

EIGRP

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**Purpose**

The purpose of this lab is to configure EIGRP on 6 routers to help routers exchange information more efficiently, with load balancing between two of the routers. Students will learn to EIGRP commands such as **router eigrp** autonomous-system id and **metric weights** tos K1 K2 K3 K4 K5.

**Background Information on lab concepts**

EIGRP is a routing protocol that allows routers to exchange information more efficiently and help prevent calculation errors when attempting to determine the best path to a remote network. It is a Cisco proprietary protocol released as an informational RFC 7868, and was designed to replace IGRP in 1993. It is an interior gateway protocol, which means it was designed to be used within a single autonomous system. It is also an advanced distance vector protocol and uses link-state link features.

The goal of EIGRP is to learn the best route to any subnet within the network. EIGRP sends updates from one router to the next. In EIGRP, each router can only see their neighboring routers. This means that when a router wants to find a route to a subnet, they will have to find a route through their neighbors. For example, if router 1 wants to add a route to subnet 10.0.0.0, and they have 3 neighbors that have routes to the 10.0.0.0 subnet, those neighboring routers will send their best routes along with the metric. Then router 1 will do some calculations to figure out which route is best, then it will advertise the winning route to its downstream neighbors.

EIGRP has a three steps process: becoming neighbors, exchange routing information, and choosing the best routes. In the becoming neighbors process, two routers running EIGRP on the same link agree to form a neighbor relationship. Like OSPF, EIGRP forms neighbor relationships with their connected routers. When you enable EIGRP on a router, it will start looking for potential neighbors using a hello message. These hello messages are also used to maintain neighbor relationships, by letting the other routers know they’re still alive. There are three aspects of hello messages: hello interval, hold timer, and multicast. Hello messages are sent every 5 second for high bandwidth links or 60 seconds for low bandwidth links (hello interval). They also have a hold timer which is how long a router should wait before assuming that neighbor is dead. These hello messages are sent to the multicast address of 224.0.0.10. When a router receives a hello message, there has to be certain requirements that match for the router to become neighbors with the sending router. The routers must have the same AS number (set when configuring EIGRP), subnet, K-values (EIGRP uses K-values when calculating the metric), and authentication. In the exchanging of routing information process, neighbors exchange their topology information. EIGRP doesn’t use UDP or TCP to send update type messages, but instead uses RTP (Reliable Transfer Protocol). It uses sequence numbers to identify if messages have been received by its neighbors. It also uses DUAL (Diffusing update algorithm) to do all route computations to make sure no routing loops happen. When routers exchange routing information, both routers will send full update messages which contain all routing information known by that router. The receiving router would then send an acknowledgement message to acknowledge the delivery of that message. After all routing information is shared, only partial updates will be sent if a change happens in the network. If no changes happen, the routers will just send hello message back and forth to make sure they are still alive. If a link goes down and there are no backup routes, the router will start route read computation, which is when the router tries to find a loop free route to the last subnet. First, the route enters an active state. Then, the router connected to the down link sends a query message to all its neighbors asking if they have any routes to the last subnet. The receiving routers will send an acknowledgement message and will reply with a new route to the lost subnet, or a message saying they don’t. If none of the neighbors have a route, that root is dead and will be removed from the routing tables. In the process of choosing the best routes, each router chooses the best routes to add to its routing table. The routers will calculate the best routes and add them to their routing tables. To calculate which route is the best, routers use the Metric Calculation Formula, which is ((10^7 / Least bandwidth) + Cumulative delay)\*256. Another thing to know about metrics is Reported Distance (RD) and Feasible Distance (FD). Reported Distance is the metric for a route as advertised by a neighboring router, and Feasible Distance is the metric for a route from the local router (reported distance plus your distance). To choose the best route to add to their routing tables, routers use successive roots and feasible successive roots. A successive root is the route with the best metric to the destination, and the feasible successive root is a backup route if the successor fails. The feasible successor must have a RD that is less than the successor FD.

**Lab Summary**

In this lab, I used six 4321 Cisco Routers, four copper-straight through cables, 1 Serial DTE cable, and one 1 Serial DCE cable. To connect four of the routers, I used copper straight through cables, and to connect the last two routers I used 1 Serial DTE cable and 1 Serial DCE cable. Each router had one copper-straight through cable going from the GigabitEthernet 0/0/1 interface to one of the interfaces on the middle routers. The middle routers had two copper-straight through cables, one in the GigabitEthernet 0/0/1 interface and one in the GigabitEthernet 0/0/0 interface. The middle routers also had 1 Serial DCE cable in the S0/0/1 interface, and 1 Serial DTE cable in the S0/1/1 interface. After plugging those in, I assigned the interfaces of each router an IPv4 and IPv6 address and configured loopback addresses on the routers. Next, I configured EIGRP on the routers, with load balancing on the middle routers. Finally, I pinged my routers with each other to verify connectivity and did other commands like show ip route and show ipv6 route to ensure that EIGRP was working.

**Lab Commands**

Router(config)**#ipv6 unicast-routing**

This command globally enables IPv6 routing.

Router(config)**#router eigrp** autonomous-system number.

This command configures an EIGRP autonomous-system (AS) configuration for IPv4.

Router(config)**#ipv6 router eigrp** autonomous-system number.

This command configures an EIGRP autonomous-system (AS) configuration for IPv6.

Router(config-router)**#eigrp router**-id

This command is used on EIGRP external routes to prevent routing loops.

Router(config-if)**#ipv6 eigrp**

This command enables EIGRPv6 on interfaces

Router(config-router)**#metric weights** tos K1 K2 K3 K4 K5

This command is used to change the K values, which can increase bandwidth.

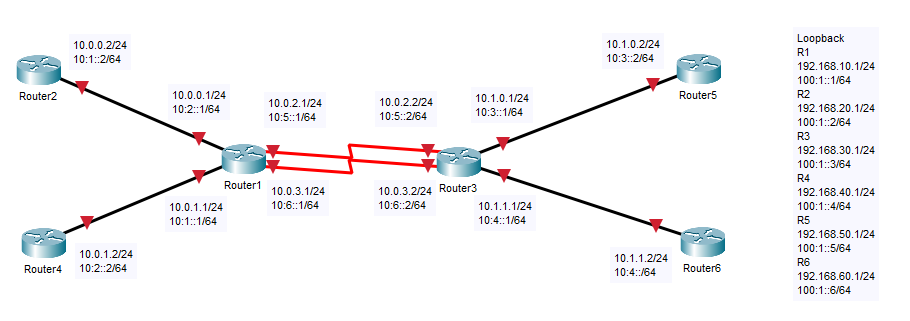
Router(config-rtr)**#variance** multiplier

This command is used to balanced load costs equally.

Router(config-if)**#bandwidth** value

This command communicates the speed of interface to higher level protocols.

**Network Diagram with IP's**



|  |  |  |  |
| --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **IPv6 Address** |
| R1 | G0/0/0 | 10.0.1.1 /24 | 10:1::1 /64 |
| G0/0/1 | 10.0.0.1 /24 | 10:2::1 /64 |
| S0/1/0 | 10.0.2.1 /24 | 10:5::1 /64 |
| S0/1/1 | 10.0.3.1 /24 | 10:6::1 /64 |
| R2 | G0/0/0 | 10.0.0.2 /24 | 10:1::2/64 |
| R3 | G0/0/0 | 10.1.1.1 /24 | 10:4::1/64 |
| G0/0/1 | 10.1.0.1 /24 | 10:3::1/64 |
| S0/1/0 | 10.0.2.2 /24 | 10:5::2/64 |
| S0/1/1 | 10.0.3.2 /24 | 10:6::2/64 |
| R4 | G0/0/1 | 10.0.1.2 /24 | 10:2::2/64 |
| R5 | G0/0/1 | 10.1.0.2 /24 | 10:3::2/64 |
| R6 | G0/0/1 | 10.1.1.2 /24 | 10:4::2/64 |

**Configurations**

**Router 1**

**show run**

R1#show run

Building configuration...

Current configuration : 2017 bytes

!

