTL=126

Reply from 2::2: bytes=32 time=8ms TTL=126

Reply from 2::2: bytes=32 time=3ms TTL=126

Ping statistics for 2::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 3ms, Maximum = 8ms, Average = 5ms

C:\>**ping 4::2**

Pinging 4::2 with 32 bytes of data:

Reply from 4::2: bytes=32 time=2ms TTL=126

Reply from 4::2: bytes=32 time=4ms TTL=126

Reply from 4::2: bytes=32 time=1ms TTL=126

Reply from 4::2: bytes=32 time=9ms TTL=126

Ping statistics for 4::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 9ms, Average = 4ms

C:\>**ping 5::2**

Pinging 5::2 with 32 bytes of data:

Reply from 5::2: bytes=32 time=5ms TTL=125

Reply from 5::2: bytes=32 time=35ms TTL=125

Reply from 5::2: bytes=32 time=2ms TTL=125

Reply from 5::2: bytes=32 time=13ms TTL=125

Ping statistics for 5::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 2ms, Maximum = 35ms, Average = 13ms

PC4

C:\>**ping 1::2**

Pinging 1::2 with 32 bytes of data:

Reply from 1::2: bytes=32 time=47ms TTL=124

Reply from 1::2: bytes=32 time=28ms TTL=124

Reply from 1::2: bytes=32 time=314ms TTL=124

Reply from 1::2: bytes=32 time=13ms TTL=124

Ping statistics for 1::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 13ms, Maximum = 314ms, Average = 100ms

C:\>**ping 2::2**

Pinging 2::2 with 32 bytes of data:

Reply from 2::2: bytes=32 time=3ms TTL=125

Reply from 2::2: bytes=32 time=11ms TTL=125

Reply from 2::2: bytes=32 time=4ms TTL=125

Reply from 2::2: bytes=32 time=10ms TTL=125

Ping statistics for 2::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 3ms, Maximum = 11ms, Average = 7ms

C:\>**ping 3::2**

Pinging 3::2 with 32 bytes of data:

Reply from 3::2: bytes=32 time=2ms TTL=126

Reply from 3::2: bytes=32 time=11ms TTL=126

Reply from 3::2: bytes=32 time=7ms TTL=126

Reply from 3::2: bytes=32 time=1ms TTL=126

Ping statistics for 3::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 11ms, Average = 5ms

C:\>**ping 5::2**

Pinging 5::2 with 32 bytes of data:

Reply from 5::2: bytes=32 time=2ms TTL=126

Reply from 5::2: bytes=32 time=1ms TTL=126

Reply from 5::2: bytes=32 time=10ms TTL=126

Reply from 5::2: bytes=32 time=1ms TTL=126

Ping statistics for 5::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 10ms, Average = 3ms

PC5

C:\>**ping 1::2**

Pinging 1::2 with 32 bytes of data:

Reply from 1::2: bytes=32 time=55ms TTL=123

Reply from 1::2: bytes=32 time=4ms TTL=123

Reply from 1::2: bytes=32 time=13ms TTL=123

Reply from 1::2: bytes=32 time=22ms TTL=123

Ping statistics for 1::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 4ms, Maximum = 55ms, Average = 23ms

C:\>**ping 2::2**

Pinging 2::2 with 32 bytes of data:

Reply from 2::2: bytes=32 time=12ms TTL=124

Reply from 2::2: bytes=32 time=5ms TTL=124

Reply from 2::2: bytes=32 time=7ms TTL=124

Reply from 2::2: bytes=32 time=19ms TTL=124

Ping statistics for 2::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 5ms, Maximum = 19ms, Average = 10ms

C:\>**ping 3::2**

Pinging 3::2 with 32 bytes of data:

Reply from 3::2: bytes=32 time=2ms TTL=125

Reply from 3::2: bytes=32 time=11ms TTL=125

Reply from 3::2: bytes=32 time=4ms TTL=125

Reply from 3::2: bytes=32 time=2ms TTL=125

Ping statistics for 3::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 2ms, Maximum = 11ms, Average = 4ms

C:\>**ping 4::2**

Pinging 4::2 with 32 bytes of data:

Reply from 4::2: bytes=32 time=3ms TTL=126

Reply from 4::2: bytes=32 time=3ms TTL=126

Reply from 4::2: bytes=32 time=1ms TTL=126

Reply from 4::2: bytes=32 time=3ms TTL=126

Ping statistics for 4::2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 3ms, Average = 2ms

**Router 1**

R1#**show run**

Building configuration...

