PES UNIVERSITY

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100-ft Ring Road, Bengaluru – 560 085, Karnataka, India

UE21EC351A – COMPUTER COMMUNICATION NETWORK

Mini Project report on:

EIGRP(ENHANCED INTERIOR GATEWAY PROTOCOL) CONFIGURATION

Submitted by :

PES1UG21EC112 Hemant Chandrashekhar wade

Guided By: Dr.Rajashekahr

Sem: 5

Section: 'B'

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROGRAM - B.TECH

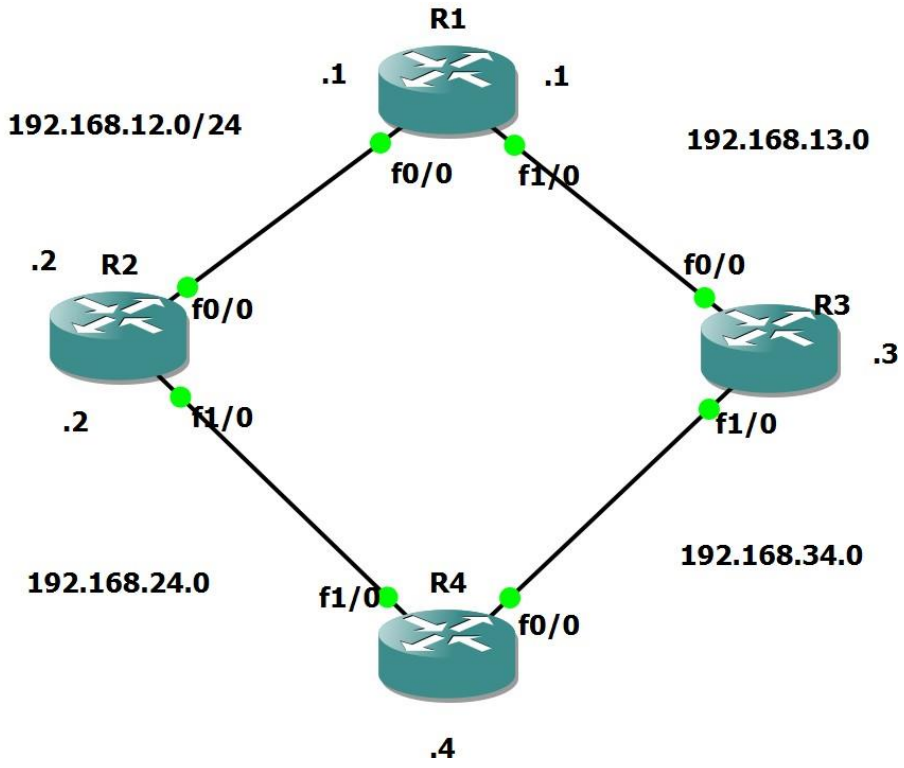
INTRODUCTION:

In this GNS3 project, we implemented Enhanced Interior Gateway Routing Protocol (EIGRP), a Cisco proprietary routing protocol designed for rapid convergence and efficient bandwidth utilization. EIGRP operates within an Autonomous System (AS), where routers share routing information. Neighbor relationships are established through Hello packets, and a composite metric, considering bandwidth, delay, load, and reliability, is used for route calculation. EIGRP's routing table is maintained by the Diffusing Update Algorithm (DUAL), ensuring loop-free routes. The concept of a feasible successor provides route redundancy. To configure EIGRP in GNS3, use commands like `router eigrp [AS_NUMBER]` and `network [NETWORK_ADDRESS]`. Verification and troubleshooting can be done using commands like `show ip eigrp neighbors` and `debug eigrp packets`. EIGRP's strengths lie in its speed of convergence and support for both IPv4 and IPv6, making it a robust choice for dynamic routing in Cisco environments.

In the vast world of networking, EIGRP stands out like a superhero cape. Compared to its routing protocol cousins, EIGRP has a few tricks up its sleeve. Unlike traditional protocols, EIGRP doesn't flood the network with constant updates; it's more like a smart whisperer, only sharing the changes when something significant happens. This not only keeps the network chatter to a minimum but also saves precious bandwidth. Another cool feature is its ability to quickly adapt to changes. Picture it as a superhero changing its course on the fly to avoid traffic jams. This adaptability, along with its seamless integration with both IPv4 and IPv6, makes EIGRP a standout choice for Cisco-based networks. So, if you want a routing protocol that's efficient, nimble, and works seamlessly with Cisco gear, EIGRP is your networking superhero!

