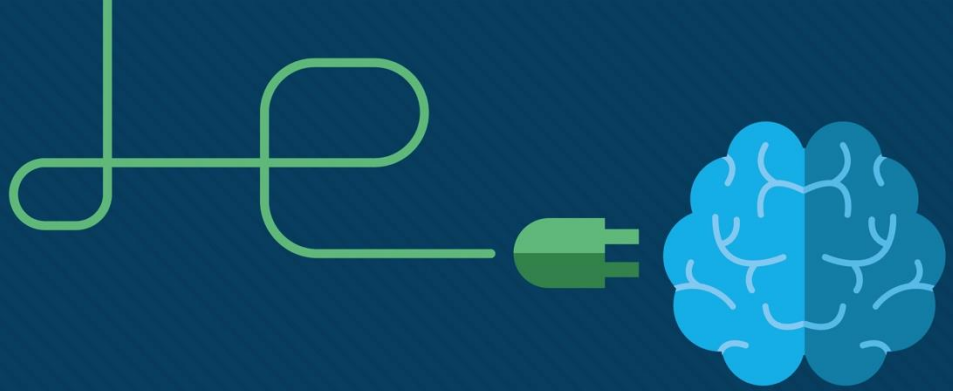


Chapter 7: EIGRP Tuning and Troubleshooting

CCNA Routing and Switching

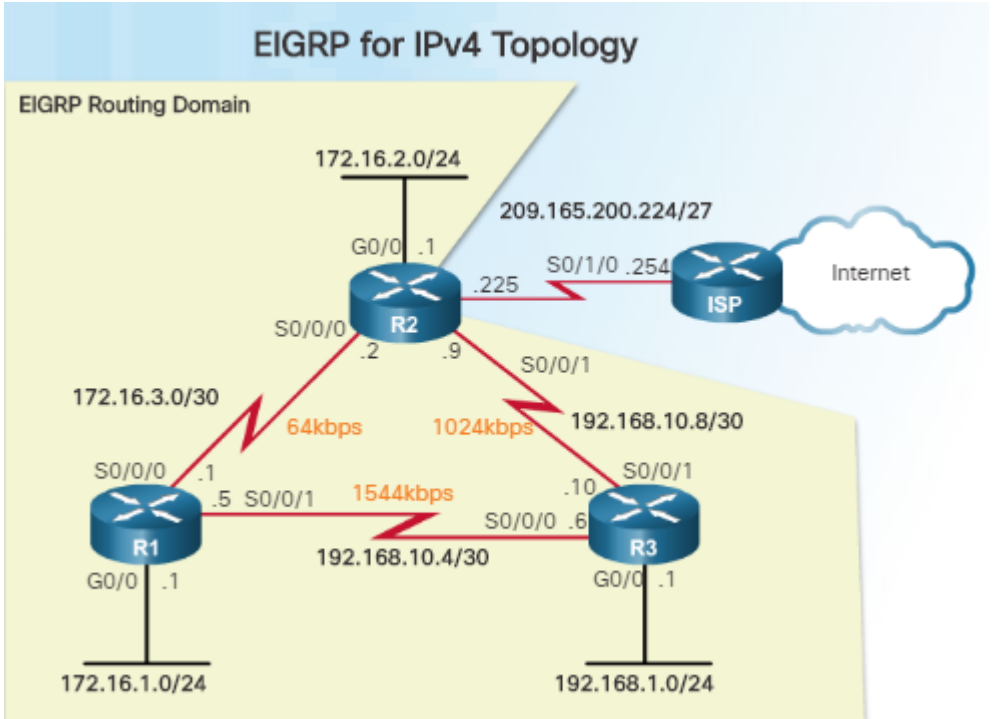
Scaling Networks v6.0

Chapter 7 - Sections & Objectives

- 7.1 Tune EIGRP
  - Configure EIGRP to improve network performance.
    - Configure EIGRP autosummarization.
    - Configure a router to propagate a default route in an EIGRP network.
    - Configure EIGRP interface settings to improve network performance.
- 7.2 Troubleshoot EIGRP
  - Troubleshoot common EIGRP configuration issues in a small to medium-sized business network.
    - Explain the process and tools used to troubleshoot an EIGRP network.
    - Troubleshoot neighbor adjacency issues in an EIGRP network.
    - Troubleshoot missing route entries in an EIGRP routing table.

7.1 Tune EIGRP

Network Topology



This network topology will be used for this chapter.

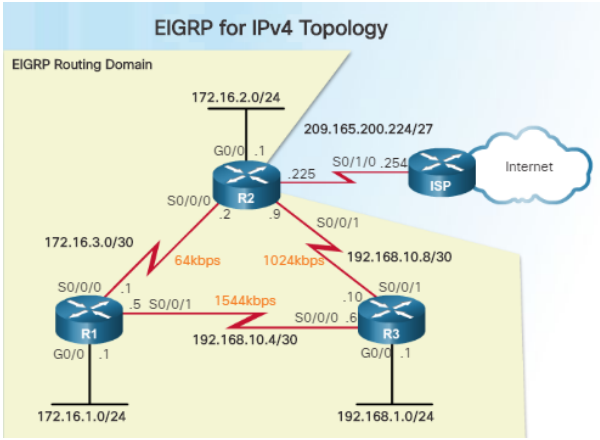
- Before tuning EIGRP features, start with a basic implementation of EIGRP.
- Serial interfaces and their bandwidths may not reflect the more common types of connections found in networks today.
- The bandwidth of the serial links is used in the calculation of the routing protocol metrics and the process of best path selection.
- The bandwidth command will be used to modify the default serial bandwidth of 1.544 kb/s.

Automatic Summarization

Network Topology (Cont.)

```
R1# show running-config
<output omitted>
version 15.2
!
interface GigabitEthernet0/0
 ip address 172.16.1.1 255.255.255.0
!
interface Serial0/0/0
 bandwidth 64
 ip address 172.16.3.1 255.255.255.252
 clock rate 64000
!
interface Serial0/0/1
 ip address 192.168.10.5 255.255.255.252
!
router eigrp 1
 network 172.16.0.0
 network 192.168.10.0
 eigrp router-id 1.1.1.1
```

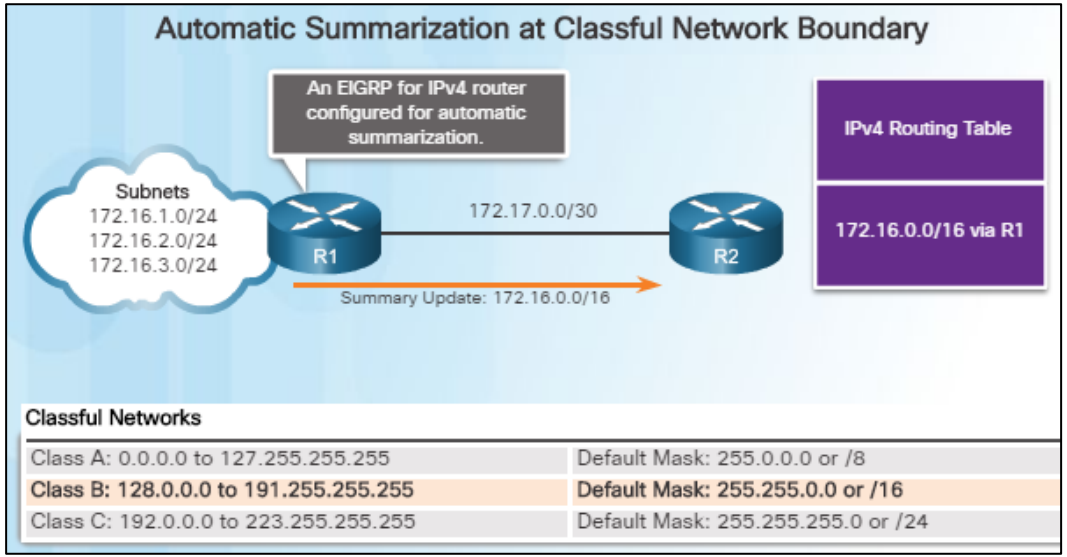
Starting IPv4 Interface and EIGRP Configuration




```
R2# show running-config
<output omitted>
version 15.2
!
interface GigabitEthernet0/0
 ip address 172.16.2.1 255.255.255.0
!
interface Serial0/0/0
 bandwidth 64
 ip address 172.16.3.2 255.255.255.252
!
interface Serial0/0/1
 bandwidth 1024
 ip address 192.168.10.9 255.255.255.252
 clock rate 64000
!
interface Serial0/1/0
 ip address 209.165.200.225 255.255.255.224
!
router eigrp 1
 network 172.16.0.0
 network 192.168.10.8 0.0.0.3
 eigrp router-id 2.2.2.2
```