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

no platform punt-keepalive disable-kernel-core

!

hostname R1

!

boot-start-marker

boot-end-marker

!

vrf definition Mgmt-intf

!

address-family ipv4

exit-address-family

!

address-family ipv6

exit-address-family

!

no aaa new-model

!

no ip domain lookup

!

ipv6 unicast-routing

!

subscriber templating

multilink bundle-name authenticated

!

license udi pid ISR4321/K9 sn FDO214811ZM

!

spanning-tree extend system-id

!

redundancy

mode none

!

vlan internal allocation policy ascending

!

interface Loopback0

ip address 192.168.10.1 255.255.255.0

ipv6 address 100:1::1/64

ipv6 eigrp 1000

!

interface GigabitEthernet0/0/0

ip address 10.0.1.1 255.255.255.0

negotiation auto

ipv6 address 10:1::1/64

ipv6 eigrp 1000

!

interface GigabitEthernet0/0/1

ip address 10.0.0.1 255.255.255.0

negotiation auto

ipv6 address 10:2::1/64

ipv6 eigrp 1000

!

interface Serial0/1/0

bandwidth 500

ip address 10.0.2.1 255.255.255.0

delay 200

ipv6 address 10:5::1/64

ipv6 eigrp 1000

!

interface Serial0/1/1

bandwidth 500

ip address 10.0.3.1 255.255.255.0

ipv6 address 10:6::1/64

ipv6 eigrp 1000

!

interface GigabitEthernet0/2/0

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0/2/1

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1000

metric weights 0 1 1 1 1 0

network 10.0.0.0 0.0.0.255

network 10.0.1.0 0.0.0.255

network 10.0.2.0 0.0.0.255

network 10.0.3.0 0.0.0.255

network 192.168.10.0

eigrp router-id 1.1.1.1

!

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

!

ipv6 router eigrp 1000

eigrp router-id 1.1.1.1

variance 2

!

control-plane

!

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 route**

R1#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, \* - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 10 subnets, 2 masks

C 10.0.0.0/24 is directly connected, GigabitEthernet0/0/1

L 10.0.0.1/32 is directly connected, GigabitEthernet0/0/1

C 10.0.1.0/24 is directly connected, GigabitEthernet0/0/0

L 10.0.1.1/32 is directly connected, GigabitEthernet0/0/0

C 10.0.2.0/24 is directly connected, Serial0/1/0

L 10.0.2.1/32 is directly connected, Serial0/1/0

C 10.0.3.0/24 is directly connected, Serial0/1/1

L 10.0.3.1/32 is directly connected, Serial0/1/1

D 10.1.0.0/24 [90/5191534] via 10.0.2.2, 01:00:03, Serial0/1/0

D 10.1.1.0/24 [90/5191534] via 10.0.2.2, 01:00:03, Serial0/1/0

192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.10.0/24 is directly connected, Loopback0

L 192.168.10.1/32 is directly connected, Loopback0

D 192.168.20.0/24 [90/130826] via 10.0.0.2, 01:00:03, GigabitEthernet0/0/1

D 192.168.30.0/24 [90/5319278] via 10.0.2.2, 01:00:03, Serial0/1/0

D 192.168.40.0/24 [90/130826] via 10.0.1.2, 01:00:03, GigabitEthernet0/0/0

D 192.168.50.0/24 [90/5319534] via 10.0.2.2, 01:00:03, Serial0/1/0

D 192.168.60.0/24 [90/5319534] via 10.0.2.2, 01:00:03, Serial0/1/0

R1#show ipv6 route

IPv6 Routing Table - default - 18 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, a - Application

C 10:1::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

L 10:1::1/128 [0/0]

via GigabitEthernet0/0/0, receive

C 10:2::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

L 10:2::1/128 [0/0]

via GigabitEthernet0/0/1, receive

D 10:3::/64 [90/5171456]

via FE80::2C1:B1FF:FED5:5330, Serial0/1/0

via FE80::2C1:B1FF:FED5:5330, Serial0/1/1

D 10:4::/64 [90/5171456]

via FE80::2C1:B1FF:FED5:5330, Serial0/1/0

via FE80::2C1:B1FF:FED5:5330, Serial0/1/1

C 10:5::/64 [0/0]

via Serial0/1/0, directly connected

L 10:5::1/128 [0/0]

via Serial0/1/0, receive

C 10:6::/64 [0/0]

via Serial0/1/1, directly connected

L 10:6::1/128 [0/0]

via Serial0/1/1, receive

C 100:1::/64 [0/0]

via Loopback0, directly connected

L 100:1::1/128 [0/0]

via Loopback0, receive

D 100:2::/64 [90/130816]

via FE80::B6A8:B9FF:FE47:9471, GigabitEthernet0/0/1

D 100:3::/64 [90/5299200]

via FE80::2C1:B1FF:FED5:5330, Serial0/1/0

via FE80::2C1:B1FF:FED5:5330, Serial0/1/1

D 100:4::/64 [90/130816]

via FE80::227:90FF:FED4:F31, GigabitEthernet0/0/0

D 100:5::/64 [90/5299456]

via FE80::2C1:B1FF:FED5:5330, Serial0/1/0

via FE80::2C1:B1FF:FED5:5330, Serial0/1/1

D 100:6::/64 [90/5299456]

via FE80::2C1:B1FF:FED5:5330, Serial0/1/0

via FE80::2C1:B1FF:FED5:5330, Serial0/1/1

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 eigrp neighbors**

R1#show ip eigrp neighbors

EIGRP-IPv4 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

3 10.0.3.2 Se0/1/1 13 01:08:21 5 294 0 24

2 10.0.2.2 Se0/1/0 13 01:08:25 1 294 0 23

1 10.0.0.2 Gi0/0/1 11 01:10:38 1 100 0 8

0 10.0.1.2 Gi0/0/0 11 01:10:39 1 100 0 9

R1#show ipv6 eigrp neighbors

EIGRP-IPv6 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

3 Link-local address: Se0/1/1 11 01:08:25 7 300 0 24

FE80::2C1:B1FF:FED5:5330

2 Link-local address: Se0/1/0 10 01:08:28 1 300 0 23

FE80::2C1:B1FF:FED5:5330

1 Link-local address: Gi0/0/1 11 01:10:42 332 1992 0 10

FE80::B6A8:B9FF:FE47:9471

0 Link-local address: Gi0/0/0 12 01:10:43 333 1998 0 10

FE80::227:90FF:FED4:F31

**show ip/ipv6 eigrp topology**

R1#show ip eigrp topology

EIGRP-IPv4 Topology Table for AS(1000)/ID(1.1.1.1)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 192.168.10.0/24, 1 successors, FD is 128257

via Connected, Loopback0

P 10.0.3.0/24, 1 successors, FD is 5652078

via Connected, Serial0/1/1

P 10.0.1.0/24, 1 successors, FD is 2826

via Connected, GigabitEthernet0/0/0

P 10.1.0.0/24, 1 successors, FD is 5191534

via 10.0.2.2 (5191534/2826), Serial0/1/0

via 10.0.3.2 (5652334/2826), Serial0/1/1

P 192.168.30.0/24, 1 successors, FD is 5319278

via 10.0.2.2 (5319278/128257), Serial0/1/0

via 10.0.3.2 (5780078/128257), Serial0/1/1

P 10.0.0.0/24, 1 successors, FD is 2826

via Connected, GigabitEthernet0/0/1

P 192.168.40.0/24, 1 successors, FD is 130826

via 10.0.1.2 (130826/128257), GigabitEthernet0/0/0

P 10.0.2.0/24, 1 successors, FD is 5191278

via Connected, Serial0/1/0

P 192.168.50.0/24, 1 successors, FD is 5319534

via 10.0.2.2 (5319534/130826), Serial0/1/0

via 10.0.3.2 (5780334/130826), Serial0/1/1

P 192.168.60.0/24, 1 successors, FD is 5319534

via 10.0.2.2 (5319534/130826), Serial0/1/0

via 10.0.3.2 (5780334/130826), Serial0/1/1

P 10.1.1.0/24, 1 successors, FD is 5191534

via 10.0.2.2 (5191534/2826), Serial0/1/0

via 10.0.3.2 (5652334/2826), Serial0/1/1

P 192.168.20.0/24, 1 successors, FD is 130826

via 10.0.0.2 (130826/128257), GigabitEthernet0/0/1

R1#show ipv6 eigrp topology

EIGRP-IPv6 Topology Table for AS(1000)/ID(1.1.1.1)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 10:2::/64, 1 successors, FD is 2816

via Connected, GigabitEthernet0/0/1

P 10:4::/64, 2 successors, FD is 5171456

via FE80::2C1:B1FF:FED5:5330 (5632256/2816), Serial0/1/1

via FE80::2C1:B1FF:FED5:5330 (5171456/2816), Serial0/1/0

P 100:4::/64, 1 successors, FD is 130816

via FE80::227:90FF:FED4:F31 (130816/128256), GigabitEthernet0/0/0

P 100:6::/64, 2 successors, FD is 5299456

via FE80::2C1:B1FF:FED5:5330 (5760256/130816), Serial0/1/1

via FE80::2C1:B1FF:FED5:5330 (5299456/130816), Serial0/1/0

P 10:5::/64, 1 successors, FD is 5171200

via Connected, Serial0/1/0

P 100:3::/64, 2 successors, FD is 5299200

via FE80::2C1:B1FF:FED5:5330 (5760000/128256), Serial0/1/1

via FE80::2C1:B1FF:FED5:5330 (5299200/128256), Serial0/1/0

P 10:1::/64, 1 successors, FD is 2816

via Connected, GigabitEthernet0/0/0

P 10:6::/64, 1 successors, FD is 5632000

via Connected, Serial0/1/1

P 100:1::/64, 1 successors, FD is 128256

via Connected, Loopback0

P 100:2::/64, 1 successors, FD is 130816

via FE80::B6A8:B9FF:FE47:9471 (130816/128256), GigabitEthernet0/0/1

P 100:5::/64, 2 successors, FD is 5299456

via FE80::2C1:B1FF:FED5:5330 (5760256/130816), Serial0/1/1

via FE80::2C1:B1FF:FED5:5330 (5299456/130816), Serial0/1/0

P 10:3::/64, 2 successors, FD is 5171456

via FE80::2C1:B1FF:FED5:5330 (5632256/2816), Serial0/1/1

via FE80::2C1:B1FF:FED5:5330 (5171456/2816), Serial0/1/0

**show ip protocols**

R1#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "eigrp 1000"

