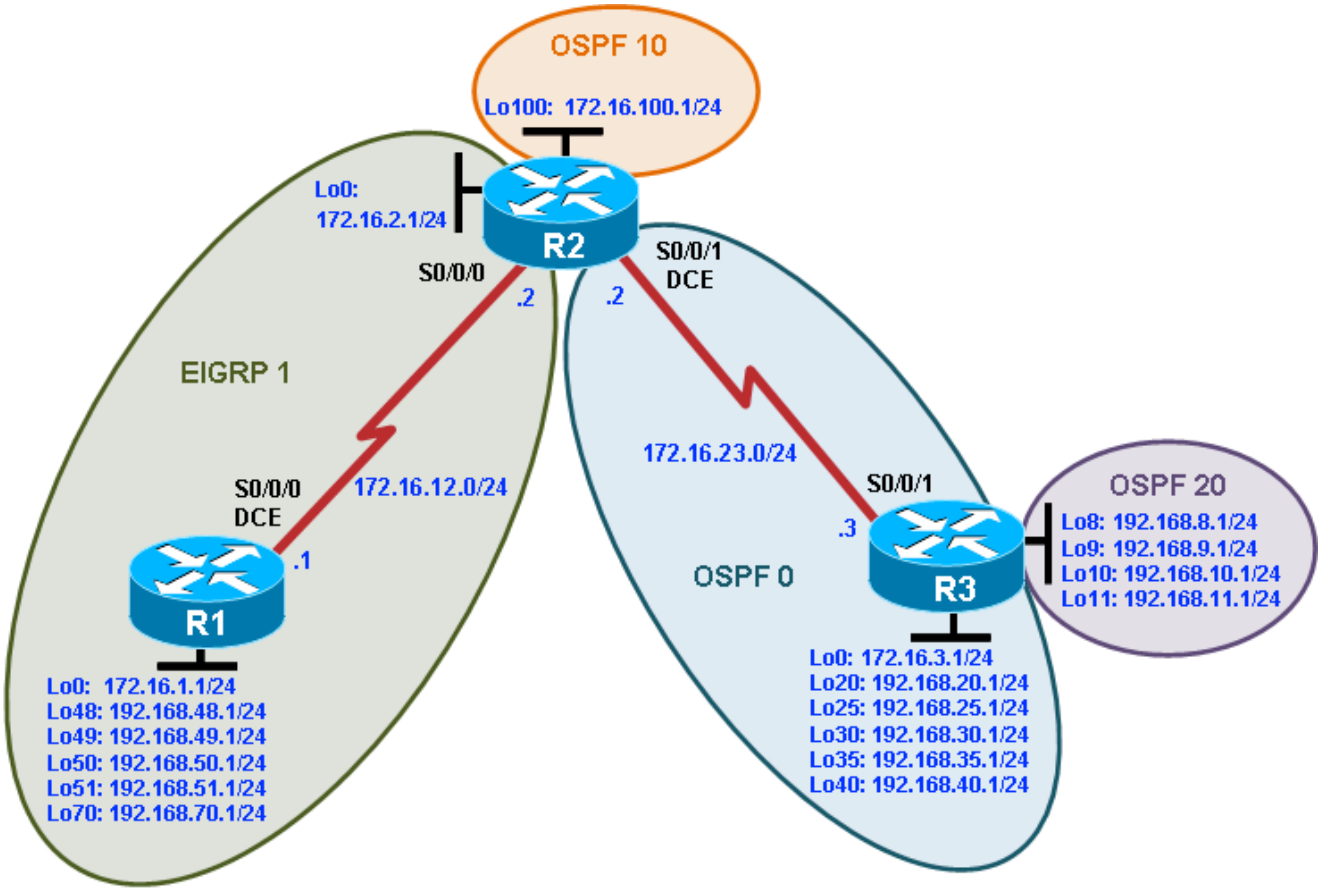
# Lab 9 Redistribution Between EIGRP and OSPF

## Topology




## Objectives

- Review EIGRP and OSPF configuration.
- Redistribute into EIGRP.
- Redistribute into OSPF.
- Summarize routes in EIGRP.
- Filter routes using route maps.
- Modify EIGRP distances.
- Modify OSPF distances.
- Create passive interfaces in EIGRP.
- Summarize in OSPF at an ABR and an ASBR.

