LAB 3

OSPF Protocol

Networking

Configure the infrastructure using The OSPF protocol

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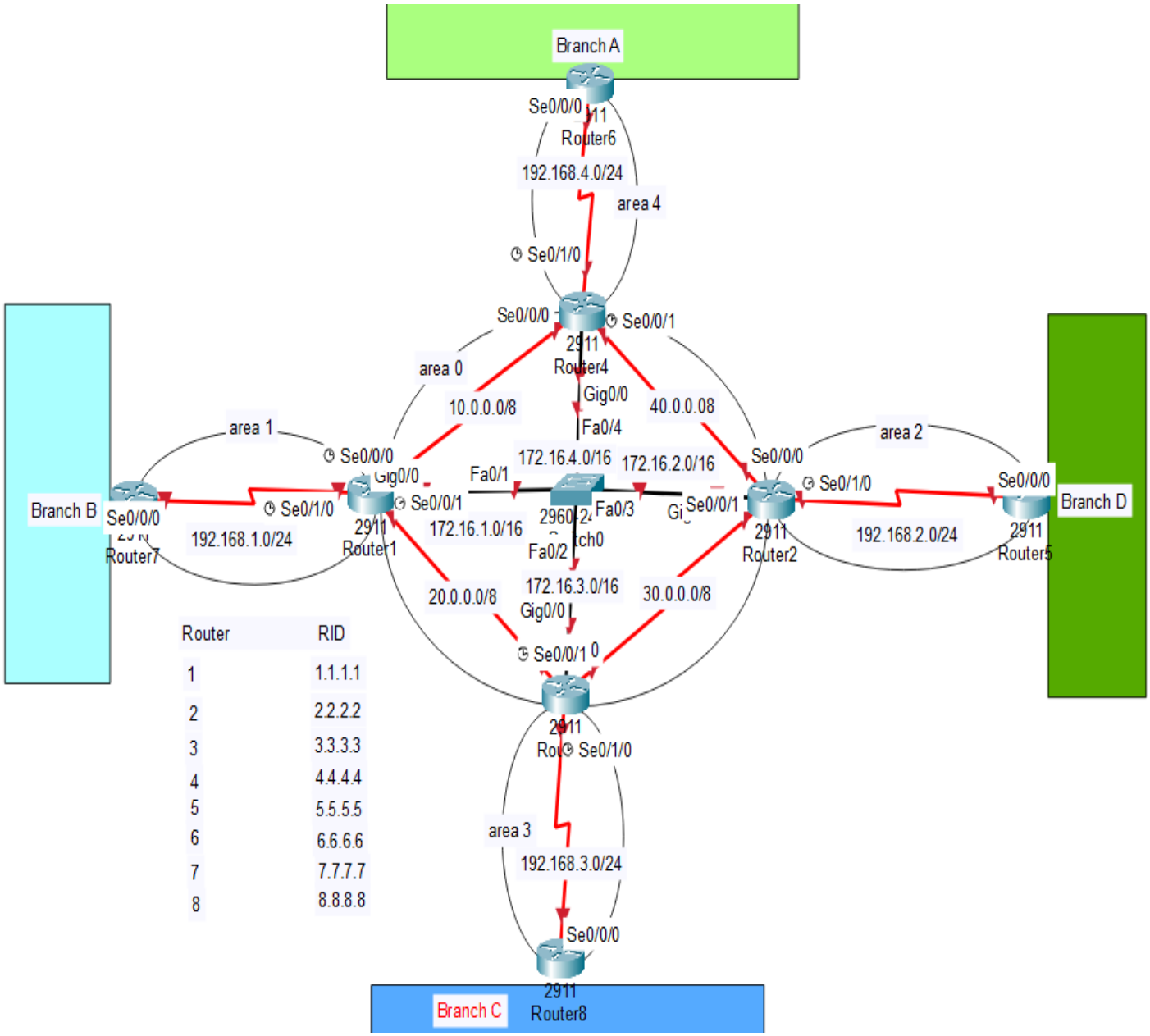
❖ This lab is an infrastructure for a company or ISP based on the OSPF protocol for four branches A, B, C, D.

