

PROTOCOL HIGHLIGHTS

Type	Advanced Distance Vector (Internal)
Algorithm	Diffuse Update Algorithm (DUAL)
Standard	IETF Informational RFC (Cisco controlled)
Metric	Composite metric — see below
Timers	5 / 15 s 60 / 180 s (hello / dead)
Administrative distance	90 internal · 170 external · 5 summary
Network protocols	IPv4, IPv6, IPX, AppleTalk
Authentication	Message-Digest 5 (MD5)
Multicast	224.0.0.10 (v4) · FF02::A (v6) link-local

EIGRP COMPOSITE METRIC

$$\text{metric} = \left[k1 * bw + \frac{(k2 * bw)}{256 - \text{load}} + k3 * \text{delay} \right] * \left[\frac{k5}{\text{reliability} + k4} \right]$$

bw = (10⁷ ÷ min. path bandwidth in kbps) * 256

delay = (cumulative interface delays in µs ÷ 10) * 256

- Values in the metric are those seen with **show interface**
- Only values on egress interfaces are considered in the calculation
- No floating point maths — all calculated values are rounded down
- Default **k** values — k1 = k3 = 1, k2 = k4 = k5 = 0

metric weights tos k1 k2 k3 k4 k5

to change the default values

no metric weights

to reset to the default values

- Infinite metric is **4,294,967,295** (2³² - 1)

EIGRP BASIC CONFIGURATION

IPv4 configuration steps

```
R1(config)#router eigrp 110
  Set the autonomous system number <1-65535>
R1(config-router)#no auto-summary
  Disable the automatic summarization feature
R1(config-router)#network 172.16.10.0 0.0.0.255
  Enable EIGRP on interfaces and advertise networks
R1(config-router)#passive-interface Ethernet 0
  Suppress sending and receiving EIGRP packets
R1(config-router)#eigrp stub connected summary
  Configure EIGRP stub features — see stub routing
R1(config-router)#neighbor 10.10.10.2 Serial 0
  Statically define a neighbor for a non-broadcast network
```

IPv6 configuration steps

```
R1(config)#ipv6 router eigrp 110
  Set the autonomous system number <1-65535>
R1(config-router)#no shutdown
  Enables EIGRP
R1(config-router)#router-id 1.1.1.1
  EIGRP router ID, in 32-bit dotted decimal format
R1(config-router)#passive-interface Ethernet 0
  Suppress sending and receiving EIGRP packets
R1(config-router)#eigrp stub connected summary
  Configure EIGRP stub features — see stub routing
R1(config)#interface FastEthernet 0/0
R1(config-if)#ipv6 eigrp 110
  Enable EIGRP on interfaces and advertise networks
```

HEADER FORMAT

Unchanged since EIGRP released 1 Update 3 Query 4 Reply 6 IPX SA 10 SIA Query 11 SIA Reply Applies to the entire EIGRP packet, excluding the IP header

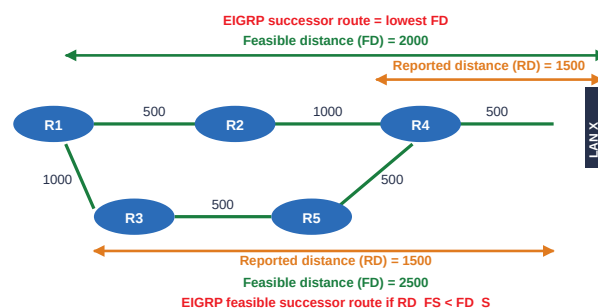
Version	8	Opcode	8	Checksum	16
Flags				32	
Sequence Number				32	
Acknowledgement Number				32	
Autonomous System Number				32	
Type	16			Length	16
Value				32	
Other TLV Triplets...					

rows 1–5 are the EIGRP packet header · the rest are type-length-value triplets

FRAME PAYLOAD

Frame header	IPv4 header (protocol 88)	EIGRP packet payload	Frame footer
	IPv6 header (next header 88)		

EIGRP TERMINOLOGY



EIGRP successor (S) — the path or paths with the lowest feasible distance. The best route.

EIGRP feasible successor (FS) — the path or paths with the next best feasible distance that meet the feasibility condition.

Feasible distance (FD) — the overall metric for a given path.

Reported distance (RD) — the overall metric for a neighbor to reach the destination. Also called advertised distance.

Feasibility condition (FC) — a backup path is only considered a feasible successor if its reported distance is less than the feasible distance of the current successor path.

Variance — configurable value for unequal-cost load balancing. A multiplier against the FD of the current successor; paths in range are considered equal cost if they meet the feasibility condition.

If variance = 2 and FD = 2000, then 2000–4000 is an equal-cost path.

Stuck in active (SIA) — the condition when a successor route becomes unreachable with no feasible successor, triggering a query to neighbors, and not all queries are answered. Adjacencies with unresponsive neighbors are reset before 12.1(5); an SIA query is sent from 12.1(5) onward.

EIGRP stub — a router which advertises a subset of routes, or no routes (connected, summary, redistributed, static or receive-only), and is exempt from any query process.