## Background

R1 is running EIGRP, and R3 is running multi-area OSPF. In this lab, you configure redistribution on R2 to enable these two routing protocols to interact, allowing full connectivity between all networks. In Appendix A of this lab, you explore black hole operation.

## Step 1: Configure loopbacks and additional addressing.

a. Start with the final configurations of Lab 4.1, “Redistribution Between RIP and OSPF.” On R1 and R2, remove the RIPv2 configuration and the static route with the following commands.

```
R1(config)# no router rip
R1(config)# no ip route 192.168.48.0 255.255.252.0 null0
R1(config)# no ip prefix-list RIP-OUT

R2(config)# no router rip
R2(config)# router ospf 1
R2(config-router)# no default-information originate
R2(config-router)# no redistribute rip
R2(config-router)# no default-metric 10000
```

b. Configure the additional loopback interfaces on R2 and R3, as shown in the diagram.

```
R2(config)# interface loopback 100
R2(config-if)# ip address 172.16.100.1 255.255.255.0

R3(config)# interface loopback 8
R3(config-if)# ip address 192.168.8.1 255.255.255.0
R3(config-if)# interface loopback 9
R3(config-if)# ip address 192.168.9.1 255.255.255.0
R3(config-if)# interface loopback 10
R3(config-if)# ip address 192.168.10.1 255.255.255.0
R3(config-if)# interface loopback 11
R3(config-if)# ip address 192.168.11.1 255.255.255.0
```

## Step 2: Configure EIGRP.

a. Configure R1 and R2 to run EIGRP in autonomous system 1. On R1, add in all connected interfaces either with classful **network** commands or with wildcard masks. Use a classful **network** statement on R2 and disable automatic summarization.

```
R1(config)# router eigrp 1
R1(config-router)# no auto-summary
R1(config-router)# network 172.16.0.0
R1(config-router)# network 192.168.48.0
R1(config-router)# network 192.168.49.0
R1(config-router)# network 192.168.50.0
R1(config-router)# network 192.168.51.0
R1(config-router)# network 192.168.70.0
```

or

```
R1(config)# router eigrp 1
R1(config-router)# no auto-summary
R1(config-router)# network 172.16.0.0
R1(config-router)# network 192.168.0.0 0.0.255.255

R2(config)# router eigrp 1
R2(config-router)# no auto-summary
```

```
R2(config-router)# network 172.16.0.0
```

b. Verify the configuration with the **show ip eigrp neighbors** and **show ip route eigrp** commands on both routers.

```
R1# show ip eigrp neighbors
IP-EIGRP neighbors for process 1
H   Address                 Interface       Hold Uptime   SRTT   RTO  Q  Seq
                                            (sec)         (ms)       Cnt Num
0   172.16.12.2             Se0/0/0           11 00:00:30   36   216  0  3

R1# show ip route eigrp
     172.16.0.0/24 is subnetted, 5 subnets
D       172.16.23.0 [90/41024000] via 172.16.12.2, 00:01:38, Serial0/0/0
D       172.16.2.0 [90/40640000] via 172.16.12.2, 00:01:16, Serial0/0/0
D       172.16.100.0 [90/40640000] via 172.16.12.2, 00:02:13, Serial0/0/0

R2# show ip eigrp neighbors
IP-EIGRP neighbors for process 1
H   Address                 Interface       Hold Uptime   SRTT   RTO  Q  Seq
                                            (sec)         (ms)       Cnt Num
0   172.16.12.1             Se0/0/0           11 00:01:53 1604  5000  0  2

R2# show ip route eigrp
     172.16.0.0/24 is subnetted, 6 subnets
D       172.16.1.0 [90/40640000] via 172.16.12.1, 00:01:08, Serial0/0/0
D    192.168.70.0/24 [90/40640000] via 172.16.12.1, 00:01:08, Serial0/0/0
D    192.168.51.0/24 [90/40640000] via 172.16.12.1, 00:01:08, Serial0/0/0
D    192.168.50.0/24 [90/40640000] via 172.16.12.1, 00:01:08, Serial0/0/0
D    192.168.49.0/24 [90/40640000] via 172.16.12.1, 00:01:08, Serial0/0/0
D    192.168.48.0/24 [90/40640000] via 172.16.12.1, 00:01:08, Serial0/0/0
```