- **Network Topology**



Router	RID
1	1.1.1.1
2	2.2.2.2
3	3.3.3.3
4	4.4.4.4
5	5.5.5.5
6	6.6.6.6
7	7.7.7.7
8	8.8.8.8

- **Configurations Topology**

Area 0

Router	Interface	Network	RID
Router 1	Se0/0/0	10.0.0.1/8	1.1.1.1
	Se0/0/1	20.0.0.1/8	
	Gig0/0	172.16.1.1/16	
Router 2	Se0/0/0	40.0.0.2/8	2.2.2.2
	Se0/0/1	30.0.0.2/8	
	Gig0/0	172.16.2.2/16	
Router 3	Se0/0/0	30.0.0.3/8	3.3.3.3
	Se0/0/1	20.0.0.3/8	
	Gig0/0	172.16.3.3/16	
Router 4	Se0/0/0	10.0.0.4/8	4.4.4.4
	Se0/0/1	40.0.0.4/8	
	Gig0/0	172.16.4.4/16	

Area 1

Router	Interface	Network	RID
Router 1	Se0/1/0	192.168.1.1/24	1.1.1.1
Router 7	Se0/0/0	192.168.1.7/24	7.7.7.7

Area 2

Router	Interface	Network	RID
Router 2	Se0/1/0	192.168.2.2/24	2.2.2.2
Router 5	Se0/0/0	192.168.2.5/24	5.5.5.5

Area 3

Router	Interface	Network	RID
Router 3	Se0/1/0	192.168.3.3/24	3.3.3.3
Router 8	Se0/0/0	192.168.3.8/24	8.8.8.8

Area 4

Router	Interface	Network	RID
Router 4	Se0/1/0	192.168.4.4/24	4.4.4.4
Router 6	Se0/0/0	192.168.4.6/24	6.6.6.6

- Configurations assign Ips in Interface in all Routers

Router 1

```
Router(config)#int se0/0/0
Router(config-if)#ip add 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#int se0/0/1
Router(config-if)#ip add 20.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#int gig0/0
Router(config-if)#ip add 172.16.1.1 255.255.0.0
Router(config-if)#no shutdown
Router(config-if)#int se0/1/0
Router(config-if)#ip add 192.168.1.1 255.255.255.0
Router(config-if)#no shutdown
```

Router 2

```
Router(config)#int se0/0/0
Router(config-if)#ip add 40.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#int se0/0/1
Router(config-if)#ip add 30.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#int gig0/0
Router(config-if)#ip add 172.16.2.2 255.255.0.0
Router(config-if)#no shutdown
Router(config-if)#int se0/1/0
Router(config-if)#ip add 192.168.2.2 255.255.255.0
Router(config-if)#no shutdown
```

Router 3

```
Router(config)#int se0/0/0
Router(config-if)#ip add 30.0.0.3 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#int se0/0/1
Router(config-if)#ip add 20.0.0.3 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#int gig0/0
Router(config-if)#ip add 172.16.3.3 255.255.0.0
Router(config-if)#no shutdown
Router(config-if)#int se0/1/0
Router(config-if)#ip add 192.168.3.3 255.255.255.0
Router(config-if)#no shutdown
```

Router 4

```
Router(config)#int se0/0/0
Router(config-if)#ip add 10.0.0.4 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#int se0/0/1
Router(config-if)#ip add 40.0.0.4 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#int gig0/0
Router(config-if)#ip add 172.16.4.4 255.255.0.0
Router(config-if)#no shutdown
Router(config-if)#int se0/1/0
Router(config-if)#ip add 192.168.4.4 255.255.255.0
Router(config-if)#no shutdown
```

Router 5

```
Router(config)#int se0/0/0
Router(config-if)#ip add 192.168.2.5 255.255.255.0
Router(config-if)#no shutdown
```

Router 6

```
Router(config)#int se0/0/0
Router(config-if)#ip add 192.168.4.6 255.255.255.0
Router(config-if)#no shutdown
```

Router 7

```
Router(config)#int se0/0/0
Router(config-if)#ip add 192.168.1.7 255.255.255.0
Router(config-if)#no shutdown
```

Router 8

```
Router(config)#int se0/0/0
Router(config-if)#ip add 192.168.3.8 255.255.255.0
Router(config-if)#no shutdown
```

- Configurations OSPF protocol all Routers.

