



# سييسكو في 6 ساعات



الكورس

يختصر أكثر من مائة ساعة  
يركز على احتياجات المهندسين  
في سوق العمل

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Second Edition  
حقوق النشر والترجمة محفوظة

## - EIGRP

### - EIGRP Tables

#### -Neighbors table:

Hello ( 5s )  
Holdtime ( 15s )

#### -Topology table :

**DUAL** Algorithm  
Metric = 256 (BW+Dly)

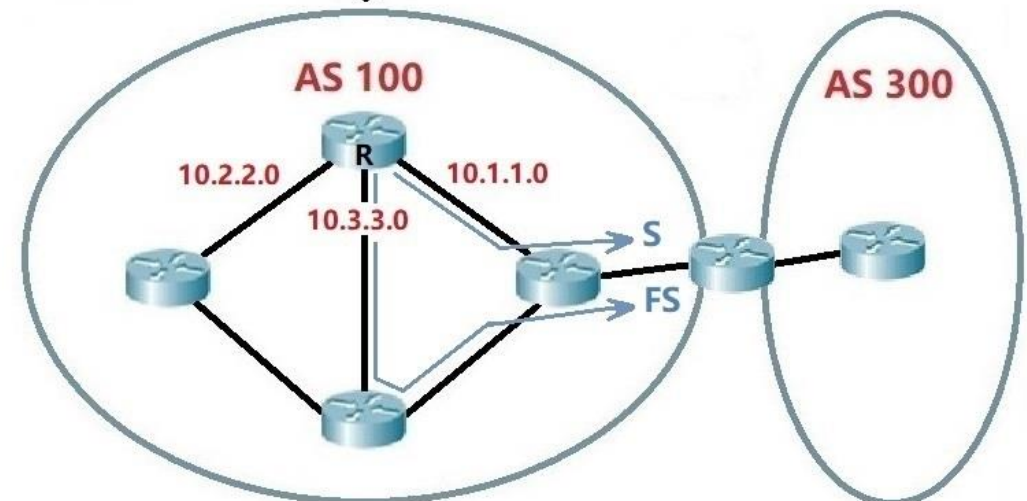
Successor ( S )  
Feasible Successor ( FS )

#### -Routing table :

Successor ( S )  
Update the change → Neighbors  
(Send Successor only)

Enable eigrp      ASN ( can be from 1 to 65535 )

```
R(config)# router eigrp 100
R(config-router)# network 10.1.1.0
R(config-router)# network 10.2.2.0
R(config-router)# network 10.3.3.0
```

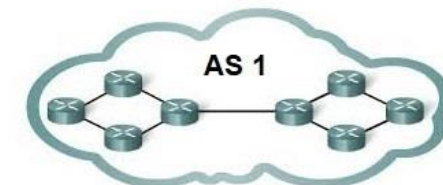


## - EIGRP

### - Key points

- **EIGRP** : Enhanced Interior Gateway Routing Protocol
- Eigrp can only configured on Cisco hardware
- The Previous version is **IGRP** ( No longer supported )
- Advanced Distance-Vector routing protocol
- Communicate if they are in **same Autonomous System**
- Administrative Distance (**90**) in local (**AS**)
- Updates are sent when there is **change** in the Route
- **DUAL** ( Diffusing Update Algorithm) used to determine the Best path and Backup path
- **DUAL** Use by default **Bandwidth** and **delay**

Eigrp
VLSM
224 hop
Multicast
224.0.0.10
Authentication (MD5)
RTP to send Packets



## - EIGRP

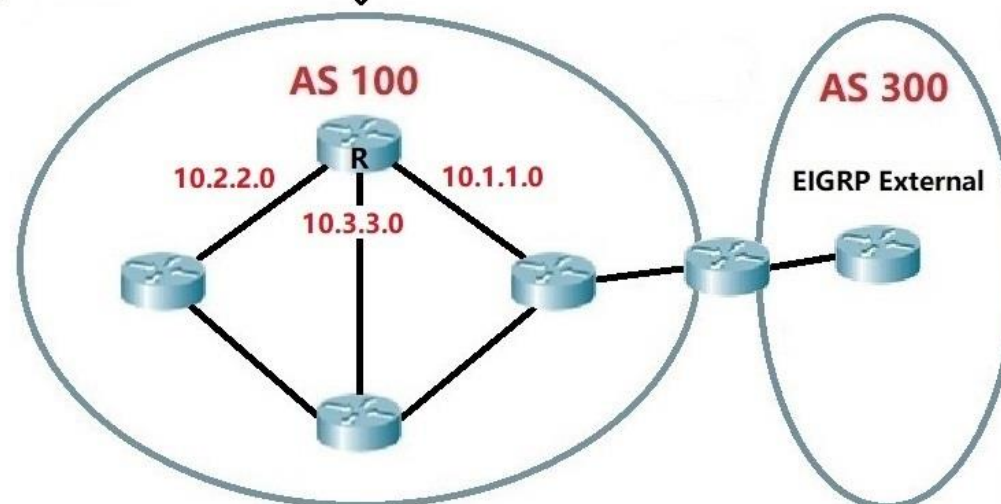
### - Autonomous system ( AS )