## Step 3: Create passive interfaces in EIGRP.

a. Issue the **show ip eigrp interfaces** command on R2.

```
R2# show ip eigrp interfaces
IP-EIGRP interfaces for process 1

                        Xmit Queue   Mean   Pacing Time   Multicast
Pending
Interface         Peers  Un/Reliable  SRTT   Un/Reliable   Flow Timer   Routes
Se0/0/0             1        0/0        32     10/380        496           0
Se0/0/1             0        0/0         0      0/1            0           0
Lo0                 0        0/0         0      0/1            0           0
Lo100               0        0/0         0      0/1            0           0
```

Because you used the classful **network** command, both serial interfaces are involved with EIGRP.

b. To stop EIGRP from sending or processing received EIGRP packets on the serial interface going to R3, use the **passive-interface** *interface_type interface_number* command.

```
R2(config)# router eigrp 1
R2(config-router)# passive-interface serial 0/0/1
```

c. Verify the change with the **show ip eigrp interfaces** and **show ip protocols** commands.

```
R2# show ip eigrp interfaces
IP-EIGRP interfaces for process 1
```

```
                         Xmit Queue   Mean   Pacing Time   Multicast
Pending
Interface        Peers  Un/Reliable  SRTT   Un/Reliable   Flow Timer   Routes
Se0/0/0            1        0/0        32      10/380        496           0
Lo0                0        0/0         0       0/1            0           0
Lo100              0        0/0         0       0/1            0           0

R2# show ip protocols
Routing Protocol is "ospf 1"
<output omitted>

Routing Protocol is "eigrp 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  EIGRP maximum hopcount 100
  EIGRP maximum metric variance 1
  Redistributing: eigrp 1
  EIGRP NSF-aware route hold timer is 240s
  Automatic network summarization is not in effect
  Maximum path: 4
  Routing for Networks:
    172.16.0.0
  Passive Interface(s):
    Serial0/0/1
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.16.12.1           90      00:27:57
  Distance: internal 90 external 170
```

How does preventing hello packets out of an interface affect the update capabilities of EIGRP out that interface?

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Is this behavior more like RIP or like OSPF in regard to the **passive-interface** command?

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## Step 4: Manually summarize with EIGRP.

You can have EIGRP summarize routes sent out an interface to make routing updates more efficient by using the **ip summary-address eigrp** *as network mask* command.

a. Have R1 advertise one supernet for loopbacks 48 and 49 to R2. Do not summarize loopbacks 50 and 51 in this statement, because these will be summarized in Step 9.

```
R1(config)# interface serial 0/0/0
R1(config-if)# ip summary-address eigrp 1 192.168.48.0 255.255.254.0

*Feb 23 18:20:21.219: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 172.16.12.2
(Serial0/0/0) is resync: summary configured

R1# show ip route eigrp
     172.16.0.0/24 is subnetted, 6 subnets
D       172.16.23.0 [90/41024000] via 172.16.12.2, 00:45:21, Serial0/0/0
D       172.16.2.0 [90/40640000] via 172.16.12.2, 00:45:21, Serial0/0/0
D       172.16.100.0 [90/40640000] via 172.16.12.2, 00:08:12, Serial0/0/0
D    192.168.48.0/23 is a summary, 04:27:07, Null0
```

b. Verify the configuration with the **show ip route eigrp** and **show ip route 192.168.48.0 255.255.254.0** commands on R1. Notice the administrative distance for this route.

```
R1# show ip route 192.168.48.0 255.255.254.0
Routing entry for 192.168.48.0/23, supernet
  Known via "eigrp 1", distance 5, metric 128256, type internal
  Redistributing via eigrp 1
  Routing Descriptor Blocks:
  * directly connected, via Null0
      Route metric is 128256, traffic share count is 1
      Total delay is 5000 microseconds, minimum bandwidth is 10000000 Kbit
      Reliability 255/255, minimum MTU 1514 bytes
      Loading 1/255, Hops 0
```

Why does EIGRP make the administrative distance different for summary routes?

