



Cisco Support Community Presents  
**Tech-Talk Series**

# Enhancements in EIGRP

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# Agenda

- EIGRP IETF Draft
- EIGRP Named Mode
- EIGRP Wide Metric
- New Innovations in EIGRP
  - ✓ Add Path Support in EIGRP
  - ✓ EIGRP Over the Top
  - ✓ EIGRP Loop-Free Alternate - Fast Reroute
  - ✓ EIGRP Route Tag Enhancements

# EIGRP IETF Draft

Open since 18<sup>th</sup> Feb. 2013.

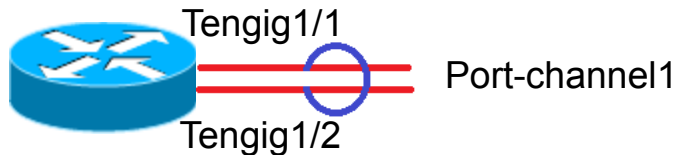
IETF Draft Link :

<http://tools.ietf.org/html/draft-savage-eigrp-01>

Frequently Asked Questions :

[http://www.cisco.com/en/US/prod/collateral/iosswrel/ps6537/ps6554/ps6599/ps6630/qa\\_C67-726299.html](http://www.cisco.com/en/US/prod/collateral/iosswrel/ps6537/ps6554/ps6599/ps6630/qa_C67-726299.html)

# EIGRP Wide Metric



Bandwidth of port-channel1	Classic Metric	Wide Metric
10Gb	2816	6619136
11Gb	2560	119156
12Gb	2560	109226
20Gb	2560	65536

\* Above metric values have been calculated using a constant Delay value of 100 usec

When the wide metric routes are installed in Routing Table, metric is scaled by a constant value called “rib-scale factor = 128”

```
#sh ip eigrp topo 10.0.0.0/8
```

```
EIGRP-IPv4 VR(Named) Topology Entry for AS(100)/ID(10.10.12.2) for 10.0.0.0/8
```

```
State is Passive, Query origin flag is 1, 1 Successor(s), FD is 6619136, RIB is 51712
```

```
Descriptor Blocks:
```

```
10.10.12.1 (Port-channel1), from 10.10.12.1, Send flag is 0x0
```

```
Composite metric is (6619136/6586368), route is Internal
```

```
#sh ip route 10.0.0.0 255.0.0.0
```

```
Routing entry for 10.0.0.0/8
```

```
Known via "eigrp 100", distance 90, metric 51712, type internal
```

# Wide Metric Formula

Following are the formulas and static variables used in the calculation while calculating the metrics

## Static Variables:

EIGRP\_BANDWIDTH = 10,000,000  
EIGRP\_DELAY\_PICO = 1,000,000  
EIGRP\_INACCESSIBLE = -1  
EIGRP\_MAX\_HOPS = 100

EIGRP\_CLASSIC\_SCALE = 256  
EIGRP\_WIDE\_SCALE = 65536  
EIGRP\_RIB\_SCALE = 128  
VERY\_HIGH\_BANDWIDTH = 10000011

For interfaces up to 1 gigabit, the value of delay will be derived from the reported interface delay:

**Delay** = Delay \* EIGRP\_DELAY\_PICO (picoseconds)

Beyond 1 gigabit or for loopback interfaces that are reported as 8G by IOS:

**Delay** =  $\frac{\text{EIGRP\_BANDWIDTH} * \text{EIGRP\_DELAY\_PICO}}{\text{IF BW in kbps}}$

Based on the Delay value Latency is calculated:

**Latency** =  $\frac{\text{Delay} * \text{EIGRP\_WIDE\_SCALE}}{\text{EIGRP\_DELAY\_PICO}}$

**Throughput** =  $\frac{\text{EIGRP\_BANDWIDTH} * \text{EIGRP\_WIDE\_SCALE}}{\text{IF BW in kbps}}$

**Wide Metric** = min(Throughput) + Cumulative(Latency)

min(Throughput) will be maximum of all the Throughput values, as Throughput value in decimal will be low if the IF BW is High (So highest decimal value will have lowest BW)

