Basic EIGRP for IPv4

Introduction

EIGRP is an enhanced version of IGRP. The same distance vector technology found in IGRP is also used in EIGRP, and the underlying distance information remains unchanged. The convergence properties and the operating efficiency of this protocol have improved significantly. Although EIGRP has Link State routing protocol characteristics, EIGRP falls under the Distance Vector routing protocol classification and is referred to as an advanced Distance Vector routing protocol instead. EIGRP runs directly over IP.

Objective(s)

In this lab the student will:

- Build the Network and Verify Connectivity
- Configure EIGRP Routing
- Verify EIGRP Routing
- Configure Passive Interfaces ● Disable Auto summarization

Equipment/Supplies Needed

- Your computer workstation
- Cisco Packet Tracer
- Basic EIGRP for IPv4.pkt file

Note: The routers used with CCNA hands-on labs are Cisco 1941 Integrated Services Routers (ISRs) with Cisco IOS Release 15.2(4)M3 (universalk9 image). Other routers and Cisco IOS versions can be used.

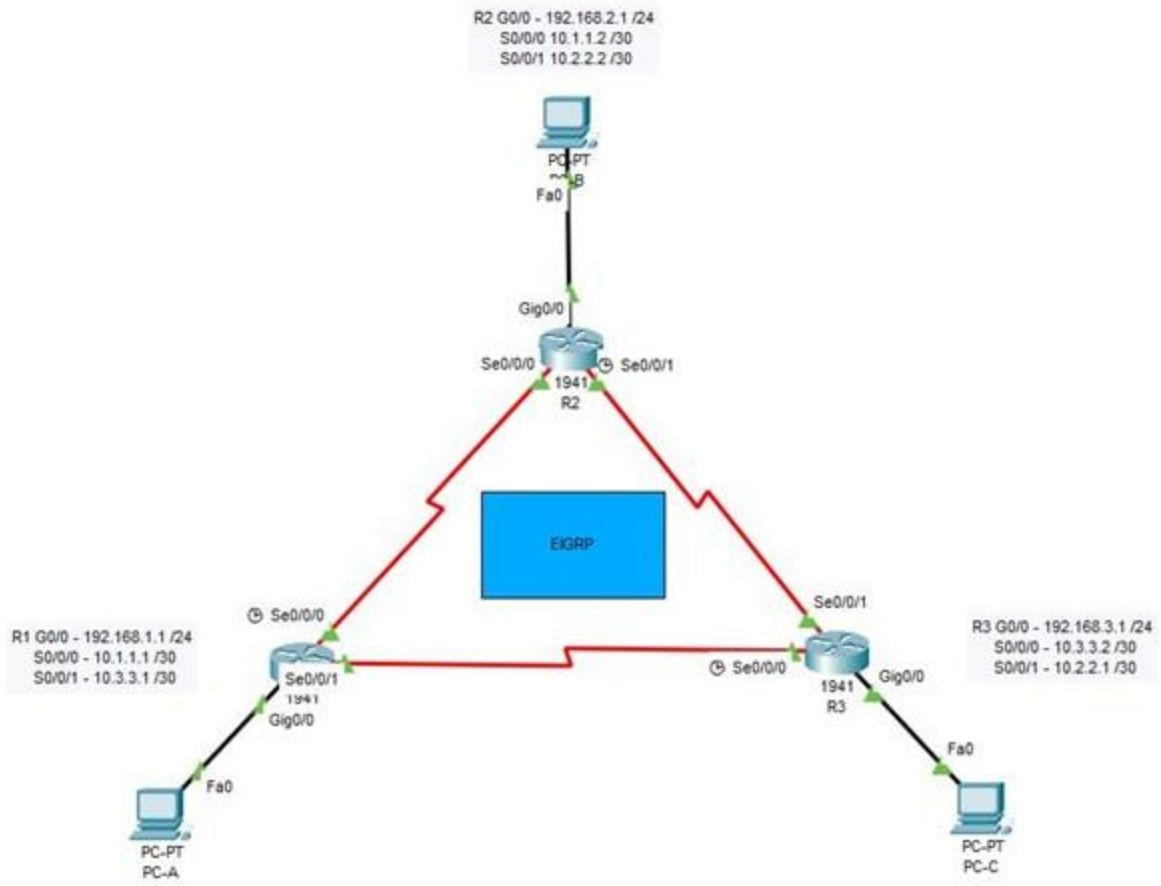
Depending on the model and Cisco IOS version, the commands available and output produced might vary from what is shown in the labs. Refer to the Router Interface Summary Table at the end of this lab for the correct interface identifiers.

Make sure that the routers have been erased and have no startup configurations. If you are unsure, contact your instructor.

Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0	192.168.1.1	255.255.255.0	N/A
	S0/0/0 (DCE)	10.1.1.1	255.255.255.252	N/A
	S0/0/1	10.3.3.1	255.255.255.252	N/A
R2	G0/0	192.168.2.1	255.255.255.0	N/A
	S0/0/0	10.1.1.2	255.255.255.252	N/A
	S0/0/1 (DCE)	10.2.2.2	255.255.255.252	N/A
R3	G0/0	192.168.3.1	255.255.255.0	N/A
	S0/0/0 (DCE)	10.3.3.2	255.255.255.252	N/A
	S0/0/1	10.2.2.1	255.255.255.252	N/A
PC-A	NIC	192.168.1.3	255.255.255.0	192.168.1.1
PC-B	NIC	192.168.2.3	255.255.255.0	192.168.2.1
PC-C	NIC	192.168.3.3	255.255.255.0	192.168.3.1

Topology



Procedure

Perform the steps in this lab in the order they are presented to you. Answer all questions and record the requested information in a file.

