version 4


# IEWB-RS Technology Labs
# EIGRP

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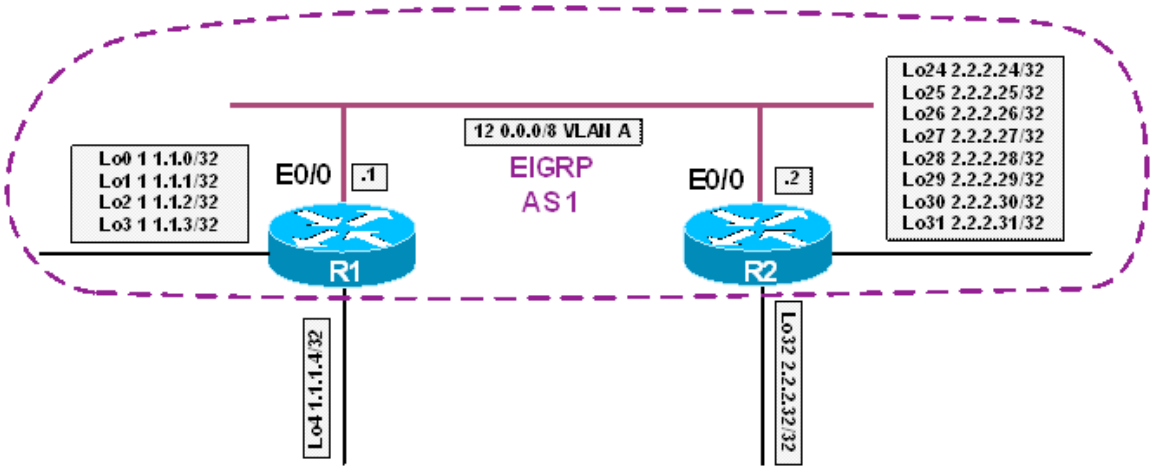
## Understanding the EIGRP Network Statement

**Objective:** Configure EIGRP between R1 and R2 on all interfaces except Loopback4 on R1 and Loopback32 on R2 using exactly two network statements on R1 and R2 each




### Directions

- Configure R1's Ethernet0/0 with an IP address of 12.0.0.1/8
- Configure R2's Ethernet0/0 with an IP address of 12.0.0.2/8
- Create Loopback interfaces on R1 and R2 per the diagram
- Configure EIGRP AS 1 on R1 and R2
- Configure two network statements on R1 and R2 to advertise all interfaces except Lo4 on R1 and Lo32 on R2

### Ask Yourself

- What is the EIGRP network statement used for?
- How is the EIGRP network statement similar to the OSPF network statement?
- How does the subnet mask of an interface relate to a network statement in EIGRP?

**Final Configuration**

**R1:**

```
interface Loopback0
 ip address 1.1.1.0 255.255.255.255
!
interface Loopback1
 ip address 1.1.1.1 255.255.255.255
!
```

```
interface Loopback2
 ip address 1.1.1.2 255.255.255.255
!
interface Loopback3
 ip address 1.1.1.3 255.255.255.255
!
interface Loopback4
 ip address 1.1.1.4 255.255.255.255
!
interface Ethernet0/0
 ip address 12.0.0.1 255.0.0.0
!
router eigrp 1
 network 1.1.1.0 0.0.0.3
 network 12.0.0.1 0.0.0.0
 no auto-summary
```

**R2:**

```
interface Loopback24
 ip address 2.2.2.24 255.255.255.255
!
interface Loopback25
 ip address 2.2.2.25 255.255.255.255
!
interface Loopback26
 ip address 2.2.2.26 255.255.255.255
!
interface Loopback27
 ip address 2.2.2.27 255.255.255.255
!
interface Loopback28
 ip address 2.2.2.28 255.255.255.255
!
interface Loopback29
 ip address 2.2.2.29 255.255.255.255
!
interface Loopback30
 ip address 2.2.2.30 255.255.255.255
!
```

```
interface Loopback31
 ip address 2.2.2.31 255.255.255.255
!
interface Loopback32
 ip address 2.2.2.32 255.255.255.255
!
interface Ethernet0/0
 ip address 12.0.0.2 255.0.0.0
!
router eigrp 1
 network 2.2.2.24 0.0.0.7
 network 12.0.0.2 0.0.0.0
 no auto-summary
```

**Verification**

```
R1#show ip route
Codes: 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, L1 - IS-IS level-1, L2 - IS-IS level-2,
ia - IS-IS inter area
       * - candidate default, U - per-user static route, o
- ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     1.0.0.0/32 is subnetted, 5 subnets
C       1.1.1.1 is directly connected, Loopback1
C       1.1.1.0 is directly connected, Loopback0
C       1.1.1.3 is directly connected, Loopback3
C       1.1.1.2 is directly connected, Loopback2
C       1.1.1.4 is directly connected, Loopback4
     2.0.0.0/32 is subnetted, 8 subnets
D       2.2.2.26 [90/409600] via 12.0.0.2, 00:00:35,
```

```
Ethernet0/0

D       2.2.2.27 [90/409600] via 12.0.0.2, 00:00:35,
Ethernet0/0

D       2.2.2.24 [90/409600] via 12.0.0.2, 00:00:35,
Ethernet0/0

D       2.2.2.25 [90/409600] via 12.0.0.2, 00:00:36,
Ethernet0/0

D       2.2.2.30 [90/409600] via 12.0.0.2, 00:00:36,
Ethernet0/0

D       2.2.2.31 [90/409600] via 12.0.0.2, 00:00:36,
Ethernet0/0

D       2.2.2.28 [90/409600] via 12.0.0.2, 00:00:36,
Ethernet0/0

D       2.2.2.29 [90/409600] via 12.0.0.2, 00:00:36,
Ethernet0/0

C    12.0.0.0/8 is directly connected, Ethernet0/0

R1#


R2#show ip route

Codes: 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, L1 - IS-IS level-1, L2 - IS-IS level-2,
ia - IS-IS inter area

       * - candidate default, U - per-user static route, o
- ODR

       P - periodic downloaded static route


Gateway of last resort is not set


     1.0.0.0/32 is subnetted, 4 subnets

D       1.1.1.1 [90/409600] via 12.0.0.1, 00:00:49,
Ethernet0/0

D       1.1.1.0 [90/409600] via 12.0.0.1, 00:00:49,
Ethernet0/0

D       1.1.1.3 [90/409600] via 12.0.0.1, 00:00:49,
Ethernet0/0

D       1.1.1.2 [90/409600] via 12.0.0.1, 00:00:49,
Ethernet0/0

     2.0.0.0/32 is subnetted, 9 subnets

C       2.2.2.26 is directly connected, Loopback26
```

```
C       2.2.2.27 is directly connected, Loopback27
C       2.2.2.24 is directly connected, Loopback24
C       2.2.2.25 is directly connected, Loopback25
C       2.2.2.30 is directly connected, Loopback30
C       2.2.2.31 is directly connected, Loopback31
C       2.2.2.28 is directly connected, Loopback28
C       2.2.2.29 is directly connected, Loopback29
C       2.2.2.32 is directly connected, Loopback32
C    12.0.0.0/8 is directly connected, Ethernet0/0
```

## 🕮 Recommended Reading

Cisco IOS Command Reference: network (EIGRP)

# EIGRP Auto-Summary

**Objective:** Configure EIGRP on all interfaces between R1 and R2. R1 and R2 should see each other's Loopback0 interfaces with a mask of /8 in their routing tables, but should see each other's Loopback1 interfaces with the actual mask


## Directions

- Configure R1's interface Ethernet0/0 with an IP address of 12.0.0.1/16
- Configure R2's interface Ethernet0/0 with an IP address of 12.0.0.2/16
- Configure R1 with an interface Loopback0 with the IP address 1.1.1.1/32 and interface Loopback1 with the IP address of 12.1.1.1/24
- Configure R2 with an interface Loopback0 with the IP address 2.2.2.2/32 and interface Loopback1 with the IP address of 12.2.2.2/24
- Configure EIGRP AS 1 on all active interfaces of R1 and R2

## Ask Yourself

- How does auto-summary in EIGRP differ from auto-summary in RIP and BGP?
- In what case is a network automatically summarized in EIGRP?

### Final Configuration

**R1:**

```
interface Loopback0
 ip address 1.1.1.1 255.255.255.255
!
interface Loopback1
 ip address 12.1.1.1 255.255.255.0
!
interface Ethernet0/0
 ip address 12.0.0.1 255.255.0.0
!
```

```
router eigrp 1
 network 0.0.0.0
 auto-summary
```

**R2:**

```
interface Loopback0
 ip address 2.2.2.2 255.255.255.255
!
interface Loopback1
 ip address 12.2.2.2 255.255.255.0
!
interface Ethernet0/0
 ip address 12.0.0.2 255.255.0.0
!
router eigrp 1
 network 0.0.0.0
 auto-summary
```

**Verification**

```
R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF
inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
       E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

     1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       1.1.1.1/32 is directly connected, Loopback0
D       1.0.0.0/8 is a summary, 00:00:44, Null0
```

```
D    2.0.0.0/8 [90/409600] via 12.0.0.2, 00:00:44,
Ethernet0/0

     12.0.0.0/8 is variably subnetted, 4 subnets, 3 masks

D       12.0.0.0/8 is a summary, 00:00:44, Null0

D       12.2.2.0/24 [90/409600] via 12.0.0.2, 00:00:44,
Ethernet0/0

C       12.1.1.0/24 is directly connected, Loopback1

C       12.0.0.0/16 is directly connected, Ethernet0/0

R1#


R2#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP

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

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

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

       i - IS-IS, 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


Gateway of last resort is not set


D    1.0.0.0/8 [90/409600] via 12.0.0.1, 00:04:51,
Ethernet0/0

     2.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

C       2.2.2.2/32 is directly connected, Loopback0

D       2.0.0.0/8 is a summary, 00:07:38, Null0

     12.0.0.0/8 is variably subnetted, 4 subnets, 3 masks

D       12.1.1.0/24 [90/409600] via 12.0.0.1, 00:04:51,
Ethernet0/0

D       12.0.0.0/8 is a summary, 00:07:38, Null0

C       12.2.2.0/24 is directly connected, Loopback1

C       12.0.0.0/16 is directly connected, Ethernet0/0

R2#
```