**Scaled BW** =  $\frac{10^7}{\text{minimum bandwidth (Bw) in kbps}}$

**Scaled Delay** =  $\frac{\text{Delay}}{10}$

**Unscaled BW** =  $\frac{\text{EIGRP\_BANDWIDTH} * \text{EIGRP\_CLASSIC\_SCALE}}{\text{Scaled BW}}$

**Unscaled Delay** =  $\frac{(10 * \text{Scaled Delay})}{\text{EIGRP\_CLASSIC\_SCALE}}$

**Legacy Metric** = (Scaled BW + Scaled Delay) \* 256

# EIGRP Named Mode

**Classic mode:** Configuring “router eigrp” command with a number

**Named mode:** Configuring “router eigrp” command with the virtual-instance-name

With Named Mode the commands are configured in hierarchical manner under the router-config mode. Unlike classic mode, the commands in Named mode are not scattered across interfaces and router mode.

Most of the new features like Wide Metrics, EIGRP Route Tag Enhancements, Add Path Support, EIGRP Over the Top, EIGRP Loop-Free Alternate Fast Reroute, IPv6 VRF Lite are supported with Named Mode only.

Metric in combination with AD for summary-routes could be defined

# EIGRP Classic Mode to Named Mode Conversion

Just one command to migrate all your EIGRP configuration from Classic Mode to Named mode :

**eigrp upgrade-cli EIGRPNamed**

Usage :

```
router eigrp <AS #>  
eigrp upgrade-cli EIGRPNamed
```

Please note : Interface level EIGRP commands won't work after migrating to Named mode even if we try to configure them manually.

# EIGRP Classic Mode to Named Mode Conversion

## Example :

```
asr1000rp1-advipservicesk9.03.11.00.S.154-1.S-std.bin
eigrp-release : 15.00.00 : Portable EIGRP Release
```

```
interface GigabitEthernet0/0/1.2
 encapsulation dot1Q 2
 ip vrf forwarding test
 ip address 172.17.254.224 255.255.255.0
!
interface GigabitEthernet0/0/1.10
 encapsulation dot1Q 10
 ip address 172.23.0.74 255.255.255.0
 ip authentication mode eigrp 100 md5
 ip authentication key-chain eigrp 100 cisco
 ip bandwidth-percent eigrp 100 200
 ip hello-interval eigrp 100 4
 ip hold-time eigrp 100 12
 ip summary-address eigrp 100 192.168.0.0 255.255.0.0
!
interface Loopback10
 ip address 10.10.10.20 255.255.255.255
!
router eigrp 100
!
 address-family ipv4 vrf test autonomous-system 200
   network 172.17.254.224 0.0.0.0
   eigrp router-id 10.10.10.20
 exit-address-family
 network 10.10.10.20 0.0.0.0
 network 172.23.0.74 0.0.0.0
 eigrp router-id 10.10.10.20
 eigrp event-log-size 10000
!
```