Router 1

```
Router(config)#router ospf 1
Router(config-router)#router-ID 1.1.1.1
Router(config)#int se0/0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int se0/0/1
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int gig0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int s0/1/0
Router(config-if)#ip ospf 1 area 1
```

Router 2

```
Router(config)#router ospf 1
Router(config-router)#router-id 2.2.2.2
Router(config)#int se0/0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int se0/0/1
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int gig0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int se0/1/0
Router(config-if)#ip ospf 1 area 2
```

Router 3

```
Router(config)#router ospf 1
Router(config-router)#router-id 3.3.3.3
Router(config)#int se0/0/1
Router(config-if)#ip ospf 1 area 0
```

```
Router(config-if)#int se0/0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int gig0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int se0/1/0
Router(config-if)#ip ospf 1 area 3
```

Router 4

```
Router(config)#router ospf 1
Router(config-router)#router-id 4.4.4.4
Router(config)#int se0/0/1
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int se0/0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int gig0/0
Router(config-if)#ip ospf 1 area 0
Router(config-if)#int se0/1/0
Router(config-if)#ip ospf 1 area  4
```

Router 5

```
Router(config)#router ospf 1
Router(config-router)#router-id 5.5.5.5
Router(config)#int se0/0/0
Router(config-if)#ip ospf 1 area 2
```

Router 6

```
Router(config)#router ospf 1
Router(config-router)#router-id 6.6.6.6
Router(config)#int se0/0/0
Router(config-if)#ip ospf 1 area 4
```

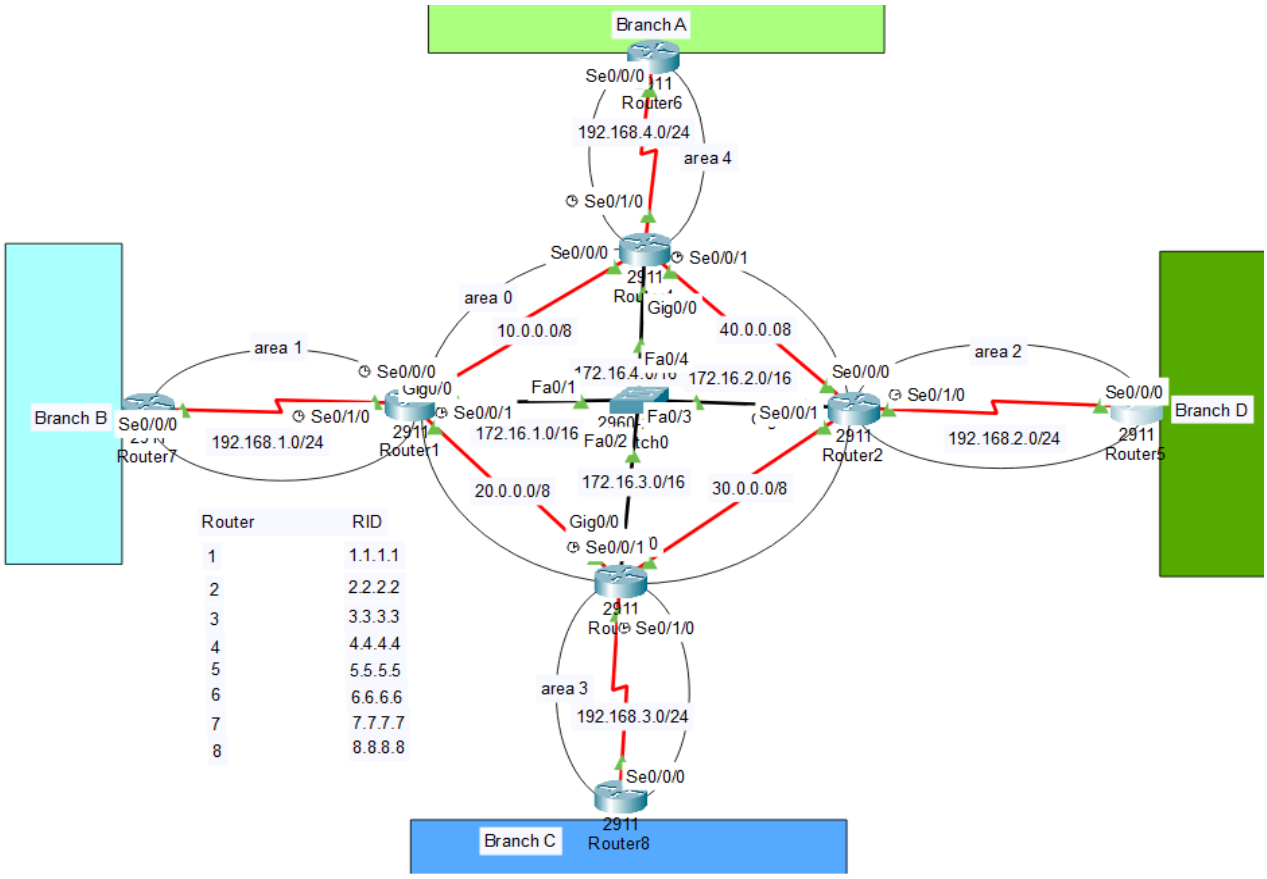
Router 7

```
Router(config)#router ospf 1
Router(config-router)#router-id 7.7.7.7
Router(config)#int se0/0/0
Router(config-if)#ip ospf 1 area 1
```

