LAB9: OSPF – IPv6

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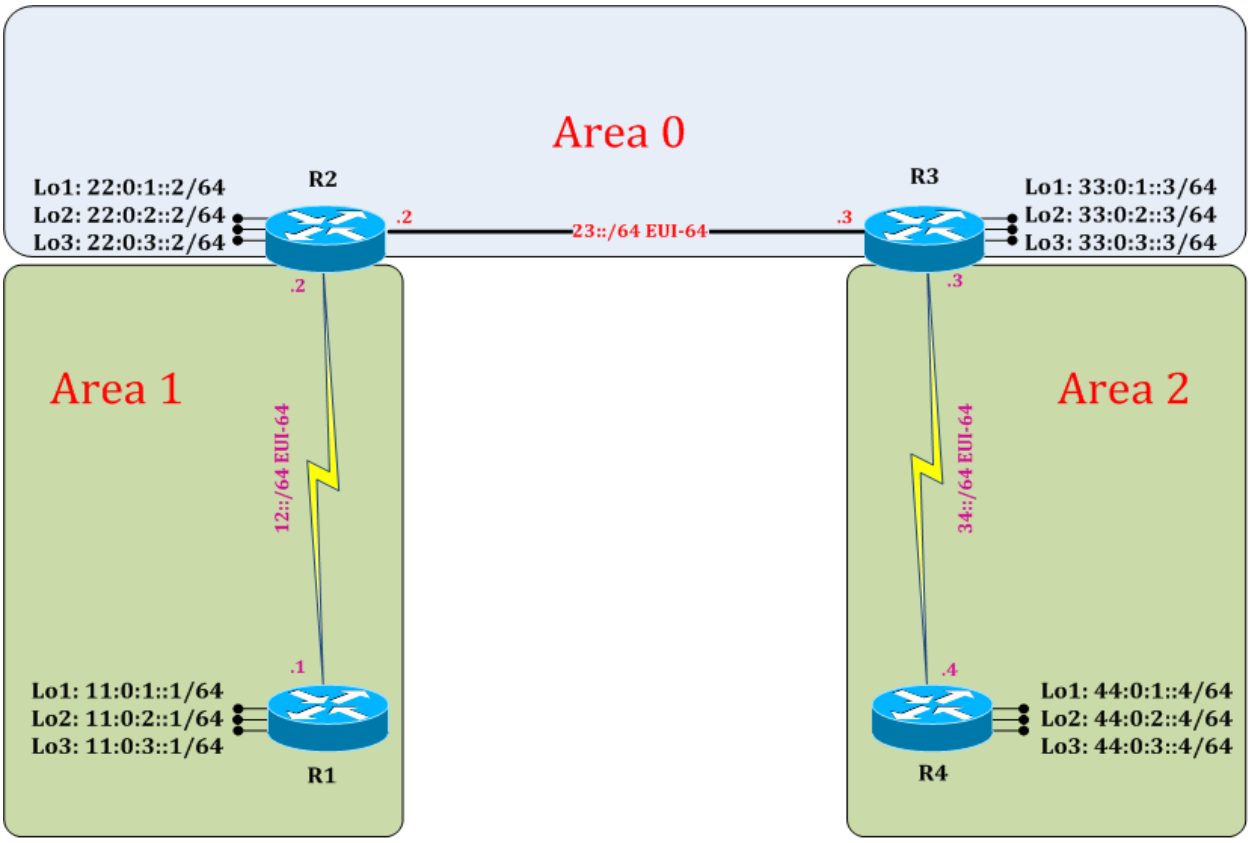
LAB 9: Diagram

Note: This Lab was developed on Cisco IOS Version15.2(4) M1 ADVENTERPRISEK9-M.



LAB 9: Configure OSPF FOR IPv6:

Task 1: Configure IPv6 OSPF process for Autonomous

Step 1 In the configuration mode of router configure IPv6 OSPF Process by following command:

R1:

```
ipv6 router ospf 1          ! (Start IPv6 OSPF with Process ID 1)
interface s2/0              ! (Send updates on interface in given area)
ipv6 ospf 1 area 1
interface loopback 1
ipv6 ospf 1 area 1
interface loopback 2
ipv6 ospf 1 area 1
interface loopback 3
ipv6 ospf 1 area 1
exit
```

R2:

```
ipv6 router ospf 1
interface s2/0
ipv6 ospf 1 area 1
interface e0/0
ipv6 ospf 1 area 0
interface loopback 1
ipv6 ospf 1 area 0
interface loopback 2
ipv6 ospf 1 area 0
interface loopback 3
ipv6 ospf 1 area 0
exit
```

R3:

```
ipv6 router ospf 1
interface e0/0
ipv6 ospf 1 area 0
interface s2/0
ipv6 ospf 1 area 2
interface loopback 1
ipv6 ospf 1 area 0
interface loopback 2
ipv6 ospf 1 area 0
interface loopback 3
ipv6 ospf 1 area 0
exit
```

