

Day 25: RIP and EIGRP

Routing Protocols

CCNA Study Guide:

Comparative Analysis of RIP and EIGRP

1.0 Introduction

While OSPFv2 is the primary protocol for configuration on the CCNA 200-301 exam, understanding RIP and EIGRP is essential for mastering routing fundamentals. These protocols represent the evolution of distance-vector logic and provide context for why modern networks are designed the way they are.

2.0 Routing Information Protocol (RIP)

RIP is the classic "Routing by Rumor" protocol. It is a legacy Interior Gateway Protocol (IGP) that relies on periodic updates and a simplistic view of the network.

2.1 Core Characteristics

- Algorithm: Bellman-Ford (Distance Vector).
- Metric: Hop Count. Each router is one hop; the path with the fewest routers is chosen.

- Maximum Hop Count: 15. A hop count of 16 is considered "infinite" (unreachable).
- Administrative Distance (AD): 120.
- Update Timer: Full routing table broadcast/multicast every 30 seconds.

2.2 Evolution: RIPv1 vs. RIPv2

RIP evolved to support modern networking requirements like VLSM and CIDR.

Feature	RIPv1	RIPv2
Addressing	Classful (A, B, C)	Classless (VLSM/CIDR)
Subnet Masks	Not sent in updates	Included in updates
Transmission	Broadcast (255.255.255.255)	Multicast (224.0.0.9)
Authentication	Not supported	Supported

2.3 Basic Configuration

```
Router(config)# router rip
```

```
Router(config-router)# version 2
```

```
Router(config-router)# no auto-summary
```

```
Router(config-router)# network 192.168.1.0
```

```
Router(config-router)# passive-interface g0/0
```

```
Router(config-router)# default-information originate
```

3.0 Enhanced Interior Gateway Routing Protocol (EIGRP)

EIGRP is an Advanced Distance Vector (or Hybrid) protocol. It is designed for extremely fast convergence and efficiency, utilizing the Diffusing Update Algorithm (DUAL).

3.1 Core Characteristics

- Algorithm: DUAL.
- Multicast Address: 224.0.0.10.
- Administrative Distance (AD): 90 (Internal), 170 (External).
- Convergence: Very fast due to pre-calculated backup paths.
- Routing Code: Identified in the routing table by the letter D (for DUAL).

3.2 The Composite Metric

EIGRP uses a complex formula considering multiple path attributes. By default, only Bandwidth and Delay are used.

$$\text{Metric} = \left(\frac{10^7}{\text{Slowest Bandwidth}} + \text{Sum of Delays} \right) \times 256$$

3.3 EIGRP Terminology (DUAL)

Term	Definition
Successor	The best, lowest-metric route installed in the routing table.
Feasible Successor (FS)	A loop-free backup route.
Feasible Distance (FD)	The local router's total metric to the destination.
Reported Distance (RD)	The metric advertised by a neighbor to reach the destination.

The Feasibility Condition: For a neighbor to be a Feasible Successor, its RD must be less than the current FD ($RD < FD$). This ensures a loop-free backup path.

4.0 Advanced Features and Configuration

4.1 Unequal-Cost Load Balancing

EIGRP is the only IGP that supports unequal-cost load balancing. Using the variance command, a router can distribute traffic across paths with different metrics if the backup path is a Feasible Successor.

4.2 Configuration Example

```
Router(config)# router eigrp 100
```

```
Router(config-router)# eigrp router-id 1.1.1.1
```

```
Router(config-router)# network 10.0.0.0 0.0.0.255
```

```
Router(config-router)# no auto-summary
```

```
Router(config-router)# variance 2
```

5.0 Verification and Troubleshooting Commands

Command	Purpose
show ip protocols	Summarizes all active routing protocols (timers, AD, networks).
show ip route [rip eigrp]	Filters the routing table for specific protocol entries.
show ip eigrp neighbors	Verifies successful adjacencies with neighboring routers.
show ip eigrp topology	Displays the DUAL database, including Successors and FS.

6.0 Head-to-Head Comparison: RIP vs. EIGRP

Feature	RIP	EIGRP
Type	Distance Vector	Advanced Distance Vector
Metric	Hop Count	Bandwidth + Delay
Convergence	Slow	Very Fast
Load Balancing	Equal Cost Only	Equal & Unequal Cost
Admin Distance	120	90
Standard	Industry Standard	Cisco (Open since 2013)

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