router eigrp 100  
eigrp upgrade-cli EIGRPNamed

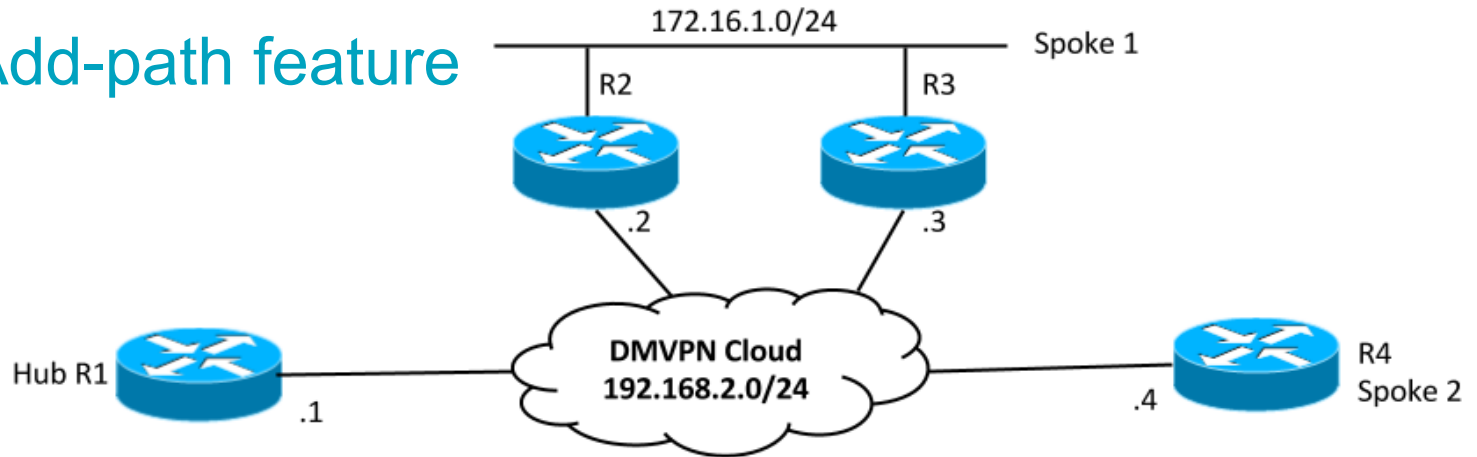
```
interface GigabitEthernet0/0/1.2
 encapsulation dot1Q 2
 ip vrf forwarding test
 ip address 172.17.254.224 255.255.255.0
```

```
interface GigabitEthernet0/0/1.10
 encapsulation dot1Q 10
 ip address 172.23.0.74 255.255.255.0
!
```

```
router eigrp EIGRPNamed
!
 address-family ipv4 unicast autonomous-system 100
 af-interface GigabitEthernet0/0/1.10
   summary-address 192.168.0.0 255.255.0.0
   authentication mode md5
   authentication key-chain cisco
   bandwidth-percent 200
   hello-interval 4
   hold-time 12
 exit-af-interface
!
 topology base
   eigrp event-log-size 10000
 exit-af-topology
 network 10.10.10.20 0.0.0.0
 network 172.23.0.74 0.0.0.0
 eigrp router-id 10.10.10.20
 exit-address-family
!
 address-family ipv4 unicast vrf test autonomous-system 200
!
 topology base
 exit-af-topology
 network 172.17.254.224 0.0.0.0
 eigrp router-id 10.10.10.20
 exit-address-family
```



# EIGRP Add-path feature



```
R1#sh ip route | sec 172.16.1.0
D      172.16.1.0 [90/77312000] via 192.168.2.3, 00:13:37, Tunnel702
      [90/77312000] via 192.168.2.2, 00:13:37, Tunnel702
```

```
R4#sh ip route | sec 172.16.1.0
D      172.16.1.0 [90/27161600] via 192.168.2.2, 00:00:30, Tunnel702
```

## Configuring Add-path feature on Hub:

```
R1(config)#router eigrp Named
R1(config-router)#address-family ipv4 unicast autonomous-system 100
R1(config-router-af)#af-interface Tunnel702
R1 (config-router-af-interface)#add-paths 2
```

```
R4#sh ip route | sec 172.16.1.0
D      172.16.1.0 [90/27161600] via 192.168.2.3, 00:00:39, Tunnel702
      [90/27161600] via 192.168.2.2, 00:00:39, Tunnel702
```

**Spoke2-R1 now learns the prefix from 2 routes !!!**

# EIGRP Over-the-top (OTP)

Run EIGRP across the ISP cloud :

- Without advertising EIGRP routes to ISP network.
- Without creating any tunnel over the ISP cloud.

Uses EIGRP on the control plane and Locator ID Separation Protocol (LISP) encapsulation on the data plane to route traffic across the underlying WAN architecture.