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(1000)

Metric weight K1=1, K2=1, K3=1, K4=1, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 1.1.1.1

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

Maximum path: 4

Routing for Networks:

10.0.0.0/24

10.0.1.0/24

10.0.2.0/24

10.0.3.0/24

192.168.10.0

Routing Information Sources:

Gateway Distance Last Update

10.0.0.2 90 01:06:55

10.0.1.2 90 01:06:55

10.0.2.2 90 01:06:55

Gateway Distance Last Update

10.0.3.2 90 01:06:56

Distance: internal 90 external 170

R1#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "eigrp 1000"

EIGRP-IPv6 Protocol for AS(1000)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 1.1.1.1

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 2

Interfaces:

Loopback0

GigabitEthernet0/0/0

GigabitEthernet0/0/1

Serial0/1/0

Serial0/1/1

Redistribution:

None

**Router 2**

**show run**

R2#show run

Building configuration...

Current configuration : 1736 bytes

!

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

no platform punt-keepalive disable-kernel-core

!

hostname R2

!

boot-start-marker

boot-end-marker

!

vrf definition Mgmt-intf

!

address-family ipv4

exit-address-family

!

address-family ipv6

exit-address-family

!

no aaa new-model

!

no ip domain lookup

!

ipv6 unicast-routing

!

subscriber templating

multilink bundle-name authenticated

!

license udi pid ISR4321/K9 sn FDO214414TX

!

spanning-tree extend system-id

!

redundancy

mode none

!

vlan internal allocation policy ascending

!

interface Loopback0

ip address 192.168.20.1 255.255.255.0

ipv6 address 100:2::1/64

ipv6 eigrp 1000

!

interface GigabitEthernet0/0/0

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0/0/1

ip address 10.0.0.2 255.255.255.0

negotiation auto

ipv6 address 10:1::2/64

ipv6 eigrp 1000

!

interface Serial0/1/0

no ip address

shutdown

!

interface Serial0/1/1

no ip address

shutdown

!

interface GigabitEthernet0/2/0

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0/2/1

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1000

metric weights 0 1 1 1 1 0

network 10.0.0.0 0.0.0.255

network 192.168.20.0

eigrp router-id 2.2.2.2

!

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

!

ipv6 router eigrp 1000

eigrp router-id 2.2.2.2

variance 2

!

control-plane

!

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 route**

R2#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, \* - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

C 10.0.0.0/24 is directly connected, GigabitEthernet0/0/1

L 10.0.0.2/32 is directly connected, GigabitEthernet0/0/1

D 10.0.1.0/24 [90/3082] via 10.0.0.1, 01:11:37, GigabitEthernet0/0/1

D 10.0.2.0/24 [90/5191534] via 10.0.0.1, 01:09:29, GigabitEthernet0/0/1

D 10.0.3.0/24 [90/5652334] via 10.0.0.1, 01:09:22, GigabitEthernet0/0/1

D 10.1.0.0/24 [90/5191790] via 10.0.0.1, 01:09:25, GigabitEthernet0/0/1

D 10.1.1.0/24 [90/5191790] via 10.0.0.1, 01:09:25, GigabitEthernet0/0/1

D 192.168.10.0/24 [90/130826] via 10.0.0.1, 01:11:37, GigabitEthernet0/0/1

192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.20.0/24 is directly connected, Loopback0

L 192.168.20.1/32 is directly connected, Loopback0

D 192.168.30.0/24

[90/5319534] via 10.0.0.1, 01:09:25, GigabitEthernet0/0/1

D 192.168.40.0/24 [90/131082] via 10.0.0.1, 01:11:35, GigabitEthernet0/0/1

D 192.168.50.0/24

[90/5319790] via 10.0.0.1, 01:09:25, GigabitEthernet0/0/1

D 192.168.60.0/24

[90/5319790] via 10.0.0.1, 01:09:25, GigabitEthernet0/0/1

R2#show ipv6 route

IPv6 Routing Table - default - 15 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, a - Application

C 10:1::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

L 10:1::2/128 [0/0]

via GigabitEthernet0/0/1, receive

D 10:2::/64 [90/3072]

via FE80::267E:12FF:FE55:5721, GigabitEthernet0/0/1

D 10:3::/64 [90/5632512]

via FE80::267E:12FF:FE55:5721, GigabitEthernet0/0/1

D 10:4::/64 [90/5632512]

via FE80::267E:12FF:FE55:5721, GigabitEthernet0/0/1

D 10:5::/64 [90/5171456]

via FE80::267E:12FF:FE55:5721, GigabitEthernet0/0/1

D 10:6::/64 [90/5632256]

via FE80::267E:12FF:FE55:5721, GigabitEthernet0/0/1

D 100:1::/64 [90/130816]

via FE80::267E:12FF:FE55:5721, GigabitEthernet0/0/1

C 100:2::/64 [0/0]

via Loopback0, directly connected

L 100:2::1/128 [0/0]

via Loopback0, receive

D 100:3::/64 [90/5760256]

via FE80::267E:12FF:FE55:5721, GigabitEthernet0/0/1

D 100:4::/64 [90/131072]

via FE80::267E:12FF:FE55:5721, GigabitEthernet0/0/1

D 100:5::/64 [90/5760512]

via FE80::267E:12FF:FE55:5721, GigabitEthernet0/0/1

D 100:6::/64 [90/5760512]

via FE80::267E:12FF:FE55:5721, GigabitEthernet0/0/1

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 eigrp neighbors**

R2#show ip eigrp neighbors

EIGRP-IPv4 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

0 10.0.0.1 Gi0/0/1 14 01:13:58 1 100 0 26

R2#show ipv6 eigrp neighbors

EIGRP-IPv6 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

0 Link-local address: Gi0/0/1 14 01:14:02 1 100 0 28

FE80::267E:12FF:FE55:5721

**show ip/ipv6 eigrp topology**

R2#show ip eigrp topology

EIGRP-IPv4 Topology Table for AS(1000)/ID(2.2.2.2)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 192.168.10.0/24, 1 successors, FD is 130826

via 10.0.0.1 (130826/128257), GigabitEthernet0/0/1

P 10.0.3.0/24, 1 successors, FD is 5652334

via 10.0.0.1 (5652334/5652078), GigabitEthernet0/0/1

P 10.0.1.0/24, 1 successors, FD is 3082

via 10.0.0.1 (3082/2826), GigabitEthernet0/0/1

P 10.1.0.0/24, 1 successors, FD is 5191790

via 10.0.0.1 (5191790/5191534), GigabitEthernet0/0/1

P 192.168.30.0/24, 1 successors, FD is 5319534

via 10.0.0.1 (5319534/5319278), GigabitEthernet0/0/1

P 10.0.0.0/24, 1 successors, FD is 2826

via Connected, GigabitEthernet0/0/1

P 192.168.40.0/24, 1 successors, FD is 131082

via 10.0.0.1 (131082/130826), GigabitEthernet0/0/1

P 10.0.2.0/24, 1 successors, FD is 5191534

via 10.0.0.1 (5191534/5191278), GigabitEthernet0/0/1

P 192.168.50.0/24, 1 successors, FD is 5319790

via 10.0.0.1 (5319790/5319534), GigabitEthernet0/0/1

P 192.168.60.0/24, 1 successors, FD is 5319790

via 10.0.0.1 (5319790/5319534), GigabitEthernet0/0/1

P 10.1.1.0/24, 1 successors, FD is 5191790

via 10.0.0.1 (5191790/5191534), GigabitEthernet0/0/1

P 192.168.20.0/24, 1 successors, FD is 128257

via Connected, Loopback0

R2#show ipv6 eigrp topology

EIGRP-IPv6 Topology Table for AS(1000)/ID(2.2.2.2)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 10:2::/64, 1 successors, FD is 3072

