LAB1: OSPF – IPv4

Disclaimer

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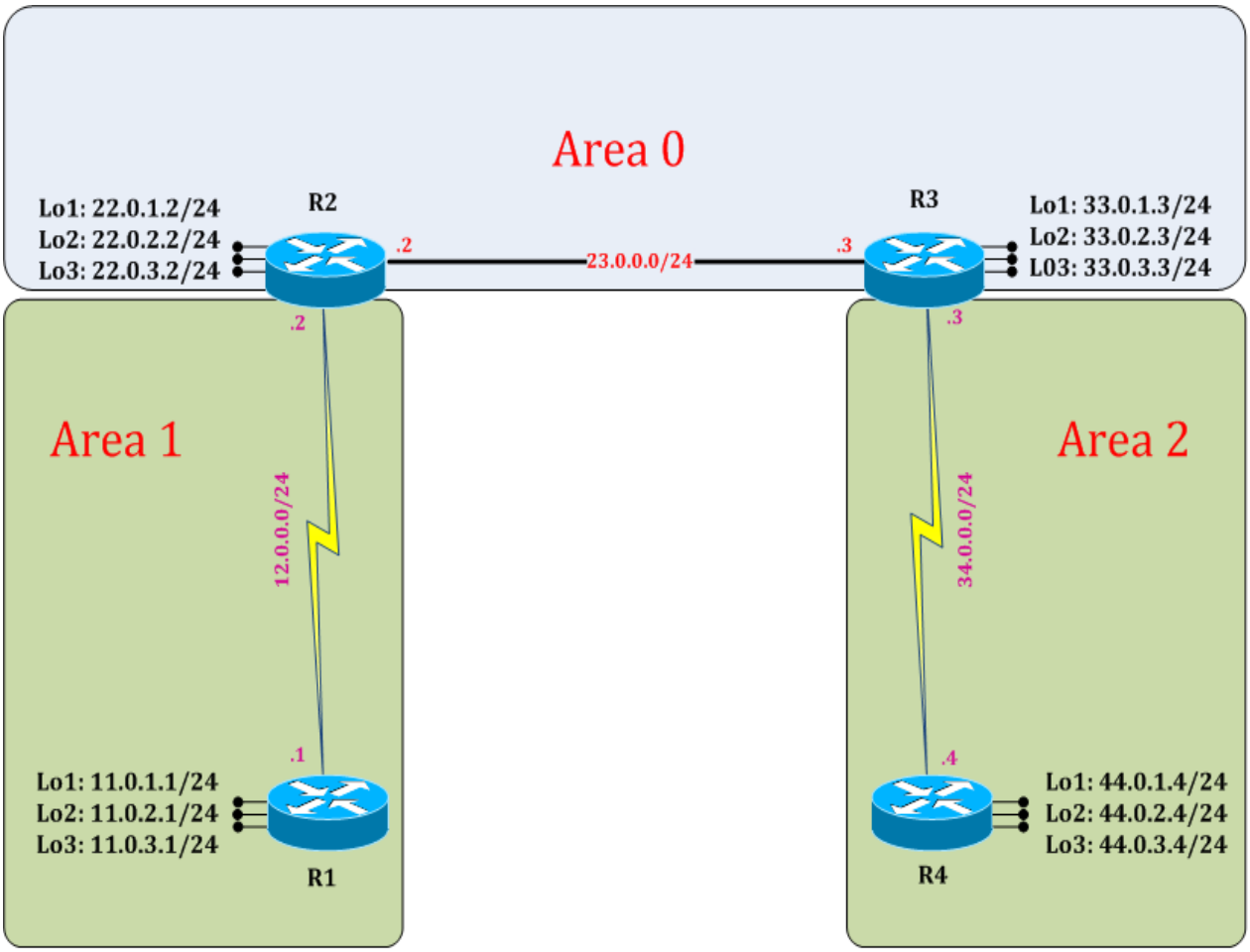
LAB 1: Diagram

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



LAB 1: Configure OSPF FOR IPv4:

Task 1: Configure IPv4 OSPF process for Autonomous

Step 1 In the configuration mode of router configure IPv4 OSPF Process by following command:

R1:

```
router ospf 1                                    ! ( Initiate OSPF process for Process ID 1)
network 11.0.1.1 255.255.255.0 area 1! (Send updates on int. where these N/W
network 11.0.2.1 255.255.255.0 area 1            are configured in given area)
network 11.0.3.1 255.255.255.0 area 1
network 12.0.0.1 255.255.255.0 area 1
exit
```

