



Chapter 5: EIGRPv6

Instructor Materials

CCNP Enterprise: Advanced Routing



Chapter 5 Content

This chapter covers the following content:

- **EIGRPv6 Fundamentals** - This section provides an overview of EIGRPv6 and the correlation to EIGRP for routing IPv4 networks.
- **Troubleshooting EIGRPv6 Neighbor Issues** - This section discusses the reasons EIGRPv6 neighbor relationships may not be formed and how to identify them.
- **Troubleshooting EIGRPv6 Routes** - This section explores the reasons EIGRPv6 routes might be missing and how to determine why they are missing.
- **Troubleshooting Named EIGRP** - This section introduces the show commands that you can use to troubleshoot named EIGRP configurations.
- **EIGRPv6 and Named EIGRP Trouble Tickets** - This section provides trouble tickets that demonstrate how to use a structured troubleshooting process to solve a reported problem.

EIGRPv6 Fundamentals

- EIGRP's functional behavior is unchanged between IPv4 and IPv6.
- The same administrative distance, metrics, timers, and DUAL mechanisms are in place to build the routing table.
- This section is devoted to discussing the components of the routing protocol that are unique to IPv6.

EIGRPv6 Inter-Router Communication

- EIGRP packets are identified using the well-known protocol ID 88 for both IPv4 and IPv6.
- When EIGRPv6 is enabled, the routers communicate with each other using the interface's IPv6 link-local address as the source. The destination address may be either a unicast link-local address or the multicast link-local address FF02::A.
- Table 5-2 shows the source and destination addresses for the EIGRP packet types.

Table 5-2 EIGRPv6 Packets

EIGRP Packet	Source	Destination	Purpose
Hello	Link-local address	FF02::A	Neighbor discovery and keepalive
Acknowledgment	Link-local address	Link-Local address	Acknowledges receipt of an update
Query	Link-local address	FF02::A	Request for route information during a topology change event
Reply	Link-local address	Link-Local address	A response to a query message
Update	Link-local address	Link-Local address	Adjacency forming
Update	Link-local address	FF02::A	Topology change

EIGRPv6 Configuration

There are two methods for configuring IPv6 for EIGRP on IOS and IOS XE routers:

- Classic AS mode
- Named mode

EIGRPv6 Classic Mode Configuration

Classic mode is the original IOS method for enabling IPv6 on EIGRP. In this mode, the routing process is configured using an autonomous system number.

The steps for configuring EIGRPv6 on an IOS router are as follows:

- **Step 1.** Configure the EIGRPv6 process by using the global configuration command **ipv6 router eigrp** *as-number*.
- **Step 2.** Assign the router ID by using the IPv6 address family command **eigrp router-id** *id*. The router ID should be manually assigned to ensure proper operation of the routing process. The default behavior for EIGRP is to locally assign a router ID based on the highest IPv4 loopback address or, if that is not available, the highest IPv4 address.
- **Step 3.** Enable the process on the interface by using the interface parameter command **ipv6 eigrp** *as-number*.

EIGRPv6 Named Mode Configuration

Named mode provides support for IPv4, IPv6, and virtual routing and forwarding (VRF), all within a single EIGRP instance.

The steps for configuring EIGRP named mode are as follows:

- **Step 1.** Configure the EIGRPv6 routing process in global configuration mode by using the command **router eigrp** *process-name*. Unlike in classic mode, you specify a name instead of an autonomous system number.
- **Step 2.** Define the address family and autonomous system number (ASN) to the routing process by using the command **address-family ipv6 autonomous-system** *as-number*.
- **Step 3.** Assign the router ID by using the IPv6 address family command **eigrp router-id** *router-id*.

All of the EIGRP-specific interface parameters are configured in the **af-interface default** or **af-interface** *interface-id* submode within the IPv6 address family of the named EIGRP process.

When the IPv6 address family is configured for the EIGRP named process, all the IPv6-enabled interfaces immediately start participating in routing. To disable the routing process on the interface, the interface needs to be shut down in **af-interface** configuration mode.

EIGRPv6 Verification

IPv6 uses the same EIGRP verification commands described in Chapters 3 and 4. Table 5-3 lists the IPv6 versions of the **show** commands that are covered in this chapter.

Table 5-3 EIGRP Display Commands

Command	Description
show ipv6 eigrp interfaces [<i>interface-id</i>] [detail]	Displays the EIGRPv6 interfaces.
show ipv6 eigrp neighbors	Displays the EIGRPv6 neighbors.
show ipv6 route eigrp	Displays only EIGRP IPv6 routes in the routing table.
show ipv6 protocols	Displays the current state of the active routing protocol processes.

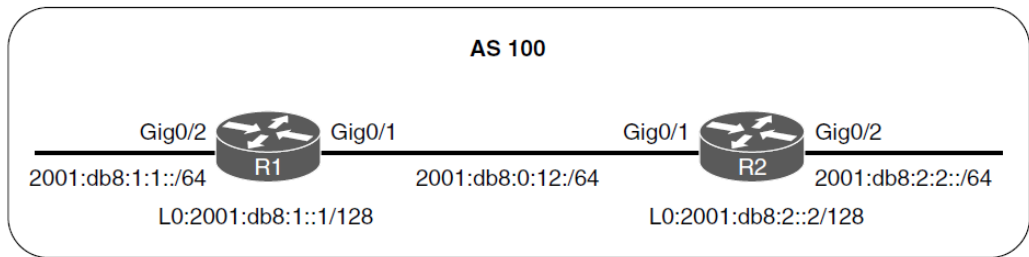


Figure 5-1 Simple EIGRPv6 Topology

EIGRPv6 Verification Configuration

Example 5-1 shows the full EIGRPv6 configuration for the sample topology. Both EIGRPv6 classic AS and named mode configurations are provided.