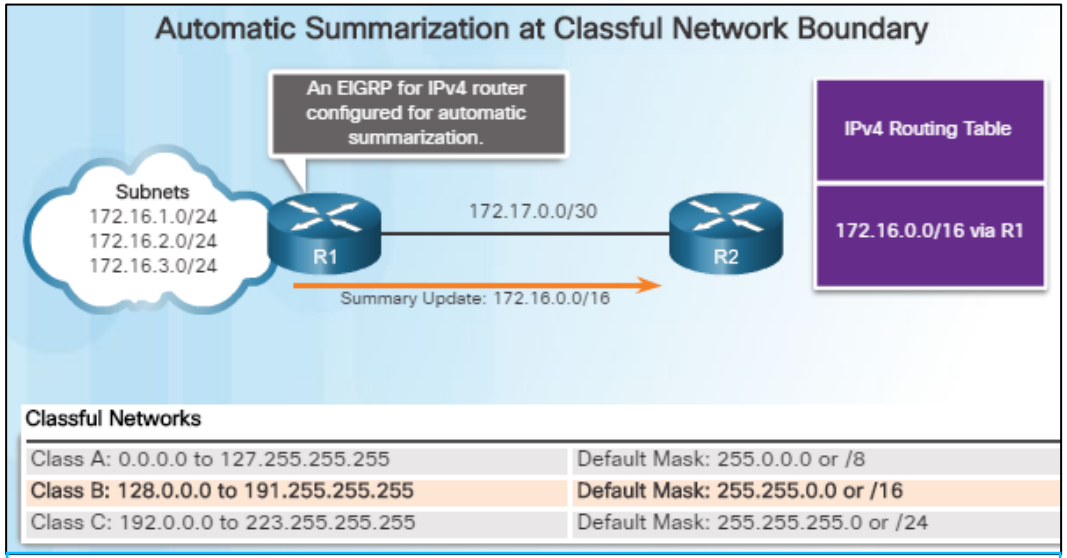
```
R3# show running-config
<output omitted>
version 15.2
!
interface GigabitEthernet0/0
 ip address 192.168.1.1 255.255.255.0
!
interface Serial0/0/0
 ip address 192.168.10.6 255.255.255.252
 clock rate 64000
!
interface Serial0/0/1
 bandwidth 1024
 ip address 192.168.10.10 255.255.255.252
!
router eigrp 1
 network 192.168.1.0
 network 192.168.10.4 0.0.0.3
 network 192.168.10.8 0.0.0.3
 eigrp router-id 3.3.3.3
```

EIGRP Automatic Summarization



- Route summarization is one of the most common methods of tuning EIGRP.
- Route summarization works by grouping multiple networks together and advertising them as one larger network – or summarized route.
- EIGRP can be enabled to perform automatic summarization at classful boundaries.
- EIGRP automatically recognizes subnets as a single Class A, B, or C network and creates only one entry in the routing table for the summary route.

EIGRP Automatic Summarization (Cont.)



For routers to find the best route for each individual subnet, subnet information must be sent. In the example above, automatic summarization should be disabled so subnet information will be sent.

- Routers R1 and R2 are both configured using EIGRP for IPV4 with automatic summarization.
- R1 has three subnets in its routing table:
  - 172.16.1.0/24
  - 172.16.2.0/24
  - 172.16.3.0/24
- These subnets are all considered part of a larger class B network: 172.16.0.0/16.
- When R1 sends its routing table to R2, it will send the 172.16.0.0/16 summarized network.

Configuring EIGRP Automatic Summarization

Configuring Automatic Summarization

```
R1(config)# router eigrp 1
R1(config-router)# auto-summary
R1(config-router)#
*Mar  9 19:40:19.342: %DUAL-5-NBRCHANGE: EIGRP-IPv4 1: Neighbor
192.168.10.6 (Serial0/0/1) is resync: summary configured
*Mar  9 19:40:19.342: %DUAL-5-NBRCHANGE: EIGRP-IPv4 1: Neighbor
192.168.10.6 (Serial0/0/1) is resync: summary up, remove components
*Mar  9 19:41:03.630: %DUAL-5-NBRCHANGE: EIGRP-IPv4 1: Neighbor
192.168.10.6 (Serial0/0/1) is resync: peer graceful-restart
```

```
R2(config)# router eigrp 1
R2(config-router)# auto-summary
R2(config-router)#
```

- Automatic summarization is disabled by default for EIGRP IPv4 beginning with Cisco IOS Release 15.0(1)M and 12.2(33).
- Use the **show ip protocols** command to determine if EIGRP automatic summarization is disabled.
- To enable automatic summarization for EIGRP, use the **auto-summary** command in router configuration mode as shown in the figure to the left.
- Use the command **no auto-summary** to disable automatic summarization

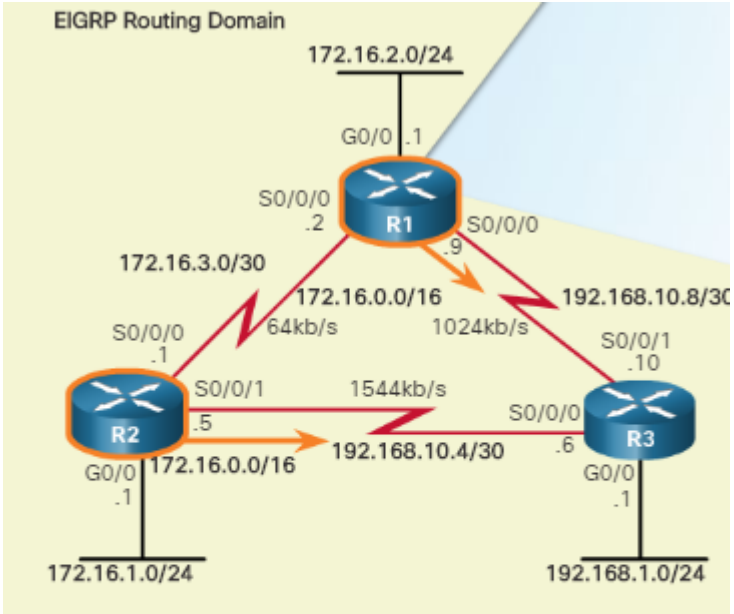
Verifying Auto-Summary: show ip protocols

Verifying Automatic Summarization is Enabled

```
R1# show ip protocols
*** IP Routing is NSF aware ***

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-IPv4 Protocol for AS(1)
    Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
<output omitted>

Automatic Summarization: enabled
    192.168.10.0/24 for Gi0/0, Se0/0/0
      Summarizing 2 components with metric 2169856
    172.16.0.0/16 for Se0/0/1
      Summarizing 3 components with metric 2816
<output omitted>
```

- Output from the **show ip protocols** command on R1 shows that automatic summarization is enabled.
- Output also indicates the networks that are summarized and on which interfaces.
- Notice that R1 summarizes two networks in its EIGRP routing updates:
  - 192.168.10.0/24 sent out the GigabitEthernet 0/0 and Serial 0/0/0 interfaces
  - 172.16.0.0/16 sent out the Serial 0/0/1 interface
- Please refer back to the figure in slide 7.1.1.1 for the Network Topology Diagram used throughout this chapter.