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## Step 5: Additional OSPF configuration.

OSPF is already partially configured on R2 and R3.

a. You need to add the area 10 configuration to R2 and the area 20 configuration to R3 to complete the configuration.

```
R2(config)# router ospf 1
R2(config-router)# network 172.16.100.0 0.0.0.255 area 10
```

```
R3(config)# router ospf 1
R3(config-router)# network 192.168.8.0 0.0.3.255 area 20
```

b. Verify that your adjacencies come up with the **show ip ospf neighbor** command, and make sure that you have routes from OSPF populating the R2 routing table using the **show ip route ospf** command.

```
R2# show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
192.168.40.1      0   FULL/  -        00:00:35    172.16.23.3     Serial0/0/1

R3# show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
172.16.2.1        0   FULL/  -        00:00:35    172.16.23.2     Serial0/0/1

R2# show ip route ospf
O    192.168.30.0/24 [110/1563] via 172.16.23.3, 00:12:10, Serial0/0/1
     192.168.8.0/32 is subnetted, 1 subnets
O IA    192.168.8.1 [110/1563] via 172.16.23.3, 00:20:48, Serial0/0/1
O    192.168.25.0/24 [110/1563] via 172.16.23.3, 00:12:10, Serial0/0/1
     192.168.9.0/32 is subnetted, 1 subnets
O IA    192.168.9.1 [110/1563] via 172.16.23.3, 00:20:48, Serial0/0/1
     192.168.10.0/32 is subnetted, 1 subnets
O IA    192.168.10.1 [110/1563] via 172.16.23.3, 00:20:48, Serial0/0/1
O    192.168.40.0/24 [110/1563] via 172.16.23.3, 00:12:10, Serial0/0/1
     172.16.0.0/24 is subnetted, 6 subnets
O       172.16.3.0 [110/1563] via 172.16.23.3, 00:21:26, Serial0/0/1
     192.168.11.0/32 is subnetted, 1 subnets
O IA    192.168.11.1 [110/1563] via 172.16.23.3, 00:20:48, Serial0/0/1
O    192.168.20.0/24 [110/1563] via 172.16.23.3, 00:12:10, Serial0/0/1
O    192.168.35.0/24 [110/1563] via 172.16.23.3, 00:12:10, Serial0/0/1

R3# show ip route ospf
     172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
O IA    172.16.100.1/32 [110/1563] via 172.16.23.2, 00:00:15, Serial0/0/1
```

Notice that for the newly added loopback interfaces, OSPF advertised /32 destination prefixes (for example, R2 has a route to 192.168.8.1/32 in its routing table).

c. Override this default behavior by using the **ip ospf network point-to-point** command on the OSPF loopback interfaces on R2 and R3. You can copy and paste the following configurations to save time.

Router R2:

```
interface loopback 100
 ip ospf network point-to-point
```

Router R3:
(Only configure the point-to-point network type for the newly added loopbacks in area 20. The area 0 loopbacks were configured in Lab 4-1.)

```
interface loopback 8
 ip ospf network point-to-point

interface loopback 9
 ip ospf network point-to-point

interface loopback 10
```

```
 ip ospf network point-to-point

interface loopback 11
 ip ospf network point-to-point
```

**Note:** You can also use the **interface range** command to configure multiple interfaces simultaneously, as shown below.

```
interface range lo 8 - 11
 ip ospf network point-to-point
```