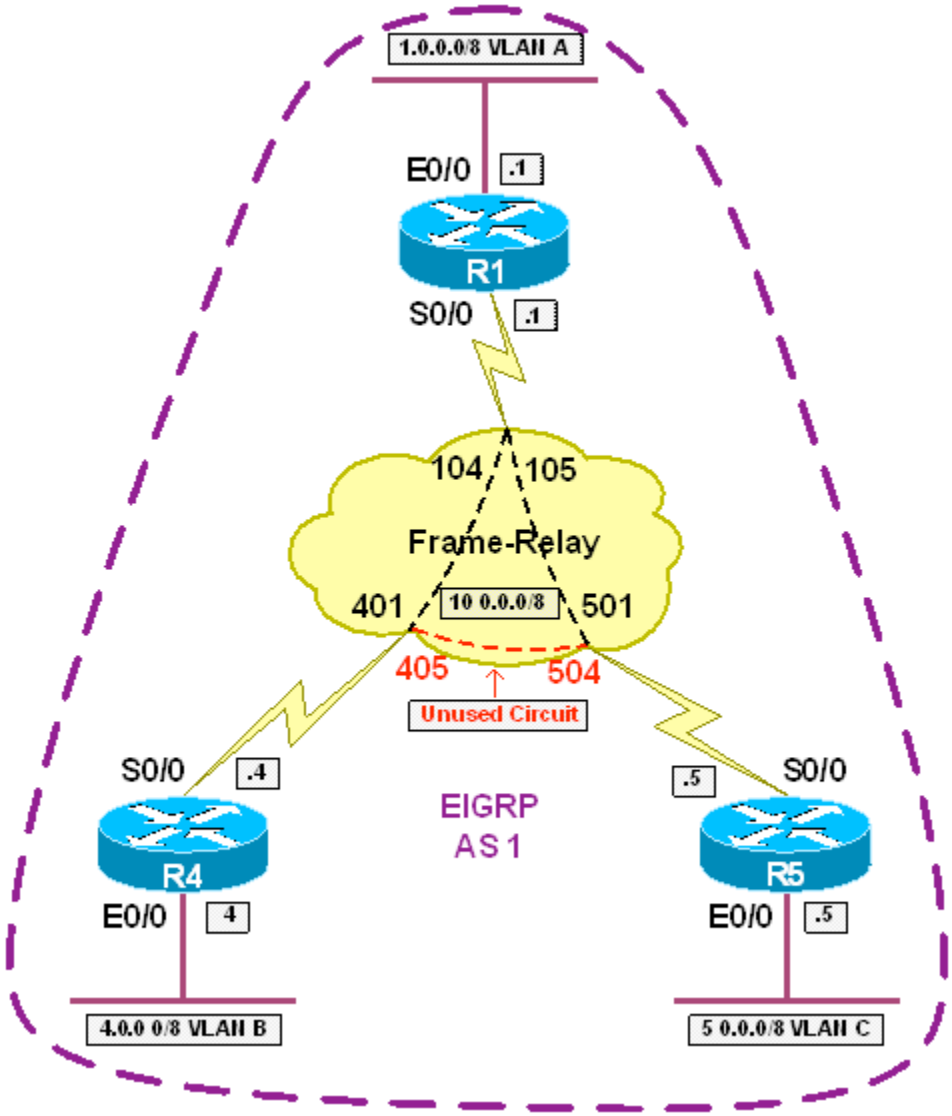
 

## Recommended Reading

Cisco IOS Command Reference: auto-summary (EIGRP)

## EIGRP Split Horizon

**Objective:** Configure EIGRP on R1, R4, and R5 to obtain connectivity between VLAN, VLAN B, and VLAN C




**Directions**

- Configure IP addressing on R1, R4, and R5 per the diagram
- Configure a Frame Relay hub-and-spoke network between R1, R4, and R5 with R1 as the hub
- All traffic between R4 and R5 should transit R1
- Configure EIGRP AS 1 on all active interfaces of R1, R4, and R5
- Disable EIGRP Split Horizon for IP on R1's interface Serial0/0

## Ask Yourself

- How does EIGRP Split-Horizon differ from IP Split-Horizon?
- When is EIGRP Split-Horizon enabled by default? Disabled by default?
- How can you verify whether EIGRP Split-Horizon is enabled or disabled?
- In what circumstances is it necessary to disable Split-Horizon for EIGRP?

### Final Configuration

**R1:**

```
interface Ethernet0/0
 ip address 1.0.0.1 255.0.0.0
!
interface Serial0/0
ip address 10.0.0.1 255.0.0.0
encapsulation frame-relay
no ip split-horizon eigrp 1
frame-relay map ip 10.0.0.4 104 broadcast
frame-relay map ip 10.0.0.5 105 broadcast
!
router eigrp 1
 network 0.0.0.0
```

**R4:**

```
interface Ethernet0/0
 ip address 4.0.0.4 255.0.0.0
!
interface Serial0/0
 ip address 10.0.0.4 255.0.0.0
 encapsulation frame-relay
 frame-relay map ip 10.0.0.1 401 broadcast
 frame-relay map ip 10.0.0.5 401
 no frame-relay inverse-arp
!
router eigrp 1
 network 0.0.0.0
```

**R5:**

```
interface Ethernet0/0
```

```
 ip address 5.0.0.5 255.0.0.0
!
interface Serial0/0
 ip address 10.0.0.5 255.0.0.0
 encapsulation frame-relay
 frame-relay map ip 10.0.0.1 501 broadcast
 frame-relay map ip 10.0.0.4 501
 no frame-relay inverse-arp
!
router eigrp 1
 network 0.0.0.0
```

**Verification**

*Before Disabling EIGRP Split-Horizon on R1*

```
R4#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF
inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
       E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

D    1.0.0.0/8 [90/2195456] via 10.0.0.1, 00:02:03,
Serial0/0
C    4.0.0.0/8 is directly connected, Ethernet0/0
C    10.0.0.0/8 is directly connected, Serial0/0

R5#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
```

```
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF
inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
       E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

D    1.0.0.0/8 [90/2195456] via 10.0.0.1, 00:04:57,
Serial0/0
C    5.0.0.0/8 is directly connected, Ethernet0/0
C    10.0.0.0/8 is directly connected, Serial0/0
```

*After Disabling EIGRP Split-Horizon on R1*

```
R4#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF
inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
       E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

D    1.0.0.0/8 [90/2195456] via 10.0.0.1, 00:03:10,
Serial0/0
C    4.0.0.0/8 is directly connected, Ethernet0/0
D    5.0.0.0/8 [90/2707456] via 10.0.0.1, 00:03:10,
Serial0/0
C    10.0.0.0/8 is directly connected, Serial0/0
```

```
R5#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF
inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
       E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

D    1.0.0.0/8 [90/2195456] via 10.0.0.1, 00:04:34,
Serial0/0
D    4.0.0.0/8 [90/2707456] via 10.0.0.1, 00:03:43,
Serial0/0
C    5.0.0.0/8 is directly connected, Ethernet0/0
C    10.0.0.0/8 is directly connected, Serial0/0
```

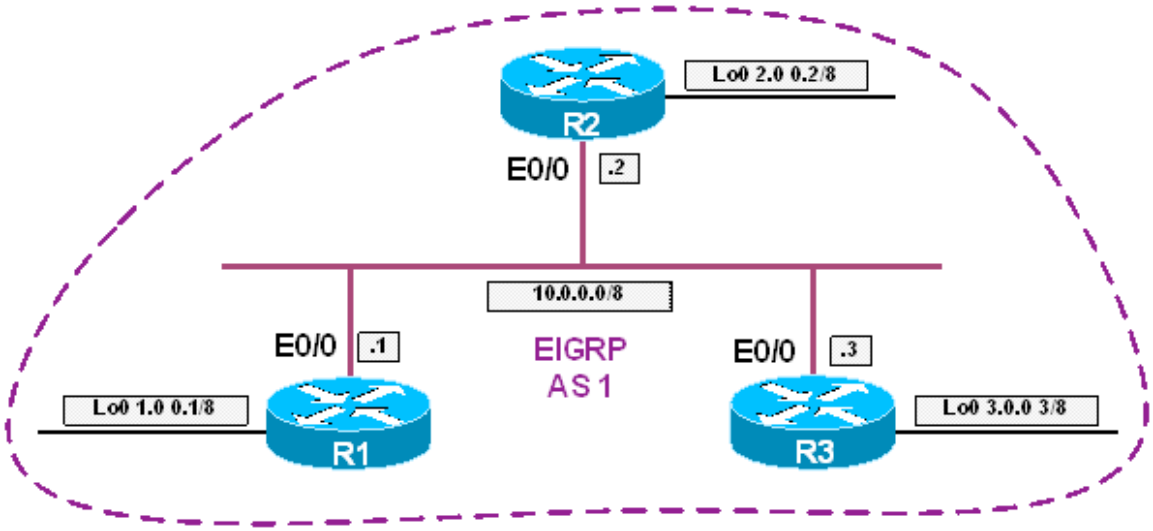
## Recommended Reading

Cisco IOS Command Reference: ip split-horizon eigrp

## Unicast EIGRP Updates

**Objective:** Configure EIGRP on the Ethernet segment between R1, R2, and R3. R3 should not be able to receive EIGRP updates passed between R1 and R2




### Directions

- Configure R1's interface Ethernet0/0 with the IP address 10.0.0.1/8
- Configure R2's interface Ethernet0/0 with the IP address 10.0.0.2/8
- Configure R3's interface Ethernet0/0 with the IP address 10.0.0.3/8
- Configure R1's interface Loopback0 with the IP address 1.0.0.1/8
- Configure R2's interface Loopback0 with the IP address 2.0.0.2/8
- Configure R3's interface Loopback0 with the IP address 3.0.0.3/8
- Configure EIGRP AS 1 on R1, R2, and R3 for all active interfaces
- Configure the neighbor under the EIGRP process of R1 and R2 to enable unicast updates to each other

### Ask Yourself

- How does EIGRP transmit updates by default?
- What configuration is necessary to enable unicast updates?
- How does this configuration differ from that of RIP?
- How can unicast updates be considered a form of network security?