Verifying Auto-Summary: Topology Table




```
R3# show ip eigrp topology all-links

P 172.16.0.0/16, 1 successors, FD is 2170112, serno 9
        via 192.168.10.5 (2170112/2816), Serial0/0/0
        via 192.168.10.9 (3012096/2816), Serial0/0/1
<output omitted>
```

- Since the routing tables of R1 and R2 contain subnets of the 172.16.0.0/16 network, they will both advertise the summary route of 172.16.0.0/16 to R3.
- Use the **show ip eigrp topology all-links** command to view all incoming EIGRP routes.
- The output from this command, as shown in the figure to the left, verifies that R3 has received the 172.16.0.0/16 summary route from both R1 and R2.
- It is important to note that only one successor has been chosen due to its faster interface bandwidth.
- The **all-links** option shows all received updates, including routes from the feasible successor (FS).

Verifying Auto-Summary: Routing Table

Verifying Summary Route in Routing Table

Automatic Summarization Disabled

```
R3# show ip route eigrp

 172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
D 172.16.1.0/24 [90/2170112] via 192.168.10.5,
                02:21:10, Serial0/0/0
D 172.16.2.0/24 [90/3012096] via 192.168.10.9,
                02:21:10, Serial0/0/1
D 172.16.3.0/30 [90/41024000] via 192.168.10.9,
                02:21:10, Serial0/0/1
                [90/41024000] via 192.168.10.5,
                02:21:10, Serial0/0/0
R3#
```

Automatic Summarization Enabled

```
R3# show ip route eigrp

D 172.16.0.0/16 [90/2170112] via 192.168.10.5, 00:12:05,
  Serial0/0/0
  192.168.10.0/24 is variably subnetted, 5 subnets, 3 masks
D 192.168.10.0/24 is a summary, 00:11:43, Null0
R3#
```

- Use the **show ip route** command to verify that the summarized route was received.
- The output of the **show ip route eigrp** command, in the figure to the left, displays R3's routing table before automatic summarization is enabled.
- The output after automatic summarization is enabled is displayed on the bottom part of the figure.
- Automatic summarization is not an option with EIGRP for IPv6 since classful addressing does not exist.
- Automatic route summarization can cause problems if the summary address advertises networks which are not available on the advertising router.

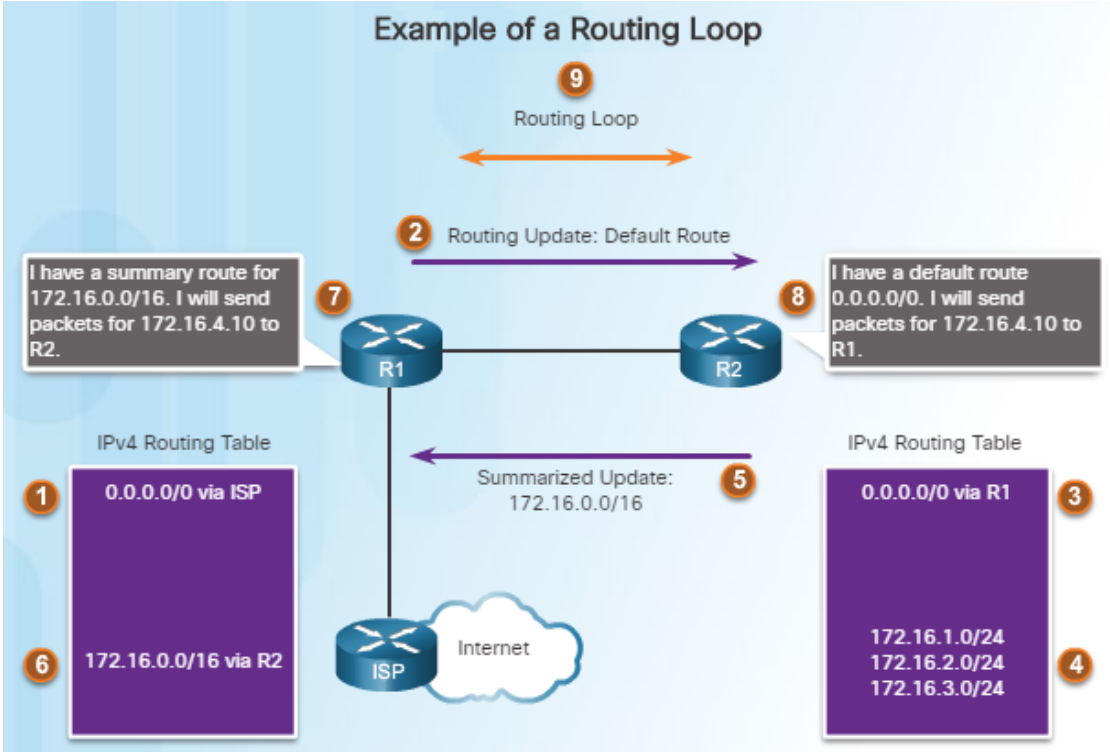
Verifying Auto-Summary: Routing Table (Cont.)

- EIGRP avoids problems caused by summarization by adding a network route for the classful network route to the routing table.
- This network entry routes packets to a Null interface - a virtual IOS interface that is a route to nowhere.
- Packets that match a route with a Null0 exit interface are discarded.

```
R1# show ip route

  172.16.0.0/16 is variably subnetted, 6 subnets, 4 masks
D   172.16.0.0/16 is a summary, 00:03:06, Null0
C   172.16.1.0/24 is directly connected, GigabitEthernet0/0
L   172.16.1.1/32 is directly connected, GigabitEthernet0/0
D   172.16.2.0/24 [90/40512256] via 172.16.3.2, 00:02:52, Serial0/0/0
C   172.16.3.0/30 is directly connected, Serial0/0/0
L   172.16.3.1/32 is directly connected, Serial0/0/0
D   192.168.1.0/24 [90/2170112] via 192.168.10.6, 00:02:51, Serial0/0/1
    192.168.10.0/24 is variably subnetted, 4 subnets, 3 masks
D   192.168.10.0/24 is a summary, 00:02:52, Null0
C   192.168.10.4/30 is directly connected, Serial0/0/1
D   192.168.10.8/30 [90/3523840] via 192.168.10.6, 00:02:59, Serial0/0/1
R1#
```

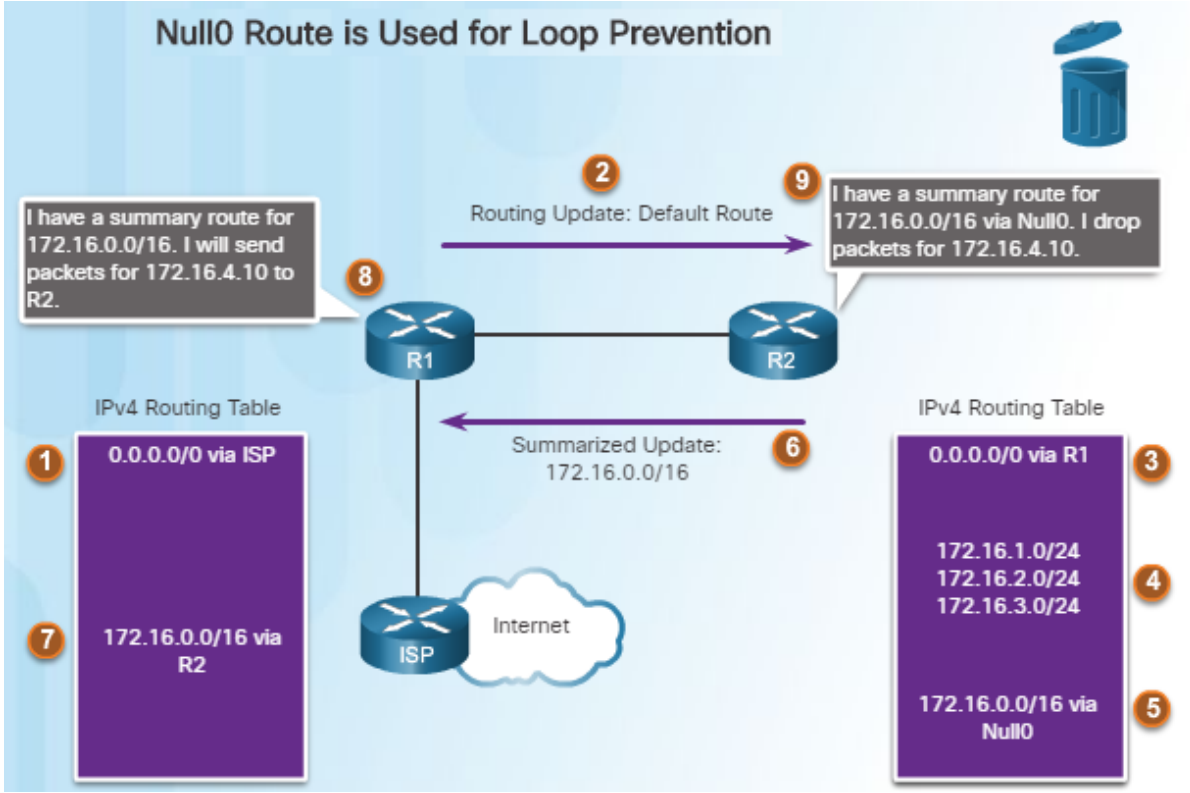
- EIGRP for IPv4 automatically includes a Null0 summary route whenever the following conditions exist:
  - Automatic summarization is enabled.
  - There is at least one subnet that was learned via EIGRP.
  - There are two or more network EIGRP router commands.