EIGRP INTERFACE CONFIGURATIONS (IPv4 | IPv6)

```
R1(config-if)#[ip | ipv6] bandwidth-percent eigrp 110 80
  Sets the maximum bandwidth EIGRP can use — 50% by default
R1(config-if)#ip summary-address eigrp 110 1.1.0.0 255.255.0.0 30
  ipv6 summary-address eigrp 110 2001:4AC4::/32 30
  Manual summarization of outbound routes — <AS> <network> <mask> <AD>
R1(config-if)#[ip | ipv6] hello-interval eigrp 110 30
  Configure the hello time — <AS> <seconds>
R1(config-if)#[ip | ipv6] hold-time eigrp 110 180
  Configure the hold time — <AS> <seconds>
R1(config-if)#no [ip | ipv6] split-horizon eigrp 110
  Disable split horizon for the EIGRP AS
```

EIGRP AUTHENTICATION (IPv4)

```
R1(config)#key chain WORD
  Key-chain name
R1(config-keychain)#key 1
  ID 0–2147483647
R1(config-keychain-key)#key-string KEY1
R1(config-keychain)#key 2
R1(config-keychain-key)#key-string KEY2
  Creates key-chain and keys on the key-chain. Key ID and pass must match on
  neighbors. Pass can be alphanumeric, 1–80 long. Can also set key send and accept
  lifetimes.
R1(config-if)#ip auth mode eigrp 1 md5
  Sets authentication mode to MD5
R1(config-if)#ip authentication key-chain eigrp 1 WORD
  Case-sensitive key-chain name. Enables authentication for neighbor(s).
```

EIGRP VERIFICATION COMMANDS

```
R1#show ip eigrp neighbors
IP-EIGRP neighbors for process 110
H  Address          Interface    Hold Uptime    SRTT  RTT  Q   Seq
   (sec)            (ms)                Cnt  Num
0  192.168.1.102    Se0/0/0     11  00:00:09    40   1000  0   1
```

IPv6 command — **show ipv6 eigrp neighbors**

- Neighbor index — neighbors in the order they were learned
- The neighbor's IP address (next-hop IP for routes to this neighbor)
- The interface on which the neighbor is reachable (exit interface for its routes)
- Remaining hold time — LAN 5 s hello, 15 s hold; WAN 60 s hello, 180 s hold
- Neighbor uptime
- Smooth round trip time — time for an ACK to be received, in ms
- Retransmission timeout — time to wait before retransmitting
- Queue count — packets queued; a high count usually means link congestion
- Sequence number — RTP sequencing 32-bit value, incremented per packet

```
R1#show ip protocols
Routing Protocol is "eigrp 1"          AS number
Default networks flagged in outgoing updates
Default networks accepted from incoming updates
EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0    K values
EIGRP maximum hopcount 100
EIGRP maximum metric variance 1    FD multiplier
Redistributing: eigrp 1
EIGRP NSF-aware route hold timer is 240s
Automatic network summarization is not in effect    no auto-summary
Maximum path: 4    load balance paths
Routing for Networks:
  1.0.0.0    network statements
Routing Information Sources:
  Gateway    Distance    Last Update
Distance: internal 90 external 170    AD values
```

IPv6 command — **show ipv6 protocols**

INTERFACE AND TOPOLOGY TABLES

```
R1#show ip eigrp interface
IP-EIGRP interfaces for process 1
Interface    Xmit Queue Mean Pacing Time Multicast Pending
Fa0/0 1      0/0      1278    0/2      50      0
```

IPv6 command — **show ipv6 eigrp interface**

- Active EIGRP interface — no passive-interface, sending hellos
- Established adjacencies on the interface (neighbors)
- Queued EIGRP packets in transmit queue (unreliable / reliable)
- Smooth round trip time — time for an ACK to be received, in ms
- How many ms between EIGRP packets sent out the interface
- How long sender waits for a missing ACK from a group member before an error
- Routes in the packets sitting in the transmit queue waiting to be sent

```
R1#show ip eigrp topology    AS / router ID
IP-EIGRP Topology Table for AS(1)/ID(1.1.1.1)
Codes: P - Passive, A - Active, U - Update,
       Q - Query, R - Reply, r - reply Status,
       s - sia Status    FD/RD
P 1.1.1.0/30, 1 successors, FD is 281600
   via Connected, FastEthernet0/0
P 2.2.2.0/30, 1 successors, FD is 307200
   via 1.1.1.2 (307200/281600), FastEthernet0/0
P 1.1.2.0/24, 1 successors, FD is 128256
   via Connected, Loopback0    passive = converged
```

- Use **show ip eigrp topology all-links** to see successors, feasible successors and other routes
- IPv6 command — **show ipv6 eigrp topology**

BASIC EIGRP DEBUG COMMANDS

```
R1#debug ip eigrp ?
<1-65535>    Autonomous System
neighbor      IP-EIGRP neighbor debugging
notifications IP-EIGRP event notifications
summary       IP-EIGRP summary route processing
<cr>         Debug all IP EIGRP packets
```

- <1-65535> debug a specific AS
- neighbor debug adjacencies
- notifications EIGRP MIB traps — neighbor auth failure, neighbor down, stuck-in-active

```
R1#debug eigrp ?
fsm          Dual Finite State Machine events/actions
neighbors     EIGRP neighbors
nsf           EIGRP Non-Stop Forwarding events/actions
packets       EIGRP packets
transmit      EIGRP transmission events
```

```
R1#show ip eigrp traffic
IP-EIGRP Traffic Statistics for AS 1
Hellos sent/received: 2357/2354
Updates sent/received: 6/6
Queries sent/received: 0/0
Replies sent/received: 0/1
Acks sent/received: 6/4
SIA-Queries sent/received: 0/0
SIA-Replies sent/received: 0/0
```

IPv6 command — **show ipv6 eigrp traffic**