- **Autonomous System** is a group of networks under single administrative control
- Maximum in **AS** is **224 hop** ( default is **100 Router** )
- Eigrp use Autonomous system as a process ID ( it is actually not real **AS number** )
- Eigrp Neighbors must use the same **AS number**

Routing Protocol	Codes	Administrative Distance ( AD )
EIGRP Summary	D	5
EIGRP internal	D	90
EIGRP External	D EX	170

100 is ASN ( can be from 1 to 65535 )

```
R(config)# router eigrp 100
R(config-router)# network 10.1.1.0
R(config-router)# network 10.2.2.0
R(config-router)# network 10.3.3.0
```



## - EIGRP

### - EIGRP Packet Types

**Hello** : To identify neighbors ,and To be a neighbor must be :

- Same autonomous system
- Same K-values

\* **Hello Timer** : Sent every 5s , its means neighbor is available

\* **HoldDown Timer** : wait 3 times of hello timer ( 15s) before considering that neighbor unavailable

**Update** : To advertise routes when a router discovers a new neighbor or routing table change

**Ack** : Acknowledges is Hello packet without data  
Confirm receipt of Update, Query and Reply

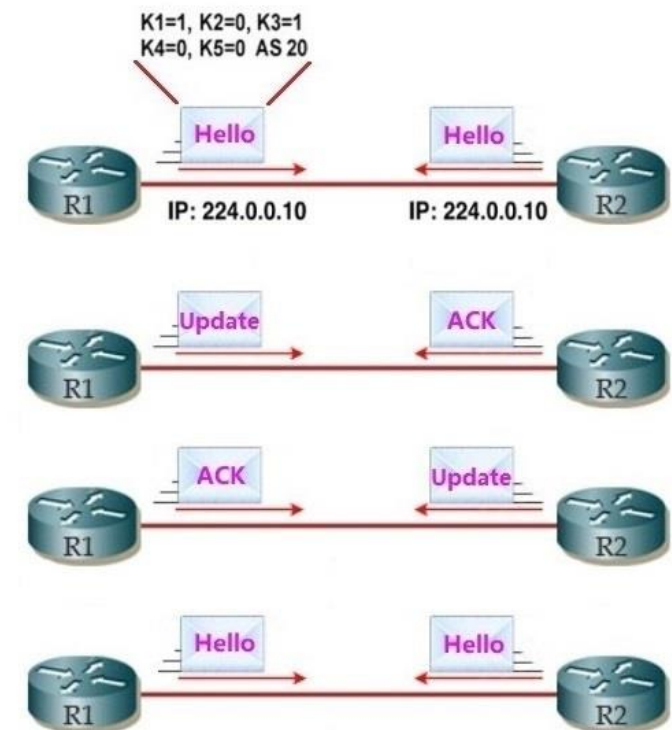
**Query** : Used to find alternate paths when EIGRP loses a network and doesnot have any backup paths