Current configuration : 1114 bytes

!

hostname R1

!

ipv6 unicast-routing

!

interface GigabitEthernet0/0/0

ip address 192.168.1.1 255.255.255.0

duplex auto

speed auto

ipv6 address FE80::1 link-local

ipv6 address 1::1/64

ipv6 ospf 1 area 0

!

interface Serial0/1/0

ip address 192.168.6.1 255.255.255.252

ipv6 address FE80::1 link-local

ipv6 address 6::1/64

ipv6 ospf 1 area 0

clock rate 2000000

!

router ospf 1

router-id 1.1.1.1

log-adjacency-changes

network 192.168.1.0 0.0.0.255 area 0

network 192.168.6.0 0.0.0.3 area 0

!

ipv6 router ospf 1

log-adjacency-changes

!

end

R1#**show ipv6 route**

IPv6 Routing Table - 12 entries

Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP

U - Per-user Static route, M - MIPv6

I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary

O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2

ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

D - EIGRP, EX - EIGRP external

C 1::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

L 1::1/128 [0/0]

via GigabitEthernet0/0/0, receive

O 2::/64 [110/65]

via FE80::2, Serial0/1/0

O 3::/64 [110/129]

via FE80::2, Serial0/1/0

OI 4::/64 [110/193]

via FE80::2, Serial0/1/0

OI 5::/64 [110/257]

via FE80::2, Serial0/1/0

C 6::/64 [0/0]

via Serial0/1/0, directly connected

L 6::1/128 [0/0]

via Serial0/1/0, receive

O 7::/64 [110/128]

via FE80::2, Serial0/1/0

OI 8::/64 [110/192]

via FE80::2, Serial0/1/0

OI 9::/64 [110/256]

via FE80::2, Serial0/1/0

L FF00::/8 [0/0]

via Null0, receive

R1#**show ipv6 proto**

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "ospf 1"

Interfaces (Area 0)

GigabitEthernet0/0/0

Serial0/1/0

Redistribution:

None

R1#**show ipv6 ospf int**

GigabitEthernet0/0/0 is up, line protocol is up

Link Local Address FE80::1, Interface ID 1

Area 0, Process ID 1, Instance ID 0, Router ID 192.168.5.1

Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 192.168.5.1, local address FE80::1

No backup designated router on this network

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:07

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 0, Adjacent neighbor count is 0

Suppress hello for 0 neighbor(s)

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

Link Local Address FE80::1, Interface ID 3

Area 0, Process ID 1, Instance ID 0, Router ID 192.168.5.1

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 00:00:00

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 192.168.5.5

Suppress hello for 0 neighbor(s)

**Router 2**

R2#**show run**

Building configuration...

Current configuration : 1183 bytes

!

hostname R2

!

ipv6 unicast-routing

!

interface GigabitEthernet0/0/0

ip address 192.168.2.1 255.255.255.0

duplex auto

speed auto

ipv6 address FE80::1 link-local

ipv6 address 2::1/64

ipv6 ospf 2 area 0

!

interface Serial0/1/0

ip address 192.168.6.2 255.255.255.252

ipv6 address FE80::2 link-local

ipv6 address 6::2/64

ipv6 ospf 2 area 0

!

interface Serial0/1/1

ip address 192.168.6.5 255.255.255.252

ipv6 address FE80::1 link-local

ipv6 address 7::1/64

ipv6 ospf 2 area 0

clock rate 2000000

!

router ospf 2

router-id 2.2.2.2

log-adjacency-changes

network 192.168.2.0 0.0.0.255 area 0

network 192.168.6.0 0.0.0.3 area 0

network 192.168.6.4 0.0.0.3 area 0

!