**Final Configuration**

**R1:**

```
interface Loopback0
 ip address 1.0.0.1 255.0.0.0
```

```
!
interface Ethernet0/0
 ip address 10.0.0.1 255.0.0.0
!
router eigrp 1
 network 0.0.0.0 255.255.255.255
 neighbor 10.0.0.2 Ethernet0/0
```

**R2:**

```
interface Loopback0
 ip address 2.0.0.2 255.0.0.0
!
interface Ethernet0/0
 ip address 10.0.0.2 255.0.0.0
!
router eigrp 1
 network 0.0.0.0 255.255.255.255
 neighbor 10.0.0.1 Ethernet0/0
```

**R3:**

```
interface Loopback0
 ip address 3.0.0.3 255.0.0.0
!
interface Ethernet0/0
 ip address 10.0.0.3 255.0.0.0
!
router eigrp 1
 network 0.0.0.0 255.255.255.255
```

**Verification**

*Before neighbor statements applied*

```
R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF
inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
```

```
external type 2
       E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

C    1.0.0.0/8 is directly connected, Loopback0
D    2.0.0.0/8 [90/409600] via 10.0.0.2, 00:01:16,
Ethernet0/0
D    3.0.0.0/8 [90/409600] via 10.0.0.3, 00:01:16,
Ethernet0/0
C    10.0.0.0/8 is directly connected, Ethernet0/0

R2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF
inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
       E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

D    1.0.0.0/8 [90/409600] via 10.0.0.1, 00:00:47,
Ethernet0/0
C    2.0.0.0/8 is directly connected, Loopback0
D    3.0.0.0/8 [90/409600] via 10.0.0.3, 00:00:47,
Ethernet0/0
C    10.0.0.0/8 is directly connected, Ethernet0/0

R3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
```

```
mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF
inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
       E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

D    1.0.0.0/8 [90/409600] via 10.0.0.1, 00:00:13,
Ethernet0/0
D    2.0.0.0/8 [90/409600] via 10.0.0.2, 00:00:11,
Ethernet0/0
C    3.0.0.0/8 is directly connected, Loopback0
C    10.0.0.0/8 is directly connected, Ethernet0/0

R1#debug ip packet
IP packet debugging is on
IP: s=10.0.0.1 (local), d=224.0.0.10 (Ethernet0/0), len 60,
sending broad/multicast
IP: s=10.0.0.2 (Ethernet0/0), d=224.0.0.10, len 60, rcvd 2
IP: s=10.0.0.3 (Ethernet0/0), d=224.0.0.10, len 60, rcvd 2

R2#debug ip packet
IP packet debugging is on
IP: s=10.0.0.2 (local), d=224.0.0.10 (Ethernet0/0), len 60,
sending broad/multicast
IP: s=10.0.0.1 (Ethernet0/0), d=224.0.0.10, len 60, rcvd 2
IP: s=10.0.0.3 (Ethernet0/0), d=224.0.0.10, len 60, rcvd 2

R3#debug ip packet
IP packet debugging is on
IP: s=10.0.0.3 (local), d=224.0.0.10 (Ethernet0/0), len 60,
sending broad/multicast
IP: s=10.0.0.2 (Ethernet0/0), d=224.0.0.10, len 60, rcvd 2
IP: s=10.0.0.1 (Ethernet0/0), d=224.0.0.10, len 60, rcvd 2
```

```
After neighbor statements applied


R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF
inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
       E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

C    1.0.0.0/8 is directly connected, Loopback0
D    2.0.0.0/8 [90/409600] via 10.0.0.2, 00:02:51,
Ethernet0/0
C    10.0.0.0/8 is directly connected, Ethernet0/0

R2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF
inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
       E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

D    1.0.0.0/8 [90/409600] via 10.0.0.1, 00:03:34,
Ethernet0/0
C    2.0.0.0/8 is directly connected, Loopback0
```

```
C    10.0.0.0/8 is directly connected, Ethernet0/0


R3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF
inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
       E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

C    3.0.0.0/8 is directly connected, Loopback0
C    10.0.0.0/8 is directly connected, Ethernet0/0


R1#debug ip packet
IP packet debugging is on
IP: s=10.0.0.1 (local), d=10.0.0.2 (Ethernet0/0), len 60,
sending
IP: s=10.0.0.3 (Ethernet0/0), d=224.0.0.10, len 60, rcvd 2
IP: s=10.0.0.2 (Ethernet0/0), d=10.0.0.1 (Ethernet0/0), len
60, rcvd 3


R2#debug ip packet
IP packet debugging is on
IP: s=10.0.0.2 (local), d=10.0.0.1 (Ethernet0/0), len 60,
sending
IP: s=10.0.0.3 (Ethernet0/0), d=224.0.0.10, len 60, rcvd 2
IP: s=10.0.0.1 (Ethernet0/0), d=10.0.0.2 (Ethernet0/0), len
60, rcvd 3


R3#debug ip packet
IP packet debugging is on
IP: s=10.0.0.3 (local), d=224.0.0.10 (Ethernet0/0), len 60,
sending broad/multicast
IP: s=3.0.0.3 (local), d=224.0.0.10 (Loopback0), len 60,
```

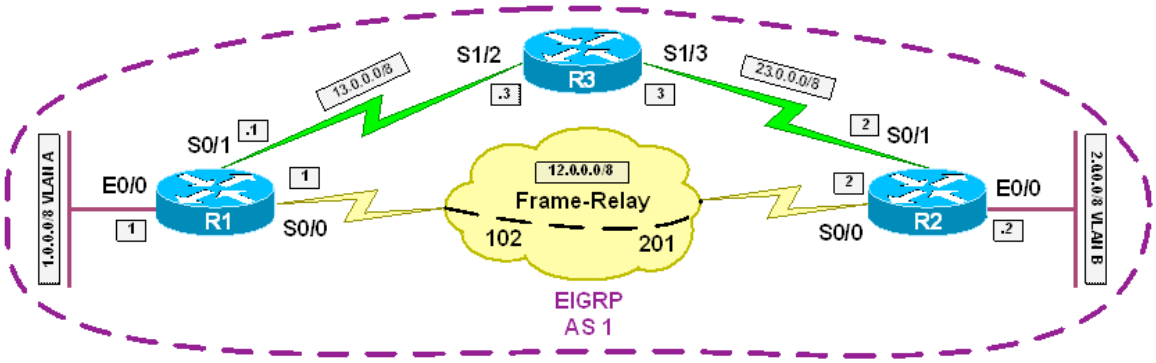
```
sending broad/multicast
```

## Recommended Reading

Cisco IOS Command Reference: neighbor (eigrp)

# Tuning EIGRP Convergence Timers

**Objective:** Configure the EIGRP network so that VLAN A regains connectivity to VLAN B within 5 seconds in the case that the frame relay circuit between R1 and R2 is down




## Directions

- Configure the IP addressing of R1, R2, and R3 per the diagram
- Configure the Frame Relay circuit between R1 and R2 using static layer 3 to layer 2 resolution
- Configure EIGRP AS 1 for all active interfaces on R1, R2, and R3
- Configure the EIGRP hello-interval as 1 second and the EIGRP hold-time as 3 seconds on R1 and R2's interface Serial0/0

## Ask Yourself

- What timers determine the convergence time of EIGRP?
- How are these timers similar to the other protocols?

### Final Configuration

**R1:**

```
interface Ethernet0/0
 ip address 1.0.0.1 255.0.0.0
!
interface Serial0/0
 ip address 12.0.0.1 255.255.255.0
 ip hello-interval eigrp 1 1
 ip hold-time eigrp 1 3
 encapsulation frame-relay
 frame-relay map ip 12.0.0.2 102 broadcast
!
```

```
interface Serial0/1
 ip address 13.0.0.1 255.0.0.0
!
router eigrp 1
 network 0.0.0.0
```

**R2:**

```
interface Ethernet0/0
 ip address 2.0.0.2 255.0.0.0
!
interface Serial0/0
 ip address 12.0.0.2 255.0.0.0
 ip hello-interval eigrp 1 1
 ip hold-time eigrp 1 3
 encapsulation frame-relay
 frame-relay map ip 12.0.0.1 201 broadcast
!
interface Serial0/1
 ip address 23.0.0.2 255.0.0.0
!
router eigrp 1
 network 0.0.0.0
```

**R3:**

```
interface Serial1/2
 ip address 13.0.0.3 255.0.0.0
 clock rate 64000
!
interface Serial1/3
 ip address 23.0.0.3 255.0.0.0
 clock rate 64000
!
router eigrp 1
 network 0.0.0.0
```

**Verification**

```
R1#ping 2.0.0.2 source ethernet0/0 repeat 1000 timeout 1
```

```
Type escape sequence to abort.
Sending 1000, 100-byte ICMP Echos to 2.0.0.2, timeout is 1 seconds:
Packet sent with a source address of 1.0.0.1
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Rack2AS>2
[Resuming connection 2 to r2 ... ]

R2(config)#interface serial0/0
R2(config-if)#shut
R2(config-if)#

Rack2AS>1
[Resuming connection 1 to r1 ... ]

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!...!!!!!!!!
%DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 12.0.0.2 (Serial0/0) is
down: holding time expired destroy peer: 12.0.0.2
RT: delete route to 2.0.0.0 via 12.0.0.2, eigrp metric [90/2195456]
RT: no routes to 2.0.0.0
RT: NET-RED 2.0.0.0/8
RT: NET-RED queued, Queue size 1
RT: delete network route to 2.0.0.0
RT: NET-RED 2.0.0.0/8
RT: NET-RED queued, Queue size 2
RT: add 2.0.0.0/8 via 13.0.0.3, eigrp metric [90/21049600]
RT: NET-RED 2.0.0.0/8
RT: NET-RED queued, Queue size 3
RT: !!!!!!!!!!!!!!!!!delete route to 23.0.0.0 via 12.0.0.2, eigrp
metric [90/2681856]
RT: no routes to 23.0.0.0
RT: NET-RED 23.0.0.0/8
RT: NET-RED queued, Queue size 4
RT: delete network route to 23.0.0.0
RT: NET-RED 23.0.0.0/8
RT: NET-RED queued, Queue size 5
RT: add 23.0.0.0/8 via 13.0.0.3, eigrp metric [90/21024000]
RT: NET-RED 23.0.0.0/8
```