**Reply** : Sent in response to query packets

### - Update

-**Periodic** : Send Hello every 5s to check the neighbor

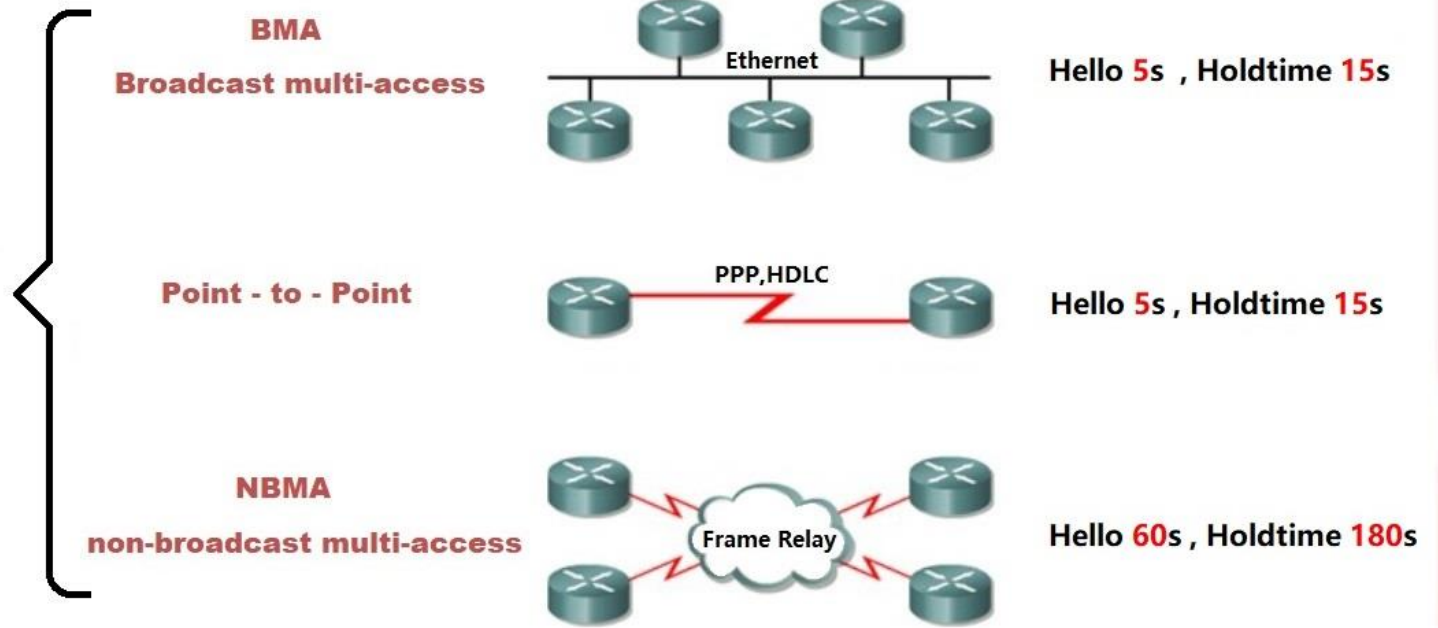
-**Triggered** : Send the change in the table , immediately



# - EIGRP

## - EIGRP Networks Types

**3** type of networks



## - EIGRP

### - Eigrp Successors & Feasible successors

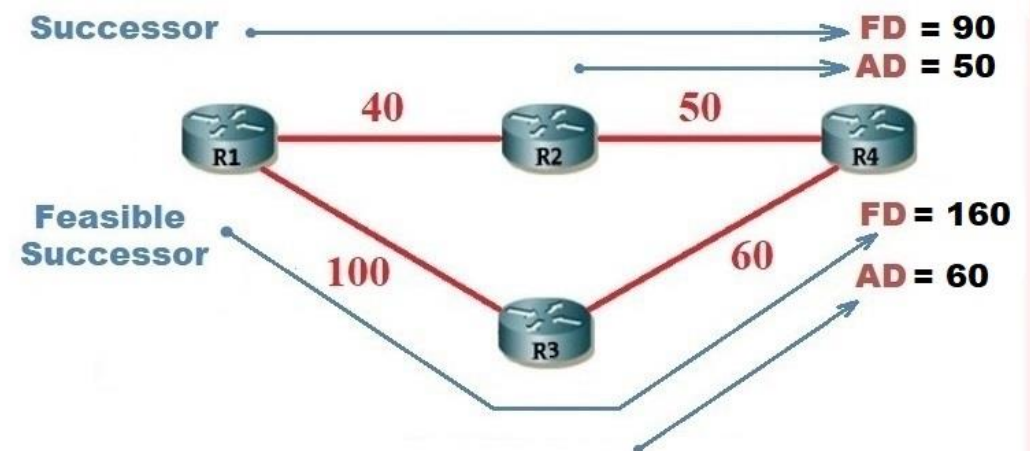
- \* **Successor** : The Best path
- \* **Feasible Successor** : The Backup path

( **FD** , **AD** )

- Feasible distance ( FD ) :**  
Cost from router to the network
- Advertised distance ( AD ) :**  
Cost from neighbor to the network

#### Condition :

- To be **successor** ( **FD** of successor is the **lowest** )
- To be **feasible successor** ( **AD** of feasible successor  $<$  **FD** of successor )