R2:

```
router ospf 1
network 22.0.1.2 255.255.255.0 area 0
network 22.0.2.2 255.255.255.0 area 0
network 22.0.3.2 255.255.255.0 area 0
network 12.0.0.2 255.255.255.0 area 1
network 23.0.0.2 255.255.255.0 area 0
exit
```

R3:

```
router ospf 1
network 33.0.1.3 255.255.255.0 area 0
network 33.0.2.3 255.255.255.0 area 0
network 33.0.3.3 255.255.255.0 area 0
network 23.0.0.3 255.255.255.0 area 0
network 34.0.0.3 255.255.255.0 area 2
exit
```

R4:

```
router ospf 1
network 44.0.1.4 255.255.255.0 area 2
network 44.0.2.4 255.255.255.0 area 2
network 44.0.3.4 255.255.255.0 area 2
network 34.0.0.4 255.255.255.0 area 2
exit
```

Task 2: Verification

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

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

        *** IP Routing is NSF aware ***

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 22.0.3.2
  It is an area border router
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    12.0.0.2 0.0.0.0 area 1
    22.0.1.2 0.0.0.0 area 0
    22.0.2.2 0.0.0.0 area 0
    22.0.3.2 0.0.0.0 area 0
    23.0.0.2 0.0.0.0 area 0
  Routing on Interfaces Configured Explicitly (Area 0):
    Loopback1
    Loopback2
    Loopback3
    Ethernet0/0
  Routing on Interfaces Configured Explicitly (Area 1):
    Serial2/0
  Routing Information Sources:
    Gateway         Distance      Last Update
    11.0.3.1             110      00:25:10
    33.0.3.3             110      00:24:35
  Distance: (default is 110)
```

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

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

Loopback1 is up, line protocol is up
  Internet Address 22.0.1.2/24, Area 0, Attached via Interface Enable
  Process ID 1, Router ID 22.0.3.2, Network Type LOOPBACK, Cost: 1
  Topology-MTID   Cost    Disabled    Shutdown      Topology Name
        0         1       no          no            Base
  Enabled by interface config, including secondary ip addresses
  Loopback interface is treated as a stub Host
```

```
Loopback2 is up, line protocol is up
  Internet Address 22.0.2.2/24, Area 0, Attached via Interface Enable
  Process ID 1, Router ID 22.0.3.2, Network Type LOOPBACK, Cost: 1
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0          1         no          no            Base
  Enabled by interface config, including secondary ip addresses
  Loopback interface is treated as a stub Host
Loopback3 is up, line protocol is up
  Internet Address 22.0.3.2/24, Area 0, Attached via Interface Enable
  Process ID 1, Router ID 22.0.3.2, Network Type LOOPBACK, Cost: 1
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0          1         no          no            Base
  Enabled by interface config, including secondary ip addresses
  Loopback interface is treated as a stub Host
Ethernet0/0 is up, line protocol is up
  Internet Address 23.0.0.2/24, Area 0, Attached via Interface Enable
  Process ID 1, Router ID 22.0.3.2, Network Type BROADCAST, Cost: 10
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0          10        no          no            Base
  Enabled by interface config, including secondary ip addresses
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 33.0.3.3, Interface address 23.0.0.3
  Backup Designated router (ID) 22.0.3.2, Interface address 23.0.0.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:02
  Supports Link-local Signaling (LLS)
  Cisco NSF helper support enabled
  IETF NSF helper support enabled
  Index 4/4, 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 33.0.3.3  (Designated Router)
  Suppress hello for 0 neighbor(s)
Serial2/0 is up, line protocol is up
  Internet Address 12.0.0.2/24, Area 1, Attached via Interface Enable
  Process ID 1, Router ID 22.0.3.2, Network Type POINT_TO_POINT, Cost: 64
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0          64        no          no            Base
  Enabled by interface config, including secondary ip addresses
  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 00:00:01
  Supports Link-local Signaling (LLS)
  Cisco NSF helper support enabled
  IETF NSF helper support enabled
```

```
 Index 1/5, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 6, maximum is 6
  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)
```

