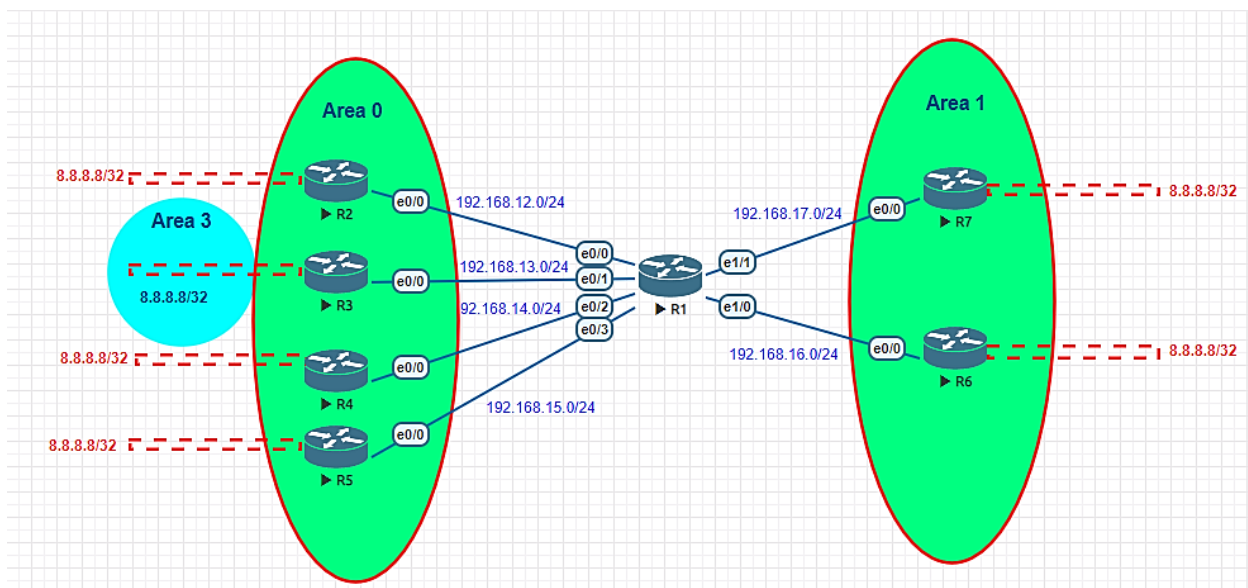


OSPF Path Selection:

- In OSPF, the Intra-Area is when routes or traffic are inside the area itself.
- In OSPF, the Inter-Area is when the routes or traffic are outside the area.
- In OSPF, the terms are used to describe traffic that is flowing internal to an area.
- In OSPF, the terms are used to describe traffic that is flowing through other areas.
- OSPF uses "Cost" as value of metric and uses a Reference Bandwidth of 100 Mbps.
- OSPF will use cost as the metric to choose the shortest path for each destination.
- OSPF first look at the "type of path" to make a decision & secondly look at metric.
- Intra Area Routes always choose these routes over all others, despite cost of link.
- Intra-area routes are preferred over inter-area or external routes regardless of cost.
- Inter-Area Routes of Open Shortest Path First are preferred over external routes.
- E1 routes Open Shortest Path First (OSPF) are preferred over E2 routes of (OSPF).

1	Intra-Area (O)	1	Intra-Area (O)
2	Inter-Area (O IA)	2	Inter-Area (O IA)
3	External Type 1 (E1)	3	NSSA Type 1 (N1)
4	External Type 2 (E2)	4	External Type 1 (E1)
5	NSSA Type 1 (N1)	5	NSSA Type 2 (N2)
6	NSSA Type 2 (N2)	6	External Type 2 (E2)

O > O IA > N1 > E1 > N2 > E2
O > O IA > E1 > E2 > N1 > N2



R1 IP Address Configuration

```
R1(config)#interface e0/0
R1(config-if)#ip add 192.168.12.1 255.255.255.0
R1(config-if)#no shutdown
```

```
R1(config)#interface e0/1
R1(config-if)#ip add 192.168.13.1 255.255.255.0
R1(config-if)#no shutdown
```

```
R1(config)#interface e0/2
R1(config-if)#ip add 192.168.14.1 255.255.255.0
R1(config-if)#no shutdown
```

```
R1(config)#interface e0/3
R1(config-if)#ip add 192.168.15.1 255.255.255.0
R1(config-if)#no shutdown
```

```
R1(config)#interface e1/1
R1(config-if)#ip add 192.168.17.1 255.255.255.0
R1(config-if)#no shutdown
```

```
R1(config)#interface e1/0
R1(config-if)#ip add 192.168.16.1 255.255.255.0
R1(config-if)#no shutdown
```

```
R2(config)#interface e0/0
R2(config-if)#ip add 192.168.12.2 255.255.255.0
R2(config-if)#no shutdown
```

```
R2(config)#interface loopback8
R2(config-if)#ip add 8.8.8.8 255.255.255.255
R2(config-if)#no shutdown
```

```
R3(config)#interface e0/0
R3(config-if)#ip add 192.168.13.3 255.255.255.0
R3(config-if)#no shutdown
```

```
R3(config)#interface loopback8
R3(config-if)#ip add 8.8.8.8 255.255.255.255
R3(config-if)#no shutdown
```

```
R4(config)#interface e0/0
R4(config-if)#ip add 192.168.14.4 255.255.255.0
R4(config-if)#no shutdown
```

```
R4(config)#interface loopback8
R4(config-if)#ip add 8.8.8.8 255.255.255.255
R4(config-if)#no shutdown
```

```
R5(config)#interface e0/0
R5(config-if)#ip add 192.168.15.5 255.255.255.0
R5(config-if)#no shutdown
```

```
R5(config)#interface loopback8
R5(config-if)#ip add 8.8.8.8 255.255.255.255
R5(config-if)#no shutdown
```

```
R6(config)#interface e0/0
R6(config-if)#ip add 192.168.16.6 255.255.255.0
R6(config-if)#no shutdown
```

```
R6(config)#interface loopback8
R6(config-if)#ip add 8.8.8.8 255.255.255.255
R6(config-if)#no shutdown
```

```
R7(config)#interface e0/0
R7(config-if)#ip add 192.168.17.7 255.255.255.0
R7(config-if)#no shutdown
```

```
R7(config)#interface loopback8
R7(config-if)#ip add 8.8.8.8 255.255.255.255
R7(config-if)#no shutdown
```