d. Verify the configuration with the **show ip route** command on R2. Notice that the routes now each show on one line with the /24 major network mask.

```
R2# show ip route
<output omitted>

Gateway of last resort is not set

O     192.168.30.0/24 [110/1563] via 172.16.23.3, 00:27:11, Serial0/0/1
O IA  192.168.8.0/24 [110/1563] via 172.16.23.3, 00:08:39, Serial0/0/1
O     192.168.25.0/24 [110/1563] via 172.16.23.3, 00:27:11, Serial0/0/1
O IA  192.168.9.0/24 [110/1563] via 172.16.23.3, 00:08:39, Serial0/0/1
O IA  192.168.10.0/24 [110/1563] via 172.16.23.3, 00:08:39, Serial0/0/1
O     192.168.40.0/24 [110/1563] via 172.16.23.3, 00:27:11, Serial0/0/1
      172.16.0.0/24 is subnetted, 6 subnets
C        172.16.23.0 is directly connected, Serial0/0/1
C        172.16.12.0 is directly connected, Serial0/0/0
D        172.16.1.0 [90/40640000] via 172.16.12.1, 00:47:33, Serial0/0/0
C        172.16.2.0 is directly connected, Loopback0
O        172.16.3.0 [110/1563] via 172.16.23.3, 00:36:27, Serial0/0/1
C        172.16.100.0 is directly connected, Loopback100
O IA  192.168.11.0/24 [110/1563] via 172.16.23.3, 00:08:41, Serial0/0/1
O     192.168.20.0/24 [110/1563] via 172.16.23.3, 00:27:13, Serial0/0/1
D     192.168.51.0/24 [90/40640000] via 172.16.12.1, 00:47:36, Serial0/0/0
D     192.168.50.0/24 [90/40640000] via 172.16.12.1, 00:47:36, Serial0/0/0
O     192.168.35.0/24 [110/1563] via 172.16.23.3, 00:27:13, Serial0/0/1
D     192.168.70.0/24 [90/40640000] via 172.16.12.1, 00:47:36, Serial0/0/0
D     192.168.48.0/23 [90/40640000] via 172.16.12.1, 00:40:01, Serial0/0/0
```

Notice that R2 is the only router with knowledge of all routes in the topology at this point, because it is involved with both routing protocols.

## Step 6: Summarize OSPF areas at the ABR.

Review the R2 routing table. Notice the inter-area routes for the R3 loopbacks in area 20.

a. Summarize the areas into a single inter-area route using the **area** *area* **range** *network mask* command on R3.

```
R3(config)# router ospf 1
R3(config-router)# area 20 range 192.168.8.0 255.255.252.0
```

b. On R2, verify the summarization with the **show ip route ospf** command on R2.

```
R2# show ip route ospf
O     192.168.30.0/24 [110/1563] via 172.16.23.3, 02:38:46, Serial0/0/1
O     192.168.25.0/24 [110/1563] via 172.16.23.3, 02:38:46, Serial0/0/1
O     192.168.40.0/24 [110/1563] via 172.16.23.3, 02:38:46, Serial0/0/1
      172.16.0.0/24 is subnetted, 6 subnets
O        172.16.3.0 [110/1563] via 172.16.23.3, 02:38:46, Serial0/0/1
```

```
O    192.168.20.0/24 [110/1563] via 172.16.23.3, 02:38:46, Serial0/0/1
O    192.168.35.0/24 [110/1563] via 172.16.23.3, 02:38:46, Serial0/0/1
O IA 192.168.8.0/22 [110/1563] via 172.16.23.3, 00:00:07, Serial0/0/1
```

Where can you summarize in OSPF?

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Compare and contrast OSPF and EIGRP in terms of where summarization takes place.

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Explain the synchronization requirement in OSPF that eliminates other routers as points of summarization.

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Why or why not does EIGRP have this requirement?

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## Step 7: Configure mutual redistribution between OSPF and EIGRP.

a. Under the OSPF process on R2, issue the **redistribute eigrp 1 subnets** command. The **subnets** command is necessary because, by default, OSPF only redistributes classful networks and supernets. A default seed metric is not required for OSPF. Under the EIGRP process, issue the **redistribute ospf 1 metric 10000 100 255 1 1500** command, which tells EIGRP to redistribute OSPF process 1 with these metrics: bandwidth of 10000, delay of 100, reliability of 255/255, load of 1/255, and a MTU of 1500. Like RIP, EIGRP requires a seed metric. You can also set a default seed metric with the **default-metric** command.

```
R2(config)# router ospf 1
R2(config-router)# redistribute eigrp 1 subnets
R2(config-router)# exit

R2(config)# router eigrp 1
R2(config-router)# redistribute ospf 1 metric 10000 100 255 1 1500
```

or

```
R2(config-router)# default-metric 10000 100 255 1 1500
R2(config-router)# redistribute ospf 1
```