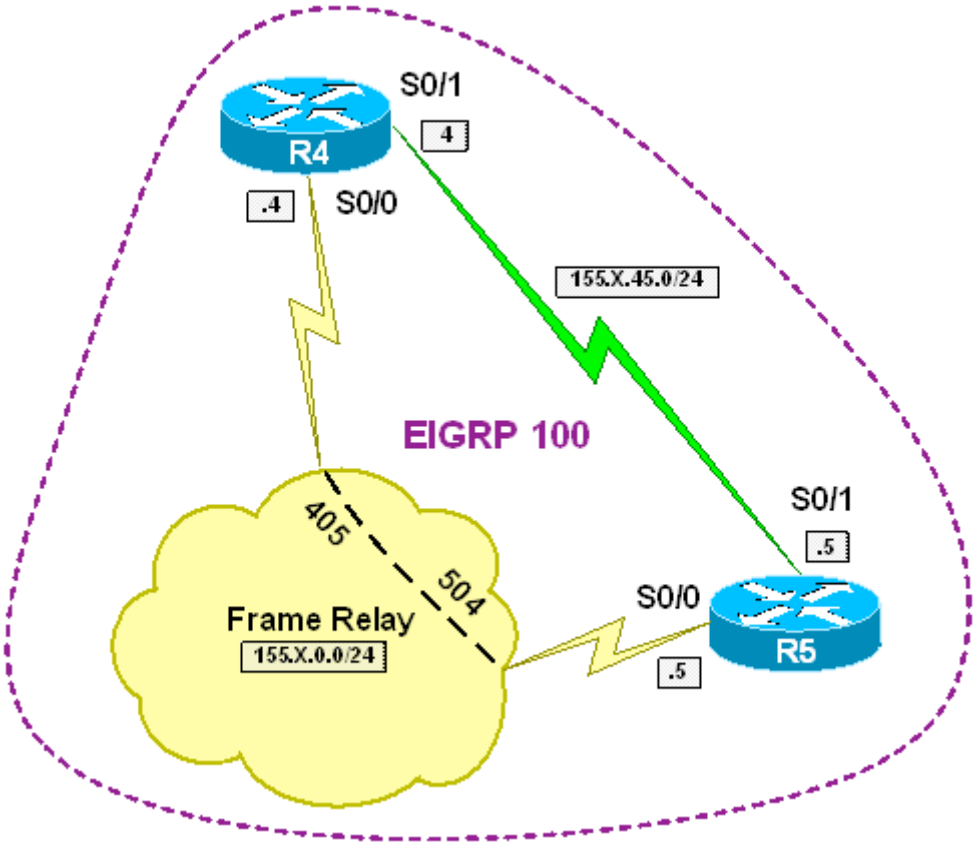
```
RT: NET-RED queued, Queue size 6!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!
Success rate is 99 percent (997/1000), round-trip min/avg/max =
4/23/68 ms
```

## 🕮 Recommended Reading

Cisco IOS Command Reference: ip hello-interval eigrp
Cisco IOS Command Reference: ip hold-interval eigrp

## Common Configuration

**Objective:** Perform configuration steps common for EIGRP scenarios




**Directions**

- Configure IP addressing as per the diagram
- Use HDLC encapsulation for Serial Link between R4 and R5
- Only use physical interfaces and static mappings on FR interfaces
- Create Loopback0 interfaces on R4 and R5 with IP addresses 150.X.4.4/24 and 150.X.5.5/24
- Configure EIGRP AS100 process on R4 and R5. Include FR and Serial interfaces into EIGRP
- Advertise Loopback interfaces on both routers into EIGRP

## Final Configuration

**R4:**

```
interface Serial0/0
 ip address 155.1.0.4 255.255.255.0
 encapsulation frame-relay
 frame-relay map ip 155.1.0.5 405 broadcast
 no frame-relay inverse-arp
 no shutdown
!
interface Serial0/1
 ip address 155.1.45.4 255.255.255.0
 no shutdown
!
interface Loopback0
 ip address 150.1.4.4 255.255.255.0
!
router eigrp 100
 no auto-summary
 network 150.1.4.4 0.0.0.0
 network 155.1.0.4 0.0.0.0
 network 155.1.45.4 0.0.0.0
```

**R5:**

```
interface Serial0/0
 bandwidth 256
 ip address 155.1.0.5 255.255.255.0
 encapsulation frame-relay
 frame-relay map ip 155.1.0.4 504 broadcast
 no frame-relay inverse-arp
 no shutdown
!
interface Serial0/1
 bandwidth 64
 ip address 155.1.45.5 255.255.255.0
 clockrate 64000
 no shutdown
!
interface Loopback0
 ip address 150.1.5.5 255.255.255.0
!
router eigrp 100
 no auto-summary
 network 150.1.5.5 0.0.0.0
 network 155.1.0.5 0.0.0.0
 network 155.1.45.5 0.0.0.0
```

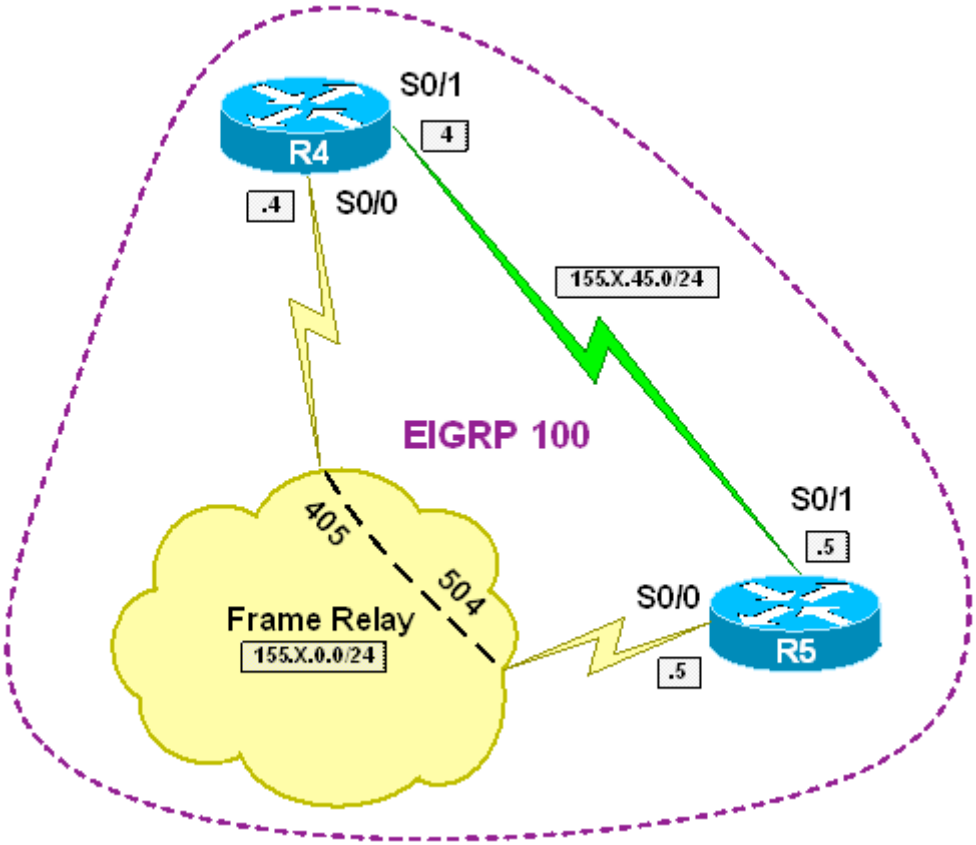
## Verification

```
R5#show ip eigrp neighbors
IP-EIGRP neighbors for process 100
H   Address                 Interface       Hold Uptime   SRTT   RTO  Q  Seq
                                            (sec)         (ms)       Cnt Num
1   155.1.0.4               Se0/0            152 00:01:26   43   570  0  6
0   155.1.45.4              Se0/1             12 00:01:56   25  2280  0  7

R5#show ip route eigrp
     150.1.0.0/24 is subnetted, 2 subnets
D       150.1.4.0 [90/10639872] via 155.1.0.4, 00:01:53, Serial0/0
```

## Unequal-Cost Load-Balancing

**Objective:** Configure EIGRP for unequal-cost load-balancing




**Directions**

- Configure routers as per the EIGRP scenario "Common Configuration"
- Frame-Relay links have provisioned bandwidth of 256Kbps and Serial Link has 64Kbps
- Calculate and configure EIGRP variance on R5 to load-balance over two available paths

**Final Configuration**

**R4:**
```
interface Serial0/0
 bandwidth 256
!
interface Serial0/1
 bandwidth 64
```

**R5:**
```
interface Serial0/0
 bandwidth 256
```

```
!
interface Serial0/1
 bandwidth 64
```

*Calculate variance now:*

```
R5#show ip eigrp topology
IP-EIGRP Topology Table for AS(100)/ID(150.1.5.5)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

P 150.1.5.0/24, 1 successors, FD is 128256
        via Connected, Loopback0
P 150.1.4.0/24, 1 successors, FD is 10639872
        via 155.1.0.4 (10639872/128256), Serial0/0
        via 155.1.45.4 (40640000/128256), Serial0/1
P 155.1.0.0/24, 1 successors, FD is 10511872
        via Connected, Serial0/0
P 155.1.45.0/24, 1 successors, FD is 40512000
        via Connected, Serial0/1
```

40640000/10639872 = 3,8..