via FE80::267E:12FF:FE55:5721 (3072/2816), GigabitEthernet0/0/1

P 10:4::/64, 1 successors, FD is 5632512

via FE80::267E:12FF:FE55:5721 (5632512/5632256), GigabitEthernet0/0/1

P 100:4::/64, 1 successors, FD is 131072

via FE80::267E:12FF:FE55:5721 (131072/130816), GigabitEthernet0/0/1

P 100:6::/64, 1 successors, FD is 5760512

via FE80::267E:12FF:FE55:5721 (5760512/5760256), GigabitEthernet0/0/1

P 10:5::/64, 1 successors, FD is 5171456

via FE80::267E:12FF:FE55:5721 (5171456/5171200), GigabitEthernet0/0/1

P 100:3::/64, 1 successors, FD is 5760256

via FE80::267E:12FF:FE55:5721 (5760256/5760000), GigabitEthernet0/0/1

P 10:1::/64, 1 successors, FD is 2816

via Connected, GigabitEthernet0/0/1

P 10:6::/64, 1 successors, FD is 5632256

via FE80::267E:12FF:FE55:5721 (5632256/5632000), GigabitEthernet0/0/1

P 100:1::/64, 1 successors, FD is 130816

via FE80::267E:12FF:FE55:5721 (130816/128256), GigabitEthernet0/0/1

P 100:2::/64, 1 successors, FD is 128256

via Connected, Loopback0

P 100:5::/64, 1 successors, FD is 5760512

via FE80::267E:12FF:FE55:5721 (5760512/5760256), GigabitEthernet0/0/1

P 10:3::/64, 1 successors, FD is 5632512

via FE80::267E:12FF:FE55:5721 (5632512/5632256), GigabitEthernet0/0/1

**show ip protocols**

R2#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "eigrp 1000"

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(1000)

Metric weight K1=1, K2=1, K3=1, K4=1, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 2.2.2.2

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

Maximum path: 4

Routing for Networks:

10.0.0.0/24

192.168.20.0

Routing Information Sources:

Gateway Distance Last Update

10.0.0.1 90 01:09:46

Distance: internal 90 external 170

R2#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "eigrp 1000"

EIGRP-IPv6 Protocol for AS(1000)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 2.2.2.2

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 2

Interfaces:

Loopback0

GigabitEthernet0/0/1

Redistribution:

None

**Router 3**

**show run**

R3#show run

Building configuration...

Current configuration : 2029 bytes

!

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

no platform punt-keepalive disable-kernel-core

!

hostname R3

!

boot-start-marker

boot-end-marker

!

vrf definition Mgmt-intf

!

address-family ipv4

exit-address-family

!

address-family ipv6

exit-address-family

!

no aaa new-model

!

no ip domain lookup

!

ipv6 unicast-routing

!

subscriber templating

multilink bundle-name authenticated

!

license udi pid ISR4321/K9 sn FDO210907U3

!

spanning-tree extend system-id

!

redundancy

mode none

!

vlan internal allocation policy ascending

!

interface Loopback0

ip address 192.168.30.1 255.255.255.0

ipv6 address 100:3::1/64

ipv6 eigrp 1000

!

interface GigabitEthernet0/0/0

ip address 10.1.1.1 255.255.255.0

negotiation auto

ipv6 address 10:4::1/64

ipv6 eigrp 1000

!

interface GigabitEthernet0/0/1

ip address 10.1.0.1 255.255.255.0

negotiation auto

ipv6 address 10:3::1/64

ipv6 eigrp 1000

!

interface Serial0/1/0

bandwidth 500

ip address 10.0.2.2 255.255.255.0

delay 200

ipv6 address 10:5::2/64

ipv6 eigrp 1000

!

interface Serial0/1/1

bandwidth 500

ip address 10.0.3.2 255.255.255.0

ipv6 address 10:6::2/64

ipv6 eigrp 1000

!

interface GigabitEthernet0/2/0

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0/2/1

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1000

metric weights 0 1 1 1 1 0

variance 2

network 10.0.2.0 0.0.0.255

network 10.0.3.0 0.0.0.255

network 10.1.0.0 0.0.0.255

network 10.1.1.0 0.0.0.255

network 192.168.30.0

eigrp router-id 3.3.3.3

!

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

!

ipv6 router eigrp 1000

eigrp router-id 3.3.3.3

variance 2

!

control-plane

!

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 route**

R3#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, \* - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 10 subnets, 2 masks

D 10.0.0.0/24 [90/5652334] via 10.0.3.1, 01:16:15, Serial0/1/1

[90/5191534] via 10.0.2.1, 01:16:15, Serial0/1/0

D 10.0.1.0/24 [90/5652334] via 10.0.3.1, 01:16:15, Serial0/1/1

[90/5191534] via 10.0.2.1, 01:16:15, Serial0/1/0

C 10.0.2.0/24 is directly connected, Serial0/1/0

L 10.0.2.2/32 is directly connected, Serial0/1/0

C 10.0.3.0/24 is directly connected, Serial0/1/1

L 10.0.3.2/32 is directly connected, Serial0/1/1

C 10.1.0.0/24 is directly connected, GigabitEthernet0/0/1

L 10.1.0.1/32 is directly connected, GigabitEthernet0/0/1

C 10.1.1.0/24 is directly connected, GigabitEthernet0/0/0

L 10.1.1.1/32 is directly connected, GigabitEthernet0/0/0

D 192.168.10.0/24 [90/5780078] via 10.0.3.1, 01:16:15, Serial0/1/1

[90/5319278] via 10.0.2.1, 01:16:15, Serial0/1/0

D 192.168.20.0/24 [90/5780334] via 10.0.3.1, 01:16:15, Serial0/1/1

[90/5319534] via 10.0.2.1, 01:16:15, Serial0/1/0

192.168.30.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.30.0/24 is directly connected, Loopback0

L 192.168.30.1/32 is directly connected, Loopback0

D 192.168.40.0/24 [90/5780334] via 10.0.3.1, 01:16:15, Serial0/1/1

[90/5319534] via 10.0.2.1, 01:16:15, Serial0/1/0

D 192.168.50.0/24 [90/130826] via 10.1.0.2, 01:16:15, GigabitEthernet0/0/1

D 192.168.60.0/24 [90/130826] via 10.1.1.2, 01:16:15, GigabitEthernet0/0/0

R3#show ipv6 route

IPv6 Routing Table - default - 18 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, a - Application

D 10:1::/64 [90/5171456]

via FE80::267E:12FF:FE55:5720, Serial0/1/0

via FE80::267E:12FF:FE55:5720, Serial0/1/1

D 10:2::/64 [90/5171456]

via FE80::267E:12FF:FE55:5720, Serial0/1/0

via FE80::267E:12FF:FE55:5720, Serial0/1/1

C 10:3::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

L 10:3::1/128 [0/0]

via GigabitEthernet0/0/1, receive

C 10:4::/64 [0/0]

via GigabitEthernet0/0/0, directly connected

L 10:4::1/128 [0/0]

via GigabitEthernet0/0/0, receive

C 10:5::/64 [0/0]

via Serial0/1/0, directly connected

L 10:5::2/128 [0/0]

via Serial0/1/0, receive

C 10:6::/64 [0/0]

via Serial0/1/1, directly connected

L 10:6::2/128 [0/0]

via Serial0/1/1, receive

D 100:1::/64 [90/5299200]

via FE80::267E:12FF:FE55:5720, Serial0/1/0

via FE80::267E:12FF:FE55:5720, Serial0/1/1

D 100:2::/64 [90/5299456]

via FE80::267E:12FF:FE55:5720, Serial0/1/0

via FE80::267E:12FF:FE55:5720, Serial0/1/1

C 100:3::/64 [0/0]

via Loopback0, directly connected

L 100:3::1/128 [0/0]

via Loopback0, receive

D 100:4::/64 [90/5299456]

via FE80::267E:12FF:FE55:5720, Serial0/1/0

via FE80::267E:12FF:FE55:5720, Serial0/1/1

D 100:5::/64 [90/130816]

via FE80::B6A8:B9FF:FE01:B5A1, GigabitEthernet0/0/1

D 100:6::/64 [90/130816]

via FE80::B6A8:B9FF:FE47:96B1, GigabitEthernet0/0/0

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 eigrp neighbors**

R3#show ip eigrp neighbors

EIGRP-IPv4 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

3 10.0.3.1 Se0/1/1 13 01:14:54 4 294 0 25

2 10.0.2.1 Se0/1/0 11 01:14:57 1 294 0 28

1 10.1.0.2 Gi0/0/1 12 01:17:11 1 100 0 6

0 10.1.1.2 Gi0/0/0 12 01:17:12 1 100 0 7

R3#show ipv6 eigrp neighbors

EIGRP-IPv6 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

3 Link-local address: Se0/1/1 11 01:14:59 7 300 0 30

FE80::267E:12FF:FE55:5720

2 Link-local address: Se0/1/0 12 01:15:02 2 300 0 31

FE80::267E:12FF:FE55:5720

1 Link-local address: Gi0/0/1 13 01:17:16 522 3132 0 8

FE80::B6A8:B9FF:FE01:B5A1

0 Link-local address: Gi0/0/0 13 01:17:17 524 3144 0 8

FE80::B6A8:B9FF:FE47:96B1

**show ip/ipv6 eigrp topology**

R3#show ip eigrp topology

EIGRP-IPv4 Topology Table for AS(1000)/ID(3.3.3.3)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 192.168.10.0/24, 2 successors, FD is 5319278