Summary Route



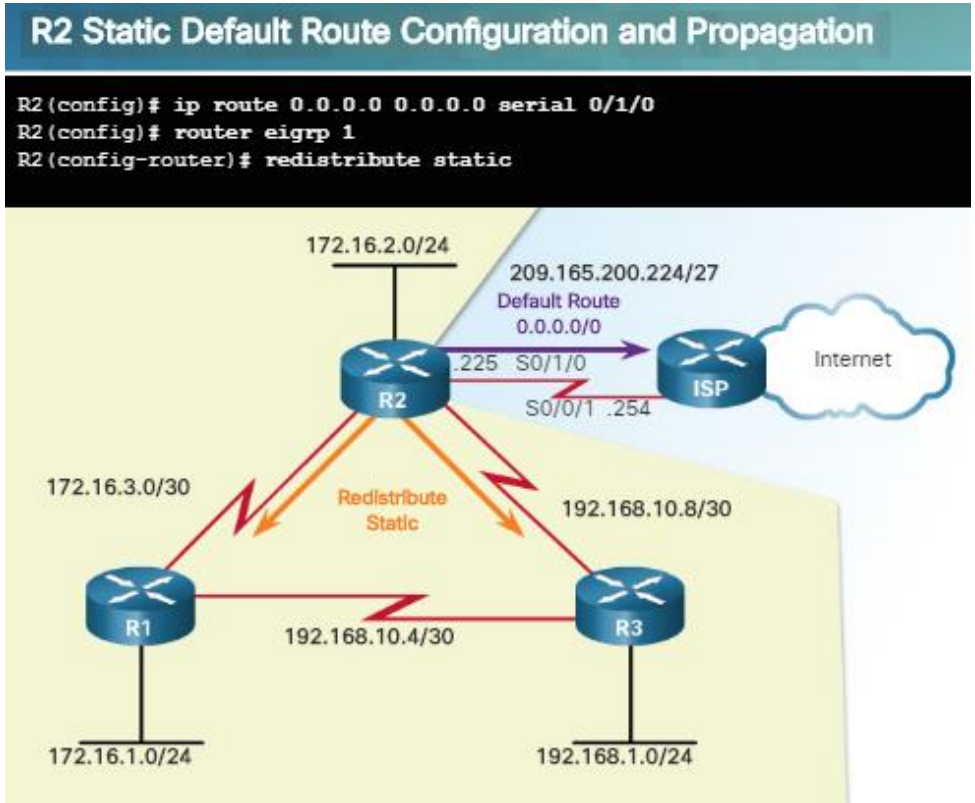
- The scenario in the figure walks you through an example of how automatic summarization could also cause a routing loop to occur:
  - R2's routing table contains the 172.16.1.0/24, 172.16.2.0/24, and 172.16.3.0/24 subnets in its routing table. (#4)
  - R2 sends a summarized update to R1 for the 172.16.0.0/16 network. (#5)
  - R1 installs the summarized route for 172.16.0.0/16 via R2. (#6)
  - R1 receives a packet for 172.16.4.10. R1 has a route for 172.16.0.0/16 via R2 and forwards the packet to R2. (#7)
  - On R2, the packet does not match any specific route, so it forwards the packet using the default route back to R1 causing a routing loop. (#8)

Summary Route (Cont.)



- EIGRP uses the Null0 interface to prevent these types of routing loops.
- R2's routing table contains the routes for 172.16.1.0/24, 172.16.2.0/24, and 172.16.3.0/24.
- R2 installs the 172.16.0.0/16 summary route to Null0 in its routing table.
- When R2 receives a packet for 172.16.4.10 from R1, it will discard the packet since it doesn't match any specific subnet of 172.16.0.0.
- The Null0 summary route is removed when autosummarization is disabled.

Propagating a Default Static Route



- Using a static route to 0.0.0.0/0 as a default route is not routing protocol-dependent.
- The “quad zero” default static route can be used with any currently supported routing protocols.
- The default static route is typically configured on the router that has a connection to a network out of the EIGRP routing domain; for example, to an ISP.
- The **redistribute static** command as shown in the figure to the left tells EIGRP to include static routes in its EIGRP updates to other routers.
- Use the **show ip protocols** command to verify.

Verifying the Propagated Default Route

Verifying Default Routes on R1 and R3

```
R1# show ip route | include 0.0.0.0
Gateway of last resort is 192.168.10.6 to network 0.0.0.0
D*EX 0.0.0.0/0  [170/3651840] via 192.168.10.6, 00:25:23,
Serial0/0/1
R1#
```

```
R3# show ip route | include 0.0.0.0
Gateway of last resort is 192.168.10.9 to network 0.0.0.0
D*EX 0.0.0.0/0  [170/3139840] via 192.168.10.9, 00:27:17,
Serial0/0/1
R3#
```

- A portion of the routing tables for R1 and R3 are shown in the figure.
- Notice the routing source and administrative distance for the new default route learned using EIGRP.
- The entry for the EIGRP learned default route is identified by the following:
  - D – Indicates it was learned from an EIGRP routing update.
  - * – Router is a candidate for a default route.
  - EX – Route is an external EIGRP route, or a static route outside of the EIGRP routing domain.
  - 170 – Administrative distance of an external EIGRP route.

EIGRP for IPv6: Default Route

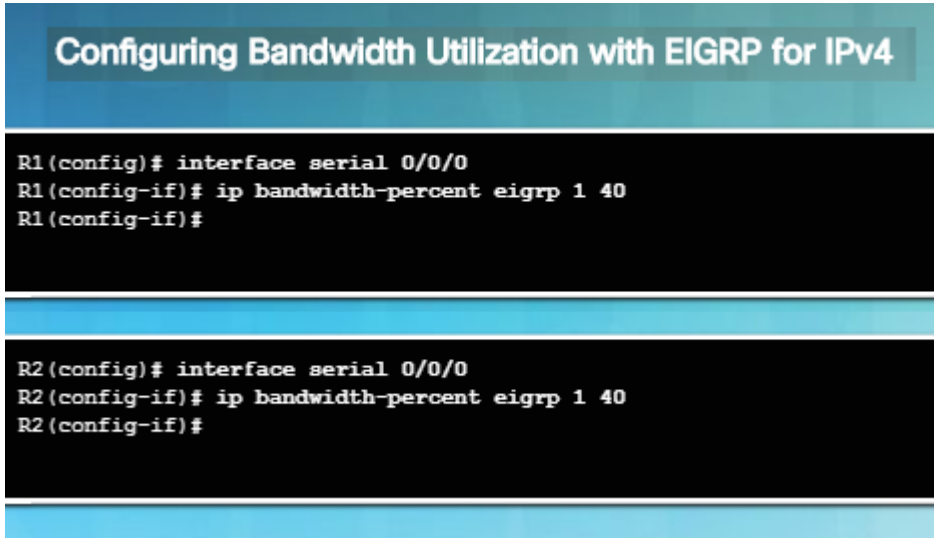
R2 IPv6 Static Default Route Configuration and Propagation

```
R2(config)# ipv6 route ::/0 serial 0/1/0
R2(config)# ipv6 router eigrp 2
R2(config-rtr)# redistribute static
```

```
R1# show ipv6 route
IPv6 Routing Table - default - 12 entries
Codes:  C - Connected, L - Local, S - Static,
        U - Per-user Static route
        B - BGP, R - RIP, I1 - ISIS L1, I2 - ISIS L2
        IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP external
        ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect
        O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
        ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
EX ::/0 [170/3523840]
        via FE80::3, Serial0/0/1
```

