LAB8: OSPF – IPv4

Disclaimer

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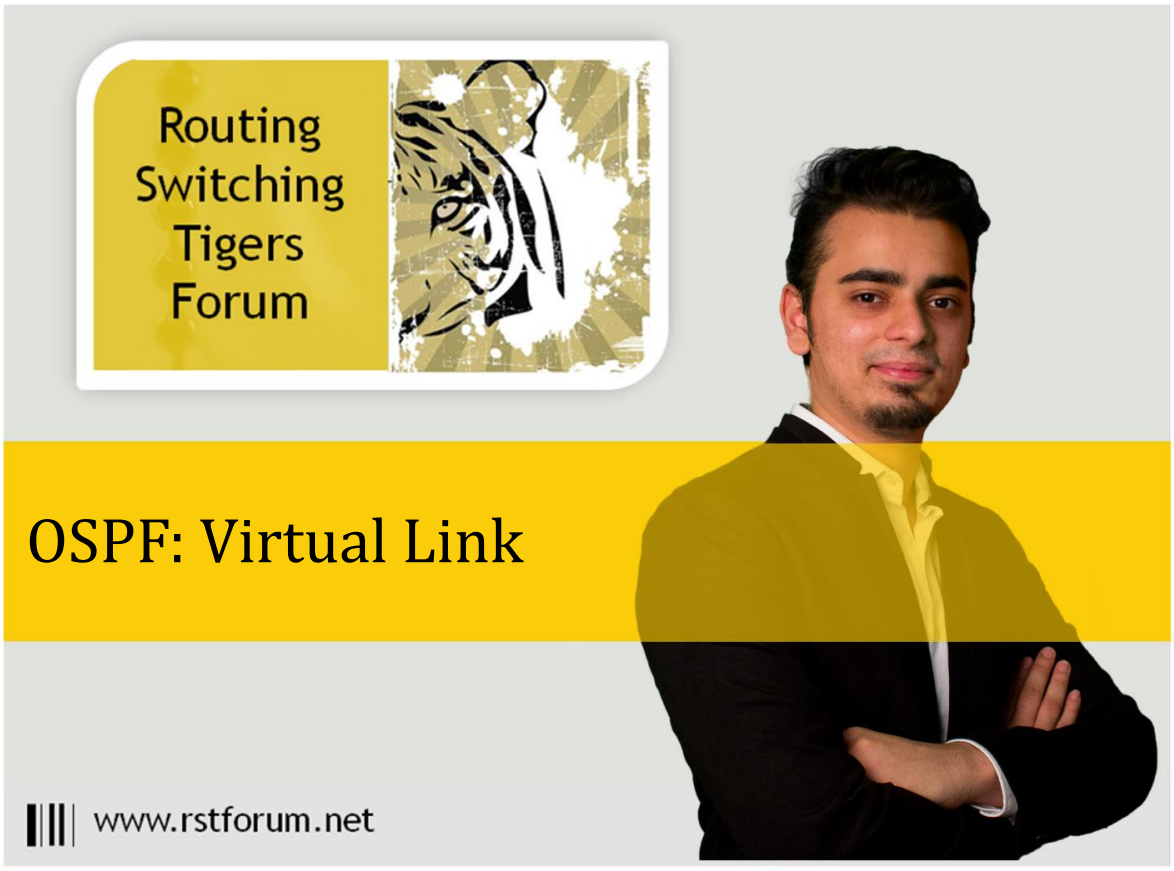
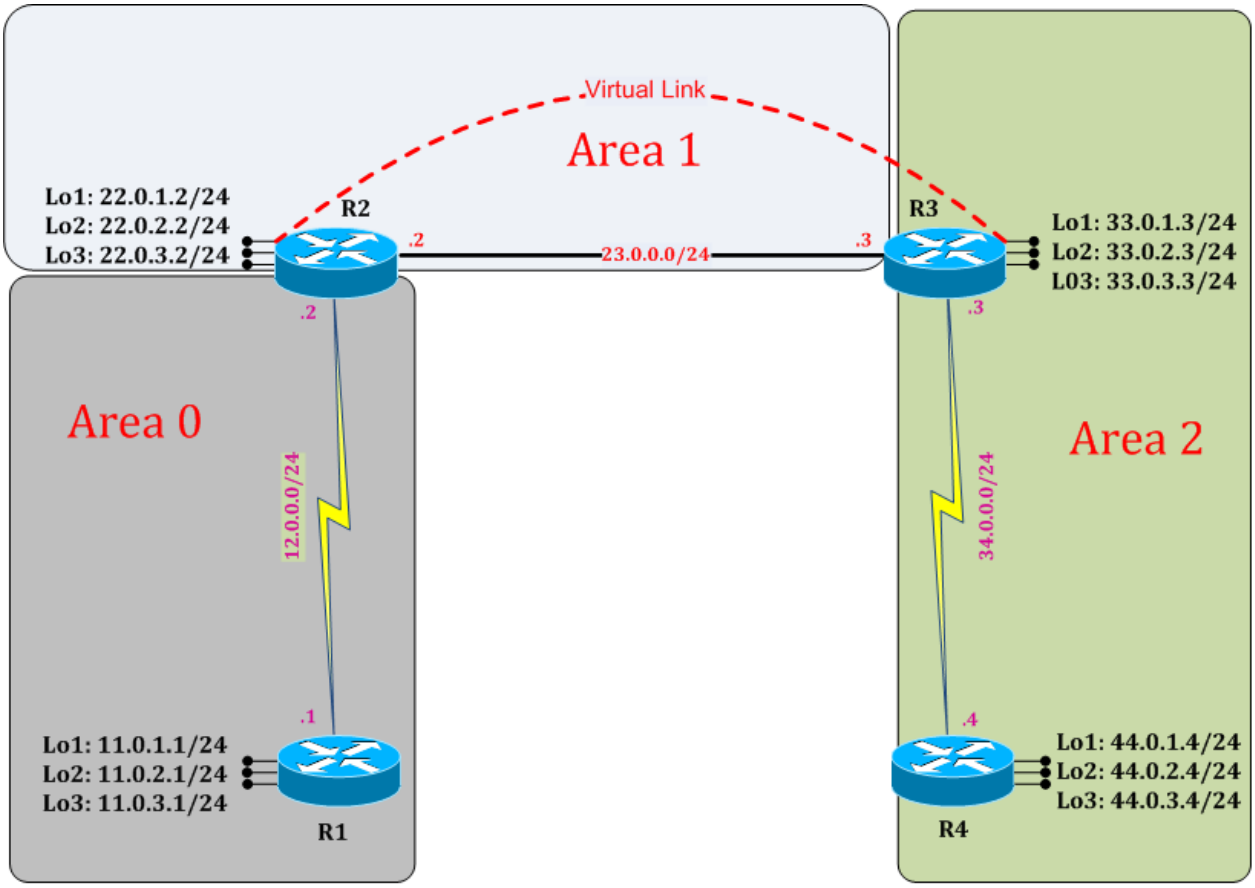