via 10.0.2.1 (5319278/128257), Serial0/1/0

via 10.0.3.1 (5780078/128257), Serial0/1/1

P 10.0.3.0/24, 1 successors, FD is 5652078

via Connected, Serial0/1/1

P 10.0.1.0/24, 2 successors, FD is 5191534

via 10.0.2.1 (5191534/2826), Serial0/1/0

via 10.0.3.1 (5652334/2826), Serial0/1/1

P 10.1.0.0/24, 1 successors, FD is 2826

via Connected, GigabitEthernet0/0/1

P 192.168.30.0/24, 1 successors, FD is 128257

via Connected, Loopback0

P 10.0.0.0/24, 2 successors, FD is 5191534

via 10.0.2.1 (5191534/2826), Serial0/1/0

via 10.0.3.1 (5652334/2826), Serial0/1/1

P 192.168.40.0/24, 2 successors, FD is 5319534

via 10.0.2.1 (5319534/130826), Serial0/1/0

via 10.0.3.1 (5780334/130826), Serial0/1/1

P 10.0.2.0/24, 1 successors, FD is 5191278

via Connected, Serial0/1/0

P 192.168.50.0/24, 1 successors, FD is 130826

via 10.1.0.2 (130826/128257), GigabitEthernet0/0/1

P 192.168.60.0/24, 1 successors, FD is 130826

via 10.1.1.2 (130826/128257), GigabitEthernet0/0/0

P 10.1.1.0/24, 1 successors, FD is 2826

via Connected, GigabitEthernet0/0/0

P 192.168.20.0/24, 2 successors, FD is 5319534

via 10.0.2.1 (5319534/130826), Serial0/1/0

via 10.0.3.1 (5780334/130826), Serial0/1/1

R3#show ipv6 eigrp topology

EIGRP-IPv6 Topology Table for AS(1000)/ID(3.3.3.3)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 10:2::/64, 2 successors, FD is 5171456

via FE80::267E:12FF:FE55:5720 (5632256/2816), Serial0/1/1

via FE80::267E:12FF:FE55:5720 (5171456/2816), Serial0/1/0

P 10:4::/64, 1 successors, FD is 2816

via Connected, GigabitEthernet0/0/0

P 100:4::/64, 2 successors, FD is 5299456

via FE80::267E:12FF:FE55:5720 (5760256/130816), Serial0/1/1

via FE80::267E:12FF:FE55:5720 (5299456/130816), Serial0/1/0

P 100:6::/64, 1 successors, FD is 130816

via FE80::B6A8:B9FF:FE47:96B1 (130816/128256), GigabitEthernet0/0/0

P 10:5::/64, 1 successors, FD is 5171200

via Connected, Serial0/1/0

P 100:3::/64, 1 successors, FD is 128256

via Connected, Loopback0

P 10:1::/64, 2 successors, FD is 5171456

via FE80::267E:12FF:FE55:5720 (5632256/2816), Serial0/1/1

via FE80::267E:12FF:FE55:5720 (5171456/2816), Serial0/1/0

P 10:6::/64, 1 successors, FD is 5632000

via Connected, Serial0/1/1

P 100:1::/64, 2 successors, FD is 5299200

via FE80::267E:12FF:FE55:5720 (5760000/128256), Serial0/1/1

via FE80::267E:12FF:FE55:5720 (5299200/128256), Serial0/1/0

P 100:2::/64, 2 successors, FD is 5299456

via FE80::267E:12FF:FE55:5720 (5760256/130816), Serial0/1/1

via FE80::267E:12FF:FE55:5720 (5299456/130816), Serial0/1/0

P 100:5::/64, 1 successors, FD is 130816

via FE80::B6A8:B9FF:FE01:B5A1 (130816/128256), GigabitEthernet0/0/1

P 10:3::/64, 1 successors, FD is 2816

via Connected, GigabitEthernet0/0/1

**show ip protocols**

R3#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "eigrp 1000"

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(1000)

Metric weight K1=1, K2=1, K3=1, K4=1, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

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 2

Automatic Summarization: disabled

Maximum path: 4

Routing for Networks:

10.0.2.0/24

10.0.3.0/24

10.1.0.0/24

10.1.1.0/24

192.168.30.0

Routing Information Sources:

Gateway Distance Last Update

10.0.3.1 90 01:15:52

10.1.1.2 90 01:15:52

10.0.2.1 90 01:15:52

10.1.0.2 90 01:15:52

Distance: internal 90 external 170

R3#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "eigrp 1000"

EIGRP-IPv6 Protocol for AS(1000)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 3.3.3.3

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 2

Interfaces:

Loopback0

GigabitEthernet0/0/0

GigabitEthernet0/0/1

Serial0/1/0

Serial0/1/1

Redistribution:

None

**Router 4**

**show run**

R4#show run

Building configuration...

Current configuration : 1616 bytes

!

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

no platform punt-keepalive disable-kernel-core

!

hostname R4

!

boot-start-marker

boot-end-marker

!

vrf definition Mgmt-intf

!

address-family ipv4

exit-address-family

!

address-family ipv6

exit-address-family

!

no aaa new-model

!

no ip domain lookup

!

ipv6 unicast-routing

!

subscriber templating

multilink bundle-name authenticated

!

license udi pid ISR4321/K9 sn FDO214328EH

!

spanning-tree extend system-id

!

redundancy

mode none

!

vlan internal allocation policy ascending

!

interface Loopback0

ip address 192.168.40.1 255.255.255.0

ipv6 address 100:4::1/64

ipv6 eigrp 1000

!

interface GigabitEthernet0/0/0

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0/0/1

ip address 10.0.1.2 255.255.255.0

negotiation auto

ipv6 address 10:2::2/64

ipv6 eigrp 1000

!

interface Serial0/1/0

no ip address

shutdown

!

interface Serial0/1/1

no ip address

shutdown

!

interface Service-Engine0/2/0

!

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1000

metric weights 0 1 1 1 1 0

network 10.0.1.0 0.0.0.255

network 192.168.40.0

eigrp router-id 4.4.4.4

!

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

!

ipv6 router eigrp 1000

eigrp router-id 4.4.4.4

variance 2

!

control-plane

!

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 route**

R4#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, \* - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

D 10.0.0.0/24 [90/3082] via 10.0.1.1, 01:19:38, GigabitEthernet0/0/1

C 10.0.1.0/24 is directly connected, GigabitEthernet0/0/1

L 10.0.1.2/32 is directly connected, GigabitEthernet0/0/1

D 10.0.2.0/24 [90/5191534] via 10.0.1.1, 01:17:30, GigabitEthernet0/0/1

D 10.0.3.0/24 [90/5652334] via 10.0.1.1, 01:17:22, GigabitEthernet0/0/1

D 10.1.0.0/24 [90/5191790] via 10.0.1.1, 01:17:26, GigabitEthernet0/0/1

D 10.1.1.0/24 [90/5191790] via 10.0.1.1, 01:17:26, GigabitEthernet0/0/1

D 192.168.10.0/24 [90/130826] via 10.0.1.1, 01:19:38, GigabitEthernet0/0/1

D 192.168.20.0/24 [90/131082] via 10.0.1.1, 01:19:34, GigabitEthernet0/0/1

D 192.168.30.0/24

[90/5319534] via 10.0.1.1, 01:17:26, GigabitEthernet0/0/1

192.168.40.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.40.0/24 is directly connected, Loopback0

L 192.168.40.1/32 is directly connected, Loopback0

D 192.168.50.0/24

[90/5319790] via 10.0.1.1, 01:17:26, GigabitEthernet0/0/1

D 192.168.60.0/24

[90/5319790] via 10.0.1.1, 01:17:26, GigabitEthernet0/0/1

R4#show ipv6 route

IPv6 Routing Table - default - 15 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, a - Application