Example 5-1 EIGRPv6 Base Configuration

R1 (Classic Configuration)

```
interface GigabitEthernet0/1
  ipv6 address 2001:DB8:0:12::1/64
  ipv6 address fe80::1 link-local
  ipv6 eigrp 100
!
interface GigabitEthernet0/2
  ipv6 address 2001:DB8:1:1::1/64
  ipv6 address fe80::1 link-local
  ipv6 eigrp 100
!
interface Loopback0
  ipv6 address 2001:DB8:1::1/128
  ipv6 eigrp 100
!
ipv6 unicast-routing
!
```

R2 (Named Mode Configuration)

```
interface GigabitEthernet0/1
  ipv6 address 2001:DB8:0:12::2/64
  ipv6 address fe80::2 link-local
!
interface GigabitEthernet0/2
  ipv6 address 2001:DB8:2:2::2/64
  ipv6 address fe80::2 link-local
!
interface Loopback0
  ipv6 address 2001:DB8:2::2/128
!
ipv6 unicast-routing
!
router eigrp NAMED-MODE
  address-family ipv6 unicast autonomous-system 100
  eigrp router-id 192.168.2.2
```

EIGRPv6 Verification Configuration

Example 5-2 provides verification of the EIGRPv6 neighbor adjacency. Example 5-3 shows routing table entries for R1 and R2.

Example 5-2 EIGRPv6 Neighbor Adjacency

```
R1# show ipv6 eigrp neighbors
EIGRP-IPv6 Neighbors for AS(100)
H   Address                               Interface      Hold Uptime    SRTT    RTO  Q  Seq
                               (sec)          (ms)        Cnt  Num
0   Link-local address:  Fe80::2/128    Gi0/1          13 00:01:14   1593   5000  0   7
                               Fe80::2
```

```
R2# show ipv6 eigrp neighbors
EIGRP-IPv6 VR(NAMED-MODE) Address-Family Neighbors for AS(100)
H   Address                               Interface      Hold Uptime    SRTT    RTO  Q  Seq
                               (sec)          (ms)        Cnt  Num
0   Link-local address:  Fe80::1/128    Gi0/1          11 00:01:07    21    126  0   5
                               Fe80::1
```

Example 5-3 EIGRPv6 Routing Table Entries

```
R1# show ipv6 route eigrp
! Output omitted for brevity
D    2001:DB8:2::2/128 [90/2848]
    via Fe80::2, GigabitEthernet0/1
D    2001:DB8:2:::/64 [90/3072]
    via Fe80::2, GigabitEthernet0/1
```

```
R2# show ipv6 route eigrp
! Output omitted for brevity
D    2001:DB8:1:1::/64 [90/15360]
    via Fe80::1, GigabitEthernet0/1
D    2001:DB8:1:1::1/128 [90/10752]
    via Fe80::1, GigabitEthernet0/1
```

IPv6 Route Summarization

There is no concept of classful or classless routing in IPv6, and therefore, autosummarization is not possible. EIGRPv6 summarization for IPv6 is manually configured on a per-interface basis, using the same rules as for IPv4:

- The summary aggregate prefix is not advertised until a prefix matches it.
- More specific prefixes are suppressed.
- A Null0 route with an administrative distance of 5 is added to the routing table as a loop-prevention mechanism.
- A leak map can be used to advertise more specific prefixes while advertising a summary address.

Network summarization is configured at the interface level in classic mode using the command **ipv6 summary-address eigrp** *as-number ipv6-prefix/prefix-length* or in named mode with the command **summary-address** *ipv6-prefix/prefix-length* under **af-interface**.

IPv6 Route Summarization

- Example 5-4 demonstrates how to configure R1 to advertise a 2001:db8:1::/48 summary route to R2 and how to configure R2 to advertise a 2001:DB8:2::/48 summary route to R1.
- Example 5-5 shows the routing tables for R1 and R2. Notice that only the /48 summary prefix is received from the neighbor router and that the more specific /64 and /128 route entries are suppressed. A Null0 route is populated on the router for the local /48 summary route advertisement.

Example 5-4 EIGRPv6 Summary Configuration

R1 (Classic Mode Configuration)

```
interface GigabitEthernet0/1
  ipv6 summary-address eigrp 100 2001:DB8:1::/48
```

R2 (Named Mode Configuration)

```
router eigrp NAMED-MODE
  address-family ipv6 unicast autonomous-system 100
    af-interface GigabitEthernet0/1
      summary-address 2001:DB8:2::/48
```

Example 5-5 EIGRPv6 Routing Table Entries

```
R1# show ipv6 route eigrp
! Output omitted for brevity
D    2001:DB8:1::/48 [5/2816]
      via Null0, directly connected
D    2001:DB8:2::/48 [90/2848]
      via FE80::2, GigabitEthernet0/1
```

```
R2# show ipv6 route eigrp
! Output omitted for brevity
D    2001:DB8:1::/48 [90/2841]
      via FE80::1, GigabitEthernet0/1
D    2001:DB8:2::/48 [5/2816]
      via Null0, directly connected
```

Default Route Advertising

Advertise a default route into the EIGRPv6 topology by placing the default prefix (::/0) as a summary address at the interface level. When you use the summary method, all prefix advertisements are suppressed by the router, except for the ::/0 default route entry.

Example 5-6 demonstrates the two configuration methods for injecting a default route into EIGRPv6.