Router 8

```
Router(config)#router ospf 1
Router(config-router)#router-id 8.8.8.8
Router(config)#int se0/0/0
Router(config-if)#ip ospf 1 area 3
```

- Note :- After Finished Configurations OSPF to All Routers ,Enter Configuration **Router#wr** , **Router#reload** in All routers.



Testing

✓ Router 1

```
Router#sh ip route
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, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter are
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.0.0.0/8 is directly connected, Serial0/0/0
L       10.0.0.1/32 is directly connected, Serial0/0/0
     20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       20.0.0.0/8 is directly connected, Serial0/0/1
L       20.0.0.1/32 is directly connected, Serial0/0/1
O    30.0.0.0/8 [110/65] via 172.16.3.3, 00:05:24, GigabitEthernet0/0
                [110/65] via 172.16.2.2, 00:05:24, GigabitEthernet0/0
O    40.0.0.0/8 [110/65] via 172.16.2.2, 00:05:24, GigabitEthernet0/0
                [110/65] via 172.16.4.4, 00:05:24, GigabitEthernet0/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.0.0/16 is directly connected, GigabitEthernet0/0
L       172.16.1.1/32 is directly connected, GigabitEthernet0/0
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, Serial0/1/0
L       192.168.1.1/32 is directly connected, Serial0/1/0
O IA 192.168.2.0/24 [110/65] via 172.16.2.2, 00:05:24, GigabitEthernet0/0
O IA 192.168.3.0/24 [110/65] via 172.16.3.3, 00:05:36, GigabitEthernet0/0
O IA 192.168.4.0/24 [110/65] via 172.16.4.4, 00:05:36, GigabitEthernet0/0

Router#
```

