EIGRP

Course Code: CSC 3116 Course Title: Computer Networks

Dept. of Computer Science
Faculty of Science and Technology

Lecturer No:	Lab 7	**Week No:**	7	**Semester:**	Summer 2020-21
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Lecture Outline

1. Introduction
2. Metric
3. Neighbor Discovery
4. EIGRP Tables
5. EIGRP Configuration

Introduction

RIP-vs_EIGRP

	RIP	EIGRP
1	It support maximum 15 routers in the network. 16 router is unreachable.	It supports maximum 255 routers in the network. However, the default is 100 routers. (highly scalable)
2	Slow convergence	Fast convergence due to feasible successor
3	In RIP routing protocol, we cannot create a separate administrative boundary in the network.	In EIGRP routing protocol we can create a separate administrative boundary in the network with the help of autonomous system No. Less routing Table exchange is required.
4	It calculates the metric In terms of Hop Count from source network to destination network.	It calculates the metric In terms of bandwidth and delay (default).
5	RIP works on Bellman Ford algorithm.	EIGRP works on DUAL(Diffusing Update Algorithm) Algorithm.
6	It only maintains the best route to each destination.	It maintains the best route and some other alternative routes for each destination.
7	It is basically use for smaller size organization.	It is basically use for medium to lager size organization in the network [1].

Metric

- Combination of different factors
  - Bandwidth
  - Delay
  - Load
  - Reliability

Default

Metric….

Bandwidth

- No. of bits that can be sent over a link (kbps)
- Depends on interface type
- Use *bandwidth* *<1-10,000,000>* command to set bandwidth in kbps
- This is not real bandwidth; real bandwidth depends on clock rate
- The *bandwidth* command only influence route selection by routing protocol
- If no bandwidth is set, the default bandwidth of an interface is considered
- Calculated as the lowest bandwidth among all links in a route

Metric....

Table II Default bandwidth and delay

Interface	*Bandwdith*	*Delay (microseconds)*
Serial (T1)	1544 Kbps	20,000
Ethernet	10 Mbps	1000
Fast Ethernet	100 Mbps	100
Gigbit Ethernet	1000 Mbps	10
10 Gigbit Ethernet	10 Gbps	10

Metric….

Delay

- *Delay* is a measure of the time for a packet to reach its destination over a route (In theory)
- In practice, it is a constant set by the network engineer
- To set delay for an interface, use *delay* <value> command
- The value can be anything between 10 to 167,772,140 microseconds
- If it is not set, the default value (Table II) of each interface comes into effect
- Calculated as sum of delays in exit interfaces of all routers in a route.

Metric....

Metric calculation

$$Metric = \left[\frac{10^7}{least\ bandwidth} + delay_{total}\right] \times 256$$

Units

Bandwidth: kbps

Delay: tens of microsecond If the total delay is 30 seconds,

$delay_{total}$=30/10=3

Metric....

Metric calculation

$$Metric = \left[\frac{10^7}{least\ bandwidth} + delay_{total}\right] \times 256$$

Route: 1-4-2-B

$Least\ BW = 56\ kbps$

$Total\ delay = 100/10 + 100/10 + 2000/10 = 220$

$Metric = \left[\frac{10^7}{56} + 220\right] \times 256 = 45770496^*$

Route: 1-3-2-B

$Least\ BW = 128\ kbps$

$Total\ delay = 100/10 + 100/10 + 1000/10 = 120$

$Metric = \left[\frac{10^7}{128} + 120\right] \times 256 = 20030720$

Perform rounding in every steps of calculation

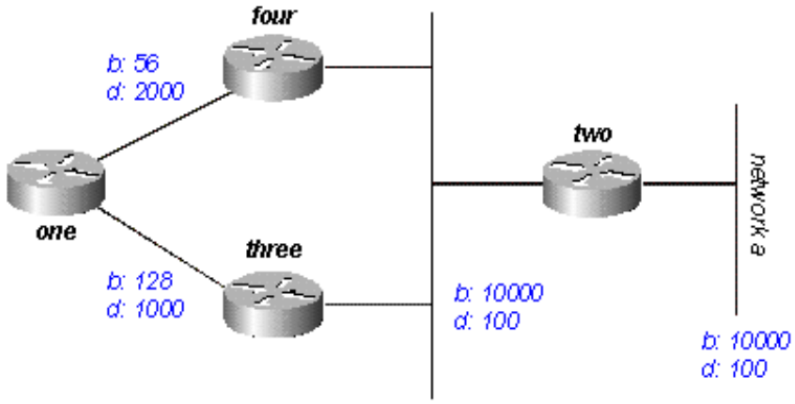


Fig. 1 A sample network [2]