Example 5-6 *EIGRPv6 Default Route Injection*

```
R2 (Classic Configuration)
interface GigabitEthernet0/1
  ipv6 eigrp 100
  ipv6 summary-address eigrp 100 ::/0

R2 (Named Mode Configuration)
router eigrp CISCO
  address-family ipv6 unicast autonomous-system 100
    af-interface GigabitEthernet0/1
      summary-address ::/0
```

Route Filtering

In IOS and IOS XE, use prefix lists to match IPv6 routes in route maps and distribution lists.

- Example 5-7 demonstrates how to use a distribution list for filtering the default route `::/0` advertisements from an upstream neighbor connected to interface GigabitEthernet0/1.
- The associated prefix list BLOCK-DEFAULT with sequence 5 is a deny statement that filters the exact match for the default route prefix `::/0`. Sequence 10 is a permit-any match statement that allows a prefix of any length to be received.

Example 5-7 *IOS Distribute List to Filter the Default Route*

R1 (Classic Configuration)

```
ipv6 router eigrp 100
  distribute-list prefix-list BLOCK-DEFAULT in GigabitEthernet0/1
!
ipv6 prefix-list BLOCK-DEFAULT seq 5 deny ::/0
ipv6 prefix-list BLOCK-DEFAULT seq 10 permit ::/0 le 128
```

R2 (Named Mode Configuration)

```
router eigrp CISCO
  address-family ipv6 unicast autonomous-system 100
    topology base
      distribute-list prefix-list BLOCK-DEFAULT in GigabitEthernet0/1
    exit-af-topology
  exit-address-family
!
ipv6 prefix-list BLOCK-DEFAULT seq 5 deny ::/0
ipv6 prefix-list BLOCK-DEFAULT seq 10 permit ::/0 le 128
```

Troubleshooting EIGRPv6 Neighbor Issues

- EIGRPv6 is based on EIGRP for IPv4, it involves similar issues when it comes to troubleshooting, although there are a few differences for IPv6.
- Although you do not have to learn a large amount of new information for EIGRPv6, you do need to know the show commands that will display the information you need to troubleshoot any given EIGRPv6-related issue.

Neighbor Issues

- The neighbor issues are mostly the same, except for a few differences based on the way EIGRPv6 is enabled on an interface.
- To verify EIGRPv6 neighbors, use the **show ipv6 eigrp neighbors** command, as shown in Example 5-8. Notice how EIGRPv6 neighbors are identified by their link-local address. In this case, R2 is a neighbor of two different routers. One is reachable out Gi1/0, and the other is reachable out Gi0/0.

Example 5-8 *Verifying EIGRPv6 Neighbors*

```
R2# show ipv6 eigrp neighbors
EIGRP-IPv6 Neighbors for AS(100)
H   Address                               Interface      Hold  Uptime    SRTT   RTO   Q   Seq
                               (sec)                  (ms)    Cnt  Num
1 Link-local address:                Gi1/0          10    00:17:59   320    2880   0    4
  FE80::C823:17FF:FE0C:1C
0 Link-local address:                Gi0/0          12    00:18:01   148     888   0    3
  FE80::C820:17FF:FE04:1C
```


Interface Is Down

- Verify that an interface is up, you use the **show ipv6 interface brief** command, as shown in Example 5-9.
- In this example, GigabitEthernet0/0 and GigabitEthernet1/0 are up/up, and GigabitEthernet2/0 is administratively down/down. This indicates that GigabitEthernet2/0 has been configured with the **shutdown** command.

Example 5-9 *Verifying the Status of IPv6 Interfaces*

```
R1# show ipv6 interface brief
GigabitEthernet0/0 [up/up]
    FE80::C80E:1FF:FE9C:8
    2001:DB8:0:1::1
GigabitEthernet1/0 [up/up]
    FE80::C80E:1FF:FE9C:1C
    2001:DB8:0:12::1
GigabitEthernet2/0 [administratively down/down]
    FE80::C80E:1FF:FE9C:38
    2001:DB8:0:13::1
```

EIGRP Issues

- **Mismatched Autonomous System Numbers:** To verify the autonomous system number being used, you can use the **show ipv6 protocols** command, as shown in Example 5-10. In this example, the EIGRP autonomous system is 100.
- **Mismatched K Values:** You verify the EIGRPv6 K values with the command **show ipv6 protocols**, as shown in Example 5-10. In this example, the K values are 1, 0, 1, 0, and 0, which are the defaults.
- **Passive Interfaces:** To verify the router interfaces participating in the EIGRPv6 autonomous system that are passive, you use the **show ipv6 protocols** command, as shown in Example 5-10. In this example, GigabitEthernet 0/0 is a passive interface.

Example 5-10 *Verifying EIGRPv6 Configurations with show ipv6 protocols*

```
R1# show ipv6 protocols
...output omitted...
IPv6 Routing Protocol is "eigrp 100"
EIGRP-IPv6 Protocol for AS(100)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  NSF-aware route hold timer is 240
  Router-ID: 10.1.12.1
  Topology : 0 (base)
    Active Timer: 3 min
    Distance: internal 90 external 170
    Maximum path: 16
    Maximum hopcount 100
    Maximum metric variance 1

Interfaces:
  GigabitEthernet1/0
  GigabitEthernet0/0 (passive)

Redistribution:
  None
```

Mismatched Authentication

- **Authentication:** The key ID and key string must match, and if the valid times are configured they must match as well between neighbors.

Example 5-11 shows how to verify whether an interface is enabled for EIGRPv6 authentication with the **show ipv6 eigrp interfaces detail** command and how to verify the configuration of the keychain that is being used with the **show key chain** command. In this example, the authentication mode is MD5, and the keychain TEST is being used.