#### R1# show ip eigrp Topology

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

P 30.0.0.0/24, 1 successors, is 30720  
via 20.0.0.2 (30720/28160), FastEthernet0/1

**FD** **AD**

# - EIGRP

## - EIGRP Metric Calculation

**IF K5 > 0**

$$\text{Metric} = 256 \times \left( \frac{K1 \times 10M}{S \text{ BW}} + \frac{K2 \times \text{BW}}{256 - \text{LOAD}} + \frac{K3 \times \text{DLY}}{10} \right) \times \frac{1}{\text{REL} + K4} \times \frac{K5}{1}$$

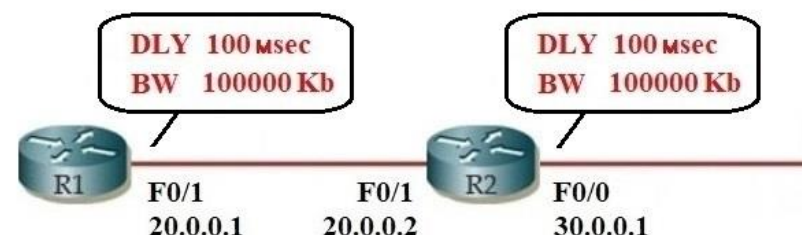
**IF K5 = 0 (Default)**

$$\text{Metric} = 256 \times \left( \frac{K1 \times 10M}{S \text{ BW}} + \frac{K2 \times \text{BW}}{256 - \text{LOAD}} + \frac{K3 \times \text{DLY}}{10} \right)$$

$$\text{Metric} = 256 \times \left( \frac{10,000,000}{\text{slowest BW}} + \frac{\text{sum DLY}}{10} \right)$$

$$\text{FD} = 256 \times [ 100 + 20 ] = 30720$$

$$\text{AD} = 256 \times [ 100 + 10 ] = 28160$$



### R1# show ip protocols

Routing Protocol is "eigrp 1"  
 Outgoing update filter list for all interfaces is not set  
 Incoming update filter list for all interfaces is not set

**EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0**

### R1# Show interface f0/1

FastEthernet0/1 is up, line protocol is up (connected)  
 Hardware is Lance, address is 00d0.580b.6402  
 Internet address is 20.0.0.1/24

MTU 1500 bytes, **BW 100000 Kbit**, **DLY 100 msec**,  
 reliability 255/255, txload 1/255, rxload 1/255

### R1# show ip eigrp Topology

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,  
 P 30.0.0.0/24, 1 successors, FD is **30720**  
 via 20.0.0.2 (30720/28160), FastEthernet0/1



## - EIGRP

### - EIGRP Tables



**-Neighbors table:** router which are directly connected and running EIGRP , and **HoldDown timer**

**-Topology table :** All possible routes for the destination learned from neighbors

**Successors**

**Feasible successors**

**FD** Feasible distance

**AD** Advertised distance

**-Routing table :** best routes from EIGRP topology table

**AD** Administrative Distance

**Met** Metric

**R1# show ip eigrp neighbors**

IP-EIGRP neighbors for process 1

H	Address	Interface	Hold	Uptime	SRTT	RTO	Q	Seq
0	20.0.0.2	Fa0/1	11s	02:21:30	40s	1000	0	7

3 hello

**R1# show ip eigrp Topology**

IP-EIGRP Topology Table for AS 1 / ID (20.0.0.1)

Codes : P - Passive, A - Active, U - Update, Q - Query, R - Reply

P 20.0.0.0/8, 1 successors, FD is 28160  
via Connected, FastEthernet0/1

P 30.0.0.0/8, 1 successors, FD is 30720  
**Successors** — via 20.0.0.2 (30720/28160), FastEthernet0/1

**Feasible successors** — via 40.0.0.2 (52000/28160), FastEthernet0/0

**FD**

**AD**

**R1# show ip route**

Codes : C - connected, S - static, R - RIP, D - EIGRP, O - OSPF

C 20.0.0.0/8 is directly connected, FastEthernet0/1

D 30.0.0.0/8 [90/30720] via 20.0.0.2, 02:13:59 , FastEthernet0/1

**AD** **Met**

## - Summarization

### - Advantage

- Make routing table small
- Reduce Processor workload
- Reduce memory usage

### - 2 Type :

#### - Auto-Summarization :

- \* Return the mask in to the default Class
- \* The default routing in RIP and EIGRP
- \* Canceled in RIP and EIGRP by command