- EIGRP maintains separate tables for IPv4 and IPv6, therefore an IPv6 default route must be propagated separately.
- As shown in the figure, an IPv6 default static route is configured and propagated.
- The ::/0 prefix and prefix-length is equivalent to the 0.0.0.0 0.0.0.0 address and subnet mask used in IPv4.
- The **redistribute static** command is used for IPv6 to redistribute the default static route into EIGRP.
- The propagation of the IPv6 static default route can be verified by using the **show ipv6 route** command.

EIGRP Bandwidth Utilization



- By default, EIGRP uses only up to 50 percent of an interface's bandwidth for EIGRP information in order to prevent it from over-utilizing a link.
- In interface config mode, use the **ip bandwidth-percent eigrp** *as-number percent* command to configure the percentage of bandwidth that can be used by EIGRP on an interface.
- To restore the default value, use the **no** form of this command.
- To configure the percentage of bandwidth that can be used by EIGRP for IPv6 on an interface, use **the ipv6 bandwidth-percent eigrp** command.

Hello and Hold Timers

Configuring EIGRP for IPv4 Hello and Hold Timers

```
R1(config)# interface s0/0/0
R1(config-if)# ip hello-interval eigrp 1 50
R1(config-if)# ip hold-time eigrp 1 150
```

Default Hello Intervals and Hold Times for EIGRP

Bandwidth	Example Link	Default Hello Interval	Default Hold Time
1.544 Mbps	Multipoint Frame Relay	60 seconds	180 seconds
Greater than 1.544 Mbps	T1, Ethernet	5 seconds	15 seconds

Configuring EIGRP for IPv6 Hello and Hold Timers

```
R1(config)# inter serial 0/0/0
R1(config-if)# ipv6 hello-interval eigrp 2 50
R1(config-if)# ipv6 hold-time eigrp 2 150
```

- EIGRP uses a lightweight Hello protocol to establish and monitor the connection status of its neighbor.
- The hold time tells the router the maximum time the router should wait to receive the next Hello before declaring that neighbor unreachable.
- Use the **ip hello-interval eigrp** *as-number seconds* command to configure a different Hello interval.
- Use the **ip hold-time eigrp** *as-number seconds* command to configure a different hold time.
- Hello intervals and hold times are configured on a per-interface basis and do not have to match with other EIGRP routers to establish or maintain adjacencies.

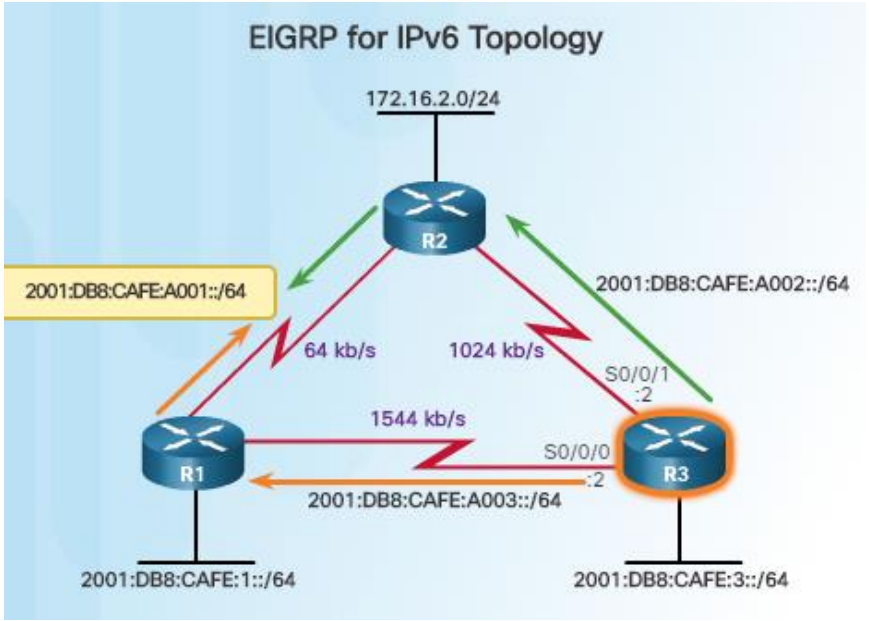
Load Balancing IPv4

R3's Maximum Paths

```
R3# show ip protocols
*** IP Routing is NSF aware ***

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-IPv4 Protocol for AS(1)
    Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
    NSF-aware route hold timer is 240
    Router-ID: 3.3.3.3
    Topology : 0 (base)
      Active Timer: 3 min
      Distance: internal 90 external 170
      Maximum path: 4
      Maximum hopcount 100
      Maximum metric variance 1

  Automatic Summarization: disabled
  Address Summarization:
    192.168.0.0/22 for Se0/0/0, Se0/0/1
      Summarizing 3 components with metric 2816
  Maximum path: 4

<output omitted>
```

- Equal-cost load balancing is the ability of a router to distribute outbound traffic using all interfaces that have the same metric from the destination address.
- Cisco IOS applies load balancing using up to four equal-cost paths by default.
- The **show ip protocols** command can be used to verify the number of equal-cost paths configured on the router.
- When a packet is process-switched, load balancing over equal-cost paths occurs on a per-packet basis.
- When packets are fast-switched, load balancing over equal-cost paths occurs on a per-destination basis. CEF can perform both per packet and per-destination load balancing.
- Use the **maximum-paths** *value* command in router config mode to modify the default of four equal cost paths.

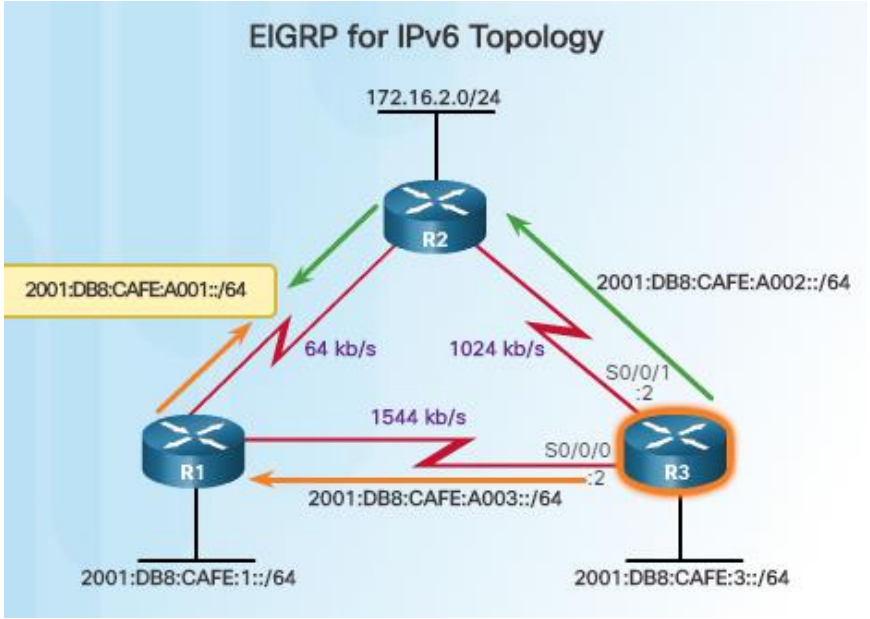
Load Balancing IPv6



- R3 has two EIGRP equal-cost routes for the network between R1 and R2.
- Output of the **show ipv6 route eigrp** command below shows the EIGRP metrics. The EIGRP composite metric is the same for both EIGRP IPv6 and IPv4.