*Therefore, we take ceiling function of the product and yield variance of 4:*

**R5:**

```
router eigrp 100
 variance 4
```

## Verification

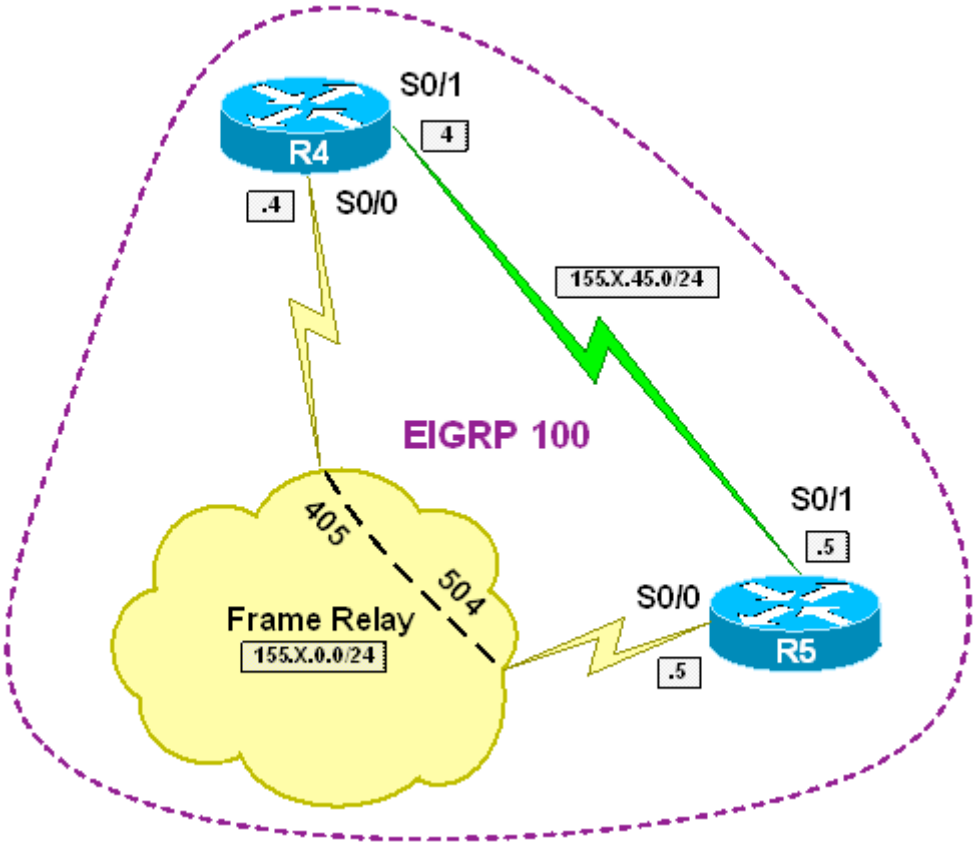
```
R5#show ip eigrp neighbors
IP-EIGRP neighbors for process 100
H   Address                 Interface       Hold Uptime   SRTT   RTO  Q  Seq
                                            (sec)         (ms)       Cnt Num
1   155.1.0.4               Se0/0            156 00:06:50   43   570  0  20
0   155.1.45.4              Se0/1             11 00:11:01   24  2280  0  21

R5#show ip route
Codes: 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

Gateway of last resort is not set

     155.1.0.0/24 is subnetted, 2 subnets
C       155.1.0.0 is directly connected, Serial0/0
C       155.1.45.0 is directly connected, Serial0/1
     150.1.0.0/24 is subnetted, 2 subnets
C       150.1.5.0 is directly connected, Loopback0
D       150.1.4.0 [90/40640000] via 155.1.45.4, 00:01:57, Serial0/1
                  [90/10639872] via 155.1.0.4, 00:01:57, Serial0/0

R5#show ip route 150.1.4.4
```

```
Routing entry for 150.1.4.0/24
  Known via "eigrp 100", distance 90, metric 10639872, type internal
  Redistributing via eigrp 100
  Last update from 155.1.45.4 on Serial0/1, 00:00:05 ago
  Routing Descriptor Blocks:
    155.1.45.4, from 155.1.45.4, 00:00:05 ago, via Serial0/1
      Route metric is 40640000, traffic share count is 21
      Total delay is 25000 microseconds, minimum bandwidth is 64 Kbit
      Reliability 255/255, minimum MTU 1500 bytes
      Loading 1/255, Hops 1
  * 155.1.0.4, from 155.1.0.4, 00:00:05 ago, via Serial0/0
      Route metric is 10639872, traffic share count is 80
      Total delay is 25000 microseconds, minimum bandwidth is 256 Kbit
      Reliability 255/255, minimum MTU 1500 bytes
      Loading 1/255, Hops 1
```

## Adjacency Authentication

**Objective:** Authenticate EIGRP adjacencies and configure key rotation




**Directions**

- Configure routers as per the EIGRP scenario "Common Configuration"
- Create key chain EIGRP and key 1, with key string CISCO123. This key should be active until 00:00:00 Jan 1 2007
- Create key 1 within key-chain EIGRP and key string CISCO456. This key should become active after 00:00:00 Jan 1 2007
- Accept both keys for additional 15 minutes before/after their lifetime begins/expires in order to accommodate for clock discrepancies
- Configure EIGRP authentication on both the Serial and FR interfaces

**Final Configuration**

**R4 & R5:**

```
key chain EIGRP
 key 1
  key-string CISCO123
  accept-lifetime 00:00:00 Jan 1 1993 00:15:00 Jan 1 2007
  send-lifetime 00:00:00 Jan 1 1993 00:00:00 Jan 1 2007
```

```
 key 2
  key-string CISCO456
  accept-lifetime 23:45:00 Dec 31 2006 infinite
  send-lifetime 00:00:00 Jan 1 2007 infinite
!
interface Serial 0/0
 ip authentication mode eigrp 100 md5
 ip authentication key-chain eigrp 100 EIGRP
!
interface Serial 0/1
 ip authentication mode eigrp 100 md5
 ip authentication key-chain eigrp 100 EIGRP
```

## Verification

```
R4#show ip eigrp neighbors
IP-EIGRP neighbors for process 100
H   Address                 Interface       Hold Uptime   SRTT   RTO  Q  Seq
                                            (sec)         (ms)       Cnt Num
1   155.1.0.5               Se0/0            129 00:05:25   53   570  0  27
0   155.1.45.5              Se0/1             14 00:05:30 1037  5000  0  28

R4#show ip eigrp interfaces detail
IP-EIGRP interfaces for process 100

                        Xmit Queue   Mean   Pacing Time   Multicast    Pending
Interface        Peers  Un/Reliable  SRTT   Un/Reliable   Flow Timer   Routes
Se0/1              1        0/0      1037      10/380       5544           0
  Hello interval is 5 sec
  Next xmit serial <none>
  Un/reliable mcasts: 0/0  Un/reliable ucasts: 12/17
  Mcast exceptions: 0  CR packets: 0  ACKs suppressed: 3
  Retransmissions sent: 0  Out-of-sequence rcvd: 1
  Authentication mode is md5,  key-chain is "EIGRP"
Se0/0              1        0/0        53       2/95          95           0
  Hello interval is 60 sec
  Next xmit serial <none>
  Un/reliable mcasts: 0/0  Un/reliable ucasts: 3/76
  Mcast exceptions: 0  CR packets: 0  ACKs suppressed: 2

                        Xmit Queue   Mean   Pacing Time   Multicast    Pending
Interface        Peers  Un/Reliable  SRTT   Un/Reliable   Flow Timer   Routes
  Retransmissions sent: 68  Out-of-sequence rcvd: 66
  Authentication mode is md5,  key-chain is "EIGRP"

R4#show key chain EIGRP
Key-chain EIGRP:
    key 1 -- text "CISCO123"
        accept lifetime (00:00:00 UTC Jan 1 1993) - (00:15:00 UTC Jan 1 2007)
[valid now]
        send lifetime (00:00:00 UTC Jan 1 1993) - (00:00:00 UTC Jan 1 2007)
[valid now]
    key 2 -- text "CISCO456"
        accept lifetime (23:45:00 UTC Dec 31 2006) - (infinite)
        send lifetime (00:00:00 UTC Jan 1 2007) - (infinite)

R4#clock set 23:55:00 31 Dec 2006

R5#clock set 00:05:00 1 Jan 2007
```

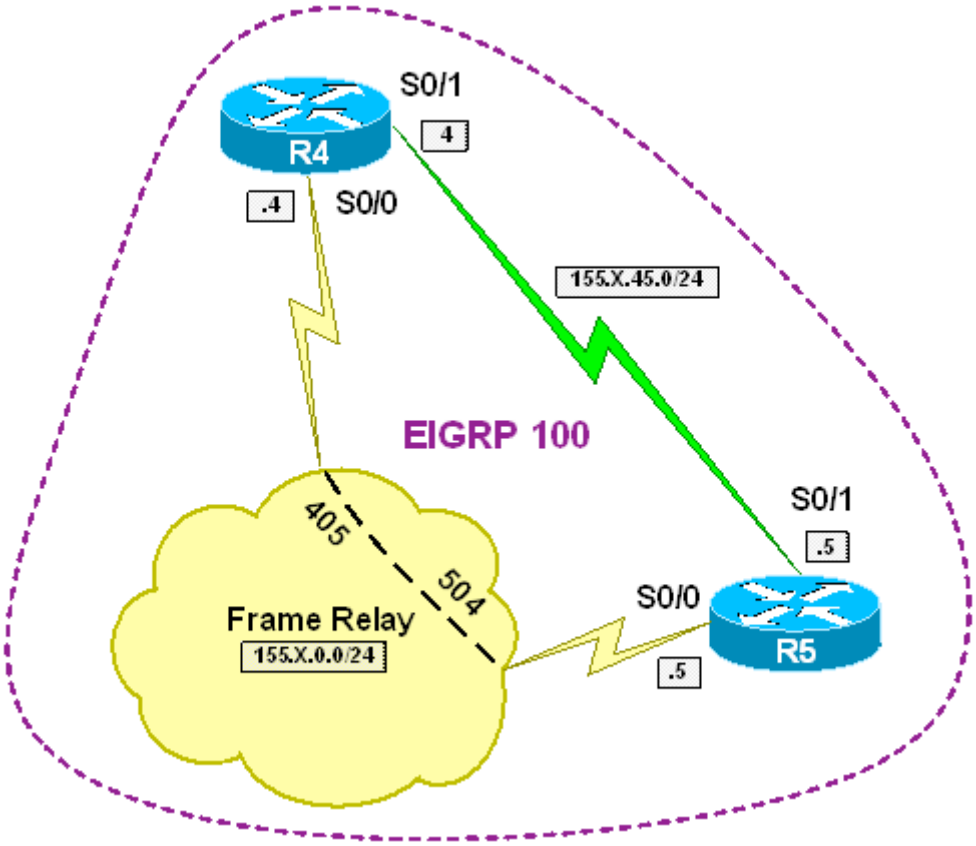
 

```
R5#show ip eigrp neighbors
IP-EIGRP neighbors for process 100
H   Address                 Interface       Hold Uptime   SRTT   RTO  Q  Seq
                                            (sec)         (ms)       Cnt Num
1   155.1.0.4               Se0/0            150 00:08:03 1244  5000  0  28
0   155.1.45.4              Se0/1             11 00:08:08   26  2280  0  29

R5#show key chain
Key-chain EIGRP:
    key 1 -- text "CISCO123"
        accept lifetime (00:00:00 UTC Jan 1 1993) - (00:15:00 UTC Jan 1 2007)
[valid now]
        send lifetime (00:00:00 UTC Jan 1 1993) - (00:00:00 UTC Jan 1 2007)
    key 2 -- text "CISCO456"
        accept lifetime (23:45:00 UTC Dec 31 2006) - (infinite) [valid now]
        send lifetime (00:00:00 UTC Jan 1 2007) - (infinite) [valid now]

R4#show key chain
Key-chain EIGRP:
    key 1 -- text "CISCO123"
        accept lifetime (00:00:00 UTC Jan 1 1993) - (00:15:00 UTC Jan 1 2007)
[valid now]
        send lifetime (00:00:00 UTC Jan 1 1993) - (00:00:00 UTC Jan 1 2007)
[valid now]
    key 2 -- text "CISCO456"
        accept lifetime (23:45:00 UTC Dec 31 2006) - (infinite) [valid now]
        send lifetime (00:00:00 UTC Jan 1 2007) - (infinite)
```