Uses EIGRP Route Reflectors (E-RRs) to form a half-mesh topology and ensure connectivity among all CEs in the network.

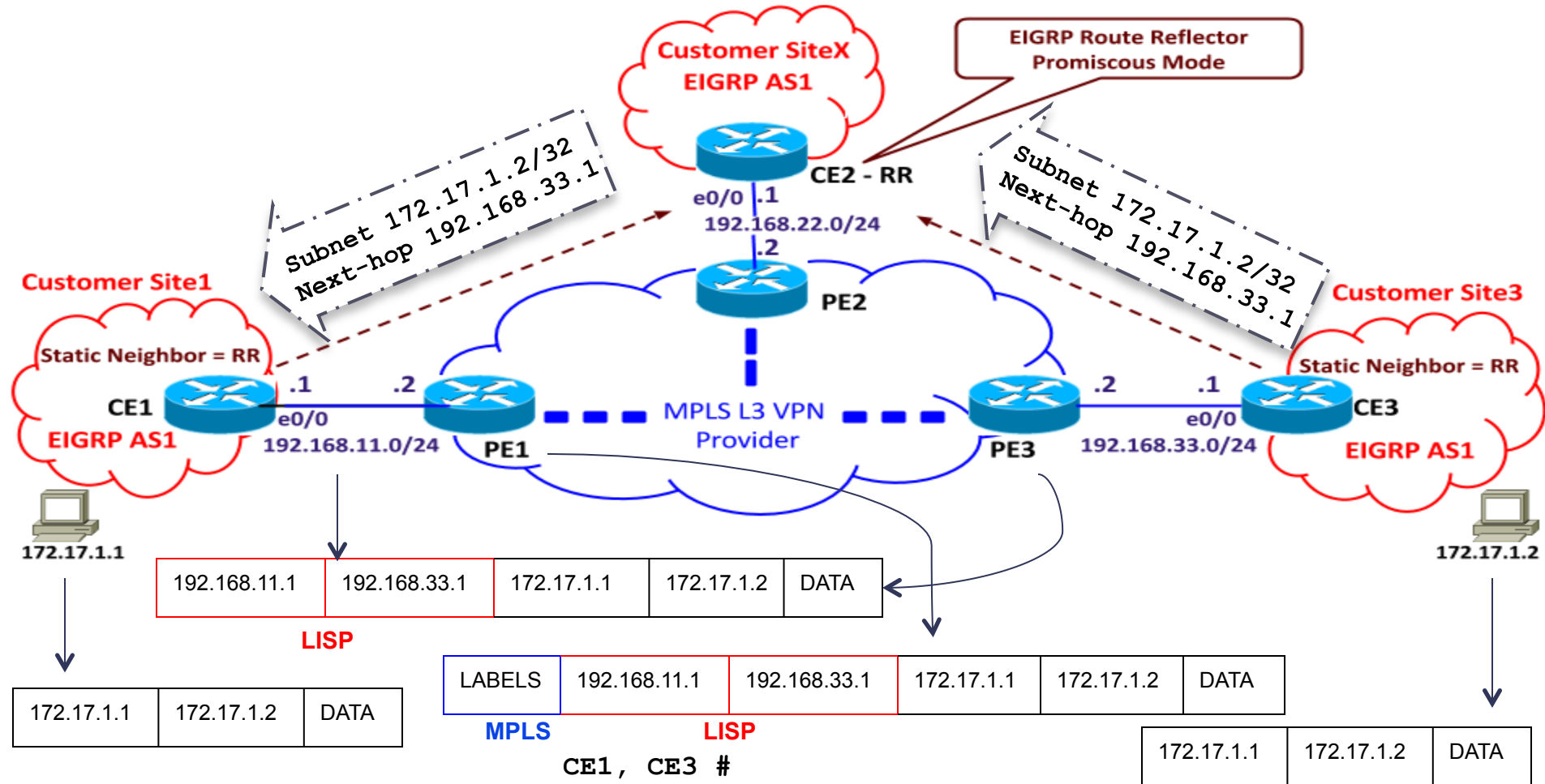
For more information regarding this feature, please visit :