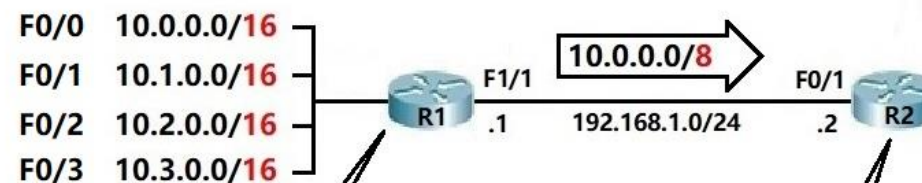
```
R1(config)# router Eigrp 1
R1(config-router)# no auto-summary
```

#### - Manual Summarization :

- \* Used in OSPF and IS-IS
- \* Done in OSPF by command

```
R1(config)# router OSPF 1
R1(config-router)# area 1 range x.x.x.x x.x.x.x
```

### Default Auto-summary



```
R2# show ip route
Codes: C - connected, S - static, R - RIP, D - EIGRP
D 10.0.0.0/8 [90/30720] via 192.168.1.1, 00:21:41, F0/1
```

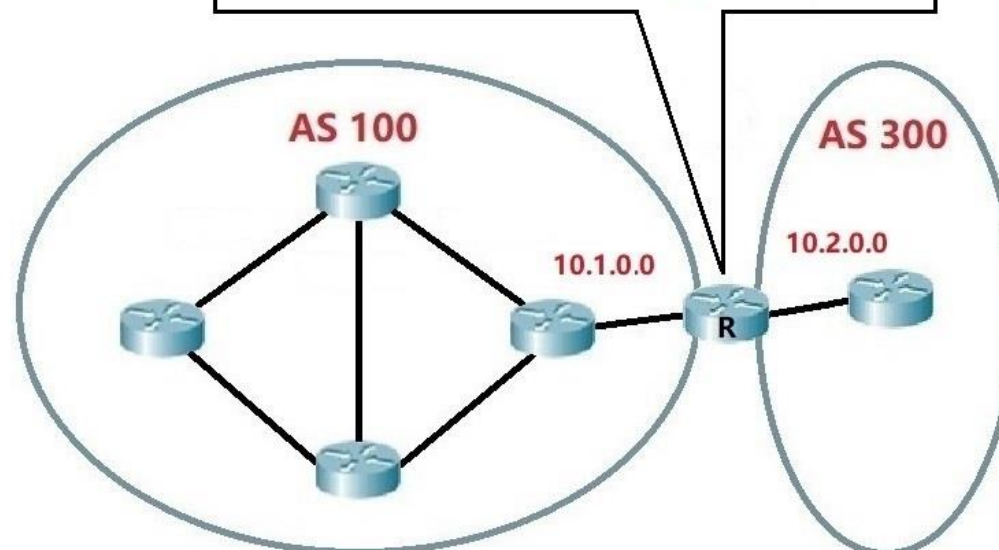
```
R1# show ip route
Codes: C - connected, S - static, R - RIP, D - EIGRP
D 10.0.0.0/8 is a summary, 00:21:14, Null0
C 10.0.0.0/16 is directly connected, FastEthernet0/0
C 10.1.0.0/16 is directly connected, FastEthernet0/1
C 10.2.0.0/16 is directly connected, FastEthernet0/2
C 10.3.0.0/16 is directly connected, FastEthernet0/3
C 192.168.1.0/24 is directly connected, FastEthernet1/1
```

Virtual interface

## - Summarization

- Use command **redistribute** to connect :
  - Two Autonomous System
  - Two different Routing Protocols

```
R(config)# router eigrp 100
R(config-router)# network 10.1.0.0 0.0.255.255
R(config-router)# redistribute eigrp 300
R(config)# router eigrp 300
R(config-router)# network 10.2.0.0 0.0.255.255
R(config-router)# redistribute eigrp 100
```