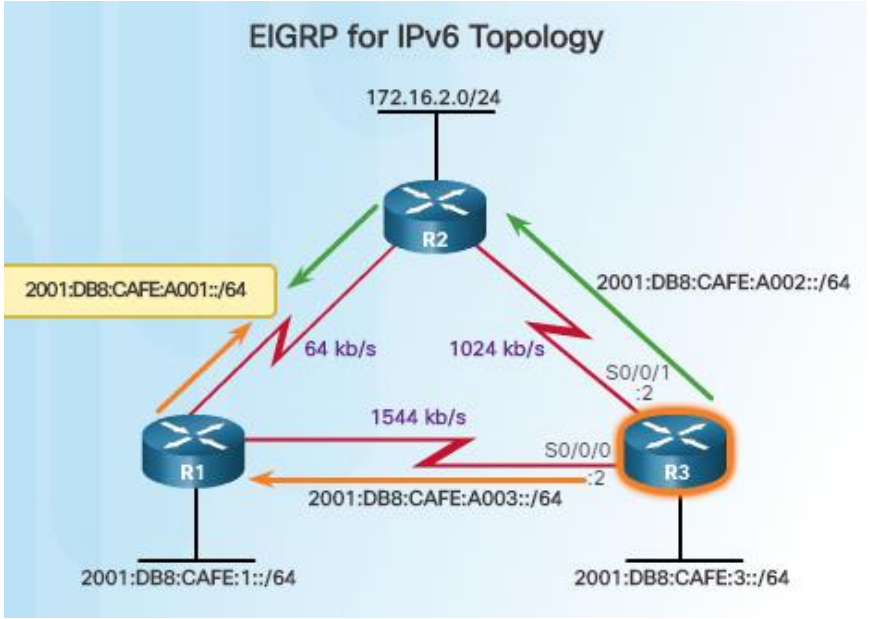
```
R3# show ipv6 route eigrp

<output omitted>

EX   ::/0 [170/3011840]
     via FE80::2, Serial0/0/1
D    2001:DB8:ACAD::/48 [5/128256]
     via Null0, directly connected
D    2001:DB8:CAFE:1::/64 [90/2170112]
     via FE80::1, Serial0/0/0
D    2001:DB8:CAFE:2::/64 [90/3012096]
     via FE80::2, Serial0/0/1
D    2001:DB8:CAFE:A001::/64 [90/41024000]
     via FE80::2, Serial0/0/1
     via FE80::1, Serial0/0/0
R3#
```

Load Balancing IPv6 (Cont.)



- EIGRP for IPv4 and IPv6 can also balance traffic across multiple routes that have different metrics. This is referred to as unequal-cost load balancing.
- Setting a value using the **variance** command in router config mode will enable EIGRP to install multiple loop-free routes with unequal cost in a local routing table.
- A route learned through EIGRP must meet two criteria to be installed in the routing table:
  - Route must be loop-free, being either a feasible successor or having a reported distance that is less than the total distance.
  - Metric of the route must be lower than the metric of the best route (successor) multiplied by the variance configured on the router.

Load Balancing IPv6 (Cont.)



- Unequal-Cost Load Balancing
  - If the variance is set to 1, only routes with the same metric as the successor are installed in the local routing table.
  - If the variance is set to 2, any EIGRP-learned route with a metric less than 2 times the successor metric will be installed in the local routing table.

7.2 Troubleshoot EIGRP

Basic EIGRP Troubleshooting Commands

R1 EIGRP Neighbor Table

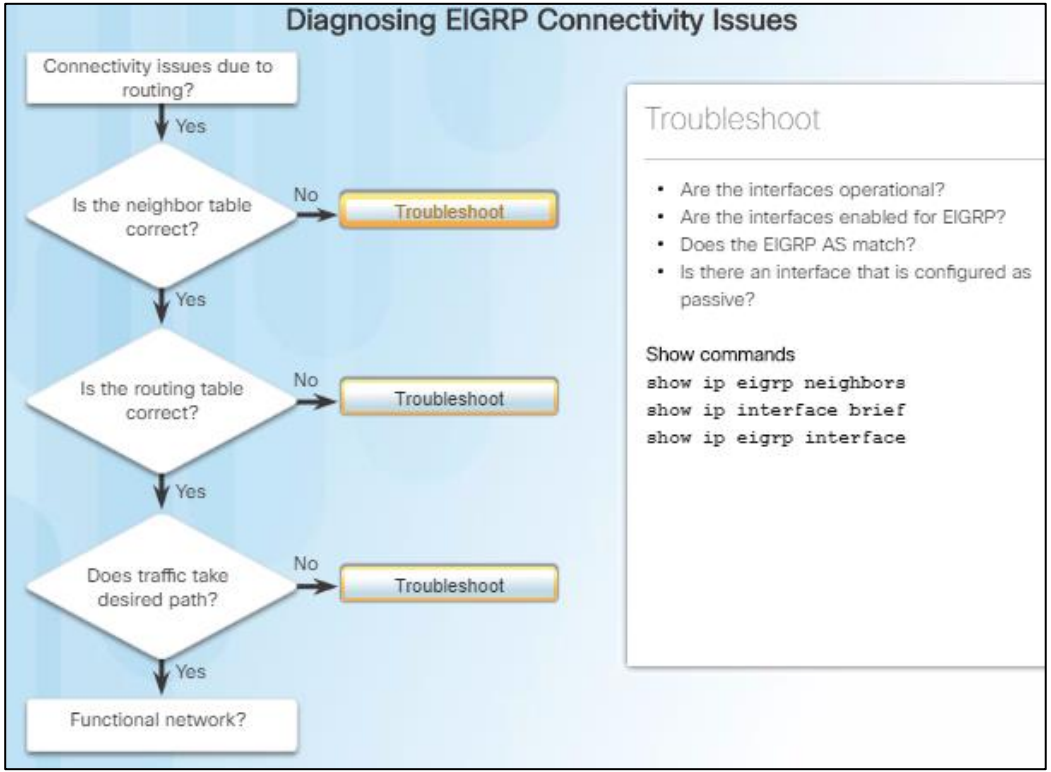
```
R1# show ip eigrp neighbors
EIGRP-IPv4 Neighbors for AS(1)
H Address       Interface  Hold Uptime    SRTT  RTO  Q  Seq
                           (sec)         (ms)     Cnt Num
1 172.16.3.2    Se0/0/0     140 03:28:12   96  2340  0  23
0 192.168.10.6  Se0/0/1      14 03:28:27   49   294  0  24
R1#
```

R1 IPv4 Routing Table

```
R1# show ip route eigrp

Gateway of last resort is 192.168.10.6 to network 0.0.0.0

D*EX  0.0.0.0/0 [170/3651840] via 192.168.10.6, 05:32:02,
      Serial0/0/1
      172.16.0.0/16 is variably subnetted, 5 subnets, 3 masks
D        172.16.2.0/24 [90/3524096] via 192.168.10.6, 05:32:02,
         Serial0/0/1
D     192.168.0.0/22 [90/2170112] via 192.168.10.6, 05:32:02,
      Serial0/0/1
      192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
D        192.168.10.8/30 [90/3523840] via 192.168.10.6,
         05:32:02,Serial0/0/1
R1#
```