✓ Router 2

```
Router#sh ip route
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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

O    10.0.0.0/8 [110/65] via 172.16.1.1, 00:06:59, GigabitEthernet0/0
                [110/65] via 172.16.4.4, 00:06:59, GigabitEthernet0/0
O    20.0.0.0/8 [110/65] via 172.16.3.3, 00:06:59, GigabitEthernet0/0
                [110/65] via 172.16.1.1, 00:06:59, GigabitEthernet0/0
     30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       30.0.0.0/8 is directly connected, Serial0/0/1
L       30.0.0.2/32 is directly connected, Serial0/0/1
     40.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       40.0.0.0/8 is directly connected, Serial0/0/0
L       40.0.0.2/32 is directly connected, Serial0/0/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.0.0/16 is directly connected, GigabitEthernet0/0
L       172.16.2.2/32 is directly connected, GigabitEthernet0/0
O IA 192.168.1.0/24 [110/65] via 172.16.1.1, 00:06:59, GigabitEthernet0/0
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, Serial0/1/0
L       192.168.2.2/32 is directly connected, Serial0/1/0
O IA 192.168.3.0/24 [110/65] via 172.16.3.3, 00:06:59, GigabitEthernet0/0
O IA 192.168.4.0/24 [110/65] via 172.16.4.4, 00:06:59, GigabitEthernet0/0
```

✓ Router 3

```
Router#sh ip route
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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

O    10.0.0.0/8 [110/65] via 172.16.1.1, 00:10:20, GigabitEthernet0/0
                [110/65] via 172.16.4.4, 00:10:20, GigabitEthernet0/0
     20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       20.0.0.0/8 is directly connected, Serial0/0/1
L       20.0.0.3/32 is directly connected, Serial0/0/1
     30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       30.0.0.0/8 is directly connected, Serial0/0/0
L       30.0.0.3/32 is directly connected, Serial0/0/0
O    40.0.0.0/8 [110/65] via 172.16.2.2, 00:10:20, GigabitEthernet0/0
                [110/65] via 172.16.4.4, 00:10:20, GigabitEthernet0/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.0.0/16 is directly connected, GigabitEthernet0/0
L       172.16.3.3/32 is directly connected, GigabitEthernet0/0
O IA 192.168.1.0/24 [110/65] via 172.16.1.1, 00:10:20, GigabitEthernet0/0
O IA 192.168.2.0/24 [110/65] via 172.16.2.2, 00:10:20, GigabitEthernet0/0
     192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.3.0/24 is directly connected, Serial0/1/0
L       192.168.3.3/32 is directly connected, Serial0/1/0
O IA 192.168.4.0/24 [110/65] via 172.16.4.4, 00:10:20, GigabitEthernet0/0
```

✓ Router 4

```
Router#sh ip route
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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.0.0.0/8 is directly connected, Serial0/0/0
L       10.0.0.4/32 is directly connected, Serial0/0/0
O    20.0.0.0/8 [110/65] via 172.16.3.3, 00:12:04, GigabitEthernet0/0
                [110/65] via 172.16.1.1, 00:12:04, GigabitEthernet0/0
O    30.0.0.0/8 [110/65] via 172.16.3.3, 00:11:42, GigabitEthernet0/0
                [110/65] via 172.16.2.2, 00:11:42, GigabitEthernet0/0
     40.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       40.0.0.0/8 is directly connected, Serial0/0/1
L       40.0.0.4/32 is directly connected, Serial0/0/1
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.0.0/16 is directly connected, GigabitEthernet0/0
L       172.16.4.4/32 is directly connected, GigabitEthernet0/0
O IA 192.168.1.0/24 [110/65] via 172.16.1.1, 00:12:04, GigabitEthernet0/0
O IA 192.168.2.0/24 [110/65] via 172.16.2.2, 00:11:42, GigabitEthernet0/0
O IA 192.168.3.0/24 [110/65] via 172.16.3.3, 00:12:04, GigabitEthernet0/0
     192.168.4.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.4.0/24 is directly connected, Serial0/1/0
L       192.168.4.4/32 is directly connected, Serial0/1/0
```