## - Load Balancing

### - load balancing

The capability of a router to distribute traffic over all router network port

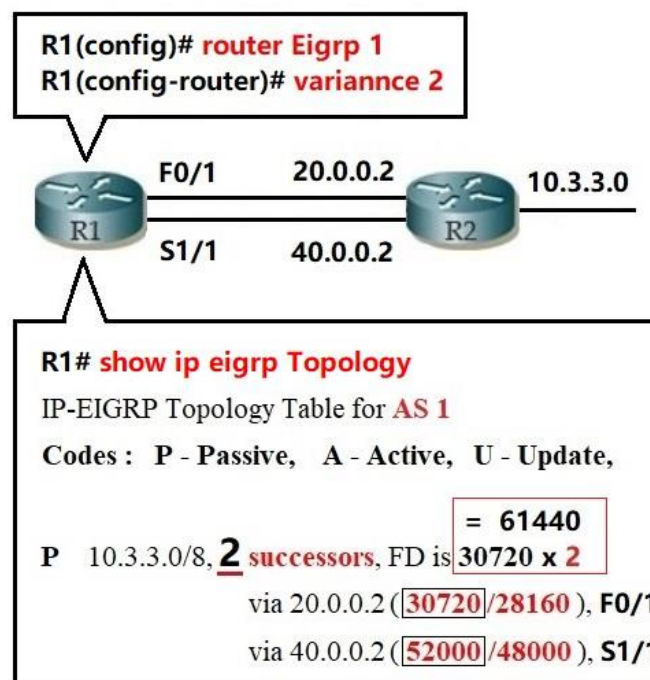
### - 2 Type

#### \* equal cost path

- Eigrp automatically use load balancing across equal cost
- By Default up to 4 links , it can be 6 link by command

#### \* unequal cost path

- Eigrp use command to load balancing across unequal cost
- The **FD** of the Successors is multiplied by **the variance No** and Any **FD** of Feasible successors is **lower** will add for load balancing



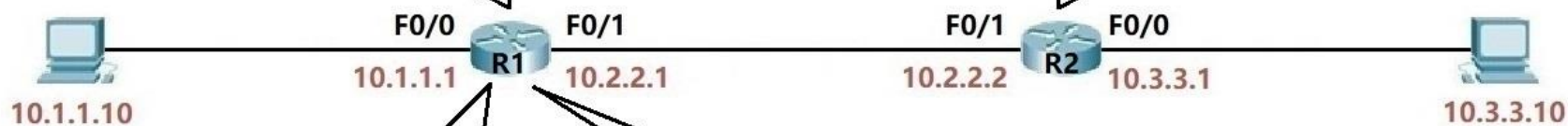
# - EIGRP

```
R1(config)# router Eigrp 1
R1(config-router)# network 10.1.1.0
R1(config-router)# network 10.2.2.0

R1(config-router)# no auto-summary
R1(config-router)# passive-interface f0/0
```

```
R2(config)# router Eigrp 1
R2(config-router)# network 10.3.3.0
R2(config-router)# network 10.2.2.0

R2(config-router)# no auto-summary
R2(config-router)# passive-interface f0/0
```



```
R1# show ip protocols
Routing Protocol is "eigrp 1 "
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
EIGRP Maximum metric variance 2

R1# show ip eigrp neighbors
IP-EIGRP neighbors for process 1
H Address Interface Hold Uptime SRTT RTO
0 10.2.2.2 Fa0/1 11s 02:21:30 40s 1000

R1(config)# interface f0/1
R1(config-if)# ip hello-interval eigrp 1 3
```

```
R1# show ip route
Codes : C - connected, S - static, R - RIP, D - EIGRP
C 10.1.1.0/8 is directly connected, FastEthernet0/0
C 10.2.2.0/8 is directly connected, FastEthernet0/1
D 10.3.3.0/8 [90/30720] via 10.2.2.2, 02:13:59 , F0/1

R1# show ip eigrp topology
IP-EIGRP Topology Table for AS 1 / ID (10.1.1.1)
P 10.1.1.0/8, 1 successors, FD is 28160
via Connected, F0/0
P 10.2.2.0/8, 1 successors, FD is 28160
via Connected, F0/1
P 10.3.3.0/8, 1 successors, FD is 30720
via 10.2.2.2 (30720/28160), F0/1
```

```
R1# debug ip eigrp summary
R1# debug eigrp packets
R1# no debug all

R1(config)# router Eigrp 1
R1(config-router)# variancne 2
```

# - EIGRP

## - Internet

R1# show ip route

Codes: C-connected, S-static, R-RIP, D-EIGRP, EX-EIGRP external

```
C 10.1.1.0/24 is directly connected, F0/0
C 10.2.2.0/24 is directly connected, F0/1
D 10.3.3.0/24 [90/30720] via 10.2.2.2, 00:00:03, F0/1
D*EX 0.0.0.0/0 [170/1308160] via 10.2.2.2, 00:00:15, F0/1
```

R2(config)# IP route 0.0.0.0 0.0.0.0 F0/2

```
R2(config)# router Eigrp 1
R2(config-router)# network 10.2.2.0
R2(config-router)# network 10.3.3.0
R2(config-router)# redistribute static
```