## Stub Router Feature

**Objective:** Configure a EIGRP router to stop unnecessary quering




**Directions**

- Configure routers as per the EIGRP scenario "Common Configuration"
- Configure R4 as EIGRP stub router
- Verify how that affects R5 EIGRP processing

### Final Configuration

**R4:**

```
router eigrp 100
 eigrp stub
```

### Verification

*Before R4 was configured as stub:*

```
R5#debug eigrp packets update query
EIGRP Packets debugging is on
    (UPDATE, QUERY)

R5#conf t
```

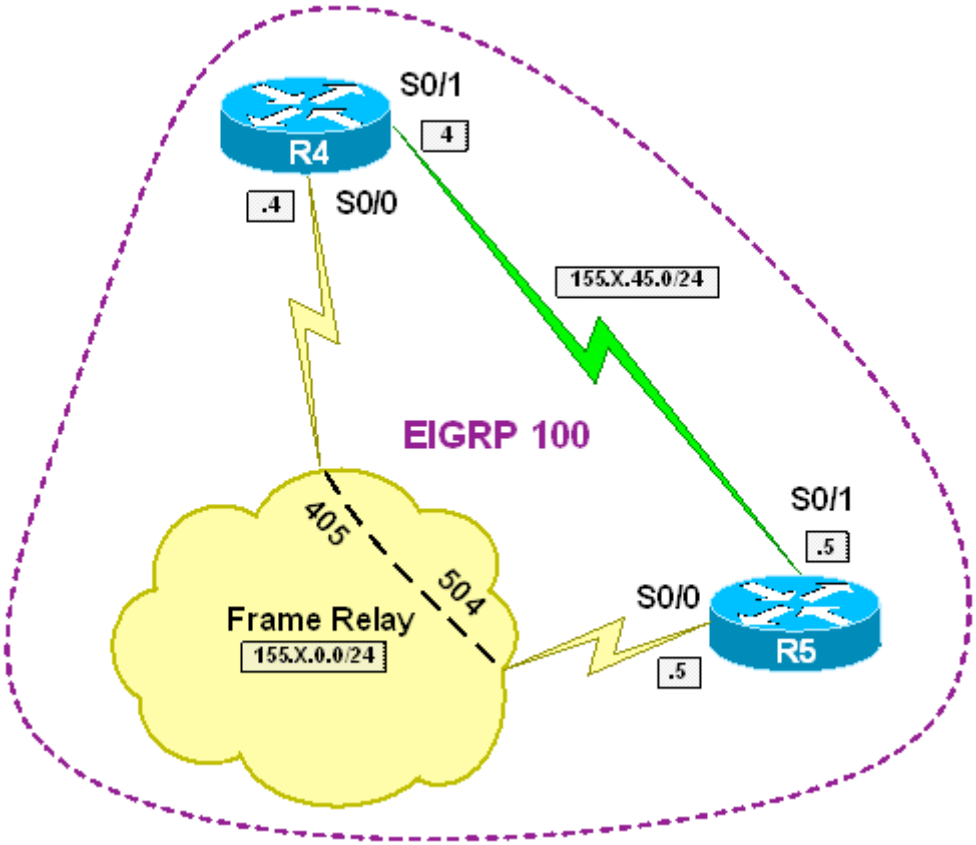
 

```
Enter configuration commands, one per line.  End with CNTL/Z.
R5(config)#int lo 0
R5(config-if)#shut
R5(config-if)#
EIGRP: Enqueueing QUERY on Serial0/0 iidbQ un/rely 0/1 serno 26-26
EIGRP: Enqueueing QUERY on Serial0/1 iidbQ un/rely 0/1 serno 26-26
EIGRP: Enqueueing QUERY on Serial0/0 nbr 155.1.0.4 iidbQ un/rely 0/0 peerQ
un/rely 0/0 serno 26-26
EIGRP: Enqueueing QUERY on Serial0/1 nbr 155.1.45.4 iidbQ un/rely 0/0 peerQ
un/rely 0/0 serno 26-26

EIGRP: Sending QUERY on Serial0/0 nbr 155.1.0.4
   AS 100, Flags 0x0, Seq 52/52 idbQ 0/0 iidbQ un/rely 0/0 peerQ un/rely 0/1
serno 26-26
EIGRP: Sending QUERY on Serial0/1 nbr 155.1.45.4
   AS 100, Flags 0x0, Seq 53/51 idbQ 0/0 iidbQ un/rely 0/0 peerQ un/rely 0/1
serno 26-26

EIGRP: Received QUERY on Serial0/0 nbr 155.1.0.4
   AS 100, Flags 0x0, Seq 54/52 idbQ 0/0 iidbQ un/rely 0/0 peerQ un/rely 0/0
EIGRP: Received QUERY on Serial0/1 nbr 155.1.45.4
   AS 100, Flags 0x0, Seq 55/53 idbQ 0/0 iidbQ un/rely 0/0 peerQ un/rely 0/0

After stub router feature has been configured on R4:

R5#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R5(config)#int lo 0
R5(config-if)#shut
EIGRP: Enqueueing UPDATE on Serial0/1 iidbQ un/rely 0/1 serno 31-31
EIGRP: Enqueueing UPDATE on Serial0/0 iidbQ un/rely 0/1 serno 31-31
EIGRP: Enqueueing UPDATE on Serial0/1 nbr 155.1.45.4 iidbQ un/rely 0/0 peerQ
un/rely 0/0 serno 31-31
EIGRP: Enqueueing UPDATE on Serial0/0 nbr 155.1.0.4 iidbQ un/rely 0/0 peerQ
un/rely 0/0 serno 31-31

EIGRP: Sending UPDATE on Serial0/1 nbr 155.1.45.4
  AS 100, Flags 0x0, Seq 63/63 idbQ 0/0 iidbQ un/rely 0/0 peerQ un/rely 0/1
serno 31-31
EIGRP: Sending UPDATE on Serial0/0 nbr 155.1.0.4
   AS 100, Flags 0x0, Seq 64/62 idbQ 0/0 iidbQ un/rely 0/0 peerQ un/rely 0/1
serno 31-31

EIGRP: Received QUERY on Serial0/1 nbr 155.1.45.4
   AS 100, Flags 0x0, Seq 64/63 idbQ 0/0 iidbQ un/rely 0/0 peerQ un/rely 0/0
EIGRP: Received QUERY on Serial0/0 nbr 155.1.0.4
   AS 100, Flags 0x0, Seq 65/64 idbQ 0/0 iidbQ un/rely 0/0 peerQ un/rely 0/0
```

## Default Route Origination with Summarization

**Objective:** Configure router to send default information into EIGRP using route summarization




**Directions**

- Configure routers as per the EIGRP scenario “Common Configuration”
- We are going to advertise default route as summary to R4, and yet announce (“unsuppress”) route to Loopback 0 of R5
- Create prefix-list R5_LO0 and match ip address 150.X.5.0/24
- Create route-map LEAK and match prefix-list R5_LO0
- Configure R5 to send summaries of 0.0.0.0 0.0.0.0 to R4 on Serial and FR interfaces. Use route-map “LEAK” as leak-map for this summary

## Final Configuration

**R5:**

```
ip prefix-list R5_LO0 permit 150.1.5.0/24
!
route-map LEAK
 match ip address prefix-list R5_LO0
!
interface Serial 0/0
 ip summary-address eigrp 100 0.0.0.0 0.0.0.0 leak-map LEAK
!
interface Serial 0/1
 ip summary-address eigrp 100 0.0.0.0 0.0.0.0 leak-map LEAK
```

