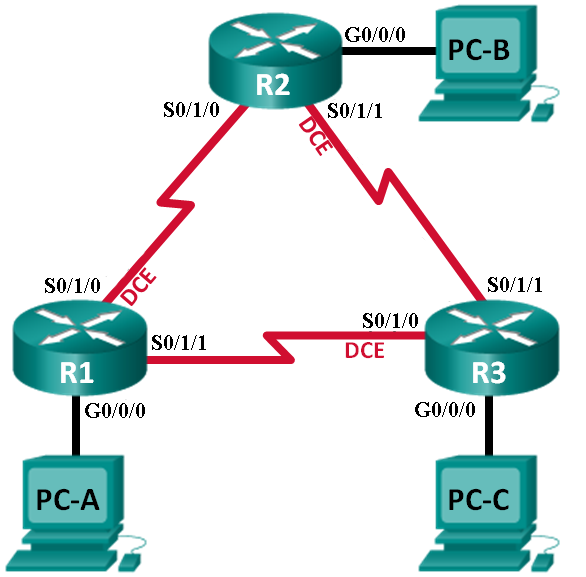
EE3315 Lab 2 – 6.2.2.5 Configuring Basic EIGRP for IPv4

* Sem B 2021/2022 PT

1. Topology



1. Addressing Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device | Interface | IP Address | Subnet Mask | Default Gateway |
| R1 | G0/0/0 | 192.168.11.1 | 255.255.255.0 | N/A |
|  | S0/1/0 (DCE) | 10.1.1.1 | 255.255.255.252 | N/A |
|  | S0/1/1 | 10.3.3.1 | 255.255.255.252 | N/A |
| R2 | G0/0/0 | 192.168.12.1 | 255.255.255.0 | N/A |
|  | S0/1/0 | 10.1.1.2 | 255.255.255.252 | N/A |
|  | S0/1/1 (DCE) | 10.2.2.2 | 255.255.255.252 | N/A |
| R3 | G0/0/0 | 192.168.13.1 | 255.255.255.0 | N/A |
|  | S0/1/0 (DCE) | 10.3.3.2 | 255.255.255.252 | N/A |
|  | S0/1/1 | 10.2.2.1 | 255.255.255.252 | N/A |
| PC-A | NIC | 192.168.11.3 | 255.255.255.0 | 192.168.11.1 |
| PC-B | NIC | 192.168.12.3 | 255.255.255.0 | 192.168.12.1 |
| PC-C | NIC | 192.168.13.3 | 255.255.255.0 | 192.168.13.1 |

1. Objectives

Part 1: Build the Network and Verify Connectivity

Part 2: Configure EIGRP Routing

Part 3: Verify EIGRP Routing

Part 4: Configure Bandwidth and Passive Interfaces

1. Background / Scenario

Enhanced Interior Gateway Routing Protocol (EIGRP) is a powerful distance vector routing protocol and is relatively easy to configure for basic networks.

In this lab, you will configure EIGRP for the topology and networks shown above. You will modify bandwidth and configure passive interfaces to allow EIGRP to function more efficiently.

1. Required Resources

* 3 Routers (Cisco ISR4321)
* 3 PCs (Windows 10)
* Console cables to configure the Cisco IOS devices via the console ports
* Ethernet and serial cables as shown in the topology

1. Build the Network and Verify Connectivity

In Part 1, you will set up the network topology and configure basic settings, such as the interface IP addresses, device access, and passwords.

* 1. Use the template file: lab2\_EIGRP\_template.pkt and cable the network as shown in the topology. The video file EE3315\_lab2.mp4 is for reference only. Please follow the lab sheet.
  2. Configure PC hosts.
  3. Configure basic settings for each router.
     1. Configure IP addresses for the routers, as listed in the Addressing Table.
     2. Configure device name as shown in the topology.
     3. Configure **logging synchronous** to prevent console messages from interrupting command entry. (optional)
     4. Check the default bandwidth of all the serial interface, the default value should be 1544 Kbit/sec. If not, set it to 1544 Kbit/sec.
     5. Copy the running configuration to the startup configuration.
  4. Verify connectivity.

