EIGRP — General

Advanced Distance Vector (Hybrid) Protocol
Cisco Proprietary (classic) / RFC 7868 (named)
Uses DUAL (Diffusing Update Algorithm)
Classless — supports VLSM & CIDR
Protocol Number: 88
Multicast Address: 224.0.0.10
Supports IPv4, IPv6 (EIGRPv6), Named Mode
Partial & Bounded Updates (bandwidth-efficient)
Supports unequal-cost load balancing
Hello-based neighbor discovery

Administrative Distance

Internal EIGRP	90
External EIGRP	170
Summary Route	5

Key Timers

Hello (LAN)	5 seconds
Hold (LAN)	15 seconds
Hello (WAN/NBMA)	60 seconds
Hold (WAN/NBMA)	180 seconds
Active Timer	3 minutes (default)

EIGRP Packet Types

Hello	Neighbor discovery / keepalive
Update	Routing information
Query	Request for route (DUAL)
Reply	Response to Query
ACK	Acknowledges Update/Query/Reply
SIA-Query	Stuck-in-Active check
SIA-Reply	Response to SIA-Query

EIGRP Metric Calculation

Composite Metric = [K1*BW + K3*Delay] * 256
Default K-values: K1=1, K2=0, K3=1, K4=0, K5=0
BW = (10,000,000 / lowest BW kbps) * 256
Delay = (sum of delays in 10us units) * 256
K2 (Load) and K4/K5 (Reliability) off by default
Named mode uses Wide Metrics (64-bit)
K-values must match between neighbors

DUAL Terminology

Feasible Distance (FD)	Best metric to destination
Reported Distance (RD)	Neighbor's metric to dest
Successor	Best path — in routing table
Feasible Successor (FS)	Backup — in topology table
Feasibility Condition	RD of FS < FD of Successor
Active State	Route lost — DUAL recomputing
Passive State	Route stable — normal operation
SIA	Stuck-In-Active (no reply rcvd)

Neighbor Requirements

AS Number	Must match
K-values	Must match
Subnet	Must be on same subnet
Auth	MD5 or SHA (named mode)
Hello/Hold	Do NOT need to match
Passive intf	No neighbors formed

Load Balancing

Equal-cost LB	Default — up to 4 paths (max 32)
Unequal-cost LB	Use variance command
Variance 1	Equal-cost only (default)
Variance N	Include: FD <= N * best FD
traffic-share bal	Proportional load balancing
max-paths	Set max parallel paths (1–32)

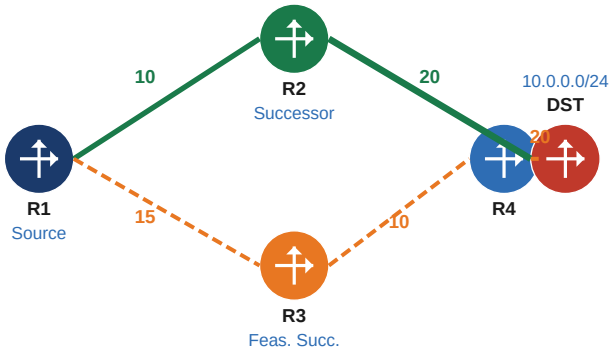
Routing Table Codes

D	EIGRP internal route
D EX	EIGRP external route
D*	EIGRP candidate default

Key Cisco IOS Commands

router eigrp <ASN>
network <ip> <wildcard>
eigrp router-id <a.b.c.d>
no auto-summary
passive-interface <intf>
ip summary-address eigrp <ASN> <ip> <mask>
ip hello-interval eigrp <ASN> <sec>
ip hold-time eigrp <ASN> <sec>
ip bandwidth-percent eigrp <ASN> <pct>
variance <multiplier>
maximum-paths <n>
redistribute <proto> metric <bw> <dly> <rel> <ld> <mtu>
show ip eigrp neighbors
show ip eigrp topology
show ip eigrp topology all-links
show ip route eigrp
show ip eigrp interfaces
show ip eigrp traffic

EIGRP Topology — Successor & Feasible Successor



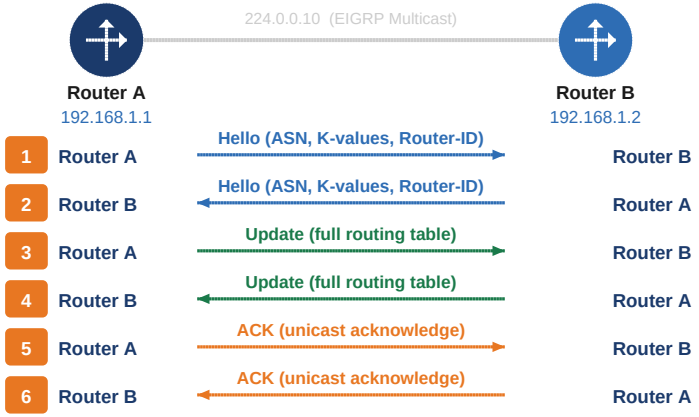
DUAL Calculation from R1's perspective

Via R2 (Successor):	FD = 10+20 = 30 RD = 20
Via R3->R4 (Feas. Succ.):	FD = 15+10+20 = 45 RD = 30
Feasibility Check:	RD(45) > FD(30) — NOT a FS!
Direct R3->DST (if exists):	RD must be < FD(30) to qualify

Legend:

- Successor path (best route — installed in RIB)
- Feasible Successor path (backup in topology table)
- Destination network

EIGRP Neighbor Formation & Packet Exchange



Neighbor Adjacency ESTABLISHED — FULL state

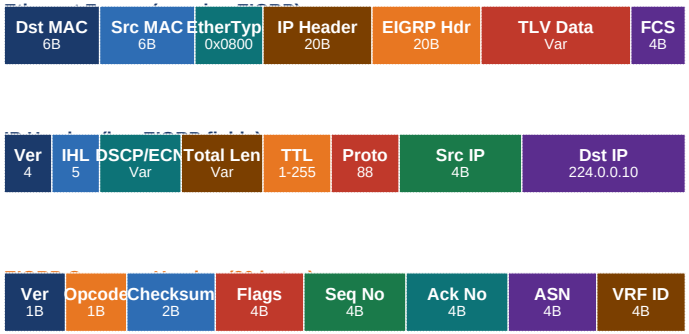
Neighbor Requirement Rules

ASN must match (e.g. router eigrp 100)
K-values must match (default K1=1 K3=1)
Routers must be on same IP subnet
Authentication password must match (if set)
Interface must NOT be passive
After Hello — Updates sent via unicast (RTP)

SIA — Stuck In Active

Route goes Active — DUAL sends Query to all neighbors.
If no Reply in 3 min (Active Timer) — neighbor is reset.

EIGRP Packet & Frame Structure



EIGRP Opcode Values

1	Update — Routing information
2	Request — Not commonly used
3	Query — Route no longer reachable
4	Reply — Answer to Query
5	Hello — Neighbor discovery / keepalive
6	IPX SAP — Legacy (not used in modern EIGRP)
10	SIA-Query — Stuck-In-Active query
11	SIA-Reply — Stuck-In-Active reply

TLV — Type-Length-Value (EIGRP Data Format)

Each EIGRP message carries TLVs: Parameters TLV (K-values) | IP Internal Routes TLV | IP External Routes TLV | Sequence TLV