R4:

```
ipv6 router ospf 1
interface s2/0
ipv6 ospf 1 area 2
interface loopback 1
ipv6 ospf 1 area 2
interface loopback 2
ipv6 ospf 1 area 2
interface loopback 3
ipv6 ospf 1 area 2
exit
```

Task 2: Verification:

Step 1 Verify IPv6 protocols and its details by following command:

```
R2#show ipv6 protocols
! (Gives details of protocols running on router)

IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "ND"
IPv6 Routing Protocol is "ospf 1"
Router ID 22.0.3.2
Area border router
Number of areas: 2 normal, 0 stub, 0 nssa
Interfaces (Area 0):
Loopback1
Loopback2
Loopback3
Ethernet0/0
Interfaces (Area 1):
Serial2/0
Redistribution:
None
```

Step 2 Verify OSPF updates are sent on relevant interfaces by following command:

```
R2#show ipv6 ospf interfaces
! (Gives detailed list of interfaces on which IPv6 OSPF is sending updates)

Loopback1 is up, line protocol is up
Link Local Address FE80::A8BB:CCFF:FE00:200, Interface ID 18
Area 0, Process ID 2, Instance ID 0, Router ID 22.0.3.2
Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host
Loopback2 is up, line protocol is up

Link Local Address FE80::A8BB:CCFF:FE00:200, Interface ID 19
```

Area 0, Process ID 2, Instance ID 0, Router ID 22.0.3.2
Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host
Loopback3 is up, line protocol is up
Link Local Address FE80::A8BB:CCFF:FE00:200, Interface ID 20
Area 0, Process ID 2, Instance ID 0, Router ID 22.0.3.2
Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host
Ethernet0/0 is up, line protocol is up
Link Local Address FE80::A8BB:CCFF:FE00:200, Interface ID 3
Area 0, Process ID 2, Instance ID 0, Router ID 22.0.3.2
Network Type BROADCAST, Cost: 10
Transmit Delay is 1 sec, State BDR, Priority 1
Designated Router (ID) 33.0.3.3, local address FE80::A8BB:CCFF:FE00:300
Backup Designated router (ID) 22.0.3.2, local address
FE80::A8BB:CCFF:FE00:200
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:02
Graceful restart helper support enabled
Index 1/1/2, flood queue length 0
Next 0x0(0)/0x0(0)/0x0(0)
Last flood scan length is 2, maximum is 2
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 33.0.3.3 (Designated Router)
Suppress hello for 0 neighbor(s)
Serial2/0 is up, line protocol is up
Link Local Address FE80::A8BB:CCFF:FE00:200, Interface ID 11
Area 1, Process ID 2, Instance ID 0, Router ID 22.0.3.2
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 00:00:01
Graceful restart helper support enabled
Index 1/1/1, flood queue length 0
Next 0x0(0)/0x0(0)/0x0(0)
Last flood scan length is 7, maximum is 7
Last flood scan time is 0 msec, maximum is 1 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 11.0.3.1
Suppress hello for 0 neighbor(s)

(In IPv6, Router ID is in form of IPv4)

Step 3 Verify OSPF neighborship by following command:

R2#show ipv6 ospf neighbors
! (Gives list of IPv6 OSPF neighbors)

OSPFv3 Router with ID (22.0.3.2) (Process ID 1)

Neighbor ID	Pri	State	Dead Time	Interface ID	Interface
33.0.3.3	1	FULL/DR	00:00:33	3	Ethernet0/0
11.0.3.1	0	FULL/ -	00:00:38	11	Serial2/0

Step 4 Verify IPv6 OSPF database by following command:

R2#show ipv6 ospf database
! (Shows details of IPv6 OSPF database based on Area Perspective and LSA Perspective)

OSPFv3 Router with ID (22.0.3.2) (Process ID 1)

Router Link States (Area 0)

ADV Router	Age	Seq#	Fragment ID	Link count	Bits
22.0.3.2	126	0x80000003	0	1	B
33.0.3.3	127	0x80000003	0	1	B

Net Link States (Area 0)

ADV Router	Age	Seq#	Link ID	Rtr count
33.0.3.3	127	0x80000001	3	2

Inter Area Prefix Link States (Area 0)

ADV Router	Age	Seq#	Prefix
22.0.3.2	154	0x80000001	11:0:1::1/128
22.0.3.2	154	0x80000001	11:0:2::1/128
22.0.3.2	154	0x80000001	11:0:3::1/128
22.0.3.2	154	0x80000001	12::/61
22.0.3.2	154	0x80000001	12::/64
33.0.3.3	154	0x80000001	34::/64
33.0.3.3	154	0x80000001	44:0:1::4/128
33.0.3.3	154	0x80000001	44:0:2::4/128
33.0.3.3	154	0x80000001	44:0:3::4/128