The routers should be able to ping one another, and each PC should be able to ping its default gateway. The PCs will not be able to ping other PCs until EIGRP routing is configured. Verify and troubleshoot if necessary.

1. Configure EIGRP Routing
   1. Enable EIGRP routing on R1. Use AS number 10.

R1(config)# **router eigrp 10**

* 1. Advertise the directly connected networks on R1 using the wildcard mask.

R1(config-router)# **network 10.1.1.0 0.0.0.3**

R1(config-router)# **network 192.168.11.0 0.0.0.255**

R1(config-router)# **network 10.3.3.0 0.0.0.3**

Why is it a good practice to use wildcard masks when advertising networks? Could the mask have been omitted from any of the network statements above? If so, which one(s)?

**If you want to change for a classful protocol or a classless just using this command, no auto-summary because when you use the wildcard mask EIGRP automatically assume is a classful mask**

* 1. Enable EIGRP routing and advertise the directly connected networks on R2 and R3.

You will see neighbor adjacency messages as interfaces are added to the EIGRP routing process. The messages on R2 are displayed as an example.

\*Apr 14 15:24:59.543: %DUAL-5-NBRCHANGE: EIGRP-IPv4 10: Neighbor 10.1.1.1 (Serial0/1/0) is up: new adjacency

* 1. Verify end-to-end connectivity.

All devices should be able to ping each other if EIGRP is configured correctly.

**Note**: Depending on the operating system, it may be necessary to disable the firewall for the pings to the host PCs to be successful.

1. Verify EIGRP Routing
   1. Examine the EIGRP neighbor table.

On R1, issue the **show ip eigrp neighbors** command to verify that the adjacency has been established with its neighboring routers.

R1# **show ip eigrp neighbors**

EIGRP-IPv4 Neighbors for AS(10)

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

1 10.3.3.2 Se0/1/1 13 00:24:58 8 100 0 17

0 10.1.1.2 Se0/1/0 13 00:29:23 7 100 0 23

* 1. Examine the IP EIGRP routing table.

R1# **show ip route eigrp**

Codes: L - local, 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, H - NHRP, l - LISP

+ - replicated route, % - next hop override

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks

D 10.2.2.0/30 [90/2681856] via 10.3.3.2, 00:29:01, Serial0/1/1

[90/2681856] via 10.1.1.2, 00:29:01, Serial0/1/0

D 192.168.12.0/24 [90/2172416] via 10.1.1.2, 00:29:01, Serial0/1/0

D 192.168.13.0/24 [90/2172416] via 10.3.3.2, 00:27:56, Serial0/1/1

Why does R1 have two paths to the 10.2.2.0/30 network?

**EIGRP does equal-cost load balancing R1 has 2 ways to reach the 10.2.2.0/30 network**

* 1. Examine the EIGRP topology table.

R1# **show ip eigrp topology**

EIGRP-IPv4 Topology Table for AS(10)/ID(192.168.11.1)

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

r - reply Status, s - sia Status

P 192.168.13.0/24, 1 successors, FD is 2172416

via 10.3.3.2 (2172416/28160), Serial0/1/1

P 192.168.12.0/24, 1 successors, FD is 2172416

via 10.1.1.2 (2172416/28160), Serial0/1/0

P 10.2.2.0/30, 2 successors, FD is 2681856

via 10.1.1.2 (2681856/2169856), Serial0/1/0

via 10.3.3.2 (2681856/2169856), Serial0/1/1

P 10.3.3.0/30, 1 successors, FD is 2169856

via Connected, Serial0/1/1

P 192.168.11.0/24, 1 successors, FD is 5120

via Connected, GigabitEthernet0/0/0

P 10.1.1.0/30, 1 successors, FD is 2169856

via Connected, Serial0/1/0

Why are there no feasible successors listed in the R1 topology table?

**The feasible condition (FC) has not been met**

* 1. Verify the EIGRP routing parameters and networks advertised.

Issue the **show ip protocols** command to verify the EIGRP routing parameters used.