ROUTER SETUP:

EIGRP



ROUTER CONFIGURATION R1:-

```
*Nov 17 15:15:18.547: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/1, changed state to down
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int fo/0
               ^
% Invalid input detected at '^' marker.

R1(config)#int f0/0
R1(config-if)#ip add 192.168.12.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Nov 17 15:16:46.667: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R1(config-if)#
*Nov 17 15:16:46.667: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Nov 17 15:16:47.667: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#int f1/0
R1(config-if)#ip add 192.168.13.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#exit
R1(config)#
*Nov 17 15:18:58.263: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R1(config)#
*Nov 17 15:18:58.263: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Nov 17 15:18:59.263: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R1(config)#exit
R1#
*Nov 17 15:19:05.683: %SYS-5-CONFIG_I: Configured from console by console
R1#sh ip int br
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            192.168.12.1    YES manual up                    up
FastEthernet1/0            192.168.13.1    YES manual up                    up
FastEthernet1/1            unassigned      YES unset  administratively down down
```

EIGRP CONFIGURING R1:-

```
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router eigrp 1
R1(config-router)#network 192.168.12.0
R1(config-router)#network 192.168.13.0
R1(config-router)#no auto summary
                          ^
% Invalid input detected at '^' marker.

R1(config-router)#no auto summarry
                          ^
% Invalid input detected at '^' marker.

R1(config-router)#no auto-summary
R1(config-router)#sh ip protocols
                  ^
% Invalid input detected at '^' marker.

R1(config-router)#s
% Ambiguous command:  "s"
R1(config)#show ip  protocols
             ^
% Invalid input detected at '^' marker.

R1(config)#exit
R1#
```

R2:-

```
  Distance: internal 90 external 170

R1#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

C    192.168.12.0/24 is directly connected, FastEthernet0/0
C    192.168.13.0/24 is directly connected, FastEthernet1/0
R1#`
```

```
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int f0/0
R2(config-if)#ip address 192.168.12.2. 255.255.255.0
                                     ^
% Invalid input detected at '^' marker.

R2(config-if)#ip address 192.168.12.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Nov 17 15:59:51.007: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R2(config-if)#
*Nov 17 15:59:51.007: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Nov 17 15:59:52.007: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config-if)#int f1/0
R2(config-if)#ip add 192.168.24.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Nov 17 16:00:27.495: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R2(config-if)#e
*Nov 17 16:00:27.495: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Nov 17 16:00:28.495: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R2(config-if)#exit
R2(config)#exit
R2#
*Nov 17 16:00:33.051: %SYS-5-CONFIG_I: Configured from console by console
R2#sh ip int br
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            192.168.12.2    YES manual up                    up
FastEthernet1/0            192.168.24.2    YES manual up                    up
FastEthernet1/1            unassigned      YES unset  administratively down down
R2#config t
```

EIGRP R2:-

```
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router eigrp 1
R2(config-router)#network 192.168.12.0
R2(config-router)#n
*Nov 17 16:01:28.531: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 192.168.12.1 (FastEthernet0/0) is up: new adjacency
R2(config-router)#network 192.168.24.0
R2(config-router)#no auto-summary
R2(config-router)#
*Nov 17 16:02:12.255: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 192.168.12.1 (FastEthernet0/0) is resync: summary configured
R2(config-router)#exit
R2(config)#exit
R2#sho
*Nov 17 16:02:21.827: %SYS-5-CONFIG_I: Configured from console by console
R2#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

C    192.168.12.0/24 is directly connected, FastEthernet0/0
D    192.168.13.0/24 [90/30720] via 192.168.12.1, 00:00:59, FastEthernet0/0
C    192.168.24.0/24 is directly connected, FastEthernet1/0
R2#
*Nov 17 16:58:15.887: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 192.168.24.4 (FastEthernet1/0) is up: new adjacency
R2#
*Nov 17 16:58:27.683: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 192.168.24.4 (FastEthernet1/0) is resync: peer graceful-restart
R2#
```