Homework

Calculate metric for all possible routes from router ONE to network A

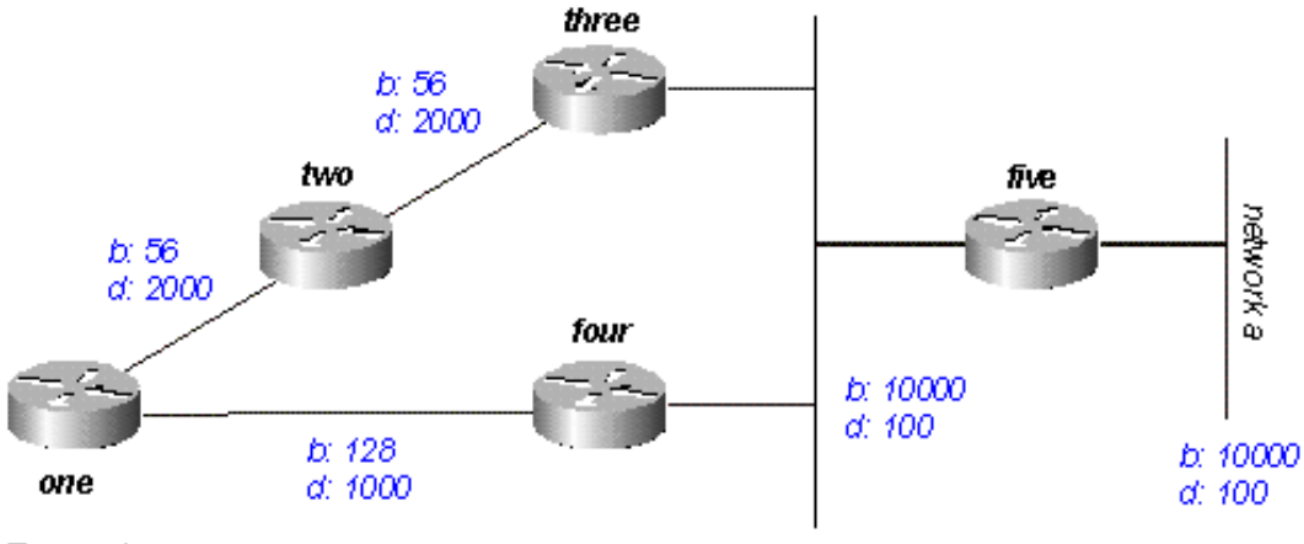


Fig. 2 A sample network [2]