R1# **show ip protocols**

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "eigrp 10"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Default networks flagged in outgoing updates

Default networks accepted from incoming updates

EIGRP-IPv4 Protocol for AS(10)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

NSF-aware route hold timer is 240

Router-ID: 192.168.11.1

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 4

Maximum hopcount 100

Maximum metric variance 1

Automatic Summarization: disabled

Maximum path: 4

Routing for Networks:

10.1.1.0/30

10.3.3.0/30

192.168.11.0

Routing Information Sources:

Gateway Distance Last Update

10.3.3.2 90 02:38:34

10.1.1.2 90 02:38:34

Distance: internal 90 external 170

Based on the output of issuing the **show ip protocols** command, answer the following questions.

What AS number is used? **10**

What networks are advertised? **10.1.1.0/30, 10.3.3.0/30 and 192.168.11.0/24**

What is the administrative distance for EIGRP? **Distance: internal 90 external 170**

How many equal cost paths does EIGRP use by default? **4**

☞ Check point 1 : all interface all ping each other. If not, troubleshoot.

1. Configure Bandwidth and Passive Interfaces

EIGRP uses a default bandwidth based on the type of interface in the router. In Part 4, you will modify the bandwidth so that the link between R1 and R3 has a lower bandwidth than the link between R1/R2 and R2/R3. In addition, you will set passive interfaces on each router.

* 1. Observe the current routing settings.
     1. Issue the **show interface s0/1/0** command on R1.

R1# **show interface s0/1/0**

Serial0/1/0 is up, line protocol is up

Hardware is WIC MBRD Serial

Internet address is 10.1.1.1/30

MTU 1500 bytes, BW 1544 Kbit/sec, DLY 20000 usec,

reliability 255/255, txload 1/255, rxload 1/255

Encapsulation HDLC, loopback not set

Keepalive set (10 sec)

Last input 00:00:01, output 00:00:02, output hang never

Last clearing of "show interface" counters 03:43:45

Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0

Queueing strategy: fifo

Output queue: 0/40 (size/max)

5 minute input rate 0 bits/sec, 0 packets/sec

5 minute output rate 0 bits/sec, 0 packets/sec

4050 packets input, 270294 bytes, 0 no buffer

Received 1554 broadcasts (0 IP multicasts)

0 runts, 0 giants, 0 throttles

1 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 1 abort

4044 packets output, 271278 bytes, 0 underruns

0 output errors, 0 collisions, 5 interface resets

4 unknown protocol drops

0 output buffer failures, 0 output buffers swapped out

12 carrier transitions

DCD=up DSR=up DTR=up RTS=up CTS=up

What is the default bandwidth for this serial interface? **1544 Kbit/sec**

* + 1. How many routes are listed in the routing table to reach the 10.2.2.0/30 network? **2**
  1. Modify the bandwidth on the routers.
     1. Modify the bandwidth on R1 for the serial interfaces.

R1(config)# **interface s0/1/0**

R1(config-if)# **bandwidth 2000**

R1(config-if)# **interface s0/1/1**

R1(config-if)# **bandwidth 64**

Issue **show ip route** command on R1. Is there a difference in the routing table? If so, what is it?

Codes: L - local, 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, H - NHRP, l - LISP

+ - replicated route, % - next hop override

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks

C 10.1.1.0/30 is directly connected, Serial0/1/0

L 10.1.1.1/32 is directly connected, Serial0/1/0

D 10.2.2.0/30 [90/2681856] via 10.1.1.2, 00:03:09, Serial0/1/0

C 10.3.3.0/30 is directly connected, Serial0/1/1

L 10.3.3.1/32 is directly connected, Serial0/1/1

192.168.11.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.11.0/24 is directly connected, GigabitEthernet0/0/0

L 192.168.11.1/32 is directly connected, GigabitEthernet0/0/0

D 192.168.12.0/24 [90/1794560] via 10.1.1.2, 00:03:09, Serial0/1/0

D 192.168.13.0/24 [90/2684416] via 10.1.1.2, 00:03:08, Serial0/1/0

To reach 10.2.2.0/30 there is only one path

* + 1. Modify the bandwidth on the R2 and R3 serial interfaces.