b. Issue the **show ip protocols** command on the redistributing router, R2. Compare your output with the following output.

```
R2# show ip protocols
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 172.16.2.1
  It is an area border and autonomous system boundary router
  Redistributing External Routes from,
    eigrp 1, includes subnets in redistribution
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.16.23.0 0.0.0.255 area 0
    172.16.100.0 0.0.0.255 area 10
 Reference bandwidth unit is 100 mbps
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.40.1         110      00:00:33
  Distance: (default is 110)

Routing Protocol is "eigrp 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  EIGRP maximum hopcount 100
  EIGRP maximum metric variance 1
  Redistributing: ospf 1, eigrp 1
  EIGRP NSF-aware route hold timer is 240s
  Automatic network summarization is not in effect
  Maximum path: 4
  Routing for Networks:
    172.16.0.0
  Passive Interface(s):
    Serial0/0/1
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.16.12.1           90      00:00:49
  Distance: internal 90 external 170
```

c. Display the routing tables on R1 and R3 so that you can see the redistributed routes. Redistributed OSPF routes display on R1 as D EX, which means that they are external EIGRP routes. Redistributed EIGRP routes are tagged in the R3 routing table as O E2, which means that they are OSPF external type 2. Type 2 is the default OSPF external type.

```
R1# show ip route
<output omitted>

Gateway of last resort is not set
```

```
D EX 192.168.30.0/24 [170/40537600] via 172.16.12.2, 00:00:05, Serial0/0/0
D EX 192.168.25.0/24 [170/40537600] via 172.16.12.2, 00:00:05, Serial0/0/0
D EX 192.168.40.0/24 [170/40537600] via 172.16.12.2, 00:00:05, Serial0/0/0
     172.16.0.0/24 is subnetted, 6 subnets
D       172.16.100.0 [90/40640000] via 172.16.12.2, 00:38:02, Serial0/0/0
D       172.16.23.0 [90/41024000] via 172.16.12.2, 00:38:02, Serial0/0/0
C       172.16.12.0 is directly connected, Serial0/0/0
C       172.16.1.0 is directly connected, Loopback0
D       172.16.2.0 [90/40640000] via 172.16.12.2, 00:38:02, Serial0/0/0
D EX    172.16.3.0 [170/40537600] via 172.16.12.2, 00:00:06, Serial0/0/0
D EX 192.168.20.0/24 [170/40537600] via 172.16.12.2, 00:00:06, Serial0/0/0
C    192.168.51.0/24 is directly connected, Loopback51
C    192.168.50.0/24 is directly connected, Loopback50
D EX 192.168.35.0/24 [170/40537600] via 172.16.12.2, 00:00:06, Serial0/0/0
C    192.168.49.0/24 is directly connected, Loopback49
C    192.168.70.0/24 is directly connected, Loopback70
C    192.168.48.0/24 is directly connected, Loopback48
D EX 192.168.8.0/22 [170/40537600] via 172.16.12.2, 00:00:07, Serial0/0/0
D    192.168.48.0/23 is a summary, 04:19:50, Null0
```

```
R3# show ip route
<output omitted>

Gateway of last resort is not set

C    192.168.30.0/24 is directly connected, Loopback30
C    192.168.8.0/24 is directly connected, Loopback8
C    192.168.25.0/24 is directly connected, Loopback25
C    192.168.9.0/24 is directly connected, Loopback9
C    192.168.10.0/24 is directly connected, Loopback10
C    192.168.40.0/24 is directly connected, Loopback40
     172.16.0.0/24 is subnetted, 6 subnets
C       172.16.23.0 is directly connected, Serial0/0/1
O E2    172.16.12.0 [110/20] via 172.16.23.2, 00:41:48, Serial0/0/1
O E2    172.16.1.0 [110/20] via 172.16.23.2, 00:41:48, Serial0/0/1
O E2    172.16.2.0 [110/20] via 172.16.23.2, 00:41:48, Serial0/0/1
O IA    172.16.100.0 [110/1563] via 172.16.23.2, 00:41:48, Serial0/0/1
C       172.16.3.0 is directly connected, Loopback0
C    192.168.11.0/24 is directly connected, Loopback11
C    192.168.20.0/24 is directly connected, Loopback20
O E2 192.168.51.0/24 [110/20] via 172.16.23.2, 00:41:48, Serial0/0/1
O E2 192.168.50.0/24 [110/20] via 172.16.23.2, 00:41:48, Serial0/0/1
C    192.168.35.0/24 is directly connected, Loopback35
O E2 192.168.70.0/24 [110/20] via 172.16.23.2, 00:41:48, Serial0/0/1
O    192.168.8.0/22 is a summary, 01:34:48, Null0
O E2 192.168.48.0/23 [110/20] via 172.16.23.2, 00:41:48, Serial0/0/1
```