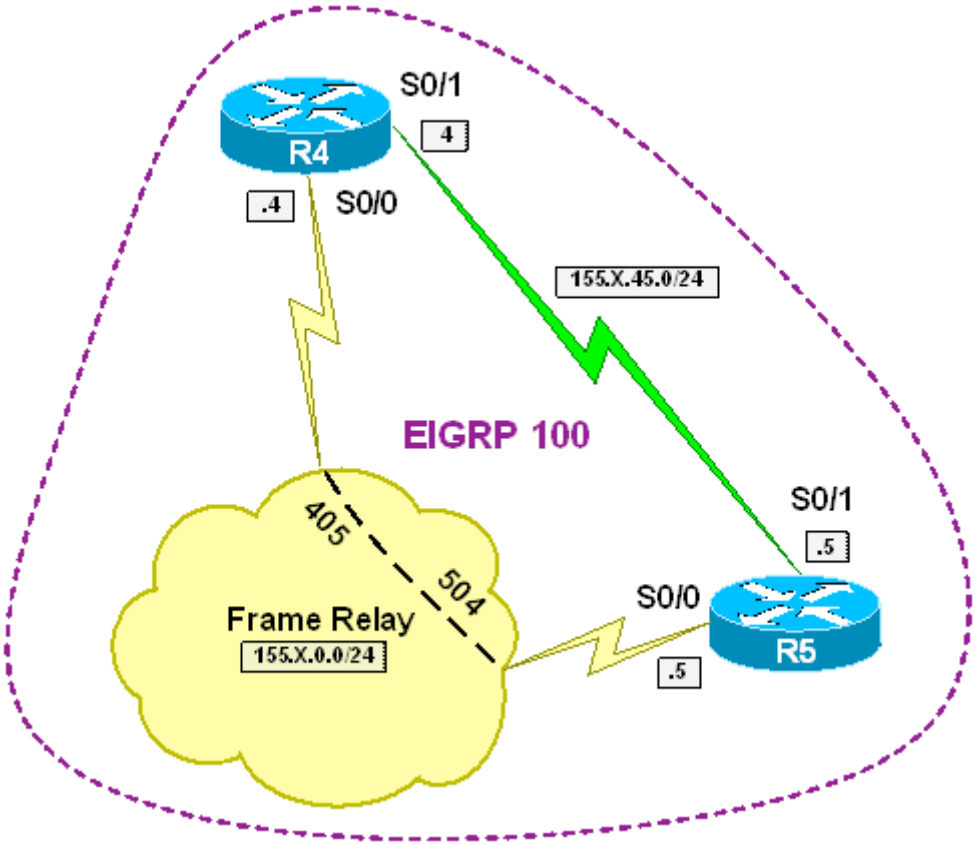
## Verification

```
R4#show ip route
Codes: 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

Gateway of last resort is 155.1.0.5 to network 0.0.0.0

     155.1.0.0/24 is subnetted, 3 subnets
C       155.1.146.0 is directly connected, Ethernet0/1
C       155.1.0.0 is directly connected, Serial0/0
C       155.1.45.0 is directly connected, Serial0/1
     150.1.0.0/24 is subnetted, 2 subnets
D       150.1.5.0 [90/10639872] via 155.1.0.5, 00:00:21, Serial0/0
C       150.1.4.0 is directly connected, Loopback0
D*   0.0.0.0/0 [90/10639872] via 155.1.0.5, 00:00:21, Serial0/0

R4#show ip ei topo
IP-EIGRP Topology Table for AS(100)/ID(150.1.4.4)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

P 0.0.0.0/0, 1 successors, FD is 10639872
        via 155.1.0.5 (10639872/128256), Serial0/0
        via 155.1.45.5 (40640000/128256), Serial0/1
P 150.1.5.0/24, 1 successors, FD is 10639872
        via 155.1.0.5 (10639872/128256), Serial0/0
        via 155.1.45.5 (40640000/128256), Serial0/1
P 150.1.4.0/24, 1 successors, FD is 128256
        via Connected, Loopback0
P 155.1.0.0/24, 1 successors, FD is 10511872
        via Connected, Serial0/0
P 155.1.45.0/24, 1 successors, FD is 40512000
        via Connected, Serial0/1
```

## Default Routing with Default-Network

**Objective:** Configure EIGRP to support routing to default network




**Directions**

- Configure routers as per the EIGRP scenario "Common Configuration"
- Configure 150.X.5.0/24 as default network on R5. To do that, first enter: "ip default-network 150.x.5.0" and then again "ip default-network 150.X.0.0"
- Redistribute static on R5 in order to make default network available to other routers
- Note that "default-network" is always classful

**Final Configuration**

**R5:**

```
router eigrp 100
 no auto-summary
 network 150.1.5.5 0.0.0.0
 network 155.1.0.5 0.0.0.0
 network 155.1.45.5 0.0.0.0
 redistribute static
!
ip default-network 150.1.5.0
```

```
ip default-network 150.1.0.0
```

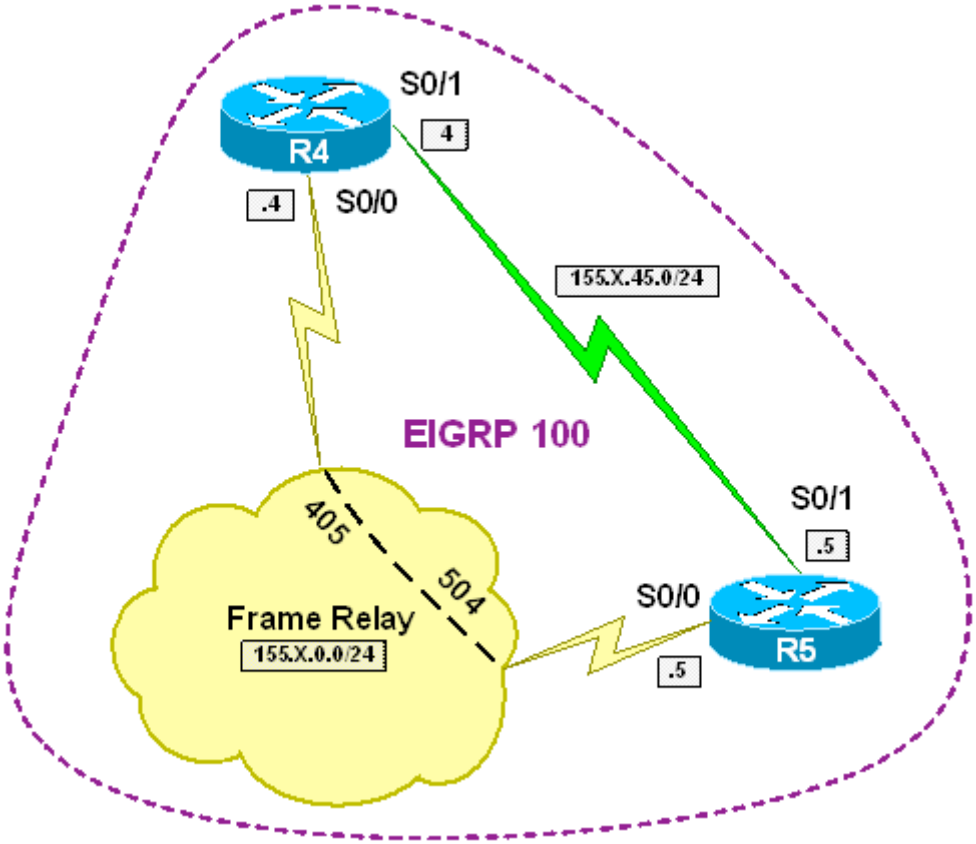
## Verification

```
R5#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R5(config)#ip default-network 150.1.5.0
R5(config)#do show run | inc ip route
ip route 150.1.0.0 255.255.0.0 150.1.5.0

R5(config)#ip default-network 150.1.0.0

R5(config)#^Z
R5#sho ip route
Codes: 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

Gateway of last resort is 150.1.5.0 to network 150.1.0.0

     155.1.0.0/24 is subnetted, 2 subnets
C       155.1.0.0 is directly connected, Serial0/0
C       155.1.45.0 is directly connected, Serial0/1
 *   150.1.0.0/16 is variably subnetted, 3 subnets, 2 masks
C       150.1.5.0/24 is directly connected, Loopback0
D       150.1.4.0/24 [90/40640000] via 155.1.45.4, 01:16:56, Serial0/1
                     [90/10639872] via 155.1.0.4, 01:16:56, Serial0/0
S*      150.1.0.0/16 [1/0] via 150.1.5.0

R4#show ip route
Codes: 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

Gateway of last resort is 155.1.0.5 to network 150.1.0.0

     155.1.0.0/24 is subnetted, 3 subnets
C       155.1.146.0 is directly connected, Ethernet0/1
C       155.1.0.0 is directly connected, Serial0/0
C       155.1.45.0 is directly connected, Serial0/1
     150.1.0.0/16 is variably subnetted, 2 subnets, 2 masks
D       150.1.5.0/24 [90/10639872] via 155.1.0.5, 00:07:35, Serial0/0
D*EX    150.1.0.0/16 [170/10639872] via 155.1.0.5, 00:01:02, Serial0/0
```

## Administrative Distance Manipulation

**Objective:** Change Administrative distance for EIGRP internal and external routes




**Directions**

- Configure routers as per the EIGRP scenario “Common Configuration”
- Create additional Loopback1 interface on R5 with IP address 150.X.55.55/24. Advertise this interface into EIGRP
- Create static route 160.X.5.0/24 to Null0 on R5 and redistribute it into EIGRP 100 process
- Create static route 160.X.55.0/24 to Null0 on R5 and redistribute it into EIGRP 100 process
- Adjust EIGRP internal distance on R4 to 99.
- Create access-list 99 to match R5’s Loopback1 network on R4. Adjust AD for this prefix to 199 when it’s advertised over Serial interface.
- Adjust external EIGRP distance to 200
- Note, that can not change distance for individual external EIGRP prefixes
- Also note, that you specify neighbor’s IP address (like with RIP and unlike OSPF) when you fine-tune AD based on access-list

## Final Configuration

```
R5:
interface Loopback1
 ip address 150.1.55.55 255.255.255.0
!
ip route 160.1.5.0 255.255.255.0 null 0
ip route 160.1.55.0 255.255.255.0 null 0
!
router eigrp 100
 network 150.1.55.55 0.0.0.0
 redistribute static

R4:
access-list 99 permit 150.1.55.0

router eigrp 100
 distance eigrp 99 200
 distance 199 155.1.45.5 0.0.0.0 99
```

## Verification

```
R4#sh ip route
Codes: 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

Gateway of last resort is not set

     155.1.0.0/24 is subnetted, 3 subnets
C       155.1.146.0 is directly connected, Ethernet0/1
C       155.1.0.0 is directly connected, Serial0/0
C       155.1.45.0 is directly connected, Serial0/1
     160.1.0.0/24 is subnetted, 2 subnets
D EX    160.1.55.0 [200/10511872] via 155.1.0.5, 00:01:45, Serial0/0
D EX    160.1.5.0 [200/10511872] via 155.1.0.5, 00:01:45, Serial0/0
     150.1.0.0/24 is subnetted, 2 subnets
D       150.1.5.0 [99/10639872] via 155.1.0.5, 00:01:45, Serial0/0
D       150.1.55.0 [99/10639872] via 155.1.0.5, 00:01:04, Serial0/0

R4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#int se 0/0
R4(config-if)#shut

%DUAL-5-NBRCHANGE: IP-EIGRP(0) 100: Neighbor 155.1.0.5 (Serial0/0) is down:
interface down

R4(config-if)#do show ip ro
Codes: 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
```