R2(config)# **interface s0/1/0**

R2(config-if)# **bandwidth 2000**

R2(config-if)# **interface s0/1/1**

R2(config-if)# **bandwidth 2000**

R3(config)# **interface s0/1/0**

R3(config-if)# **bandwidth 64**

R3(config-if)# **interface s0/1/1**

R3(config-if)# **bandwidth 2000**

* 1. Verify the bandwidth modifications.
     1. Verify bandwidth modifications. Issue a **show interface serial 0/1/x** command, with x being the appropriate serial interface on all three routers to verify that bandwidth is set correctly. R1 is shown as an example.

R1# **show interface s0/1/0**

Serial0/1/0 is up, line protocol is up

Hardware is WIC MBRD Serial

Internet address is 10.1.1.1/30

MTU 1500 bytes, BW 2000 Kbit/sec, DLY 20000 usec,

reliability 255/255, txload 1/255, rxload 1/255

Encapsulation HDLC, loopback not set

Keepalive set (10 sec)

Last input 00:00:01, output 00:00:02, output hang never

Last clearing of "show interface" counters 04:06:06

Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0

Queueing strategy: fifo

Output queue: 0/40 (size/max)

5 minute input rate 0 bits/sec, 0 packets/sec

5 minute output rate 0 bits/sec, 0 packets/sec

4767 packets input, 317155 bytes, 0 no buffer

Received 1713 broadcasts (0 IP multicasts)

0 runts, 0 giants, 0 throttles

1 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 1 abort

4825 packets output, 316451 bytes, 0 underruns

0 output errors, 0 collisions, 5 interface resets

4 unknown protocol drops

0 output buffer failures, 0 output buffers swapped out

12 carrier transitions

DCD=up DSR=up DTR=up RTS=up CTS=up

Based on your bandwidth configuration, try and determine what the R2 and R3 routing tables will look like before you issue a **show ip route** command. Are their routing tables the same or different?

**In R1, R2 and R3 are the same.**

* 1. Configure G0/0/0 interface as passive on R1, R2, and R3.

A passive interface does not allow outgoing and incoming routing updates over the configured interface. The **passive-interface** *interface* command causes the router to stop sending and receiving Hello packets over an interface; however, the network associated with the interface is still advertised to other routers through the non-passive interfaces. Router interfaces connected to LANs are typically configured as passive.

R1(config)# **router eigrp 10**

R1(config-router)# **passive-interface g0/0/0**

R2(config)# **router eigrp 10**

R2(config-router)# **passive-interface g0/0/0**

R3(config)# **router eigrp 10**

R3(config-router)# **passive-interface g0/0/0**

* 1. Verify the passive interface configuration.

Issue a **show ip protocols** command on R1, R2, and R3 and verify that G0/0/0 has been configured as passive.

R1# **show ip protocols**

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "eigrp 10"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Default networks flagged in outgoing updates

Default networks accepted from incoming updates

EIGRP-IPv4 Protocol for AS(10)

Metric weight K1=1, K2=0, K3=1, K4=0, K5=0

NSF-aware route hold timer is 240

Router-ID: 192.168.11.1

Topology : 0 (base)

Active Timer: 3 min

Distance: internal 90 external 170

Maximum path: 4

Maximum hopcount 100

Maximum metric variance 1

Automatic Summarization: disabled

Maximum path: 4

Routing for Networks:

10.1.1.0/30

10.3.3.0/30

192.168.11.0

Passive Interface(s):

GigabitEthernet0/0/0

Routing Information Sources:

Gateway Distance Last Update

10.3.3.2 90 00:48:09

10.1.1.2 90 00:48:26

Distance: internal 90 external 170

**\*\* All PCs can ping each other. If not, troubleshoot.**

**\*\* Save the .pkt file and submit to Canvas.**

**\*\* Fill in the answers and submit the lab sheet (.docx) to Canvas. Remember to zip the**

**two files.**

1. Reflection

You could have used only static routing for this lab. What is an advantage of using EIGRP?

**EIGRP can remove networks when the link is down, or automatically adjusted for network topology changes such as adding networks, also EIGRP picks the best path when the bandwidth of a link is modified and load balancing across multiple equal-cost paths.**