D 10:1::/64 [90/3072]

via FE80::267E:12FF:FE55:5720, GigabitEthernet0/0/1

C 10:2::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

L 10:2::2/128 [0/0]

via GigabitEthernet0/0/1, receive

D 10:3::/64 [90/5632512]

via FE80::267E:12FF:FE55:5720, GigabitEthernet0/0/1

D 10:4::/64 [90/5632512]

via FE80::267E:12FF:FE55:5720, GigabitEthernet0/0/1

D 10:5::/64 [90/5171456]

via FE80::267E:12FF:FE55:5720, GigabitEthernet0/0/1

D 10:6::/64 [90/5632256]

via FE80::267E:12FF:FE55:5720, GigabitEthernet0/0/1

D 100:1::/64 [90/130816]

via FE80::267E:12FF:FE55:5720, GigabitEthernet0/0/1

D 100:2::/64 [90/131072]

via FE80::267E:12FF:FE55:5720, GigabitEthernet0/0/1

D 100:3::/64 [90/5760256]

via FE80::267E:12FF:FE55:5720, GigabitEthernet0/0/1

C 100:4::/64 [0/0]

via Loopback0, directly connected

L 100:4::1/128 [0/0]

via Loopback0, receive

D 100:5::/64 [90/5760512]

via FE80::267E:12FF:FE55:5720, GigabitEthernet0/0/1

D 100:6::/64 [90/5760512]

via FE80::267E:12FF:FE55:5720, GigabitEthernet0/0/1

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 eigrp neighbors**

R4#show ip eigrp neighbors

EIGRP-IPv4 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

0 10.0.1.1 Gi0/0/1 12 01:21:15 1 100 0 27

R4#show ipv6 eigrp neighbors

EIGRP-IPv6 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

0 Link-local address: Gi0/0/1 10 01:21:20 1 100 0 29

FE80::267E:12FF:FE55:5720

**show ip/ipv6 eigrp topology**

R4#show ip eigrp topology

EIGRP-IPv4 Topology Table for AS(1000)/ID(4.4.4.4)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 192.168.10.0/24, 1 successors, FD is 130826

via 10.0.1.1 (130826/128257), GigabitEthernet0/0/1

P 10.0.3.0/24, 1 successors, FD is 5652334

via 10.0.1.1 (5652334/5652078), GigabitEthernet0/0/1

P 10.0.1.0/24, 1 successors, FD is 2826

via Connected, GigabitEthernet0/0/1

P 10.1.0.0/24, 1 successors, FD is 5191790

via 10.0.1.1 (5191790/5191534), GigabitEthernet0/0/1

P 192.168.30.0/24, 1 successors, FD is 5319534

via 10.0.1.1 (5319534/5319278), GigabitEthernet0/0/1

P 10.0.0.0/24, 1 successors, FD is 3082

via 10.0.1.1 (3082/2826), GigabitEthernet0/0/1

P 192.168.40.0/24, 1 successors, FD is 128257

via Connected, Loopback0

P 10.0.2.0/24, 1 successors, FD is 5191534

via 10.0.1.1 (5191534/5191278), GigabitEthernet0/0/1

P 192.168.50.0/24, 1 successors, FD is 5319790

via 10.0.1.1 (5319790/5319534), GigabitEthernet0/0/1

P 192.168.60.0/24, 1 successors, FD is 5319790

via 10.0.1.1 (5319790/5319534), GigabitEthernet0/0/1

P 10.1.1.0/24, 1 successors, FD is 5191790

via 10.0.1.1 (5191790/5191534), GigabitEthernet0/0/1

P 192.168.20.0/24, 1 successors, FD is 131082

via 10.0.1.1 (131082/130826), GigabitEthernet0/0/1

R4#show ipv6 eigrp topology

EIGRP-IPv6 Topology Table for AS(1000)/ID(4.4.4.4)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 10:2::/64, 1 successors, FD is 2816

via Connected, GigabitEthernet0/0/1

P 10:4::/64, 1 successors, FD is 5632512

via FE80::267E:12FF:FE55:5720 (5632512/5632256), GigabitEthernet0/0/1

P 100:4::/64, 1 successors, FD is 128256

via Connected, Loopback0

P 100:6::/64, 1 successors, FD is 5760512

via FE80::267E:12FF:FE55:5720 (5760512/5760256), GigabitEthernet0/0/1

P 10:5::/64, 1 successors, FD is 5171456

via FE80::267E:12FF:FE55:5720 (5171456/5171200), GigabitEthernet0/0/1

P 100:3::/64, 1 successors, FD is 5760256

via FE80::267E:12FF:FE55:5720 (5760256/5760000), GigabitEthernet0/0/1

P 10:1::/64, 1 successors, FD is 3072

via FE80::267E:12FF:FE55:5720 (3072/2816), GigabitEthernet0/0/1

P 10:6::/64, 1 successors, FD is 5632256

via FE80::267E:12FF:FE55:5720 (5632256/5632000), GigabitEthernet0/0/1

P 100:1::/64, 1 successors, FD is 130816

via FE80::267E:12FF:FE55:5720 (130816/128256), GigabitEthernet0/0/1

P 100:2::/64, 1 successors, FD is 131072

via FE80::267E:12FF:FE55:5720 (131072/130816), GigabitEthernet0/0/1

P 100:5::/64, 1 successors, FD is 5760512

via FE80::267E:12FF:FE55:5720 (5760512/5760256), GigabitEthernet0/0/1

P 10:3::/64, 1 successors, FD is 5632512

via FE80::267E:12FF:FE55:5720 (5632512/5632256), GigabitEthernet0/0/1

**show ip protocols**

R4#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "eigrp 1000"

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(1000)

Metric weight K1=1, K2=1, K3=1, K4=1, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 4.4.4.4

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

Maximum path: 4

Routing for Networks:

10.0.1.0/24

192.168.40.0

Routing Information Sources:

Gateway Distance Last Update

10.0.1.1 90 01:17:46

Distance: internal 90 external 170

R4#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "eigrp 1000"

EIGRP-IPv6 Protocol for AS(1000)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 4.4.4.4

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 2

Interfaces:

Loopback0

GigabitEthernet0/0/1

Redistribution:

None

**Router 5**

**show run**

R5#show run

Building configuration...

Current configuration : 1616 bytes

!

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

no platform punt-keepalive disable-kernel-core

!

hostname R5

!

boot-start-marker

boot-end-marker

!

vrf definition Mgmt-intf

!

address-family ipv4

exit-address-family

!

address-family ipv6

exit-address-family

!

no aaa new-model

!

no ip domain lookup

!

ipv6 unicast-routing

!

subscriber templating

multilink bundle-name authenticated

!

license udi pid ISR4321/K9 sn FDO214421CH

!

spanning-tree extend system-id

!

redundancy

mode none

!

vlan internal allocation policy ascending

!

interface Loopback0

ip address 192.168.50.1 255.255.255.0

ipv6 address 100:5::1/64

ipv6 eigrp 1000

!

interface GigabitEthernet0/0/0

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0/0/1

ip address 10.1.0.2 255.255.255.0

negotiation auto

ipv6 address 10:3::2/64

ipv6 eigrp 1000

!

interface Serial0/1/0

no ip address

shutdown

!

interface Serial0/1/1

no ip address

shutdown

!

interface Service-Engine0/2/0

!

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1000

metric weights 0 1 1 1 1 0

network 10.1.0.0 0.0.0.255

network 192.168.50.0

eigrp router-id 5.5.5.5

!

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

!

ipv6 router eigrp 1000

eigrp router-id 5.5.5.5

variance 2

!

control-plane

!

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 route**

R5#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, \* - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

D 10.0.0.0/24 [90/5191790] via 10.1.0.1, 01:20:30, GigabitEthernet0/0/1

D 10.0.1.0/24 [90/5191790] via 10.1.0.1, 01:20:30, GigabitEthernet0/0/1

D 10.0.2.0/24 [90/5191534] via 10.1.0.1, 01:20:30, GigabitEthernet0/0/1

D 10.0.3.0/24 [90/5652334] via 10.1.0.1, 01:20:28, GigabitEthernet0/0/1

C 10.1.0.0/24 is directly connected, GigabitEthernet0/0/1

L 10.1.0.2/32 is directly connected, GigabitEthernet0/0/1

D 10.1.1.0/24 [90/3082] via 10.1.0.1, 01:22:42, GigabitEthernet0/0/1

D 192.168.10.0/24

[90/5319534] via 10.1.0.1, 01:20:30, GigabitEthernet0/0/1

D 192.168.20.0/24

[90/5319790] via 10.1.0.1, 01:20:30, GigabitEthernet0/0/1

D 192.168.30.0/24 [90/130826] via 10.1.0.1, 01:22:42, GigabitEthernet0/0/1

D 192.168.40.0/24

[90/5319790] via 10.1.0.1, 01:20:30, GigabitEthernet0/0/1

192.168.50.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.50.0/24 is directly connected, Loopback0

L 192.168.50.1/32 is directly connected, Loopback0

D 192.168.60.0/24 [90/131082] via 10.1.0.1, 01:22:40, GigabitEthernet0/0/1

R5#show ipv6 route

IPv6 Routing Table - default - 15 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, a - Application