- **Timers:** They do not have to match; however, if they are not configured appropriately, neighbor relationships might flap. Verify timers with the **show ipv6 eigrp interfaces detail** command.

Example 5-11 *Verifying EIGRPv6 Authentication*

```
R1# show ipv6 eigrp interfaces detail
EIGRP-IPv6 Interfaces for AS(100)

Interface  Peers  Xmit Queue  PeerQ  Mean  Pacing Time  Multicast  Pending
           Un/Reliable  Un/Reliable  SRTT  Un/Reliable  Flow Timer  Routes
Gi1/0      1        0/0        0/0    72     0/0        316       0

  Hello-interval is 5, Hold-time is 15
  Split-horizon is enabled
  Next xmit serial <none>
  Packetized sent/expedited: 5/0

  Hello's sent/expedited: 494/6
  Un/reliable mcasts: 0/4 Un/reliable ucasts: 4/59
  Mcast exceptions: 0 CR packets: 0 ACKs suppressed: 0
  Retransmissions sent: 54 Out-of-sequence rcvd: 3
  Topology-ids on interface - 0
  Authentication mode is md5, key-chain is "TEST"

R1# show key chain
Key-chain TEST:

  key 1 -- text "TEST"

    accept lifetime (always valid) - (always valid) [valid now]
    send lifetime (always valid) - (always valid) [valid now]
```

Interface Not Participating in Routing Process

- With EIGRPv6, the interfaces are enabled for the routing process with the **ipv6 eigrp** *autonomous_system_number* interface configuration command.
- You can use two **show** commands, **show ipv6 eigrp interfaces** and **show ipv6 protocols**, to verify the interfaces that are participating in the routing process, as shown in Example 5-12.

Example 5-12 *Verifying EIGRPv6 Interfaces*

```
R1# show ipv6 eigrp interfaces
EIGRP-IPv6 Interfaces for AS(100)

      Xmit Queue  PeerQ      Mean    Pacing Time    Multicast    Pending
Interface Peers Un/Reliable Un/Reliable SRTT      Un/Reliable  Flow Timer  Routes
-----
Gil/0      1      0/0        0/0      282        0/0         1348        0

R1# show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "ND"
IPv6 Routing Protocol is "eigrp 100"
EIGRP-IPv6 Protocol for AS(100)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  NSF-aware route hold timer is 240
...output omitted...
  Interfaces:
    GigabitEthernet1/0
    GigabitEthernet0/0 (passive)

Redistribution:
None
```

ACLs

- **ACLs:** EIGRPv6 uses the IPv6 multicast address FF02::A to form neighbor adjacencies.
- If an IPv6 access control list (ACL) is denying packets destined to the multicast address FF02::A, neighbor adjacencies do not form.
- In addition, because neighbor adjacencies are formed with link-local addresses, if the link-local address range is denied based on the source or destination IPv6 address in an interface with an IPv6 ACL, neighbor relationships do not form.

Troubleshooting EIGRPv6 Routes

- The reasons a route might be missing and the steps used to troubleshoot them with EIGRPv6 are similar to those listed in Chapter 4 for EIGRP for IPv4.
- This section identifies some of the most common issues and the show commands you should use to detect them.

Interface Not Participating in the Routing Process

For a network to be advertised by the EIGRPv6 process, the interface associated with that network must be participating in the routing process.

As shown in Example 5-12, you can use the commands **show ipv6 eigrp interfaces** and **show ipv6 protocols** to verify the interfaces participating in the process.

Example 5-12 *Verifying EIGRPv6 Interfaces*

```
R1# show ipv6 eigrp interfaces
EIGRP-IPv6 Interfaces for AS(100)

      Xmit Queue PeerQ      Mean   Pacing Time   Multicast   Pending
Interface Peers Un/Reliable Un/Reliable SRTT    Un/Reliable   Flow Timer   Routes
Gi1/0      1      0/0        0/0        282      0/0          1348         0

R1# show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "ND"
IPv6 Routing Protocol is "eigrp 100"
EIGRP-IPv6 Protocol for AS(100)
    Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
    NSF-aware route hold timer is 240
...output omitted...
Interfaces:
  GigabitEthernet1/0
  GigabitEthernet0/0 (passive)
Redistribution:
None
```

Better Source of Information

- If exactly the same network is learned from a more reliable source, it is used instead of the EIGRPv6-learned information.
- To verify the AD associated with the route in the routing table, you can issue the **show ipv6 route *ipv6_address/prefix*** command. In Example 5-13, the 2001:db8:0:1::/64 network has an AD of 90, and it was learned from EIGRP autonomous system 100.

Example 5-13 *Verifying AD of IPv6 Routes*

```
R2# show ipv6 route 2001:DB8:0:1::/64
Routing entry for 2001:DB8:0:1::/64
  Known via "eigrp 100", distance 90, metric 3072, type internal
  Route count is 1/1, share count 0
  Routing paths:
    FE80::C820:17FF:FE04:1C, GigabitEthernet0/0
    Last updated 00:25:27 ago
```


Route Filtering

- A filter might be preventing a route from being advertised or learned. With EIGRPv6, the **distribute-list prefix-list** command is used to configure a route filter. To verify the filter applied, use the **show run | section ipv6 router eigrp** command.
- In Example 5-14, a distribute list is using a prefix list called ENARSI_EIGRP to filter routes inbound on GigabitEthernet1/0.
- To successfully troubleshoot route filtering issues, you also need to verify the IPv6 prefix list by using the **show ipv6 prefix-list** command.