Step 3 Verify OSPF neighborship by following command:

```
R2#show ip ospf neighbors
! (Gives list of OSPF neighbors)

Neighbor ID     Pri   State           Dead Time   Address         Interface
33.0.3.3          1   FULL/DR         00:00:34    23.0.0.3        Ethernet0/0
11.0.3.1          0   FULL/  -        00:00:33    12.0.0.1        Serial2/0
```

Step 4 Verify OSPF database by following command:

```
R2#show ip ospf Database
! (Shows details of OSPF database based on Area Perspective and LSA Perspective)

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

                Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link count
22.0.3.2        22.0.3.2        391         0x80000004 0x00BC7E 4
33.0.3.3        33.0.3.3        386         0x80000004 0x00A35A 4

                Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
23.0.0.3        33.0.3.3        386         0x80000002 0x00595C

                Summary Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
11.0.1.1        22.0.3.2        391         0x80000002 0x00874B
11.0.2.1        22.0.3.2        391         0x80000002 0x007C55
11.0.3.1        22.0.3.2        391         0x80000002 0x00715F
12.0.0.0        22.0.3.2        391         0x80000002 0x00854F
34.0.0.0        33.0.3.3        386         0x80000002 0x00FCB5
44.0.1.4        33.0.3.3        386         0x80000002 0x005151
44.0.2.4        33.0.3.3        386         0x80000002 0x00465B
44.0.3.4        33.0.3.3        386         0x80000002 0x003B65
```

Router Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
11.0.3.1	11.0.3.1	405	0x80000003	0x003BB7	5
22.0.3.2	22.0.3.2	391	0x80000002	0x000340	2

Summary Net Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum
22.0.1.2	22.0.3.2	391	0x80000002	0x006B9B
22.0.2.2	22.0.3.2	391	0x80000002	0x0060A5
22.0.3.2	22.0.3.2	391	0x80000002	0x0055AF
23.0.0.0	22.0.3.2	391	0x80000002	0x00D728
33.0.1.3	22.0.3.2	391	0x80000002	0x0036BA
33.0.2.3	22.0.3.2	391	0x80000002	0x002BC4
33.0.3.3	22.0.3.2	391	0x80000002	0x0020CE
34.0.0.0	22.0.3.2	391	0x80000002	0x00CAE9
44.0.1.4	22.0.3.2	391	0x80000002	0x001F85
44.0.2.4	22.0.3.2	391	0x80000002	0x00148F
44.0.3.4	22.0.3.2	391	0x80000002	0x000999

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

```
R2#show ip route
! (Shows router's routing table and IPv4 routes entries)

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

     11.0.0.0/32 is subnetted, 3 subnets
O       11.0.1.1 [110/65] via 12.0.0.1, 00:45:16, Serial2/0
O       11.0.2.1 [110/65] via 12.0.0.1, 00:45:16, Serial2/0
O       11.0.3.1 [110/65] via 12.0.0.1, 00:45:16, Serial2/0
     12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       12.0.0.0/24 is directly connected, Serial2/0
L       12.0.0.2/32 is directly connected, Serial2/0
     22.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C       22.0.1.0/24 is directly connected, Loopback1
L       22.0.1.2/32 is directly connected, Loopback1
C       22.0.2.0/24 is directly connected, Loopback2
L       22.0.2.2/32 is directly connected, Loopback2
```

```
C       22.0.3.0/24 is directly connected, Loopback3
L       22.0.3.2/32 is directly connected, Loopback3
     23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       23.0.0.0/24 is directly connected, Ethernet0/0
L       23.0.0.2/32 is directly connected, Ethernet0/0
     33.0.0.0/32 is subnetted, 3 subnets
O       33.0.1.3 [110/11] via 23.0.0.3, 00:44:40, Ethernet0/0
O       33.0.2.3 [110/11] via 23.0.0.3, 00:44:40, Ethernet0/0
O       33.0.3.3 [110/11] via 23.0.0.3, 00:44:40, Ethernet0/0
     34.0.0.0/24 is subnetted, 1 subnets
O IA    34.0.0.0 [110/74] via 23.0.0.3, 00:44:40, Ethernet0/0
     44.0.0.0/32 is subnetted, 3 subnets
O IA    44.0.1.4 [110/75] via 23.0.0.3, 00:44:40, Ethernet0/0
O IA    44.0.2.4 [110/75] via 23.0.0.3, 00:44:40, Ethernet0/0
O IA    44.0.3.4 [110/75] via 23.0.0.3, 00:44:40, Ethernet0/0
```