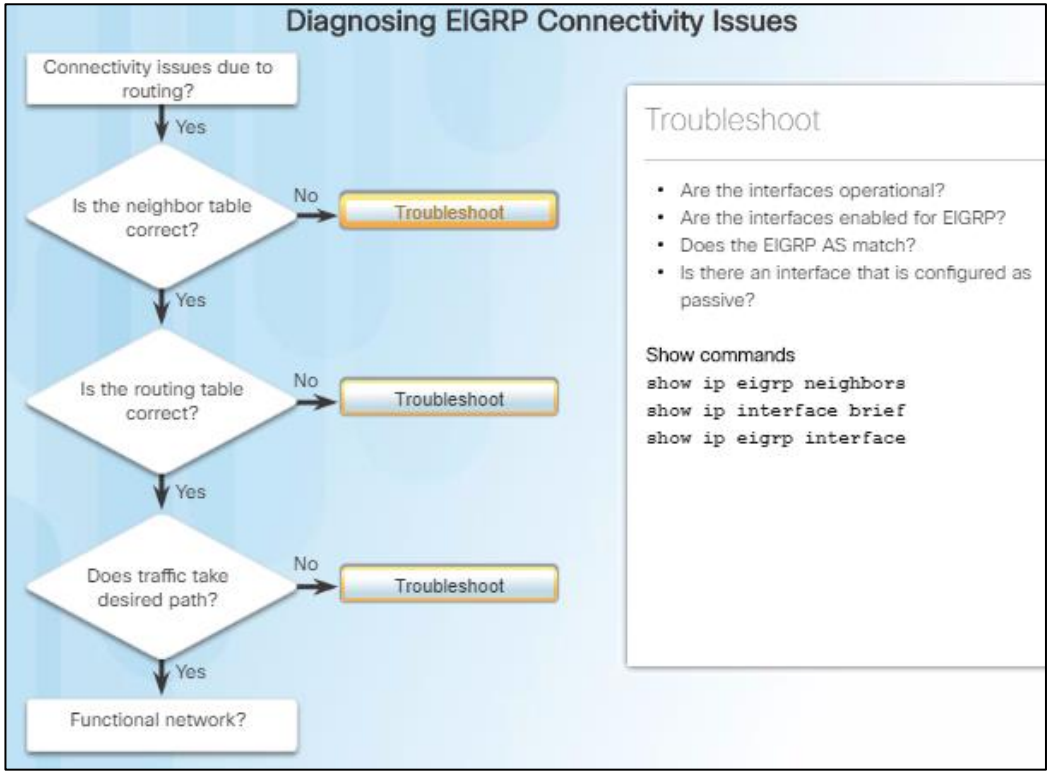
- The **show ip eigrp neighbors** command verifies that the router recognizes its neighbors. The output in the figure indicates two successful EIGRP neighbor adjacencies.
- The **show ip route eigrp** command verifies that the router learned the route to a remote network through EIGRP. The output shows that R1 has learned about four remote networks through EIGRP.
- The **show ip protocols** command can be used to display various EIGRP settings.
- EIGRP for IPv6 commands:
  - **show ipv6 eigrp neighbors**
  - **show ipv6 route**
  - **show ipv6 protocols**

Components



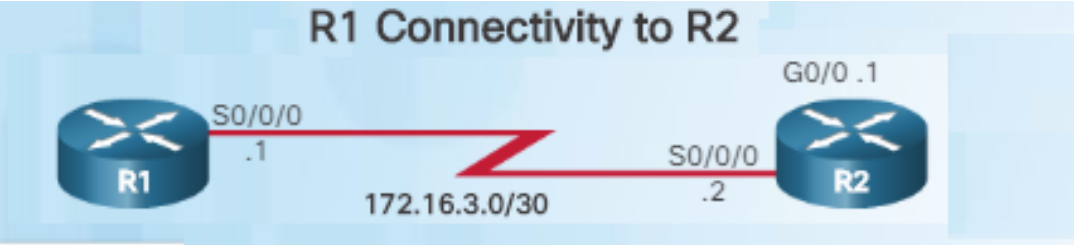
- The flowchart in the figure provides a systematic approach to troubleshooting EIGRP.
- EIGRP neighbors must first establish adjacencies with each other before they can exchange routes. Reasons why they might fail:
  - Interface between the devices is down.
  - Two routers have mismatching EIGRP autonomous system numbers.
  - Proper interfaces are not enabled for the EIGRP process.
  - An interface is configure as passive.
  - Misconfigured K values, incompatible Hello and Hold interval times or misconfigured authentication.

Components (Cont.)



- After a neighbor adjacency is established, EIGRP begins the process of exchanging routing information.
- If two routers are EIGRP neighbors, but there is still a connection issue, there may be a routing problem caused by:
  - Proper networks are not being advertised on remote routers.
  - An incorrectly-configured passive interface, or an ACL, is blocking advertisements of remote networks.
  - Automatic summarization is causing inconsistent routing in a discontiguous network.

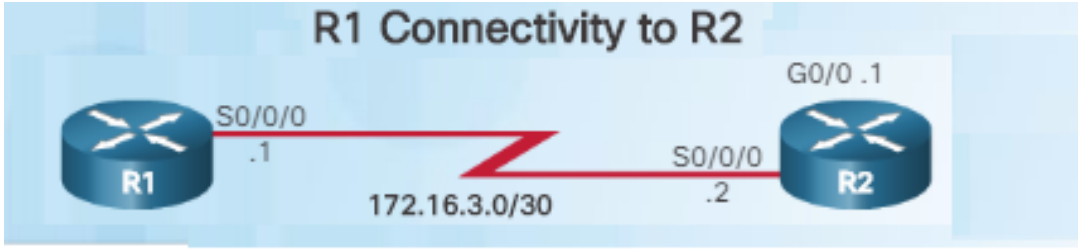
Layer 3 Connectivity




```
R1# show ip interface brief
Interface                  IP-Address      OK? Method Status
Protocol
GigabitEthernet0/0         172.16.1.1      YES manual up        up
Serial0/0/0                172.16.3.1      YES manual up        up
Serial0/0/1                192.168.10.5    YES manual up        up
R1# ping 172.16.3.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.3.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max =
28/28/28 ms
R1#
```

- Layer 3 connectivity must exist between two directly connected routers in order for a neighbor adjacency to form.
- Use the **show ip interface brief** command to verify that the status and protocol of connecting interfaces are up.
- Ping one router to another directly connected router to confirm IPv4 connectivity.
- If the ping is unsuccessful, use the **show cdp neighbor** command to verify Layer 1 and 2 connections to the neighbor.

Layer 3 Connectivity (Cont.)

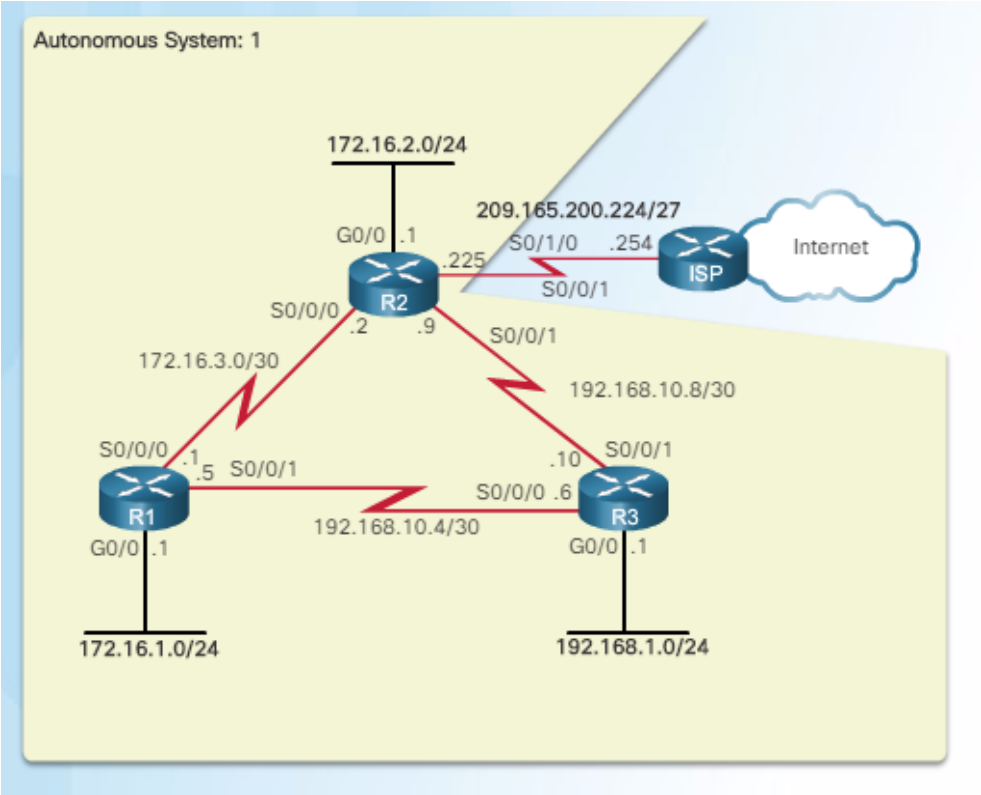



```
R1# show ip interface brief
Interface                  IP-Address      OK? Method Status
Protocol
GigabitEthernet0/0         172.16.1.1      YES manual up        up
Serial0/0/0                172.16.3.1      YES manual up        up
Serial0/0/1                192.168.10.5    YES manual up        up
R1# ping 172.16.3.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.3.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max =
28/28/28 ms
R1#
```