R3:-

```
R3#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#int f0/0
R3(config-if)#ip add 192.168.13.3 255.255.255.0
R3(config-if)#no sh
R3(config-if)#int f1/0
R3(config-if)#ip add 192.168.34.3 255.255.255.0
R3(config-if)#no sh
R3(config-if)#exit
R3(config)#exit
R3#
*Nov 17 16:32:34.215: %SYS-5-CONFIG_I: Configured from console by console
R3#sh ip int br
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            192.168.13.3    YES manual up                    up
FastEthernet1/0            192.168.34.3    YES manual up                    up
FastEthernet1/1            unassigned      YES unset  administratively down down
R3#config t
```

EIGRP R3:-

```
R3#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router eigrp 1
R3(config-router)#network 192.168.13.0
R3(config-router)#network 192.168.34.0
R3(config-router)#no auto-summary
R3(config-router)#exit
R3(config)#exit
R3#
*Nov 17 16:34:11.267: %SYS-5-CONFIG_I: Configured from console by console
R3#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

D    192.168.12.0/24 [90/30720] via 192.168.13.1, 00:06:02, FastEthernet0/0
C    192.168.13.0/24 is directly connected, FastEthernet0/0
D    192.168.24.0/24 [90/33280] via 192.168.13.1, 00:06:02, FastEthernet0/0
C    192.168.34.0/24 is directly connected, FastEthernet1/0
R3#
*Nov 17 16:58:01.407: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 192.168.34.4 (FastEthernet1/0) is up: new adjacency
R3#
*Nov 17 16:58:27.663: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 192.168.34.4 (FastEthernet1/0) is resync: peer graceful-restart
R3#
```

R4:-

```
R4#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#int f0/0
R4(config-if)#ip add 192.168.34.4 255.255.255.0
R4(config-if)#no sh
R4(config-if)#int f1/0
R4(config-if)#ip add 192.168.24.4 255.255.255.0
R4(config-if)#no sh
R4(config-if)#exit
R4(config)#exit
R4#
*Nov 17 16:55:08.663: %SYS-5-CONFIG_I: Configured from console by console
R4#sh ip int br
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            192.168.34.4    YES manual up                    up
FastEthernet1/0            192.168.24.4    YES manual up                    up
FastEthernet1/1            unassigned      YES unset  administratively down down
```

EIGRP R4:-

```
R4#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#router eigrp 1
R4(config-router)#network 192.168.34.0
R4(config-router)#ney
*Nov 17 16:58:02.011: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 192.168.34.3 (FastEthernet0/0) is up: new adjacency
R4(config-router)#network 192.168.24.0
R4(config-router)#
*Nov 17 16:58:16.495: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 192.168.24.2 (FastEthernet1/0) is up: new adjacency
R4(config-router)#no auto-summary
R4(config-router)#
*Nov 17 16:58:28.219: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 192.168.34.3 (FastEthernet0/0) is resync: summary configured
*Nov 17 16:58:28.219: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 192.168.24.2 (FastEthernet1/0) is resync: summary configured
R4(config-router)#exit
R4(config)#exit
R4#s
*Nov 17 16:58:36.807: %SYS-5-CONFIG_I: Configured from console by console
R4#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

D    192.168.12.0/24 [90/30720] via 192.168.24.2, 00:00:26, FastEthernet1/0
D    192.168.13.0/24 [90/30720] via 192.168.34.3, 00:00:26, FastEthernet0/0
C    192.168.24.0/24 is directly connected, FastEthernet1/0
C    192.168.34.0/24 is directly connected, FastEthernet0/0
```