[http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/iproute\\_eigrp/configuration/xe-3s/ire-xe-3s-book/ire-eigrp-over-the-top.html](http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/iproute_eigrp/configuration/xe-3s/ire-xe-3s-book/ire-eigrp-over-the-top.html)

# Packet Flow

**CE2-RR#**

```
router eigrp Named
address-family ipv4 unicast autonomous-system 100
  remote-neighbors source Ethernet0/0 unicast-listen lisp-encap
```



**CE1, CE3 #**

```
router eigrp Named
address-family ipv4 unicast autonomous-system 100
  neighbor 192.168.22.1 Ethernet0/0 remote 10 lisp-encapC
```

# EIGRP Loop-Free Alternate: Fast Reroute

The EIGRP Loop-Free Alternate Fast Reroute feature allows EIGRP to reduce the routing transition time to less than 50 ms by precomputing repair paths or backup routes and installing these paths or routes in the Forwarding Information Base (FIB).

## CEF Output before FRR

```
R6#sh ip cef 192.168.1.0
192.168.1.0/24
nexthop 10.10.236.3 Ethernet0/1
```

## Enabling FRR

```
router eigrp Named
 address-family ipv4 unicast autonomous-system 100
 topology base
   fast-reroute per-prefix all
 exit-af-topology
 exit-address-family
```

## CEF Output after enabling FRR

```
R6#sh ip cef 192.168.1.0
192.168.1.0/24
nexthop 10.10.236.3 Ethernet0/1
repair: attached-nexthop 10.10.246.4 Ethernet1/2
```

For more information regarding this feature, please visit :

[http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/iproute\\_eigrp/configuration/xe-3s/ire-xe-3s-book/ire-ipfrr.html](http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/iproute_eigrp/configuration/xe-3s/ire-xe-3s-book/ire-ipfrr.html)

# EIGRP Route-tag Enhancement

This feature enables us to specify and display route tags in dotted-decimal format, filter routes using the route tag value with wildcard mask same as ACL, and also set a default route tag for all Internal EIGRP routes.



## Enabling EIGRP Route Tags in Dotted Decimal Format

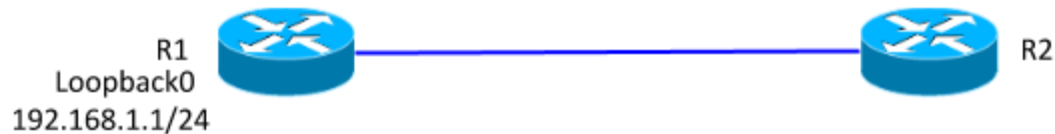
```
R1, R2 (config)#route-tag notation dotted-  
decimal
```

## Setting a tag for all internal routes in dotted decimal format

```
R1#sh run | s r e  
router eigrp Named  
address-family ipv4 unicast autonomous-system 100  
  eigrp default-route-tag 10.10.10.11  
exit-address-family
```

```
R1#sh ip eigrp topology 192.168.1.0/24 | i tag|Connected  
0.0.0.0 (Loopback0), from Connected, Send flag is 0x0  
  Internal tag is 10.10.10.11
```

# EIGRP Route-tag Enhancement



```
R2#sh ip route 192.168.1.0 | in entry|tag
Routing entry for 192.168.1.0/24
    Route tag 10.10.10.11
```

## Filtering Route using Dotted Decimal Tag value

```
route-tag list TAG seq 5 permit 10.10.10.11 0.0.0.0
```

```
route-map IN_TAG deny 10
match tag list TAG
```

```
route-map IN_TAG permit 20
```

```
router eigrp Named
address-family ipv4 unicast autonomous-system 100
topology base
    distribute-list route-map IN_TAG in
exit-af-topology
exit-address-family
```

## After using the route-map to filter the route

```
R2#sh ip route 192.168.1.0
% Network not in table
```



Thank You!!