

LAB24: EIGRP – IPv6

Disclaimer

This Configuration Guide is designed to assist members to enhance their skills in respective technology area. While every effort has been made to ensure that all material is as complete and accurate as possible, the enclosed material is presented on an “as is” basis. Neither the authors nor Forum assume any liability or responsibility to any person or entity with respect to loss or damages incurred from the information contained in this guide. This Lab Guide was developed by RSTForum. Any similarities between material presented in this configuration guide and any other material is completely coincidental.



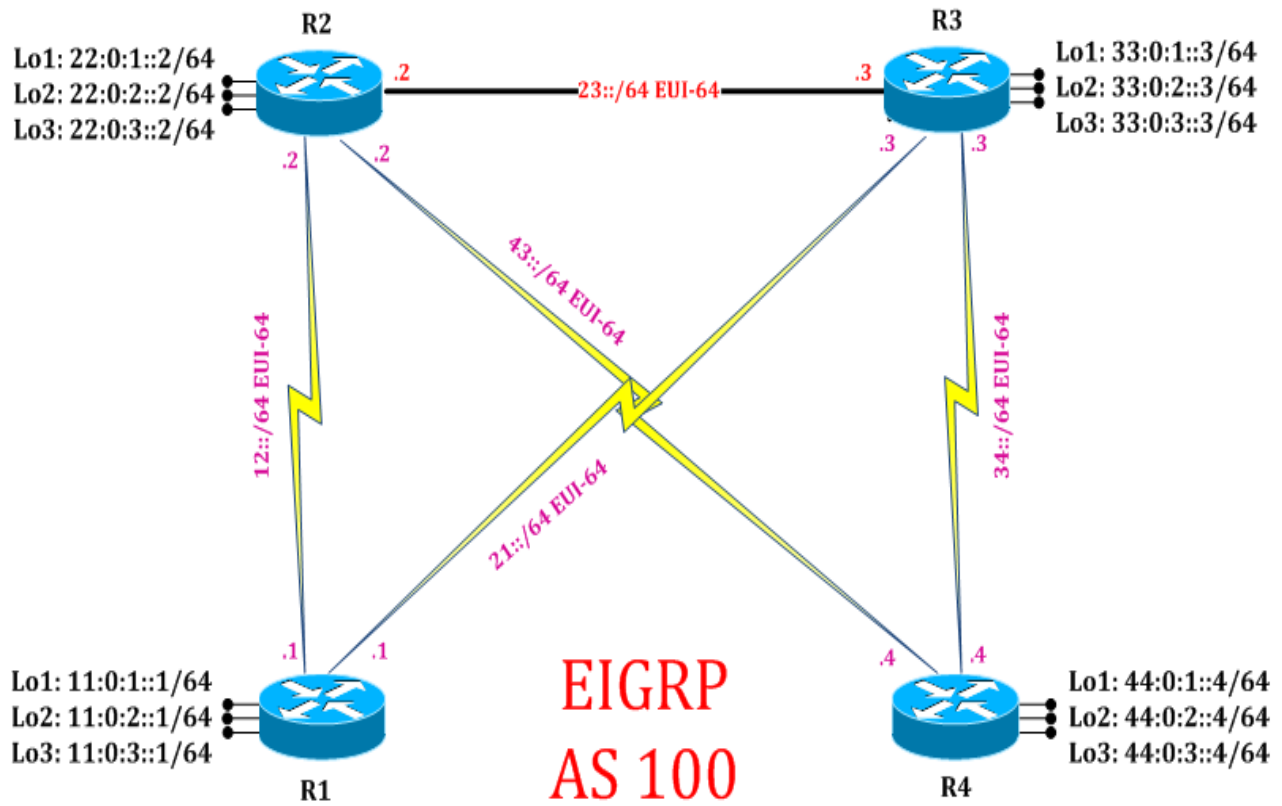
Routing
Switching
Tigers
Forum

EIGRP: Load Balancing

www.rstforum.net

LAB 24: Diagram

Note: This Lab was developed on Cisco IOS Version 15.2(4) M1 ADVENTERPRISEK9-M.