ipv6 router ospf 2

log-adjacency-changes

!

end

R2#**show ipv6 route**

IPv6 Routing Table - 13 entries

Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP

U - Per-user Static route, M - MIPv6

I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary

O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2

ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

D - EIGRP, EX - EIGRP external

O 1::/64 [110/65]

via FE80::1, Serial0/1/0

C 2::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

L 2::1/128 [0/0]

via GigabitEthernet0/0/0, receive

O 3::/64 [110/65]

via FE80::2, Serial0/1/1

OI 4::/64 [110/129]

via FE80::2, Serial0/1/1

OI 5::/64 [110/193]

via FE80::2, Serial0/1/1

C 6::/64 [0/0]

via Serial0/1/0, directly connected

L 6::2/128 [0/0]

via Serial0/1/0, receive

C 7::/64 [0/0]

via Serial0/1/1, directly connected

L 7::1/128 [0/0]

via Serial0/1/1, receive

OI 8::/64 [110/128]

via FE80::2, Serial0/1/1

OI 9::/64 [110/192]

via FE80::2, Serial0/1/1

L FF00::/8 [0/0]

via Null0, receive

R2#**show ipv6 proto**

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "ospf 2"

Interfaces (Area 0)

GigabitEthernet0/0/0

Serial0/1/0

Serial0/1/1

Redistribution:

None

R2#**show ipv6 ospf int**

GigabitEthernet0/0/0 is up, line protocol is up

Link Local Address FE80::1, Interface ID 1

Area 0, Process ID 2, Instance ID 0, Router ID 192.168.5.5

Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 192.168.5.5, local address FE80::1

No backup designated router on this network

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:00

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 0, Adjacent neighbor count is 0

Suppress hello for 0 neighbor(s)

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

Link Local Address FE80::2, Interface ID 3

Area 0, Process ID 2, Instance ID 0, Router ID 192.168.5.5

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 00:00:03

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 192.168.5.1

Suppress hello for 0 neighbor(s)

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

Link Local Address FE80::1, Interface ID 4

Area 0, Process ID 2, Instance ID 0, Router ID 192.168.5.5

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 192.168.5.9

Suppress hello for 0 neighbor(s)

**Router 3**

R3#**show run**

Building configuration...

Current configuration : 1183 bytes

!

hostname R3

!

ipv6 unicast-routing

!

interface GigabitEthernet0/0/0

ip address 192.168.3.1 255.255.255.0

duplex auto

speed auto

ipv6 address FE80::1 link-local

ipv6 address 3::1/64

ipv6 ospf 3 area 0

!

interface Serial0/1/0

ip address 192.168.6.9 255.255.255.252

ipv6 address FE80::1 link-local

ipv6 address 8::1/64

ipv6 ospf 3 area 1

clock rate 2000000

!

interface Serial0/1/1

ip address 192.168.6.6 255.255.255.252

ipv6 address FE80::2 link-local

ipv6 address 7::2/64

ipv6 ospf 3 area 0

!

router ospf 3

router-id 3.3.3.3

log-adjacency-changes

network 192.168.3.0 0.0.0.255 area 0

network 192.168.6.4 0.0.0.3 area 0

network 192.168.6.8 0.0.0.3 area 0

!

ipv6 router ospf 3

log-adjacency-changes

!

end

R3#**show ipv6 route**

IPv6 Routing Table - 13 entries

Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP

U - Per-user Static route, M - MIPv6

I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary

O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2

ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

D - EIGRP, EX - EIGRP external

O 1::/64 [110/129]

via FE80::1, Serial0/1/1

O 2::/64 [110/65]

via FE80::1, Serial0/1/1

C 3::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

L 3::1/128 [0/0]

via GigabitEthernet0/0/0, receive

O 4::/64 [110/65]

via FE80::2, Serial0/1/0

O 5::/64 [110/129]

via FE80::2, Serial0/1/0

O 6::/64 [110/128]

via FE80::1, Serial0/1/1

C 7::/64 [0/0]

via Serial0/1/1, directly connected

L 7::2/128 [0/0]

via Serial0/1/1, receive

C 8::/64 [0/0]

via Serial0/1/0, directly connected

L 8::1/128 [0/0]

via Serial0/1/0, receive

O 9::/64 [110/128]

via FE80::2, Serial0/1/0

L FF00::/8 [0/0]

via Null0, receive

R3#**show ipv6 proto**

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "ospf 3"