Example 5-14 *Verifying EIGRPv6 Distribute List*

```
R1# show run | section ipv6 router eigrp
ipv6 router eigrp 100
  distribute-list prefix-list ENARSI_EIGRP in GigabitEthernet1/0
  passive-interface default
  no passive-interface GigabitEthernet1/0
```

Troubleshooting EIGRPv6 Routes

Stub Configuration

If the wrong router is configured as a stub router, or if the wrong setting is chosen during stub router configuration, it might prevent a network from being advertised when it should be advertised. In this case, R1 is a stub router advertising connected and summary routes.

Example 5-15 *Verifying the EIGRP Stub Configuration on a Stub Router*

```
R1# show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "ND"
IPv6 Routing Protocol is "eigrp 100"
EIGRP-IPv6 Protocol for AS(100)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  NSF-aware route hold timer is 240
  Router-ID: 10.1.12.1
  Stub, connected, summary
  Topology : 0 (base)
    Active Timer: 3 min
    Distance: internal 90 external 170
    Maximum path: 16
    Maximum hopcount 100
    Maximum metric variance 1

Interfaces:
  GigabitEthernet1/0
  GigabitEthernet0/0 (passive)

Redistribution:
  None
```

Example 5-16 *Verifying the EIGRP Stub Configuration of a Neighbor Router*

```
R2# show ipv6 eigrp neighbors detail
EIGRP-IPv6 Neighbors for AS(100)
H   Address                               Interface           Hold    Uptime    SRTT    RTO    Q    Seq
                               (sec)                (ms)          Cnt Num
0 Link-local address:             Gi0/0               11      00:03:35  68      408    0    10
  FE80::C820:17FF:FE04:1C
  Version 11.0/2.0, Retrans: 0, Retries: 0, Prefixes: 2
  Topology-ids from peer - 0
  Stub Peer Advertising (CONNECTED SUMMARY ) Routes
  Suppressing queries
1 Link-local address:             Gi1/0               13      00:14:16  252     1512    0     7
  FE80::C823:17FF:FE0C:1C
  Version 11.0/2.0, Retrans: 0, Retries: 0, Prefixes: 2
  Topology-ids from peer - 0
```

Split Horizon

- Split horizon is a loop-prevention feature that prevents a router from advertising routes out the same interface on which they were learned.
- As shown in Example 5-17, you can verify whether split horizon is enabled or disabled by using the **show ipv6 eigrp interfaces detail** command.
- Split horizon is an issue in EIGRPv6 network designs that need routes to be advertised out interfaces on which they were learned—either a nonbroadcast multi-access (NBMA) Frame Relay hub-and-spoke topology or a Dynamic Multipoint Virtual Private Network (DMVPN) network which both use multipoint interfaces on the hub. Split horizon needs to be disabled on the hub in these networks.

Example 5-17 *Verifying the EIGRP Split-horizon Configuration*

```
R1# show ipv6 eigrp interfaces detail
EIGRP-IPv6 Interfaces for AS(100)

```

Interface	Peers	Xmit Queue	PeerQ	Mean SRTT	Pacing Time	Multicast Flow Timer	Pending Routes
Gil/0	1	0/0	0/0	50	0/0	208	0

```

Hello-interval is 5, Hold-time is 15
Split-horizon is enabled
Next xmit serial <none>
Packetized sent/expedited: 8/0
Hello's sent/expedited: 708/3
Un/reliable mcasts: 0/6 Un/reliable ucasts: 11/5
Mcast exceptions: 0 CR packets: 0 ACKs suppressed: 0
Retransmissions sent: 1 Out-of-sequence rcvd: 0
Topology-ids on interface - 0
Authentication mode is md5, key-chain is "TEST"

```

Troubleshooting Named EIGRP

- Named EIGRPv6 has some differences in the configuration, however all the issues already discussed for EIGRP for IPv4 and EIGRPv6 apply here as well.
- This section covers the show commands that you can use to troubleshoot named EIGRP configurations.

Sample Named EIGRP Configuration

The purpose of EIGRP named configuration is to provide a central location on the local router to perform all EIGRP for IPv4 and IPv6 configuration.

- Example 5-18 provides a sample named EIGRP configuration called ENARSI_EIGRP.
- This named EIGRP configuration includes an IPv4 unicast address family and an IPv6 unicast address family.
- They are both using autonomous system 100; however, that is not mandatory and does not cause conflict as these are separate routing processes.

Example 5-18 Sample Named EIGRP Configuration

```
Branch# show run | section router eigrp
router eigrp ENARSI_EIGRP
!
address-family ipv4 unicast autonomous-system 100
!
af-interface default
  passive-interface
exit-af-interface
!
af-interface FastEthernet1/0
  no passive-interface
exit-af-interface
!
topology base
exit-af-topology
network 10.1.4.4 0.0.0.0
network 10.1.14.4 0.0.0.0
eigrp router-id 4.4.4.4
eigrp stub connected summary
exit-address-family
!
address-family ipv6 unicast autonomous-system 100
!
af-interface default
  passive-interface
exit-af-interface
!
af-interface FastEthernet1/0
  no passive-interface
exit-af-interface
!
topology base
maximum-paths 2
variance 3
exit-af-topology
eigrp router-id 44.44.44.44
eigrp stub connected summary
exit-address-family
```

Named EIGRP Show Commands

- With named EIGRP, you can use all the same EIGRP **show** commands. However, there is also a new set of **show** commands for named EIGRP.
- The command **show eigrp protocols** (see Example 5-19) shows both the EIGRP for IPv4 address family and the EIGRPv6 address family, along with:
 - autonomous system number
 - K values
 - router ID
 - whether the router is a stub router
 - the AD
 - the maximum paths
 - the variance