d. Verify full connectivity with the following Tcl script:

```
R1# tclsh

foreach address {
172.16.1.1
192.168.48.1
192.168.49.1
192.168.50.1
192.168.51.1
192.168.70.1
172.16.12.1
```

```
172.16.2.1
172.16.100.1
172.16.12.2
172.16.23.2
172.16.3.1
192.168.20.1
192.168.25.1
192.168.30.1
192.168.35.1
192.168.40.1
192.168.8.1
192.168.9.1
192.168.10.1
192.168.11.1
172.16.23.3
} { ping $address }
```

## Step 8: Filter redistribution with route maps.

One way to filter prefixes is with a route map. When used for filtering prefixes, a route map works like an access list. It has multiple statements that are read in a sequential order. Each statement can be a deny or permit and can have a match clause for a variety of attributes, such as the route or a route tag. You can also include route attributes in each statement that will be set if the match clause is met.

a. Before filtering the R3 loopback 25 and 30 networks from being redistributed into EIGRP on R2, display the R1 routing table and verify that those two routes currently appear there.

```
R1# show ip route eigrp
D EX 192.168.30.0/24 [170/40537600] via 172.16.12.2, 00:04:28, Serial0/0/0
D EX 192.168.25.0/24 [170/40537600] via 172.16.12.2, 00:04:28, Serial0/0/0
D EX 192.168.40.0/24 [170/40537600] via 172.16.12.2, 00:04:28, Serial0/0/0
     172.16.0.0/24 is subnetted, 6 subnets
D       172.16.23.0 [90/41024000] via 172.16.12.2, 00:42:25, Serial0/0/0
D       172.16.2.0 [90/40640000] via 172.16.12.2, 00:42:25, Serial0/0/0
D EX    172.16.3.0 [170/40537600] via 172.16.12.2, 00:04:28, Serial0/0/0
D       172.16.100.0 [90/40640000] via 172.16.12.2, 01:34:26, Serial0/0/0
D EX 192.168.20.0/24 [170/40537600] via 172.16.12.2, 00:04:28, Serial0/0/0
D EX 192.168.35.0/24 [170/40537600] via 172.16.12.2, 00:04:28, Serial0/0/0
D EX 192.168.8.0/22 [170/40537600] via 172.16.12.2, 00:04:28, Serial0/0/0
D    192.168.48.0/23 is a summary, 04:24:12, Null0
```

There are multiple ways to configure this filtering. For this exercise, configure an access list that matches these two network addresses and a route map that denies based on a match for that access list.

b. Configure the access list as follows:

```
R2(config)# access-list 1 permit 192.168.25.0
R2(config)# access-list 1 permit 192.168.30.0
```

c. Configure a route map with a statement that denies based on a match with this access list. Then add a permit statement without a match statement, which acts as an explicit permit all.

```
R2(config)# route-map SELECTED-DENY deny 10
R2(config-route-map)# match ip address 1
R2(config-route-map)# route-map SELECTED-DENY permit 20
```

d. Apply this route map by redoing the **redistribute** command with the route map under the EIGRP process.

```
R2(config)# router eigrp 1
R2(config-router)# redistribute ospf 1 route-map SELECTED-DENY metric 64 100
255 1 1500
```

e. As an alternative, if you previously configured a default metric under EIGRP, you can simply use the following command.

```
R2(config-router)# redistribute ospf 1 route-map SELECTED-DENY
```