D 10:1::/64 [90/5632512]

via FE80::2C1:B1FF:FED5:5331, GigabitEthernet0/0/1

D 10:2::/64 [90/5632512]

via FE80::2C1:B1FF:FED5:5331, GigabitEthernet0/0/1

C 10:3::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

L 10:3::2/128 [0/0]

via GigabitEthernet0/0/1, receive

D 10:4::/64 [90/3072]

via FE80::2C1:B1FF:FED5:5331, GigabitEthernet0/0/1

D 10:5::/64 [90/5171456]

via FE80::2C1:B1FF:FED5:5331, GigabitEthernet0/0/1

D 10:6::/64 [90/5632256]

via FE80::2C1:B1FF:FED5:5331, GigabitEthernet0/0/1

D 100:1::/64 [90/5760256]

via FE80::2C1:B1FF:FED5:5331, GigabitEthernet0/0/1

D 100:2::/64 [90/5760512]

via FE80::2C1:B1FF:FED5:5331, GigabitEthernet0/0/1

D 100:3::/64 [90/130816]

via FE80::2C1:B1FF:FED5:5331, GigabitEthernet0/0/1

D 100:4::/64 [90/5760512]

via FE80::2C1:B1FF:FED5:5331, GigabitEthernet0/0/1

C 100:5::/64 [0/0]

via Loopback0, directly connected

L 100:5::1/128 [0/0]

via Loopback0, receive

D 100:6::/64 [90/131072]

via FE80::2C1:B1FF:FED5:5331, GigabitEthernet0/0/1

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 eigrp neighbors**

R5#show ip eigrp neighbors

EIGRP-IPv4 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

0 10.1.0.1 Gi0/0/1 12 01:22:21 1 100 0 26

R5#show ipv6 eigrp neighbors

EIGRP-IPv6 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

0 Link-local address: Gi0/0/1 13 01:22:24 1 100 0 25

FE80::2C1:B1FF:FED5:5331

**show ip/ipv6 eigrp topology**

R5#show ip eigrp topology

EIGRP-IPv4 Topology Table for AS(1000)/ID(5.5.5.5)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 192.168.10.0/24, 1 successors, FD is 5319534

via 10.1.0.1 (5319534/5319278), GigabitEthernet0/0/1

P 10.0.3.0/24, 1 successors, FD is 5652334

via 10.1.0.1 (5652334/5652078), GigabitEthernet0/0/1

P 10.0.1.0/24, 1 successors, FD is 5191790

via 10.1.0.1 (5191790/5191534), GigabitEthernet0/0/1

P 10.1.0.0/24, 1 successors, FD is 2826

via Connected, GigabitEthernet0/0/1

P 192.168.30.0/24, 1 successors, FD is 130826

via 10.1.0.1 (130826/128257), GigabitEthernet0/0/1

P 10.0.0.0/24, 1 successors, FD is 5191790

via 10.1.0.1 (5191790/5191534), GigabitEthernet0/0/1

P 192.168.40.0/24, 1 successors, FD is 5319790

via 10.1.0.1 (5319790/5319534), GigabitEthernet0/0/1

P 10.0.2.0/24, 1 successors, FD is 5191534

via 10.1.0.1 (5191534/5191278), GigabitEthernet0/0/1

P 192.168.50.0/24, 1 successors, FD is 128257

via Connected, Loopback0

P 192.168.60.0/24, 1 successors, FD is 131082

via 10.1.0.1 (131082/130826), GigabitEthernet0/0/1

P 10.1.1.0/24, 1 successors, FD is 3082

via 10.1.0.1 (3082/2826), GigabitEthernet0/0/1

P 192.168.20.0/24, 1 successors, FD is 5319790

via 10.1.0.1 (5319790/5319534), GigabitEthernet0/0/1

R5#show ipv6 eigrp topology

EIGRP-IPv6 Topology Table for AS(1000)/ID(5.5.5.5)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 10:2::/64, 1 successors, FD is 5632512

via FE80::2C1:B1FF:FED5:5331 (5632512/5632256), GigabitEthernet0/0/1

P 10:4::/64, 1 successors, FD is 3072

via FE80::2C1:B1FF:FED5:5331 (3072/2816), GigabitEthernet0/0/1

P 100:4::/64, 1 successors, FD is 5760512

via FE80::2C1:B1FF:FED5:5331 (5760512/5760256), GigabitEthernet0/0/1

P 100:6::/64, 1 successors, FD is 131072

via FE80::2C1:B1FF:FED5:5331 (131072/130816), GigabitEthernet0/0/1

P 10:5::/64, 1 successors, FD is 5171456

via FE80::2C1:B1FF:FED5:5331 (5171456/5171200), GigabitEthernet0/0/1

P 100:3::/64, 1 successors, FD is 130816

via FE80::2C1:B1FF:FED5:5331 (130816/128256), GigabitEthernet0/0/1

P 10:1::/64, 1 successors, FD is 5632512

via FE80::2C1:B1FF:FED5:5331 (5632512/5632256), GigabitEthernet0/0/1

P 10:6::/64, 1 successors, FD is 5632256

via FE80::2C1:B1FF:FED5:5331 (5632256/5632000), GigabitEthernet0/0/1

P 100:1::/64, 1 successors, FD is 5760256

via FE80::2C1:B1FF:FED5:5331 (5760256/5760000), GigabitEthernet0/0/1

P 100:2::/64, 1 successors, FD is 5760512

via FE80::2C1:B1FF:FED5:5331 (5760512/5760256), GigabitEthernet0/0/1

P 100:5::/64, 1 successors, FD is 128256

via Connected, Loopback0

P 10:3::/64, 1 successors, FD is 2816

via Connected, GigabitEthernet0/0/1

**show ip protocols**

R5#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "eigrp 1000"

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(1000)

Metric weight K1=1, K2=1, K3=1, K4=1, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 5.5.5.5

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

Maximum path: 4

Routing for Networks:

10.1.0.0/24

192.168.50.0

Routing Information Sources:

Gateway Distance Last Update

10.1.0.1 90 01:21:10

Distance: internal 90 external 170

R5#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "eigrp 1000"

EIGRP-IPv6 Protocol for AS(1000)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 5.5.5.5

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 2

Interfaces:

Loopback0

GigabitEthernet0/0/1

Redistribution:

None

**Router 6**

**show run**

R6#show run

Building configuration...

Current configuration : 1584 bytes

!

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

no platform punt-keepalive disable-kernel-core

!

hostname R6

!

boot-start-marker

boot-end-marker

!

vrf definition Mgmt-intf

!

address-family ipv4

exit-address-family

!

address-family ipv6

exit-address-family

!

no aaa new-model

!

no ip domain lookup

!

ipv6 unicast-routing

!

subscriber templating

multilink bundle-name authenticated

!

license udi pid ISR4321/K9 sn FDO214414VU

!

spanning-tree extend system-id

!

redundancy

mode none

!

vlan internal allocation policy ascending

!

interface Loopback0

ip address 192.168.60.1 255.255.255.0

ipv6 address 100:6::1/64

ipv6 eigrp 1000

!

interface GigabitEthernet0/0/0

no ip address

shutdown

negotiation auto

!

interface GigabitEthernet0/0/1

ip address 10.1.1.2 255.255.255.0

negotiation auto

ipv6 address 10:4::2/64

ipv6 eigrp 1000

!

interface Serial0/1/0

no ip address

shutdown

!

interface Serial0/1/1

no ip address

shutdown

!

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1000

metric weights 0 1 1 1 1 0

network 10.1.1.0 0.0.0.255

network 192.168.60.0

eigrp router-id 6.6.6.6

!

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

!

ipv6 router eigrp 1000

eigrp router-id 6.6.6.6

variance 2

!

control-plane

!

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

!

end

**show ip/ipv6 route**

R6#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, \* - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP

a - application route

+ - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

D 10.0.0.0/24 [90/5191790] via 10.1.1.1, 01:27:47, GigabitEthernet0/0/1

D 10.0.1.0/24 [90/5191790] via 10.1.1.1, 01:27:47, GigabitEthernet0/0/1

D 10.0.2.0/24 [90/5191534] via 10.1.1.1, 01:27:47, GigabitEthernet0/0/1

D 10.0.3.0/24 [90/5652334] via 10.1.1.1, 01:27:45, GigabitEthernet0/0/1

D 10.1.0.0/24 [90/3082] via 10.1.1.1, 01:30:00, GigabitEthernet0/0/1

C 10.1.1.0/24 is directly connected, GigabitEthernet0/0/1

L 10.1.1.2/32 is directly connected, GigabitEthernet0/0/1

D 192.168.10.0/24

[90/5319534] via 10.1.1.1, 01:27:47, GigabitEthernet0/0/1

D 192.168.20.0/24

[90/5319790] via 10.1.1.1, 01:27:47, GigabitEthernet0/0/1

D 192.168.30.0/24 [90/130826] via 10.1.1.1, 01:30:00, GigabitEthernet0/0/1

D 192.168.40.0/24

[90/5319790] via 10.1.1.1, 01:27:47, GigabitEthernet0/0/1

D 192.168.50.0/24 [90/131082] via 10.1.1.1, 01:29:56, GigabitEthernet0/0/1

192.168.60.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.60.0/24 is directly connected, Loopback0