PING:-

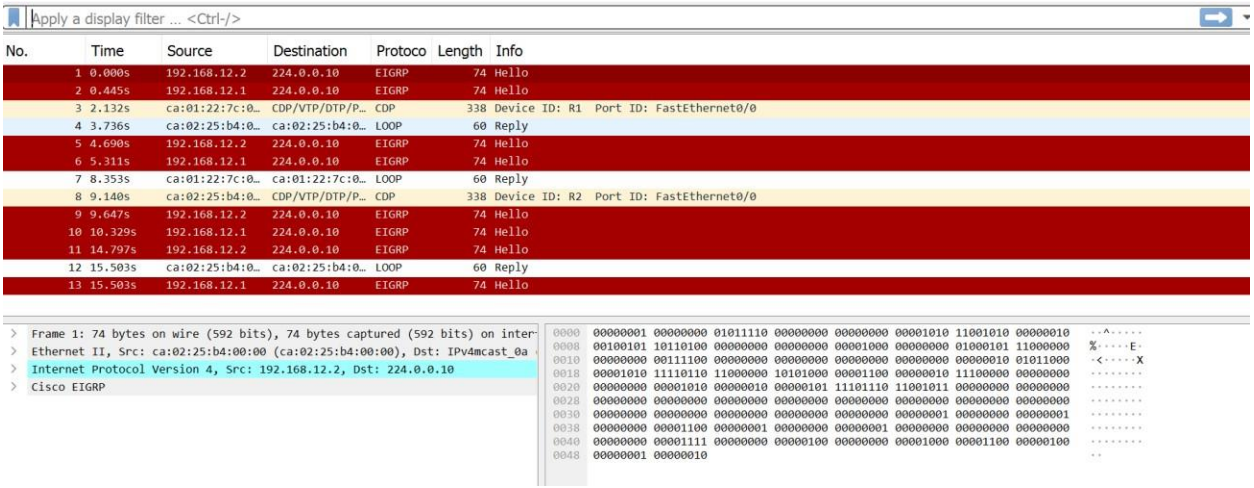
FROM R4 TO R1

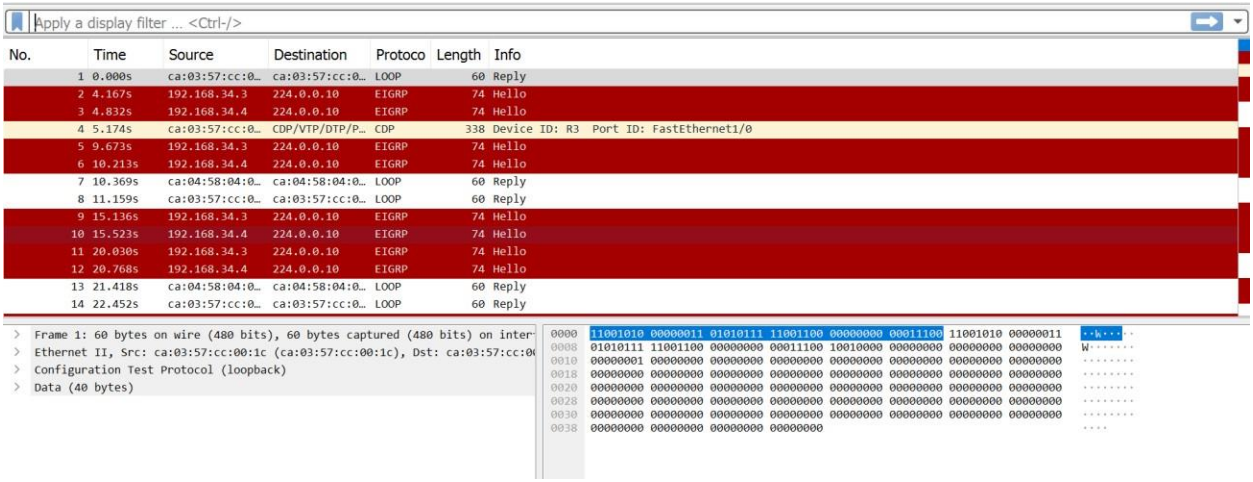
```
R4#ping 192.168.12.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.12.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/64/80 ms
R4#
```

FROM R1 TO R4

```
R1#ping 192.168.24.4

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.24.4, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 56/68/80 ms
R1#
```

WIRESHARK PACKET CAPTURE:





ADVANTAGES OF EIGRP :

- **increases availability through faster convergence, helping to avoid disruptions in the event of a link outage;**
- **improves voice and video quality by avoiding routing loops and supporting almost immediate convergence;**
- **simplifies operations and lowers costs because administrators don't need to manually update the routing design to accommodate changes;**

SUMMARY:

In this GNS3 project, we configured EIGRP across a network of four routers. Using the `router eigrp <ASN>` and `network <network-address>` commands, assigned Autonomous System Numbers (ASN) and activated EIGRP on specific interfaces. Wireshark analysis revealed EIGRP Hello packets, vital for neighbor discovery, transmitted to multicast addresses 224.0.0.10 (IPv4) or FF02::A (IPv6).

Neighbor relationships form based on Hello packet exchanges, sharing routing and topology information. EIGRP metrics consider bandwidth, delay, reliability, load, and MTU. The Feasibility Condition ensures loop-free routing. DUAL algorithm optimizes path calculation and maintains routing tables.

EIGRP supports unequal-cost load balancing, authentication, stub routing, and route summarization for efficiency.