R1 OSPF Configuration

```
R1(config)#router ospf 1
R1(config-router)#router-id 1.1.1.1
R1(config-router)#network 192.168.12.0 0.0.0.255 area 0
R1(config-router)#network 192.168.13.0 0.0.0.255 area 0
R1(config-router)#network 192.168.14.0 0.0.0.255 area 0
R1(config-router)#network 192.168.15.0 0.0.0.255 area 0
R1(config-router)#network 192.168.16.0 0.0.0.255 area 1
R1(config-router)#network 192.168.17.0 0.0.0.255 area 1
R1(config-router)#area 1 nssa
```

R2 OSPF Configuration

```
R2(config)#router ospf 1
R2(config-router)#router-id 2.2.2.2
R2(config-router)#network 192.168.12.0 0.0.0.255 area 0
R2(config-router)#network 8.8.8.8 0.0.0.0 area 0
```

R3 OSPF Configuration

```
R3(config)#router ospf 1
R3(config-router)#router-id 3.3.3.3
R3(config-router)#network 192.168.13.0 0.0.0.255 area 0
R3(config-router)#network 8.8.8.8 0.0.0.0 area 3
```

R4 OSPF Configuration

```
R4(config)#router ospf 1
R4(config-router)#router-id 4.4.4.4
R4(config-router)#network 192.168.14.0 0.0.0.255 area 0
R4(config-router)#redistribute connected subnets metric-type 1
```

R5 OSPF Configuration

```
R5(config)#router ospf 1
R5(config-router)#router-id 5.5.5.5
R5(config-router)#network 192.168.15.0 0.0.0.255 area 0
R5(config-router)#redistribute connected subnets metric-type 2
```

R6 OSPF Configuration

```
R6(config)#router ospf 1
R6(config-router)#router-id 6.6.6.6
R6(config-router)#network 192.168.16.0 0.0.0.255 area 1
R6(config-router)#redistribute connected subnets metric-type 1
R6(config-router)#area 1 nssa
```

R7 OSPF Configuration

```
R7(config)#router ospf 1
R7(config-router)#router-id 7.7.7.7
R7(config-router)#network 192.168.17.0 0.0.0.255 area 1
R7(config-router)#redistribute connected subnets metric-type 2
R7(config-router)#area 1 nssa
```

```
R1#show ip route ospf
```

```
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
a - application route
+ - replicated route, % - next hop override
```

```
Gateway of last resort is not set
```

```
o      8.0.0.0/32 is subnetted, 1 subnets
o      8.8.8.8 [110/1010] via 192.168.12.2, 02:04:30, Ethernet0/0
```

R2 Loopback Shutdown

```
R2(config)#interface loopback 8
R2(config-if)#shutdown
```

```
R1#show ip route ospf
```

```
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
a - application route
+ - replicated route, % - next hop override
```

```
Gateway of last resort is not set
```

```
8.0.0.0/32 is subnetted, 1 subnets
O IA      8.8.8.8 [110/11] via 192.168.13.3, 00:00:41, Ethernet0/1
```

R3 Loopback Shutdown

```
R3(config)#interface loopback 8
R3(config-if)#shutdown
```

```
R1#show ip route ospf
```

```
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
a - application route
+ - replicated route, % - next hop override
```

```
Gateway of last resort is not set
```

```
8.0.0.0/32 is subnetted, 1 subnets
O N1      8.8.8.8 [110/30] via 192.168.16.6, 00:00:20, Ethernet1/0
```

R6 Loopback Shutdown

```
R6(config)#interface loopback 8
R6(config-if)#shutdown
```

```
R1#show ip route ospf
```

```
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
```

```
Gateway of last resort is not set
```

```
8.0.0.0/32 is subnetted, 1 subnets
O E1      8.8.8.8 [110/30] via 192.168.14.4, 00:00:27, Ethernet0/2
```

R4 Loopback Shutdown

```
R4(config)#interface loopback 8
R4(config-if)#shutdown
```

```
R1#show ip route ospf
```

```
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
```

```
Gateway of last resort is not set
```

```
O N2    8.0.0.0/32 is subnetted, 1 subnets
         8.8.8.8 [110/20] via 192.168.17.7, 00:00:21, Ethernet1/1
```

R7 Loopback Shutdown

```
R7(config)#interface loopback 8
R7(config-if)#shutdown
```

```
R1#show ip route ospf
```

```
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
```

```
Gateway of last resort is not set
```

```
O E2    8.0.0.0/32 is subnetted, 1 subnets
         8.8.8.8 [110/20] via 192.168.15.5, 00:03:44, Ethernet0/3
```