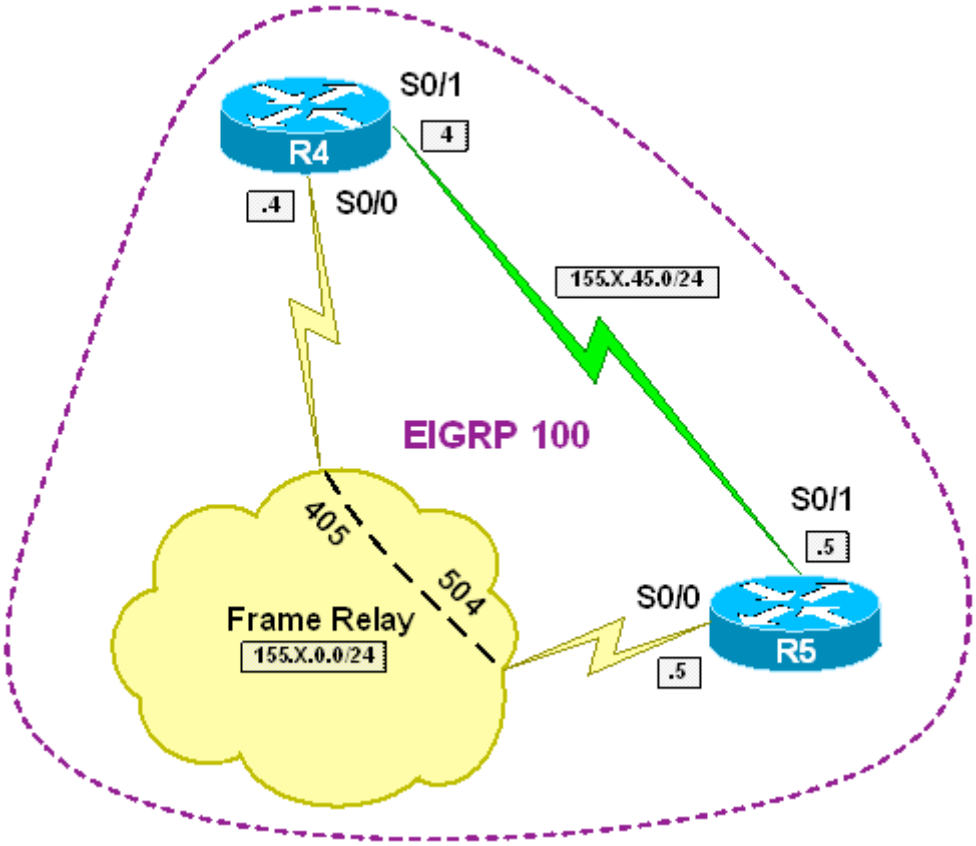
 

```
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

     155.1.0.0/24 is subnetted, 3 subnets
C       155.1.146.0 is directly connected, Ethernet0/1
D       155.1.0.0 [99/41024000] via 155.1.45.5, 00:00:05, Serial0/1
C       155.1.45.0 is directly connected, Serial0/1
     160.1.0.0/24 is subnetted, 2 subnets
D EX    160.1.55.0 [200/40512000] via 155.1.45.5, 00:00:06, Serial0/1
D EX    160.1.5.0 [200/40512000] via 155.1.45.5, 00:00:06, Serial0/1
     150.1.0.0/24 is subnetted, 2 subnets
D       150.1.5.0 [99/40640000] via 155.1.45.5, 00:00:06, Serial0/1
D       150.1.55.0 [199/40640000] via 155.1.45.5, 00:00:07, Serial0/1
```

## Filtering with Distribute-List

**Objective:** Configure EIGRP router to filter prefixes based on access-list




**Directions**

- Configure routers as per the EIGRP scenario “Common Configuration”
- Create additional Loopback1 interface on R5 with IP address 150.X.55.55/24. Advertise this interface into EIGRP
- Create standard access-list 99 on R4 to match the Loopback0 of R5
- Configure distribute-list on R4 to permit only the Loopback0 network from R5

## Final Configuration

**R5:**

```
interface Loopback1
 ip address 150.1.55.55 255.255.255.0
!
router eigrp 100
 network 150.1.55.55 0.0.0.0
```

**R4:**

```
access-list 99 permit 150.1.5.0

router eigrp 100
 distribute-list 99 in Serial 0/0
 distribute-list 99 in Serial 0/1
```

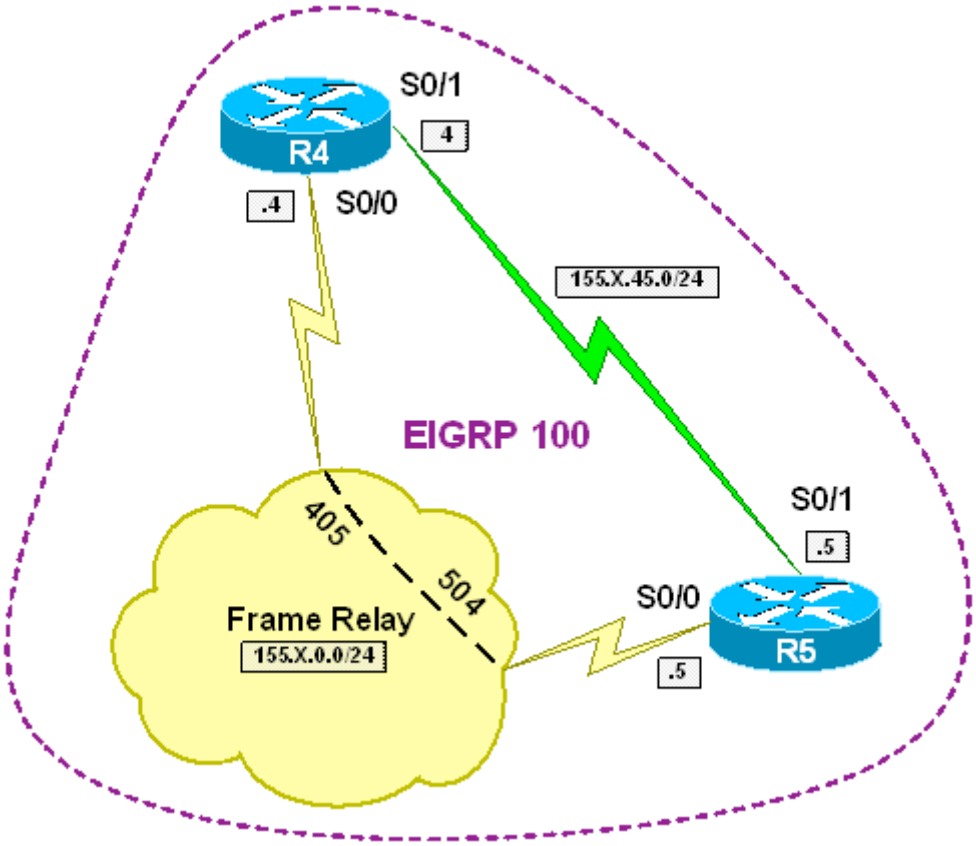
## Verification

```
R4#sho ip route eigrp
     150.1.0.0/24 is subnetted, 2 subnets
D       150.1.5.0 [90/10639872] via 155.1.0.5, 00:49:53, Serial0/0

R4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#router eigrp 100
R4(config-router)#no distribute-list 99 in serial 0/0
R4(config-router)#no distribute-list 99 in serial 0/1
R4(config-router)#do show ip route
Codes: 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

Gateway of last resort is not set

     155.1.0.0/24 is subnetted, 2 subnets
C       155.1.0.0 is directly connected, Serial0/0
C       155.1.45.0 is directly connected, Serial0/1
     150.1.0.0/24 is subnetted, 3 subnets
D       150.1.5.0 [90/10639872] via 155.1.0.5, 00:51:00, Serial0/0
C       150.1.4.0 is directly connected, Loopback0
D       150.1.55.0 [90/10639872] via 155.1.0.5, 00:00:23, Serial0/0
```

## Prefix Filtering using Distribute-List with Route-Map

**Objective:** Filter external EIGRP prefix using tag assigned to it




**Directions**

- Configure routers as per the EIGRP scenario "Common Configuration"
- Create additional Loopback1 interface on R5 with IP address 150.X.55.55/24
- Create additional Loopback2 interface on R5 with IP address 150.X.155.155/24
- Redistribute Loopback1 and Loopback2 prefixes into EIGRP on R5, and assign tag value 100 to Loopback1. Use route-map CONNECTED_TO_EIGRP to achieve this task
- Create route-map FILTER_EIGRP on R4, and deny prefixes with tag 100. Deny all other prefixes with this route-map
- Apply route-map FILTER_EIGRP under EIGRP routing process to filter prefixes on both Serial and FR interfaces

## Final Configuration

**R5:**

```
interface Loopback1
 ip address 150.1.55.55 255.255.255.0
!
interface Loopback2
 ip address 150.1.155.155 255.255.255.0
!
router eigrp 100
 redistribute connected route-map CONNECTED_TO_EIGRP

route-map CONNECTED_TO_EIGRP permit 10
  match interface Loopback1
  set tag 100
route-map CONNECTED_TO_EIGRP permit 20
```

**R4:**

```
route-map FILTER_EIGRP 10
  match tag 100
!
router eigrp 100
  distribute-list route-map FILTER_EIGRP in serial 0/1
  distribute-list route-map FILTER_EIGRP in serial 0/0
```

## Verification

*Before filtering has been configured:*

```
R4#show ip route eigrp
     150.1.0.0/24 is subnetted, 4 subnets
D EX    150.1.155.0 [170/10639872] via 155.1.0.5, 00:00:05, Serial0/0
D       150.1.5.0 [90/10639872] via 155.1.0.5, 01:18:07, Serial0/0
D EX    150.1.55.0 [170/10639872] via 155.1.0.5, 00:00:56, Serial0/0
```

*After that:*

```
R4#show ip route eigrp
     150.1.0.0/24 is subnetted, 2 subnets
D EX    150.1.55.0 [170/10639872] via 155.1.0.5, 00:02:59, Serial0/0
```