L 192.168.60.1/32 is directly connected, Loopback0

R6#show ipv6 route

IPv6 Routing Table - default - 15 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, a - Application

D 10:1::/64 [90/5632512]

via FE80::2C1:B1FF:FED5:5330, GigabitEthernet0/0/1

D 10:2::/64 [90/5632512]

via FE80::2C1:B1FF:FED5:5330, GigabitEthernet0/0/1

D 10:3::/64 [90/3072]

via FE80::2C1:B1FF:FED5:5330, GigabitEthernet0/0/1

C 10:4::/64 [0/0]

via GigabitEthernet0/0/1, directly connected

L 10:4::2/128 [0/0]

via GigabitEthernet0/0/1, receive

D 10:5::/64 [90/5171456]

via FE80::2C1:B1FF:FED5:5330, GigabitEthernet0/0/1

D 10:6::/64 [90/5632256]

via FE80::2C1:B1FF:FED5:5330, GigabitEthernet0/0/1

D 100:1::/64 [90/5760256]

via FE80::2C1:B1FF:FED5:5330, GigabitEthernet0/0/1

D 100:2::/64 [90/5760512]

via FE80::2C1:B1FF:FED5:5330, GigabitEthernet0/0/1

D 100:3::/64 [90/130816]

via FE80::2C1:B1FF:FED5:5330, GigabitEthernet0/0/1

D 100:4::/64 [90/5760512]

via FE80::2C1:B1FF:FED5:5330, GigabitEthernet0/0/1

D 100:5::/64 [90/131072]

via FE80::2C1:B1FF:FED5:5330, GigabitEthernet0/0/1

C 100:6::/64 [0/0]

via Loopback0, directly connected

L 100:6::1/128 [0/0]

via Loopback0, receive

L FF00::/8 [0/0]

via Null0, receive

**show ip/ipv6 eigrp neighbors**

R6#show ip eigrp neighbors

EIGRP-IPv4 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

0 10.1.1.1 Gi0/0/1 11 01:26:04 1 100 0 25

R6#show ipv6 eigrp neighbors

EIGRP-IPv6 Neighbors for AS(1000)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

0 Link-local address: Gi0/0/1 13 01:26:07 1 100 0 26

FE80::2C1:B1FF:FED5:5330

**show ip/ipv6 eigrp topology**

R6#show ip eigrp topology

EIGRP-IPv4 Topology Table for AS(1000)/ID(6.6.6.6)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 192.168.10.0/24, 1 successors, FD is 5319534

via 10.1.1.1 (5319534/5319278), GigabitEthernet0/0/1

P 10.0.3.0/24, 1 successors, FD is 5652334

via 10.1.1.1 (5652334/5652078), GigabitEthernet0/0/1

P 10.0.1.0/24, 1 successors, FD is 5191790

via 10.1.1.1 (5191790/5191534), GigabitEthernet0/0/1

P 10.1.0.0/24, 1 successors, FD is 3082

via 10.1.1.1 (3082/2826), GigabitEthernet0/0/1

P 192.168.30.0/24, 1 successors, FD is 130826

via 10.1.1.1 (130826/128257), GigabitEthernet0/0/1

P 10.0.0.0/24, 1 successors, FD is 5191790

via 10.1.1.1 (5191790/5191534), GigabitEthernet0/0/1

P 192.168.40.0/24, 1 successors, FD is 5319790

via 10.1.1.1 (5319790/5319534), GigabitEthernet0/0/1

P 10.0.2.0/24, 1 successors, FD is 5191534

via 10.1.1.1 (5191534/5191278), GigabitEthernet0/0/1

P 192.168.50.0/24, 1 successors, FD is 131082

via 10.1.1.1 (131082/130826), GigabitEthernet0/0/1

P 192.168.60.0/24, 1 successors, FD is 128257

via Connected, Loopback0

P 10.1.1.0/24, 1 successors, FD is 2826

via Connected, GigabitEthernet0/0/1

P 192.168.20.0/24, 1 successors, FD is 5319790

via 10.1.1.1 (5319790/5319534), GigabitEthernet0/0/1

R6#show ipv6 eigrp topology

EIGRP-IPv6 Topology Table for AS(1000)/ID(6.6.6.6)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 10:2::/64, 1 successors, FD is 5632512

via FE80::2C1:B1FF:FED5:5330 (5632512/5632256), GigabitEthernet0/0/1

P 10:4::/64, 1 successors, FD is 2816

via Connected, GigabitEthernet0/0/1

P 100:4::/64, 1 successors, FD is 5760512

via FE80::2C1:B1FF:FED5:5330 (5760512/5760256), GigabitEthernet0/0/1

P 100:6::/64, 1 successors, FD is 128256

via Connected, Loopback0

P 10:5::/64, 1 successors, FD is 5171456

via FE80::2C1:B1FF:FED5:5330 (5171456/5171200), GigabitEthernet0/0/1

P 100:3::/64, 1 successors, FD is 130816

via FE80::2C1:B1FF:FED5:5330 (130816/128256), GigabitEthernet0/0/1

P 10:1::/64, 1 successors, FD is 5632512

via FE80::2C1:B1FF:FED5:5330 (5632512/5632256), GigabitEthernet0/0/1

P 10:6::/64, 1 successors, FD is 5632256

via FE80::2C1:B1FF:FED5:5330 (5632256/5632000), GigabitEthernet0/0/1

P 100:1::/64, 1 successors, FD is 5760256

via FE80::2C1:B1FF:FED5:5330 (5760256/5760000), GigabitEthernet0/0/1

P 100:2::/64, 1 successors, FD is 5760512

via FE80::2C1:B1FF:FED5:5330 (5760512/5760256), GigabitEthernet0/0/1

P 100:5::/64, 1 successors, FD is 131072

via FE80::2C1:B1FF:FED5:5330 (131072/130816), GigabitEthernet0/0/1

P 10:3::/64, 1 successors, FD is 3072

via FE80::2C1:B1FF:FED5:5330 (3072/2816), GigabitEthernet0/0/1

**show ip protocols**

R6#show ip protocols

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "application"

Sending updates every 0 seconds

Invalid after 0 seconds, hold down 0, flushed after 0

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Maximum path: 32

Routing for Networks:

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 4)

Routing Protocol is "eigrp 1000"

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(1000)

Metric weight K1=1, K2=1, K3=1, K4=1, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 6.6.6.6

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

Maximum path: 4

Routing for Networks:

10.1.1.0/24

192.168.60.0

Routing Information Sources:

Gateway Distance Last Update

10.1.1.1 90 01:27:20

Distance: internal 90 external 170

R6#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "application"

IPv6 Routing Protocol is "ND"

IPv6 Routing Protocol is "eigrp 1000"

EIGRP-IPv6 Protocol for AS(1000)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

Soft SIA disabled

NSF-aware route hold timer is 240

EIGRP NSF disabled

NSF signal timer is 20s

NSF converge timer is 120s

Router-ID: 6.6.6.6

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 16

Maximum hopcount 100

Maximum metric variance 2

Interfaces:

Loopback0

GigabitEthernet0/0/1

Redistribution:

None

**Problems**

A problem I faced was getting some ipv6 routes to show when doing the show ipv6 route command. After I finished configuring everything, I did a show ip route and a show ipv6 route. When I did the show ip route command, everything on the network had adjacency, but when I did the show ipv6 route command, the routers had established some neighborships, and had some routes, but it didn’t have all of them. To figure out why my routers weren’t establishing neighborship, I looked at the configurations for the routers, and after looking a few times, I realized that my loopback ipv6 addresses were 10: instead of 100:, and once I change that on my routers, I had neighbor adjacency between all of my routers.

**Conclusion**

EIGRP is a routing protocol that allows routers to exchange information more efficiently and help prevent calculation errors when attempting to determine the best path to a remote network. While going through the EIGRP process, routers go through 3 steps. To configure this, you need to use EIGRP specific commands such as **router eigrp** autonomous-system id and **metric weights** tos K1 K2 K3 K4 K5. There are also some EIGRP specific show commands that are helpful to verify EIGRP is working correctly after configuring it. These include show ip/ipv6 **eigrp neighbors** and show ip/ipv6 **eigrp topology.** I was able to configure a network with EIGRP on 6 Cisco 4321 routers. Although I was having some problems achieving adjacency between routers, I was able to troubleshoot them to get EIGRP to work. Through this lab, I learned how to configure an EIGRP network in ipv4 and ipv6, with load balancing between two of the routers, as well as develop a deeper understanding of everything needed to make it work.

**Teacher Signoff Page of Lab Completed**

**Evan Choi has completed this EIGRP Lab**

**November 29, 2021**