Interfaces (Area 0)

GigabitEthernet0/0/0

Serial0/1/1

Interfaces (Area 1)

Serial0/1/0

Redistribution:

None

R3#**show ipv6 ospf int**

GigabitEthernet0/0/0 is up, line protocol is up

Link Local Address FE80::1, Interface ID 1

Area 0, Process ID 3, Instance ID 0, Router ID 192.168.5.9

Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 192.168.5.9, local address FE80::1

No backup designated router on this network

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:03

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 0, Adjacent neighbor count is 0

Suppress hello for 0 neighbor(s)

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

Link Local Address FE80::2, Interface ID 4

Area 0, Process ID 3, Instance ID 0, Router ID 192.168.5.9

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 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 192.168.5.5

Suppress hello for 0 neighbor(s)

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

Link Local Address FE80::1, Interface ID 3

Area 1, Process ID 3, Instance ID 0, Router ID 192.168.5.9

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 00:00:02

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 192.168.5.13

Suppress hello for 0 neighbor(s)

**Router 4**

R4#**show run**

Building configuration...

Current configuration : 1259 bytes

!

hostname R4

!

ipv6 unicast-routing

!

interface GigabitEthernet0/0/0

ip address 192.168.4.1 255.255.255.0

duplex auto

speed auto

ipv6 address FE80::1 link-local

ipv6 address 4::1/64

ipv6 ospf 4 area 1

!

interface Serial0/1/0

ip address 192.168.6.10 255.255.255.252

ipv6 address FE80::2 link-local

ipv6 address 8::2/64

ipv6 ospf 4 area 1

!

interface Serial0/1/1

ip address 192.168.6.13 255.255.255.252

ipv6 address FE80::1 link-local

ipv6 address 9::1/64

ipv6 ospf 4 area 1

clock rate 2000000

!

router ospf 4

router-id 4.4.4.4

log-adjacency-changes

network 192.168.4.0 0.0.0.255 area 0

network 192.168.6.8 0.0.0.3 area 0

network 192.168.6.12 0.0.0.3 area 0

!

ipv6 router ospf 4

log-adjacency-changes

!

end

R4#**show ipv6 route**

IPv6 Routing Table - 13 entries

Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP

U - Per-user Static route, M - MIPv6

I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary

O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2

ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

D - EIGRP, EX - EIGRP external

OI 1::/64 [110/193]

via FE80::1, Serial0/1/0

OI 2::/64 [110/129]

via FE80::1, Serial0/1/0

OI 3::/64 [110/65]

via FE80::1, Serial0/1/0

C 4::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

L 4::1/128 [0/0]

via GigabitEthernet0/0/0, receive

O 5::/64 [110/65]

via FE80::2, Serial0/1/1

OI 6::/64 [110/256]

via FE80::1, Serial0/1/0

OI 7::/64 [110/128]

via FE80::1, Serial0/1/0

C 8::/64 [0/0]

via Serial0/1/0, directly connected

L 8::2/128 [0/0]

via Serial0/1/0, receive

C 9::/64 [0/0]

via Serial0/1/1, directly connected

L 9::1/128 [0/0]

via Serial0/1/1, receive

L FF00::/8 [0/0]

via Null0, receive

R4#**show ipv6 proto**

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "ospf 4"

Interfaces (Area 1)

GigabitEthernet0/0/0

Serial0/1/0

Serial0/1/1

Redistribution:

None

R4#**show ipv6 ospf int**

GigabitEthernet0/0/0 is up, line protocol is up

Link Local Address FE80::1, Interface ID 1

Area 1, Process ID 4, Instance ID 0, Router ID 192.168.5.13

Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 192.168.5.13, local address FE80::1

No backup designated router on this network

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:03

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 0, Adjacent neighbor count is 0

Suppress hello for 0 neighbor(s)

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

Link Local Address FE80::2, Interface ID 3

Area 1, Process ID 4, Instance ID 0, Router ID 192.168.5.13

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 192.168.5.9

Suppress hello for 0 neighbor(s)

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

Link Local Address FE80::1, Interface ID 4

Area 1, Process ID 4, Instance ID 0, Router ID 192.168.5.13

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 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 192.168.6.14

Suppress hello for 0 neighbor(s)

**Router 5**

R5#**show run**

Building configuration...