f. Verify that these routes are filtered out in the R1 routing table.

```
R1# show ip route eigrp
D EX 192.168.40.0/24 [170/40537600] via 172.16.12.2, 00:07:24, Serial0/0/0
     172.16.0.0/24 is subnetted, 6 subnets
D       172.16.23.0 [90/41024000] via 172.16.12.2, 00:45:21, Serial0/0/0
D       172.16.2.0 [90/40640000] via 172.16.12.2, 00:45:21, Serial0/0/0
D EX    172.16.3.0 [170/40537600] via 172.16.12.2, 00:07:24, Serial0/0/0
D       172.16.100.0 [90/40640000] via 172.16.12.2, 00:45:21, Serial0/0/0
D EX 192.168.20.0/24 [170/40537600] via 172.16.12.2, 00:07:24, Serial0/0/0
D EX 192.168.35.0/24 [170/40537600] via 172.16.12.2, 00:07:24, Serial0/0/0
D EX 192.168.8.0/22 [170/40537600] via 172.16.12.2, 00:07:24, Serial0/0/0
D    192.168.48.0/23 is a summary, 04:27:07, Null0
```

## Step 9: Summarize external routes into OSPF at the ASBR.

You cannot summarize routes redistributed into OSPF using the **area range** command. This command is effective only on routes internal to the specified area. Instead, use the OSPF **summary-address** *network mask* command.

a. Before you make any changes, display the R3 routing table.

```
R3# show ip route ospf
     172.16.0.0/24 is subnetted, 6 subnets
O E2    172.16.12.0 [110/20] via 172.16.23.2, 00:00:07, Serial0/0/1
O E2    172.16.1.0 [110/20] via 172.16.23.2, 00:00:07, Serial0/0/1
O E2    172.16.2.0 [110/20] via 172.16.23.2, 00:00:07, Serial0/0/1
O IA    172.16.100.0 [110/1563] via 172.16.23.2, 00:00:07, Serial0/0/1
O E2 192.168.70.0/24 [110/20] via 172.16.23.2, 00:00:07, Serial0/0/1
O    192.168.8.0/22 is a summary, 00:00:07, Null0
O E2 192.168.51.0/24 [110/20] via 172.16.23.2, 00:00:07, Serial0/0/1
O E2 192.168.50.0/24 [110/20] via 172.16.23.2, 00:00:07, Serial0/0/1
O E2 192.168.48.0/23 [110/20] via 172.16.23.2, 00:00:07, Serial0/0/1
```

Notice the three external routes for the R1 loopback interfaces 48 through 51. Two of the loopbacks are already summarized to one /23.

Which mask should you use to summarize all four of the loopbacks to one prefix?

_____

b. You can summarize this all into one supernet on R2 using the following commands.

```
R2(config)# router ospf 1
R2(config-router)# summary-address 192.168.48.0 255.255.252.0
```

c. Verify this action in the R3 routing table.

```
R3# show ip route ospf
     172.16.0.0/24 is subnetted, 6 subnets
O E2    172.16.12.0 [110/20] via 172.16.23.2, 01:40:45, Serial0/0/1
O E2    172.16.1.0 [110/20] via 172.16.23.2, 00:48:54, Serial0/0/1
O E2    172.16.2.0 [110/20] via 172.16.23.2, 01:40:45, Serial0/0/1
O IA    172.16.100.0 [110/1563] via 172.16.23.2, 01:40:45, Serial0/0/1
O E2 192.168.70.0/24 [110/20] via 172.16.23.2, 00:48:54, Serial0/0/1
O    192.168.8.0/22 is a summary, 01:41:55, Null0
O E2 192.168.48.0/22 [110/20] via 172.16.23.2, 00:00:08, Serial0/0/1
```

What would happen if loopback 50 on R1 were to become unreachable by R2?

_____

_____

Would data destined for 192.168.50.0/24 from R3 still be sent to R2?

_____

_____

Would data destined for 192.168.50.0/24 from R2 continue to be sent to R1?

_____

_____

d. If you are unsure of the outcome, shut down the interface on R1. Issue the ICMP **traceroute** command to 192.168.50.1 from R3 and then from R2. Check your output against the output and analysis in Appendix A. Remember to issue the **no shutdown** command when you are finished checking.

Is this a desirable outcome? Explain.

_____

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