Link (Type-8) Link States (Area 0)

ADV Router	Age	Seq#	Link ID	Interface
22.0.3.2	162	0x80000002	3	Et0/0
33.0.3.3	163	0x80000002	3	Et0/0

Intra Area Prefix Link States (Area 0)

ADV Router	Age	Seq#	Link ID	Ref-lstype	Ref-LSID
22.0.3.2	126	0x80000003	0	0x2001	0
33.0.3.3	127	0x80000003	0	0x2001	0

```
33.0.3.3        127         0x80000001  3072        0x2002      3

            Router Link States (Area 1)

ADV Router      Age         Seq#        Fragment ID  Link count  Bits
11.0.3.1        162         0x80000002  0            1           None
22.0.3.2        163         0x80000001  0            1           B

            Inter Area Prefix Link States (Area 1)

ADV Router      Age         Seq#        Prefix
22.0.3.2        164         0x80000001  22:0:1::2/128
22.0.3.2        164         0x80000001  22:0:2::2/128
22.0.3.2        164         0x80000001  22:0:3::2/128
22.0.3.2        154         0x80000001  23::/64
22.0.3.2        122         0x80000001  33:0:1::3/128
22.0.3.2        122         0x80000001  33:0:2::3/128
22.0.3.2        122         0x80000001  33:0:3::3/128
22.0.3.2        122         0x80000001  44:0:3::4/128
22.0.3.2        122         0x80000001  44:0:2::4/128
22.0.3.2        122         0x80000001  44:0:1::4/128
22.0.3.2        122         0x80000001  34::/64

            Link (Type-8) Link States (Area 1)

ADV Router      Age         Seq#        Link ID     Interface
11.0.3.1        160         0x80000002  11          Se2/0
22.0.3.2        159         0x80000002  11          Se2/0

            Intra Area Prefix Link States (Area 1)

ADV Router      Age         Seq#        Link ID     Ref-lstype  Ref-LSID
11.0.3.1        162         0x80000002  0           0x2001      0
22.0.3.2        159         0x80000001  0           0x2001      0
```

Step 5 Verify routing table and IPv6 OSPF route entries by following command:

```
R2#show ipv6 route
! (Shows router's routing table and IPv6 routes entries)

IPv6 Routing Table - default - 22 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, HA - Home Agent, MR - Mobile Router, R - RIP
       H - NHRP, I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea
       IS - ISIS summary, D - EIGRP, EX - EIGRP external, NM - NEMO
       ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, l - LISP
O   11:0:1::1/128 [110/64]
```

```
   via FE80::A8BB:CCFF:FE00:100, Serial2/0
O   11:0:2::1/128 [110/64]
   via FE80::A8BB:CCFF:FE00:100, Serial2/0
O   11:0:3::1/128 [110/64]
   via FE80::A8BB:CCFF:FE00:100, Serial2/0
O   12::/61 [110/128]
   via FE80::A8BB:CCFF:FE00:100, Serial2/0
C   12::/64 [0/0]
   via Serial2/0, directly connected
L   12::A8BB:CCFF:FE00:200/128 [0/0]
   via Serial2/0, receive
C   22:0:1::/64 [0/0]
   via Loopback1, directly connected
L   22:0:1::2/128 [0/0]
   via Loopback1, receive
C   22:0:2::/64 [0/0]
   via Loopback2, directly connected
L   22:0:2::2/128 [0/0]
   via Loopback2, receive
C   22:0:3::/64 [0/0]
   via Loopback3, directly connected
L   22:0:3::2/128 [0/0]
   via Loopback3, receive
C   23::/64 [0/0]
   via Ethernet0/0, directly connected
L   23::A8BB:CCFF:FE00:200/128 [0/0]
   via Ethernet0/0, receive
O   33:0:1::3/128 [110/10]
   via FE80::A8BB:CCFF:FE00:300, Ethernet0/0
O   33:0:2::3/128 [110/10]
   via FE80::A8BB:CCFF:FE00:300, Ethernet0/0
O   33:0:3::3/128 [110/10]
   via FE80::A8BB:CCFF:FE00:300, Ethernet0/0
OI  34::/64 [110/74]
   via FE80::A8BB:CCFF:FE00:300, Ethernet0/0
OI  44:0:1::4/128 [110/74]
   via FE80::A8BB:CCFF:FE00:300, Ethernet0/0
OI  44:0:2::4/128 [110/74]
   via FE80::A8BB:CCFF:FE00:300, Ethernet0/0
OI  44:0:3::4/128 [110/74]
   via FE80::A8BB:CCFF:FE00:300, Ethernet0/0
L   FF00::/8 [0/0]
   via Null0, receive
```