✓ Router 5 in branch D

```
Router#sh ip route
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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

O IA 10.0.0.0/8 [110/192] via 192.168.2.2, 00:13:51, Serial0/0/0
O IA 20.0.0.0/8 [110/256] via 192.168.2.2, 00:13:51, Serial0/0/0
O IA 30.0.0.0/8 [110/128] via 192.168.2.2, 00:13:51, Serial0/0/0
O IA 40.0.0.0/8 [110/128] via 192.168.2.2, 00:13:51, Serial0/0/0
O IA 172.16.0.0/16 [110/65] via 192.168.2.2, 00:13:51, Serial0/0/0
O IA 192.168.1.0/24 [110/256] via 192.168.2.2, 00:13:51, Serial0/0/0
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, Serial0/0/0
L       192.168.2.5/32 is directly connected, Serial0/0/0
O IA 192.168.4.0/24 [110/192] via 192.168.2.2, 00:13:51, Serial0/0/0
```

✓ Router 6 in branch A

```
Router#sh ip route
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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

O IA 10.0.0.0/8 [110/128] via 192.168.4.4, 00:15:09, Serial0/0/0
O IA 20.0.0.0/8 [110/129] via 192.168.4.4, 00:14:44, Serial0/0/0
O IA 30.0.0.0/8 [110/129] via 192.168.4.4, 00:14:44, Serial0/0/0
O IA 40.0.0.0/8 [110/128] via 192.168.4.4, 00:15:09, Serial0/0/0
O IA 172.16.0.0/16 [110/65] via 192.168.4.4, 00:14:44, Serial0/0/0
O IA 192.168.1.0/24 [110/129] via 192.168.4.4, 00:14:44, Serial0/0/0
O IA 192.168.2.0/24 [110/129] via 192.168.4.4, 00:14:22, Serial0/0/0
O IA 192.168.3.0/24 [110/129] via 192.168.4.4, 00:14:44, Serial0/0/0
     192.168.4.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.4.0/24 is directly connected, Serial0/0/0
L       192.168.4.6/32 is directly connected, Serial0/0/0
```

✓ **Router 7 in branch B**

```
Router#sh ip route
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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

O IA 10.0.0.0/8 [110/128] via 192.168.1.1, 00:17:45, Serial0/0/0
O IA 20.0.0.0/8 [110/128] via 192.168.1.1, 00:17:55, Serial0/0/0
O IA 30.0.0.0/8 [110/256] via 192.168.1.1, 00:17:01, Serial0/0/0
O IA 40.0.0.0/8 [110/192] via 192.168.1.1, 00:17:01, Serial0/0/0
O IA 172.16.0.0/16 [110/193] via 192.168.1.1, 00:17:01, Serial0/0/0
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, Serial0/0/0
L       192.168.1.7/32 is directly connected, Serial0/0/0
O IA 192.168.2.0/24 [110/256] via 192.168.1.1, 00:17:01, Serial0/0/0
O IA 192.168.4.0/24 [110/192] via 192.168.1.1, 00:17:01, Serial0/0/0
```

✓ **Router 8 in branch C**

```
Router#sh ip route
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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

O IA 10.0.0.0/8 [110/129] via 192.168.3.3, 00:17:53, Serial0/0/0
O IA 20.0.0.0/8 [110/128] via 192.168.3.3, 00:19:26, Serial0/0/0
O IA 30.0.0.0/8 [110/128] via 192.168.3.3, 00:19:16, Serial0/0/0
O IA 40.0.0.0/8 [110/129] via 192.168.3.3, 00:17:53, Serial0/0/0
O IA 172.16.0.0/16 [110/65] via 192.168.3.3, 00:17:53, Serial0/0/0
O IA 192.168.1.0/24 [110/129] via 192.168.3.3, 00:17:53, Serial0/0/0
O IA 192.168.2.0/24 [110/129] via 192.168.3.3, 00:17:53, Serial0/0/0
     192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.3.0/24 is directly connected, Serial0/0/0
L       192.168.3.8/32 is directly connected, Serial0/0/0
O IA 192.168.4.0/24 [110/129] via 192.168.3.3, 00:17:53, Serial0/0/0
```

The infrastructure is Successfully

Thank You

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