Neighbor discovery

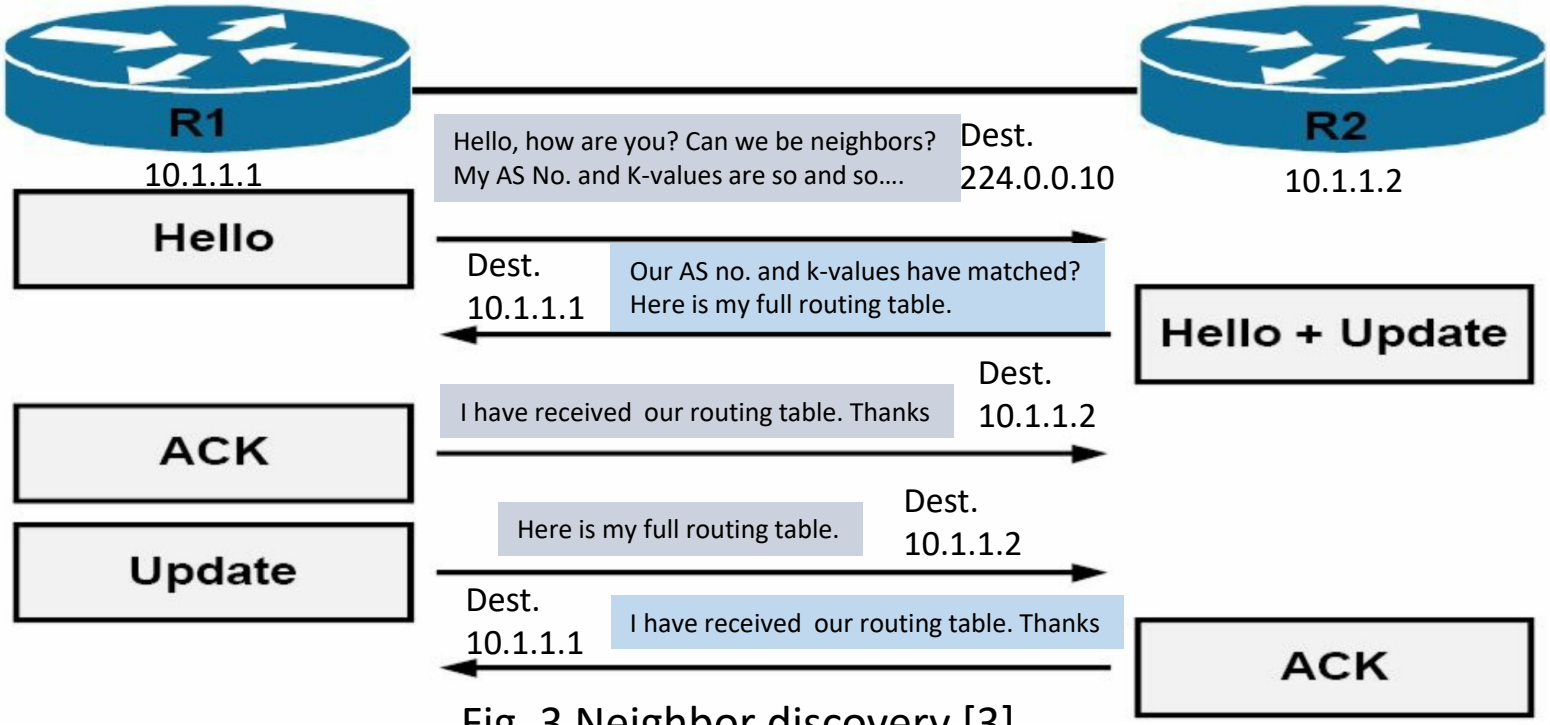


Fig. 3 Neighbor discovery [3]

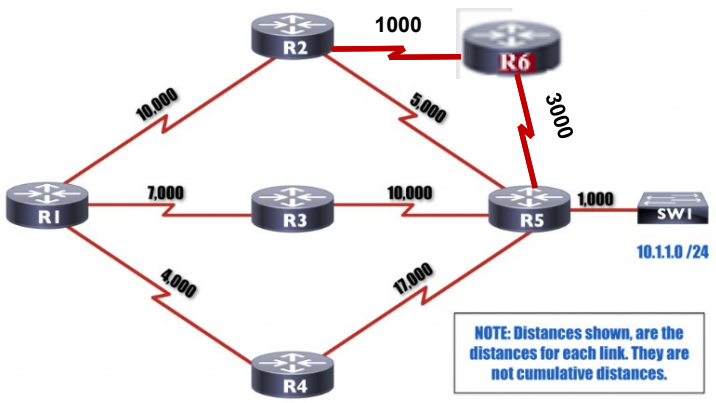
Neighbor maintenance

- In neighbor discovery process, full routing table is sent
- Otherwise, only the change in routing table is sent
- After a neighbor discovery, the Hello packet is sent in every 5 second

  to know if the neighbor is still alive
- If a router does not receive any Hello packet from a neighbor within 15 seconds (called hold time), the neighbor is considered dead.
- For low-bandwidth link (e.g., T1), the periods are 60 sec and 180 sec.

EIGRP Tables….