LAB24: IPv6 EIGRP Load balancing and Variance

Task 1: Configure IPv6 EIGRP Load balancing and variance

Step 1 Configure redundant path between two routers

R1:

```
interface serial 2/0
ipv6 address 12::1/64 eui-64
no shutdown
interface serial 2/3
ipv6 address 21::1/64 eui-64
no shutdown
interface loopback 1
ipv6 address 11:0:1::1/64
interface loopback 2
ipv6 address 11:0:2::1/64
interface loopback 3
ipv6 address 11:0:3::1/64
exit
```

R2:

```
interface serial 2/0
ipv6 address 12::2/64 eui-64
no shutdown
interface serial 2/3
ipv6 address 43::2/64 eui-64
no shutdown
interface ethernet 0/0
ipv6 address 23::2/64 eui-64
no shutdown
interface loopback 1
ipv6 address 22:0:1::2/64
interface loopback 2
ipv6 address 22:0:2::2/64
interface loopback 3
ipv6 address 22:0:3::2/64
exit
```

R3:

```
interface serial 2/0
ipv6 address 34::3/64 eui-64
no shutdown
interface serial 2/3
ipv6 address 21::3/64 eui-64
no shutdown
interface ethernet 0/0
ipv6 address 23::3/64 eui-64
no shutdown
interface loopback 1
ipv6 address 33:0:1::3/64
interface loopback 2
ipv6 address 33:0:2::3/64
interface loopback 3
ipv6 address 33:0:3::3/64
exit
```

R4:

```
interface serial 2/0
ipv6 address 34::1/64 eui-64
no shutdown
interface serial 2/3
ipv6 address 43::4/64 eui-64
no shutdown
interface loopback 1
ipv6 address 44:0:1::4/64
interface loopback 2
ipv6 address 44:0:2::4/64
interface loopback 3
ipv6 address 44:0:3::4/64
exit
```

Step 2 Configure IPv6 EIGRP to learn routes over multiple paths

R1:

```
ipv6 unicast-routing
ipv6 router eigrp 100
interface serial 2/0
ipv6 eigrp 100
interface serial 2/3
ipv6 eigrp 100
interface loopback 1
ipv6 eigrp 100
interface loopback 2
ipv6 eigrp 100
interface loopback 3
ipv6 eigrp 100
exit
```

R2:

```
ipv6 unicast-routing
ipv6 router eigrp 100
interface serial 2/0
ipv6 eigrp 100
interface serial 2/3
ipv6 eigrp 100
interface ethernet 0/0
ipv6 eigrp 100
interface loopback 1
ipv6 eigrp 100
interface loopback 2
ipv6 eigrp 100
interface loopback 3
ipv6 eigrp 100
exit
```

R3:

```
ipv6 unicast-routing
ipv6 router eigrp 100
interface serial 2/0
ipv6 eigrp 100
interface serial 2/3
ipv6 eigrp 100
interface ethernet 0/0
ipv6 eigrp 100
interface loopback 1
ipv6 eigrp 100
interface loopback 2
ipv6 eigrp 100
interface loopback 3
ipv6 eigrp 100
exit
```

R4:

```
ipv6 unicast-routing
ipv6 router eigrp 100
interface serial 2/0
ipv6 eigrp 100
interface serial 2/3
ipv6 eigrp 100
interface loopback 1
ipv6 eigrp 100
interface loopback 2
ipv6 eigrp 100
interface loopback 3
ipv6 eigrp 100
exit
```

Step 3 Dual Diffusion algorithm's rule:

- 1) For a path to be even considering as a valid path its Advertise Distance (AD) should be less than 2 times current Feasible Distance (FD).

$$FS = AD < 2 * \text{current FD}$$

Example:

(NOTE: On R3 Router there are 3 paths to reach 22:0:2::2/64 network:
1) Via 23::2/64 eui-64 2) Via 21::1/64 eui-64 3) via 34::/64 eui-64 but as seen below in the Topology Table of R3 there is only one path seen to reach 22:0:2::2/64 network.)

```
R3#show ipv6 eigrp topology
```

```
P 22:0:2::/64, 1 successors, FD is 409600  
  via FE80::A8BB:CCFF:FE00:200 (409600/128256), Ethernet0/0
```

(This is because of the rule that says "For a path to become a valid path its Advertised Distance (AD) should be less than 2 times current Feasible Distance (FD).

$$FS = AD < 2 * \text{current FD}$$

As seen below in the Topology Table of R1 Router, its FD to reach 22:0:2::/64 is 2297856.

This is the FD that R1 is advertising to R3 router, which becomes AD to Reach 22:0:2::/64.

Now because this AD (2297856) is not less than 2 times current FD (2 X 409600 = 819200) hence it is not reflecting in the topology table.

Similarly path via 34:0::0:4/64 is also not reflecting.

```
R1#show ip eigrp topology
```

```
P 33:0:2::/64, 1 successors, FD is 2297856  
  via FE80::A8BB:CCFF:FE00:300 (2297856/128256), Serial2/3  
  via FE80::A8BB:CCFF:FE00:200 (2323456/409600), Serial2/0
```

- 2) For a path to become Feasible Successor (FS) its Advertise Distance (AD) should be less than current Feasible Distance (FD)

$$FS = AD < \text{current FD}$$

Example:

(NOTE: On R1 Router there are 2 paths to reach 33:0:2::/64 network:

1) Via 12::2/64 eui-64 2) Via 21::3/64 eui-64.