Part 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.

Step 1: Configure PC hosts.

Step 2: Initialize and reload the routers as necessary.

Step 3: Configure basic settings for each router.

- Disable DNS lookup.
- Configure IP addresses for the routers, as listed in the Addressing Table.

- Configure device name as shown in the topology.
- Assign **cyber** as the console and vty passwords.
- Assign **security** as the privileged EXEC password.
- Configure logging synchronous to prevent console and vty messages from interrupting command entry.
- Configure a message of the day. "**Unauthorized Access is Prohibited**".
- Copy the running configuration to the startup configuration.

Step 4: 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.

Part 2: Configuring EIGRP

Step 1: Enable EIGRP routing on R1. Use AS number 10.

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

What is the range of numbers that can be used for AS numbers? 1-65535

Step 2: Advertise the directly connected networks on R1 using the wildcard mask.

Use the **show ip route** command to display the directly connected networks on each router.

How can you tell the difference between subnet addresses and interface addresses? C is directly connected through interface addresses and L is Local subnets on the router

On each router, configure EIGRP to advertise the specific directly connected subnets. The configuration for **R1** is shown.

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

R1(config-router)# **network 192.168.1.0 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? Using wildcard masks is crucial in routing protocols like eigrp and ospf as they allow precise definition of network ranges, enable efficient and flexible network advertisement without the boundaries of traditional subnet.

Could the mask have been omitted from any of the network statements above? If so, which one(s)? Yes network 192.168.1.0

Step 3: 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 is up: new adjacency
```

Part 3: Verify EIGRP ROUTING

Verify the EIGRP routing parameters and networks advertised.

Step: 1 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: 192.168.1.1

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

192.168.1.0

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 is the administrative distance for EIGRP? Internal 90 external 170

Note: By default EIGRP can use up to 4 equal cost paths simultaneously

Step 2: Verify Neighbors Adjacencies

All three routers should have two neighbors listed. Issue the following command to view the eigrp neighbors table.

R1# **Show ip eigrp neighbors**

The output for R1 should look similar to the following:

IP-EIGRP neighbors for process 1

H	Address	Interface		Hold	Uptime	SRTT	RTO	Q	Seq
				(sec)		(ms)		Cnt	Num
0	10.1.1.2	Se0/0/0	14	00:25:05	40	10000	28		
1	10.3.3.2	Se0/0/1	12	00:13:29	40	10000	31		

What is used to represent the eigrp neighbor routers? **Address**

Step:3 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, Serial0/0/1

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

D 192.168.2.0/24 [90/2172416] via 10.1.1.2, 00:29:01, Serial0/0/0

D 192.168.3.0/24 [90/2172416] via 10.3.3.2, 00:27:56, Serial0/0/1

What networks are advertised? 10.2.2.0/30, 192.168.2.0/24, 192.168.3.0/24

Verify end-to-end connectivity

PC1, PC2 and PC3 should now be able to ping each other. If not, troubleshoot your EIGRP configurations.

Part 4: Configure and Verify Passive interfaces

Note: A passive interface does not allow outgoing and incoming routing updates over the configured interface. The **passive-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.

Step 1: Configure the LAN interfaces to not advertise EIGRP updates on all routers. The configuration for R1 is shown.

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

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

Step 2: Verify the passive interface configuration issue a **show ip protocols** command on R1, R2, and R3 and verify that G0/0 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

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Default networks flagged in outgoing updates

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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: 192.168.1.1

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

192.168.1.0

Passive Interface(s):

GigabitEthernet0/0

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

Part 5: Disabling auto summarization

Note: By default routing protocols like RIP and EIGRP summarize subnets into major classful networks at classful boundaries. In other words, these protocols perform an auto-summarization each time they cross a border between two different major networks. To disable this behavior and advertise subnets, '**no auto-summary**' command is used. Let's say router has two subnets 172.16.8.0/24 and 172.16.4.0/24 of Class B network and one subnet 10.2.0.0/16 of Class A. When auto-summary is enabled, router will advertise only summarized major classful network 172.16.0.0/16 for class B addresses into its Class A interface but you can change this default behavior and advertise both subnets using this '**no auto-summary**'.

Prior to IOS 15 auto-summary had to be manually disabled.

The topology contains discontiguous networks. Therefore, disable automatic summarization on each router. The configuration for R1 is shown.

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

R1(config-router)# **no auto-summary**

Last Step: Save the configurations.

Submit Your Work:

Submit all text files, screenshots, or answers to questions to your instructor Using the most appropriate method below.

Packet Tracer:

Submit Packet Tracer file as well as your text file with your findings and notes.

Rubric

Checklist/Single Point Mastery

Concerns Working Towards Proficiency	Criteria Standards for This Competency	Accomplished Evidence of Mastering Competency
	Criteria #1: Basic router and switch configs configs (30 pts)	Configure basic router configs needed for all 3 routers. Configure CyberLab switch VLAN and Trunking needed. (30 pts)
	Criteria #2: Configure EIGRP protocol needed on all 3 routers for connectivity between networks (40 pts)	Configure EIGRP protocol needed on all 3 routers for connectivity between networks. (40 pts)
	Criteria #3: Configure Passive interfaces and remove auto-summarization. (10 pts)	Configure Passive interfaces on all LAN interfaces and remove EIGRP auto-summarization on each router. (10 pts)
	Criteria #4: Test connectivity between all remote networks using ping. (10 pts)	Test connectivity between all remote networks using ping. (10 pts)
	Criteria #5: Submit instructions document with lab questions completed. (10 pts)	Criteria #5: Submit instructions document with lab questions completed. (10 pts)