LAB 8: Diagram

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



LAB 8: OSPF Virtual Link

Task 1: Configure OSPF Virtual Link

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

R1:
```
router ospf 1
network 12.0.0.1 255.255.255.0 area 0
network 11.0.1.1 255.255.255.0 area 0
network 11.0.2.1 255.255.255.0 area 0
network 11.0.3.1 255.255.255.0 area 0
exit
```

R2:
```
router ospf 1
network 12.0.0.2 255.255.255.0 area 0
network 23.0.0.2 255.255.255.0 area 1
network 22.0.1.2 255.255.255.0 area 1
network 22.0.2.2 255.255.255.0 area 1
network 22.0.3.2 255.255.255.0 area 1
exit
```

R3:
```
router ospf 1
network 23.0.0.3 255.255.255.0 area 1
network 33.0.1.3 255.255.255.0 area 2
network 33.0.2.3 255.255.255.0 area 2
network 33.0.3.3 255.255.255.0 area 2
network 34.0.0.3 255.255.255.0 area 2
exit
```

R4:
```
router ospf 1
network 34.0.0.4 255.255.255.0 area 2
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
exit
```

```
R4#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

      33.0.0.0/32 is subnetted, 3 subnets
O        33.0.1.3 [110/65] via 34.0.0.3, 00:00:27, Serial2/0
O        33.0.2.3 [110/65] via 34.0.0.3, 00:00:27, Serial2/0
O        33.0.3.3 [110/65] via 34.0.0.3, 00:00:27, Serial2/0
      34.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        34.0.0.0/24 is directly connected, Serial2/0
L        34.0.0.4/32 is directly connected, Serial2/0
      44.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C        44.0.1.0/24 is directly connected, Loopback1
L        44.0.1.4/32 is directly connected, Loopback1
C        44.0.2.0/24 is directly connected, Loopback2
L        44.0.2.4/32 is directly connected, Loopback2
C        44.0.3.0/24 is directly connected, Loopback3
L        44.0.3.4/32 is directly connected, Loopback3
```

Step 2 Configure OSPF Virtual Link

R2:

```
router ospf 1
area 1 virtual-link 33.0.3.3
exit
```

R3:

```
router ospf 1
area 1 virtual-link 22.0.3.2
exit
```

Task 2: Verification:

Step 1 Verify virtual link in OSPF process:

```
R3#show ip ospf virtual-link

Virtual Link OSPF_VL0 to router 22.0.3.2 is up
Run as demand circuit
DoNotAge LSA allowed.
Transit area 1, via interface FastEthernet0/0
Topology-MTID   Cost    Disabled    Shutdown      Topology Name
    0         1         no          no            Base
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
Adjacency State FULL (Hello suppressed)
Index 1/3, retransmission queue length 0, number of retransmission 0
First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
Last retransmission scan length is 0, maximum is 0
Last retransmission scan time is 0 msec, maximum is 0 msec
```

Step 2 Verify routes on R1 & R4 router's routing table:

```
R1#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, + - replicated route

Gateway of last resort is not set

     11.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C       11.0.1.0/24 is directly connected, Loopback1
L       11.0.1.1/32 is directly connected, Loopback1
C       11.0.2.0/24 is directly connected, Loopback2
L       11.0.2.1/32 is directly connected, Loopback2
C       11.0.3.0/24 is directly connected, Loopback3
L       11.0.3.1/32 is directly connected, Loopback3
     12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       12.0.0.0/24 is directly connected, Serial1/0
L       12.0.0.1/32 is directly connected, Serial1/0
     22.0.0.0/32 is subnetted, 3 subnets
O IA    22.0.1.2 [110/65] via 12.0.0.2, 00:26:23, Serial1/0
```

```
O IA    22.0.2.2 [110/65] via 12.0.0.2, 00:26:13, Serial1/0
O IA    22.0.3.2 [110/65] via 12.0.0.2, 00:26:05, Serial1/0
    23.0.0.0/24 is subnetted, 1 subnets
O IA    23.0.0.0 [110/65] via 12.0.0.2, 00:26:36, Serial1/0
    33.0.0.0/32 is subnetted, 3 subnets
O IA    33.0.1.3 [110/66] via 12.0.0.2, 00:12:36, Serial1/0
O IA    33.0.2.3 [110/66] via 12.0.0.2, 00:12:36, Serial1/0
O IA    33.0.3.3 [110/66] via 12.0.0.2, 00:12:36, Serial1/0
    34.0.0.0/24 is subnetted, 1 subnets
O IA    34.0.0.0 [110/129] via 12.0.0.2, 00:12:36, Serial1/0
    44.0.0.0/32 is subnetted, 3 subnets
O IA    44.0.1.4 [110/130] via 12.0.0.2, 00:12:36, Serial1/0
O IA    44.0.2.4 [110/130] via 12.0.0.2, 00:12:37, Serial1/0
O IA    44.0.3.4 [110/130] via 12.0.0.2, 00:12:37, Serial1/0
```

```
R4#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, + - replicated route

Gateway of last resort is not set

    11.0.0.0/32 is subnetted, 3 subnets
O IA    11.0.1.1 [110/130] via 34.0.0.3, 00:14:14, Serial1/0
O IA    11.0.2.1 [110/130] via 34.0.0.3, 00:14:14, Serial1/0
O IA    11.0.3.1 [110/130] via 34.0.0.3, 00:14:15, Serial1/0
    12.0.0.0/24 is subnetted, 1 subnets
O IA    12.0.0.0 [110/129] via 34.0.0.3, 00:14:14, Serial1/0
    22.0.0.0/32 is subnetted, 3 subnets
O IA    22.0.1.2 [110/66] via 34.0.0.3, 00:14:19, Serial1/0
O IA    22.0.2.2 [110/66] via 34.0.0.3, 00:14:19, Serial1/0
O IA    22.0.3.2 [110/66] via 34.0.0.3, 00:14:19, Serial1/0
    23.0.0.0/24 is subnetted, 1 subnets
O IA    23.0.0.0 [110/65] via 34.0.0.3, 00:14:19, Serial1/0
    33.0.0.0/32 is subnetted, 3 subnets
O IA    33.0.1.3 [110/65] via 34.0.0.3, 00:14:21, Serial1/0
O IA    33.0.2.3 [110/65] via 34.0.0.3, 00:14:21, Serial1/0
O IA    33.0.3.3 [110/65] via 34.0.0.3, 00:14:21, Serial1/0
    34.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       34.0.0.0/24 is directly connected, Serial1/0
L       34.0.0.4/32 is directly connected, Serial1/0
    44.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
```

C 44.0.1.0/24 is directly connected, Loopback1
L 44.0.1.4/32 is directly connected, Loopback1
C 44.0.2.0/24 is directly connected, Loopback2
L 44.0.2.4/32 is directly connected, Loopback2
C 44.0.3.0/24 is directly connected, Loopback3
L 44.0.3.4/32 is directly connected, Loopback3

R4#ping 22.0.1.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 22.0.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 604/695/736 ms

(Area 2 can communicate with Area 1 without connecting through Backbone area 0 with the help of Virtual Link.)