Feasibility condition: reported distance must be less than the feasible distance through the successor



Neighbor	Reported Distance (RD)	Feasible Distance (FD)
R2	6,000	16,000
R3	11,000	18,000
R4	18,000	22,000

Reported distance:
Distance advertised from neighbor as the distance between the Neighbor and the destination.

Feasible distance (FD):
Sum of Reported distance and distance between the router and the neighbor which reports the distance.

A feasible successor is the route whose reported distance is less than the feasible distance of the best path.

EIGRP Tables

- Neighbor Table

  EIGRP shares routing information only with neighbors. To know who the neighbors are, it uses neighbor table. When a new neighbor is discovered, EIGRP would add its address and interface on which neighbor is connected in neighbor table [4].

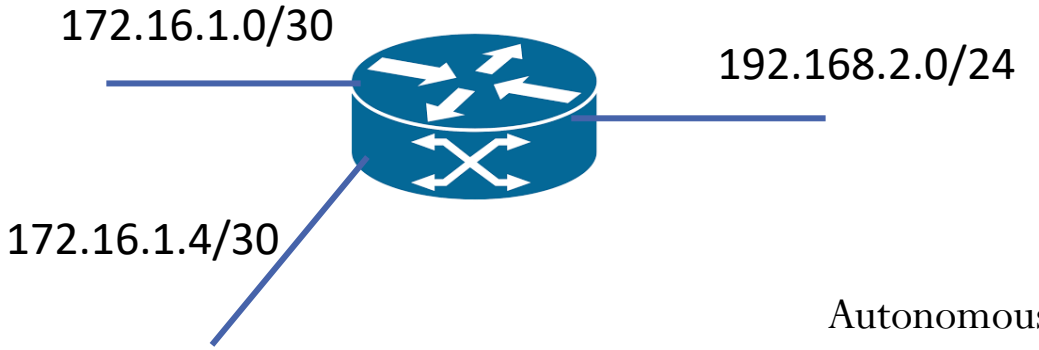
- Topology Table

  Stores all feasible successors along with the successor (best route) for each destination network. EIGRP can store up to 32 feasible successors.

- Routing Table

  EIGRP stores single best route for each destination in this table. Router uses this table to forward the packet.

EIGRP Configuration



Autonomous system no.

RIP v2

R1(config)# router rip
R1(config-router)# version 2
R1(config-router)#network 172.16.1.0
R1(config-router)#network 172.16.1.4
R1(config-router)#network 192.168.2.0
R1(config-router)#no auto-summary

EIGRP

R1(config)# router eigrp <1 -65535>
R1(config-router)#network 172.16.1.0 255.255.255.252
R1(config-router)#network 172.16.1.4 255.255.255.252
R1(config-router)#network 192.168.2.0 255.255.255.0
R1(config-router)#no auto-summary

EIGRP Configuration….

- To show protocol properties
  show ip protocols
- To show neighbor table
  show ip eigrp neighbor
- To show topology table
  show ip eigrp topology

- To show routes made by eigrp
  show ip route eigrp
- To set maximum hops
  metric maximum-hops <1-255>
- To set the number of feasible successors
  maximum-paths <0-32>

References

[1] Computer Networking Class, https://computernetworkingclass.blogspot.com... /2016/08/comparison-between-rip-eigrp-igrp-and.html, [Accessed: April. 27, 2020].

[2] Cisco, "https://www.cisco.com/c/en/us/support/docs/ip/enhanced-interior... -gateway-routing-protocol-eigrp/16406-eigrp-toc.html, [Accessed: April. 27, 2020].

[3] P. Browning, F. Tafa, D. Gheorghe, and D. Barinic, *Cisco CCNA in 60 Days*, Reality Press Ltd., UK, 2014, pp. 581

[4] Computer Networking Notes, https://www.computernetworkingnotes.com/ccna... -study-guide/eigrp-tutorial-basic-concept-explained.html, [Accessed: April. 27, 2020].

Recommended Books

1. **Official Cert Guide CCNA 200-301 , vol. 1**, *W. Odom*, Cisco Press, First Edition, 2019, USA.
2. **CCNA Routing and Switching**, *T. Lammle*, John Wily & Sons, Second Edition, 2016, USA.