As seen below in the Topology Table of R1 Router, path via 21::2/64 eui-64 is successor, as its FD (2297856) is lower compared to the FD provided by path via 12::2/64 eui-64.

Now the 2nd path via 12::2/64 eui-64 will be considered as Feasible successor if it meets the following criteria

$$FS = AD < \text{current FD}$$

For a path to become Feasible Successor (FS) its Advertise Distance (AD) should be less than current Feasible Distance (FD)

Path Via 12::2/64 eui-64 has AD 409600 that is less than current FD 2297856 hence it will be considered as FS.)

```
R1#show ipv6 eigrp topology
```

```
P 33:0:2::/64, 1 successors, FD is 2297856
  via FE80::A8BB:CCFF:FE00:300 (2297856/128256), Serial2/3
  via FE80::A8BB:CCFF:FE00:200 (2323456/409600), Serial2/0
```

Step 4 Verify that only best routes are reflecting in routing table.

```
R1#show ipv6 route
```

IPv6 Routing Table - default - 23 entries

Codes: C - Connected, L - Local, S - Static, U - Per-user Static route

B - BGP, HA - Home Agent, MR - Mobile Router, R - RIP

H - NHRP, I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea

IS - ISIS summary, D - EIGRP, EX - EIGRP external, NM - NEMO

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, I - LISP

```
C 11:0:1::/64 [0/0]
  via Loopback1, directly connected
L 11:0:1::1/128 [0/0]
  via Loopback1, receive
C 11:0:2::/64 [0/0]
  via Loopback2, directly connected
L 11:0:2::1/128 [0/0]
  via Loopback2, receive
```

```

C 11:0:3::/64 [0/0]
  via Loopback3, directly connected
L 11:0:3::1/128 [0/0]
  via Loopback3, receive
C 12::/64 [0/0]
  via Serial2/0, directly connected
L 12::A8BB:CCFF:FE00:100/128 [0/0]
  via Serial2/0, receive
C 21::/64 [0/0]
  via Serial2/3, directly connected
L 21::A8BB:CCFF:FE00:100/128 [0/0]
  via Serial2/3, receive
D 22:0:1::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
D 22:0:2::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
D 22:0:3::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
D 23::/64 [90/2195456]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 33:0:1::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 33:0:2::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 33:0:3::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 34::/64 [90/2681856]
  via FE80::A8BB:CCFF:FE00:300, Serial2/3

D 43::/64 [90/2681856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
D 44:0:1::/64 [90/2809856]
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
D 44:0:2::/64 [90/2809856]
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
D 44:0:3::/64 [90/2809856]
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
L FF00::/8 [0/0]
  via Null0, receive

```


Step 5 Configure Variance command in IPv6 EIGRP Process

```
R1:
ipv6 router eigrp 100
variance 2
exit
```

(EIGRP supports Unequal Metric Path Load Balancing with the help of Variance.)

Step 6 Verify that multiple paths are reflecting in routers IPv6 routing table

```
R1#show ipv6 route
```

```
IPv6 Routing Table - default - 23 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, HA - Home Agent, MR - Mobile Router, R - RIP
       H - NHRP, I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea
       IS - ISIS summary, D - EIGRP, EX - EIGRP external, NM - NEMO
       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, l - LISP
C 11:0:1::/64 [0/0]
  via Loopback1, directly connected
L 11:0:1::1/128 [0/0]
  via Loopback1, receive
C 11:0:2::/64 [0/0]
  via Loopback2, directly connected
L 11:0:2::1/128 [0/0]
  via Loopback2, receive
C 11:0:3::/64 [0/0]
  via Loopback3, directly connected
L 11:0:3::1/128 [0/0]
  via Loopback3, receive
C 12::/64 [0/0]
  via Serial2/0, directly connected

L 12::A8BB:CCFF:FE00:100/128 [0/0]
  via Serial2/0, receive
C 21::/64 [0/0]
  via Serial2/3, directly connected
L 21::A8BB:CCFF:FE00:100/128 [0/0]
  via Serial2/3, receive
D 22:0:1::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 22:0:2::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
```

```
D 22:0:3::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 23::/64 [90/2195456]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 33:0:1::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 33:0:2::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 33:0:3::/64 [90/2297856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 34::/64 [90/2681856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 43::/64 [90/2681856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 44:0:1::/64 [90/2809856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 44:0:2::/64 [90/2809856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
D 44:0:3::/64 [90/2809856]
  via FE80::A8BB:CCFF:FE00:200, Serial2/0
  via FE80::A8BB:CCFF:FE00:300, Serial2/3
L FF00::/8 [0/0]
  via Null0, receive
```

(Variance commands will set the benchmark and IPv6 EIGRP Router will Load Balancing the traffic between the paths within that benchmark which is reflected in router's IPv6 routing table.)