- Layer 3 problems include misconfigured IP addresses, subnets, and network addressing.
- For example, interfaces on connected devices must be on a common subnet. Watch for log messages.
- EIGRP for IPv6
  - **show ipv6 interface brief**

Troubleshoot EIGRP Neighbor Issues

EIGRP Parameters



- When troubleshooting an EIGRP network, verify that all routers participating in the EIGRP network are configured with the same autonomous system number:

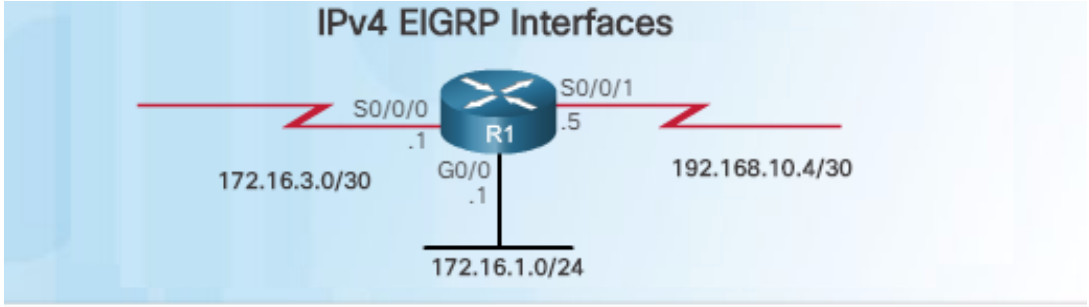
```
R1# show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is eigrp 1"
<output omitted>
```

```
R2# show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is eigrp 1"
<output omitted>
```

```
R3# show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is eigrp 1"
<output omitted>
```

- EIGRP for IPv6:
  - Router(config)# **ipv6 router eigrp** *as-number*
  - Router# **show ipv6 protocols**

EIGRP Interfaces

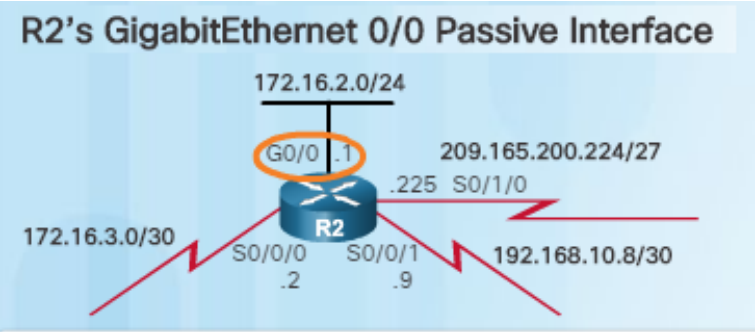



```
R1# show ip eigrp interfaces
EIGRP-IPv4 Interfaces for AS(1)
                Xmit Queue   PeerQ        Mean   Pacing Time   Multicast    Pending
Interface  Peers Un/Reliable  Un/Reliable  SRTT   Un/Reliable   Flow Timer   Routes
Gi0/1        0       0/0        0/0           0        0/0           0          0
Se0/0/0      1       0/0        0/0        1295        0/23        6459          0
Se0/0/1      1       0/0        0/0        1044        0/15        5195          0
R1#
```

```
R1# show running-config | section eigrp 1
router eigrp 1
 network 172.16.0.0
 network 192.168.10.0
 passive-interface GigabitEthernet0/0
 eigrp router-id 1.1.1.1
R1#
```

- Verify that all interfaces are participating in the EIGRP network.
- The **network** command that is configured under the EIGRP routing process indicates which router interfaces participates in EIGRP.
- The **show ip eigrp interfaces** command displays which interfaces are enabled for EIGRP.
- The **show ip protocols** command indicates which networks have been configured.
- Connected interfaces must be enabled for EIGRP in order to form an adjacency.
- EIGRP for IPv6:
  - Router# **show ipv6 protocols**
  - Router# **show ipv6 eigrp interfaces**

Passive Interface




```
R2# show ip protocols
*** IP Routing is NSF aware ***
Routing Protocol is "eigrp 1"
 <output omitted>
Routing for Networks:
    172.16.0.0
    192.168.10.8/30
  Passive Interface(s):
    GigabitEthernet0/0
    Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.10.10         90      00:08:59
    172.16.3.1            90      00:08:59
  Distance: internal 90 external 170
R2#
```

- One reason that routing tables may not reflect the correct routes is due to the **passive-interface** command.
- The **passive-interface** command stops both outgoing and incoming routing updates which prevents routers from becoming neighbors.
- Use the privileged EXEC **show ip protocols** command to verify whether any interface on a router is configured as passive.
- The **passive-interface** command can be used for security reasons. For example, the network administrator may not want the router to form an EIGRP neighbor adjacency with the ISP router.
- EIGRP for IPv6:
  - Router# **show ipv6 protocols**
  - Router(config-rtr)# **passive-interface** *type number*

Missing Network Statement

10.10.100/24 R1 Updates

```
R1# show ip protocols | begin Routing for Networks
  Routing for Networks:
    172.16.0.0
    192.168.10.0
  Passive Interface(s):
    GigabitEthernet0/0
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.10.6           90      01:34:19
    172.16.3.2             90      01:34:19
  Distance: internal 90 external 170

R1#
```

Configuring a Network

```
R1(config)# router eigrp 1
R1(config-router)# network 10.0.0.0
```

- In the top part of the figure to the left, the 10.10.10.0/24 network is not reachable through EIGRP routing.
- Output from the **show ip protocols** command indicates that the 10.10.10.0/24 network is not configured for routing.
- Output in the bottom part of the figure shows how to solve the issue by configure EIGRP routing for network 10.0.0.0.
- View the output of the **show ip protocols** command to check for ACLs that might be filtering routing updates.
- EIGRP for IPv6:
  - Router# **show ipv6 protocols**
  - Router# **show ipv6 route**
  - Router(config-if)# **ipv6 eigrp autonomous-system**

Troubleshoot EIGRP Routing Table Issues

Autosummarization

Verify Automatic Summarization Status

```
R1# show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is "eigrp 1"

  Automatic Summarization: enabled
    10.0.0.0/8 for Se0/0/0
      Summarizing 1 component with metric 28160
<output omitted>
```

```
R3# show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is "eigrp 1"

  Automatic Summarization: enabled
    10.0.0.0/8 for Se0/0/1
      Summarizing 1 component with metric 28160
<output omitted>
```

- Automatic Summarization is another issue that may create EIGRP routing problems.
- The **show ip protocols** command can be used to verify if automatic summarization is being performed.
- Autosummarization is disabled by default in IOS 12.2(33) and IOS 15.
- Before IOS 12.2(33) and IOS 15, autosummarization was enabled by default.
- Inconsistent routing could be caused by automatic summarization.
- To disable, use the **no auto-summary** command in router EIGRP configuration mode.
- EIGRP for IPv6 does not support automatic summarization.

7.3 Summary

Chapter 7: EIGRP Tuning and Troubleshooting

- Configure EIGRP to improve network performance.
- Troubleshoot common EIGRP configuration issues in a small to medium-sized business network.


CISCO