Example 5-19 Output of `show eigrp protocols`

```
Branch# show eigrp protocols
EIGRP-IPv4 VR(ENARSI_EIGRP) Address-Family Protocol for AS(100)
Metric weight K1=1, K2=0, K3=1, K4=0, K5=0 K6=0
Metric rib-scale 128
Metric version 64bit
NSF-aware route hold timer is 240
Router-ID: 4.4.4.4
Stub, connected, summary
Topology : 0 (base)
Active Timer: 3 min
Distance: internal 90 external 170
Maximum path: 4
Maximum hopcount 100
Maximum metric variance 1
Total Prefix Count: 5
Total Redist Count: 0

EIGRP-IPv6 VR(ENARSI_EIGRP) Address-Family Protocol for AS(100)
Metric weight K1=1, K2=0, K3=1, K4=0, K5=0 K6=0
Metric rib-scale 128
Metric version 64bit
NSF-aware route hold timer is 240
Router-ID: 44.44.44.44
Stub, connected, summary
Topology : 0 (base)
Active Timer: 3 min
Distance: internal 90 external 170
Maximum path: 2
Maximum hopcount 100
Maximum metric variance 3
Total Prefix Count: 7
Total Redist Count: 0
```

Named EIGRP: Verify Interfaces

- To verify the interfaces that are participating in the routing process for each address family, you can issue the **show eigrp address-family ipv4 interfaces** command and the **show eigrp address-family ipv6 interfaces** command, as shown in Example 5-20.
- Note that passive interfaces do not show up in this output. Use the classis **show ip protocols** and **show ipv6 protocols** commands to verify passive interfaces

Example 5-20 *Verifying Interfaces Participating in the Named EIGRP Process*

```
Branch# show eigrp address-family ipv4 interfaces
EIGRP-IPv4 VR(ENARSI_EIGRP) Address-Family Interfaces for AS(100)

```

	Xmit	Queue	PeerQ	Mean	Pacing Time	Multicast	Pending
Interface	Peers	Un/Reliable	Un/Reliable	SRTT	Un/Reliable	Flow Timer	Routes
Fal/0	1	0/0	0/0	88	0/0	50	0

```
Branch# show eigrp address-family ipv6 interfaces
EIGRP-IPv6 VR(ENARSI_EIGRP) Address-Family Interfaces for AS(100)

```

	Xmit	Queue	PeerQ	Mean	Pacing Time	Multicast	Pending
Interface	Peers	Un/Reliable	Un/Reliable	SRTT	Un/Reliable	Flow Timer	Routes
Fal/0	1	0/0	0/0	73	0/1	304	0

Named Interface Verify Details

- As shown in Example 5-21, when you add the **detail** keyword to the **show eigrp address-family ipv4 interfaces** command and the **show eigrp address-family ipv6 interfaces** command.
- You can verify additional interface parameters (for example, hello interval and hold time, whether split horizon is enabled, whether authentication is set, and statistics about hellos and packets).

Example 5-21 Verifying Details of Interfaces Participating in the Named EIGRP Process

```
Branch# show eigrp address-family ipv4 interfaces detail
EIGRP-IPv4 VR(ENARSI_EIGRP) Address-Family Interfaces for AS(100)

      Xmit Queue PeerQ      Mean Pacing Time Multicast Pending
Interface Peers Un/Reliable Un/Reliable SRTT Un/Reliable Flow Timer Routes
Fa1/0      1      0/0        0/0      88      0/0        50        0
Hello-interval is 5, Hold-time is 15
Split-horizon is enabled
Next xmit serial <none>
Packetized sent/expedited: 1/0
Hello's sent/expedited: 333/2
Un/reliable mcasts: 0/1 Un/reliable ucasts: 2/2
Mcast exceptions: 0 CR packets: 0 ACKs suppressed: 0

Retransmissions sent: 1 Out-of-sequence rcvd: 1
Topology-ids on interface - 0
Authentication mode is not set

Branch# show eigrp address-family ipv6 interfaces detail
EIGRP-IPv6 VR(ENARSI_EIGRP) Address-Family Interfaces for AS(100)

      Xmit Queue PeerQ      Mean Pacing Time Multicast Pending
Interface Peers Un/Reliable Un/Reliable SRTT Un/Reliable Flow Timer Routes
Fa1/0      1      0/0        0/0      73      0/1        304        0
Hello-interval is 5, Hold-time is 15
Split-horizon is enabled
Next xmit serial <none>
Packetized sent/expedited: 3/0
Hello's sent/expedited: 595/3
Un/reliable mcasts: 0/2 Un/reliable ucasts: 5/3
Mcast exceptions: 0 CR packets: 0 ACKs suppressed: 0

Retransmissions sent: 1 Out-of-sequence rcvd: 2
Topology-ids on interface - 0
Authentication mode is not set
```


Verify Named EIGRP Neighbors

- You can verify neighbors with the **show eigrp address-family ipv4 neighbors** and **show eigrp address-family ipv6 neighbors** commands, as shown in Example 5-22.
- To display the topology table, you can use the commands **show eigrp address-family ipv4 topology** and **show eigrp address-family ipv6 topology**, as shown in Example 5-23.