Current configuration : 1059 bytes

!

hostname R5

!

ipv6 unicast-routing

!

interface GigabitEthernet0/0/0

ip address 192.168.5.1 255.255.255.0

duplex auto

speed auto

ipv6 address FE80::1 link-local

ipv6 address 5::1/64

ipv6 ospf 5 area 1

!

interface Serial0/1/1

ip address 192.168.6.14 255.255.255.252

ipv6 address FE80::2 link-local

ipv6 address 9::2/64

ipv6 ospf 5 area 1

!

router ospf 5

router-id 5.5.5.5

log-adjacency-changes

network 192.168.5.0 0.0.0.255 area 0

network 192.168.6.12 0.0.0.3 area 0

!

ipv6 router ospf 5

log-adjacency-changes

!

end

R5#**show ipv6 route**

IPv6 Routing Table - 12 entries

Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP

U - Per-user Static route, M - MIPv6

I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary

O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2

ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

D - EIGRP, EX - EIGRP external

OI 1::/64 [110/257]

via FE80::1, Serial0/1/1

OI 2::/64 [110/193]

via FE80::1, Serial0/1/1

OI 3::/64 [110/129]

via FE80::1, Serial0/1/1

O 4::/64 [110/65]

via FE80::1, Serial0/1/1

C 5::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

L 5::1/128 [0/0]

via GigabitEthernet0/0/0, receive

OI 6::/64 [110/320]

via FE80::1, Serial0/1/1

OI 7::/64 [110/192]

via FE80::1, Serial0/1/1

O 8::/64 [110/128]

via FE80::1, Serial0/1/1

C 9::/64 [0/0]

via Serial0/1/1, directly connected

L 9::2/128 [0/0]

via Serial0/1/1, receive

L FF00::/8 [0/0]

via Null0, receive

R5#**show ipv6 proto**

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "ospf 5"

Interfaces (Area 1)

Serial0/1/1

GigabitEthernet0/0/0

Redistribution:

None

R5#**show ipv6 ospf int**

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

Link Local Address FE80::2, Interface ID 4

Area 1, Process ID 5, Instance ID 0, Router ID 192.168.6.14

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 00:00:02

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 192.168.5.13

Suppress hello for 0 neighbor(s)

GigabitEthernet0/0/0 is up, line protocol is up

Link Local Address FE80::1, Interface ID 1

Area 1, Process ID 5, Instance ID 0, Router ID 192.168.6.14

Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 192.168.6.14, local address FE80::1

No backup designated router on this network

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:04

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 0, Adjacent neighbor count is 0

Suppress hello for 0 neighbor(s)

Problems

Another problem that came up was how to do OSPFv3 with different areas. One person in our CCNP class call, forgot who, said that they remembered that there was a lab that we did last year in CCNA and searched for it on youtube. I did the same which helped me understand the border router with it having both areas. As well with what OSPFv3 commands that were different from OSPFv2 commands used in last lab. Like how OPSFv3 is set up in each interface and not as each networks of each router. Another problem that came up was gaining OI routes from the other area. After Mr. Mason told us to add different link-locals to each serial interface I was able to gain the missing OI and O routes from each area.

Conclusion

The lab was another good review now with ipv6 addresses and configuration. Remembering to do the command ipv6 unicast-routing to enable ipv6 on the router and how ipv6 addresses went, with the two ::/64 making it easier to create addresses. The second lab is a great one as well mixing in getting to know packet tracer again and ipv6 configuration throughout the lab. As well remember the ipv6 unicast-router and link-locals in the lab.