Example 5-22 *Verifying Named EIGRP Neighbors*

```
Branch# show eigrp address-family ipv4 neighbors
EIGRP-IPv4 VR(ENARSI_EIGRP) Address-Family Neighbors for AS(100)
H   Address                Interface      Hold  Uptime    SRTT    RTO   Q   Seq
                               (sec)         (ms)                Cnt  Num
0   10.1.14.1              Fa1/0         14    00:31:08   88      528   0    8

Branch# show eigrp address-family ipv6 neighbors
EIGRP-IPv6 VR(ENARSI_EIGRP) Address-Family Neighbors for AS(100)
H   Address                Interface      Hold  Uptime    SRTT    RTO   Q   Seq
                               (sec)         (ms)                Cnt  Num
0   Link-local address:    Fa1/0         14    00:50:33   73      438   0    40
    FE80::C820:17FF:FE04:54
```

Example 5-23 *Verifying Named EIGRP Topology Tables*

```
Branch# show eigrp address-family ipv4 topology
EIGRP-IPv4 VR(ENARSI_EIGRP) Topology Table for AS(100)/ID(4.4.4.4)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

P 10.1.12.0/24, 1 successors, FD is 13762560
   via 10.1.14.1 (13762560/1310720), FastEthernet1/0
P 10.1.14.0/24, 1 successors, FD is 13107200
   via Connected, FastEthernet1/0
P 10.1.3.0/24, 1 successors, FD is 15073280
   via 10.1.14.1 (15073280/2621440), FastEthernet1/0
P 10.1.23.0/24, 1 successors, FD is 14417920
   via 10.1.14.1 (14417920/1966080), FastEthernet1/0
P 10.1.4.0/24, 1 successors, FD is 1310720
   via Connected, GigabitEthernet0/0
P 10.1.1.0/24, 1 successors, FD is 13762560
   via 10.1.14.1 (13762560/1310720), FastEthernet1/0

Branch# show eigrp address-family ipv6 topology
EIGRP-IPv6 VR(ENARSI_EIGRP) Topology Table for AS(100)/ID(44.44.44.44)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

P 2001:DB8:0:4::/64, 1 successors, FD is 1310720
   via Connected, GigabitEthernet0/0
P 2001:DB8:0:1::/64, 1 successors, FD is 13762560
   via FE80::C820:17FF:FE04:54 (13762560/1310720), FastEthernet1/0
P 2001:DB8:0:3::/64, 1 successors, FD is 15073280
   via FE80::C820:17FF:FE04:54 (15073280/2621440), FastEthernet1/0
P ::/0, 1 successors, FD is 13762560
   via FE80::C820:17FF:FE04:54 (13762560/1310720), FastEthernet1/0
P 2001:DB8:0:14::/64, 1 successors, FD is 13107200
   via Connected, FastEthernet1/0
P 2001:DB8:0:12::/64, 1 successors, FD is 13762560
   via FE80::C820:17FF:FE04:54 (13762560/1310720), FastEthernet1/0
P 2001:DB8:0:23::/64, 1 successors, FD is 14417920
   via FE80::C820:17FF:FE04:54 (14417920/1966080), FastEthernet1/0
```

EIGRPv6 and Named EIGRP Trouble Tickets

- This section presents various trouble tickets related to the topics discussed earlier in this chapter.
- These trouble tickets show a process that you can follow when troubleshooting in the real world or in an exam environment.

Trouble Ticket 5-1

Trouble Ticket 5-1 is based on the topology shown in Figure 5-2.

- Problem: Users in the Branch network 2001:db8:0:4::/64 have indicated that they are not able to access the Internet.
- To verify the problem, you ping 2001:db8:f::f with the source address 2001:db8:0:4::4, as shown in Example 5-24. The ping fails.
- Refer to your text for next steps and examples to troubleshoot and resolve this trouble ticket.

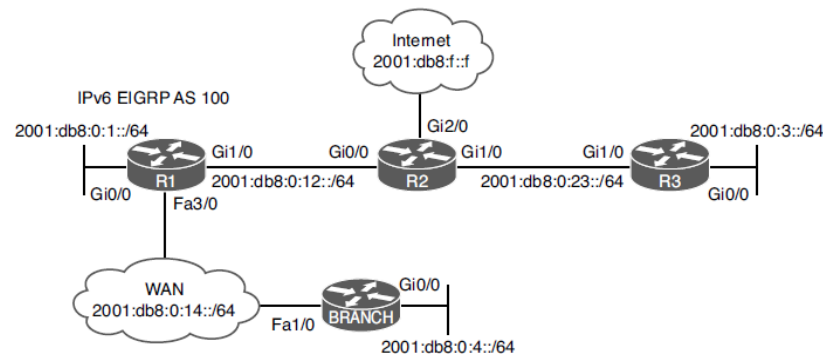


Figure 5-2 EIGRPv6 Trouble Tickets Topology

Example 5-24 Verifying the Issue Using an Extended IPv6 Ping

```
Branch# ping
Protocol [ip]: ipv6
Target IPv6 address: 2001:db8:f::f
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands? [no]: y
Source address or interface: 2001:db8:0:4::4
UDP protocol? [no]:
Verbose? [no]:
Precedence [0]:
DSCP [0]:
Include hop by hop option? [no]:
Include destination option? [no]:
Sweep range of sizes? [no]:
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:F::F, timeout is 2 seconds:
Packet sent with a source address of 2001:DB8:0:4::4
.....
Success rate is 0 percent (0/5)
```

Trouble Ticket 5-2

Trouble Ticket 5-2 is based on the topology shown in Figure 5-3.

- Problem: Users in the 10.1.4.0/24 network indicate that they are not able to access resources outside their LAN.
- On Branch, you verify the problem by pinging a few different IP addresses and source the packets from 10.1.4.4. As shown in Example 5-33, they all fail.
- Refer to your text for next steps and examples to troubleshoot and resolve this trouble ticket.

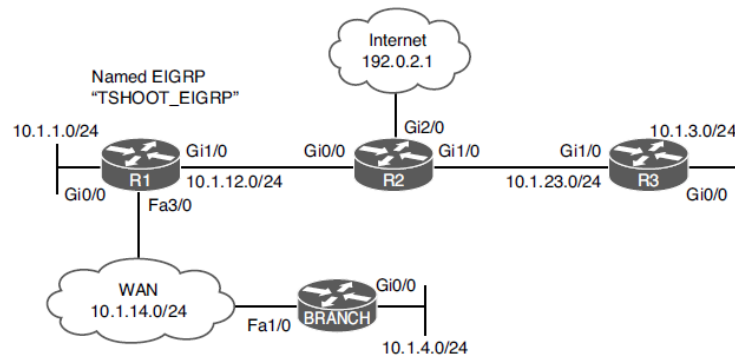


Figure 5-3 Named EIGRP Trouble Tickets Topology

Example 5-33 Verifying the Problem

```
Branch# ping 10.1.3.3 source 10.1.4.4
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.3.3, timeout is 2 seconds:
Packet sent with a source address of 10.1.4.4
.....
Success rate is 0 percent (0/5)
Branch# ping 192.0.2.1 source 10.1.4.4
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.0.2.1, timeout is 2 seconds:
Packet sent with a source address of 10.1.4.4
.....
Success rate is 0 percent (0/5)
Branch# ping 10.1.1.1 source 10.1.4.4
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
Packet sent with a source address of 10.1.4.4
.....
Success rate is 0 percent (0/5)
```

Prepare for the Exam

Prepare for the Exam

Key Topics for Chapter 5

Description	
EIGRPv6 Packets	Troubleshooting EIGRPv6 Neighbor Issues
EIGRPv6 classic configuration	Two key addresses to considered when troubleshooting ACLs and EIGRPv6 neighborships
EIGRPv6 named mode configuration	Administrative distance and the effects it has on populating the routing table with EIGRPv6 routes
Disabling the routing process on an interface	Route filtering and the effects it has on populating the routing table with EIGRPv6 routes
EIGRPv6 route summarization	Output of show eigrp protocols
EIGRPv6 route summarization	Verifying Details of Interfaces Participating in the Named EIGRP Process
Route Filtering	Verifying Named EIGRP Neighbors

Prepare for the Exam

Key Topics for Chapter 5

Description	
hello packet	split horizon
FF02::A	successor
network command	feasible successor
autonomous system number	reported distance
K value	feasible distance
passive interface	maximum paths
key ID	variance
key string	named EIGRP
keychain	address family
stub	

Command Reference Chapter 5

Task	Command Syntax
Initialize EIGRPv6 with classic configuration	ipv6 router eigrp <i>as-number</i> eigrp router-id <i>id</i> interface <i>interface-id</i> ipv6 eigrp <i>as-number</i>
Initialize EIGRPv6 with named mode configuration	router eigrp <i>process-name</i> address-family ipv6 autonomous-system <i>as-number</i> eigrp router-id <i>id</i>
Display all EIGRPv6 interfaces	show ipv6 eigrp interface <i>[interface-id]</i> [detail]
Display established EIGRPv6 neighbors	show ipv6 eigrp neighbors
Show a router's EIGRPv6 neighbors	show ipv6 eigrp neighbors

Command Reference Chapter 5 (Cont.)

Task	Command Syntax
Display the IPv6 routing protocols enabled on the router	show ipv6 protocols
Display all of a router's interfaces that are configured to participate in an EIGRPv6 routing process (with the exception of passive interfaces)	show ipv6 eigrp interfaces
Display the interfaces participating in the EIGRPv6 routing process, along with EIGRP hello and hold timers, whether the split horizon rule is enabled, and whether authentication is being used	show ipv6 eigrp interfaces detail
Display the IPv6 EIGRP configuration in the running configuration	show run section ipv6 router eigrp

Command Reference Chapter 5 (Cont.)

Task	Command Syntax
Show detailed information about a router's EIGRP neighbors, including whether the neighbor is a stub router, along with the types of networks it is advertising as a stub	show ipv6 eigrp neighbors detail
Show routes known to a router's IP routing table that were injected by the router's EIGRP routing process	show ipv6 route eigrp
Display detailed information about the EIGRP for IPv4 and IPv6 address families that are enabled on the router.	show eigrp protocols
Display the interfaces that are participating in the named EIGRP for IPv4 address family	show eigrp address-family ipv4 interfaces
Display the interfaces that are participating in the named EIGRPv6 address family	show eigrp address-family ipv6 interfaces

Command Reference Chapter 5 (Cont.)

Task	Command Syntax
Display detailed information about the interfaces participating in the named EIGRP for IPv4 address family, including hello interval and hold time, whether split horizon is enabled, if authentication is set, and statistics about hellos and packets	show eigrp address-family ipv4 interfaces detail
Display detailed information about the interfaces participating in the named EIGRPv6 address family, including hello interval and hold time, whether split horizon is enabled, if authentication is set, and statistics about hellos and packets	show eigrp address-family ipv6 interfaces detail
Display the EIGRP for IPv4 neighbor relationships that have formed	show eigrp address-family ipv4 neighbors
Display the EIGRPv6 neighbor relationships that have formed	show eigrp address-family ipv6 neighbors

Command Reference Chapter 5 (Cont.)

Task	Command Syntax
Display the EIGRP for IPv4 topology table for the address family	show eigrp address-family ipv4 topology
Display the EIGRPv6 topology table for the address family	show eigrp address-family ipv6 topology
Display all EIGRP packets exchanged with a router's EIGRP neighbors; however, the focus of the command can be narrowed to display only specific EIGRP packet types (for example, EIGRP hello packets)	debug eigrp packets

