Lab 10 – EIGRP Challenge

Instructions:

- Pre-lab is to be completed before your lab class.
- You will be working in groups of 2 for this lab.
- Each student will be configuring **at least** one router.
- Make sure you obtain all required screen captures and router output for all PC's and routers in your group. You will need them to answer your post lab.
- You will need:
  - All of the patch cables from your kit: 3 straight-throughs, and two cross-over cable.
  - Your textbook for this term.

What you need to submit and when:

- Complete the "Pre-lab – Lab 10" exercise on Blackboard, before the start of your lab period. (1/3 mark)
- Complete the in-lab part of the exercise (see below), before the end of your lab period. (1/3 mark)
- Complete the "Post-lab – Lab 10" exercise on Blackboard, before your next lab period. (1/3 mark)

Pre-Lab: Part 1 -Reading and Prepping for the lab.

1.1 Read Chapter 9.3 before coming to class.

1.2 Complete the subnetting below and submit your answers on Blackboard.

Pre-Lab: Part 2 - Subnetting – Calculate and submit on Blackboard

Complete the IP addressing based on the requirements set out below.

2.1 Given the starting network 172.30.0.0 /16. Subnet to meet the following requirements:

- Network A – 1500 hosts
- Network B – 1000 hosts
- Network C - 750 hosts
- Network D – 500 hosts
- Network E – 300 hosts
- Network F – 200 hosts

2.1.1 Assign the **last** usable IP address to the gateways and loopbacks.

2.1.2 Assign the first usable address to the workstations.

2.2 The Serial links have a starting address of 192.168.42.80 /28.

2.2.1 Assign the 1st subnet (/30) to the serial link between Finland and Norway.

2.2.2 Assign the 2nd subnet (/30) to the serial link between Norway and Sweden.

2.2.3 Assign the 3rd subnet (/30) to the serial link between Sweden and Finland.

2.2.4 Assign the lower of the 2 IP addresses to the lower Router **number** in the link. (R2 is lower than R3.... R5 is lower than R6, etc.)

2.3 Submit your answers to Pre-lab Subnetting Lab 10 found on Blackboard. This will allow you to check your subnetting. Fill in the addressing chart and the topology drawing.

IP Addressing Scheme

Device	Interface	IP address	Subnet Mask	Default Gateway
Finland (R1 or R4)	Serial 0/0			
	Serial 0/1			
	Fa 0/0			
	Lo1			
Norway (R2 or R5)	Serial 0/0			
	Serial 0/1			
	F0/0			
	Lo1			
Sweden (R3 or R6)	Serial 0/0			
	Serial 0/1			
	Fa0/0			
	Lo1			
WS A	NIC			
WS C	NIC			
WS E	NIC			

Part 1: Lab Setup

1.1 Cable the network according to the Topology Diagram - you must include the switches.

1.2 Clear any existing configurations on the routers and switches.

1.3 Using the interface and the subnetting information that you have recorded, configure your router with the basic configuration tasks listed below:

1.3.1 Router hostnames

1.3.2 Configure the encrypted EXEC mode password as class

1.3.3 Disable DNS lookup.

1.3.4 Configure a message-of-the-day banner. **The banner must include your course number, section number and username… eg "pete0001 CST8270-013"**

1.3.5 Set the passwords on the Telnet (VTY) connections and console connections as cisco

1.3.6 Prevent unwanted messages from interrupting your commands as you type.

1.3.7 Configure an EXEC timeout to 0 0 on the console and 10 0 on the vty lines.

1.3.8 Configure the appropriate interfaces, including the loopback interfaces, with:

- The correct IP address.
- An appropriate description.
- A clock rate if required
- Activate the interface.

1.3.9 **DO NOT configure any routing yet.**

1.4 Assign your PC its IP address and test the PC configuration by pinging the default gateway.

1.5 Verify ALL of your basic connectivity. **Do not proceed until all PC's can ping their gateways, all routers can ping their neighboring routers, and all directly connected networks are in the routing tables.** **Note:** You will have to wait until your partner is done configuring his/her router.

What command do you use to check your routers IP address and interface status?

_____

- Verify that the directly connected networks are in the routing table for each router. This includes the loopback interfaces. Record your answers here:

Finland's Directly Connected Networks	**Wildcard Mask**

Norway's Directly Connected Networks	Wildcard Mask
Sweden's Directly Connected Networks	**Wildcard Mask**

****** Do not go on until <u>all</u> directly connected networks are present in the appropriate routing table. ******

Part 2: EIGRP Configuration

2.1 Configure EIGRP using the following guidelines:

2.1.1 Advertise all networks <u>using wildcard masks</u>. Use the tables from 1.5 to help you. Do not forget to advertise the loopbacks as well.

2.1.2 Leave auto-summary on for now.

2.2 Verify the bandwidth settings all of your routers serial interfaces. They should all be set to **128**. Change any that vary to 128 **<u>and re-verify</u>**. You must change BOTH ends of the serial links.
(show interface s0/x)

2.3 Type show `ip eigrp neighbor` to confirm that your router has established adjacencies with the other routers.

2.4 Copy and paste the neighbor adjacencies to notepad. Call this **LAB 10 – EIGRP Adjacencies.txt**

****** Do not go on until all neighbor adjacencies have been established. ******

Check point #1

Have all 3 routers:

- EIGRP routing configurations from the running config <u>in a text file</u> ready for viewing, showing the **wildcard masks**. Identify the router names in the file.
- EIGRP Neighbors adjacencies. (File from step 2.4)

Part 3: Gathering Information

3.1 Viewing the routing table on Finland answer the following questions:

3.1.1 What do the highlighted lines in the routing table below indicate about the eigrp configuration? _____

```
192.168.42.0/24 is variably subnetted, 4 subnets, 2 masks

C       192.168.42.80/30 is directly connected, Serial0/0
D       192.168.42.84/30 [90/21024000] via 192.168.42.90, 00:20:44, Se0/1
                         [90/21024000] via 192.168.42.82, 00:20:44, Se0/0
C       192.168.42.88/30 is directly connected, Serial0/1
D       192.168.42.0/24 is a summary, 00:22:11, Null0
     172.30.0.0/16 is variably subnetted, 3 subnets, 3 masks
C       172.30.0.0/21 is directly connected, FastEthernet0/0
D       172.30.0.0/16 is a summary, 00:20:45, Null0
C       172.30.8.0/22 is directly connected, Loopback1
```

3.1.2 List the network/subnets that are missing. (There should be 4)

- _____
- _____
- _____
- _____

3.1.3 Where will packets that are destined for the 172.30.0.0 /16 network be routed to?

_____

3.1.4 Is there a load-balancing route in the routing table? _____

3.1.5 What is the feasible distance (FD) of this route? _____

3.2 Viewing the routing table on Norway, answer the following questions:

3.2.1 List the network/subnets that are missing. (There should be 4)

- _____
- _____
- _____
- _____

3.2.2 Where will packets that are destined for the 172.30.0.0 /16 network be routed to?

_____

3.2.3 Is there a load-balancing route in the routing table? _____

3.2.4 What is the feasible distance (FD) of this route? _____

3.3 Viewing the routing table on Sweden, answer the following questions:

3.3.1 List the network/subnets that are missing. (There should be 4)

- _____
- _____
- _____
- _____

3.3.2 Where will packets that are destined for the 172.30.0.0 /16 network be routed to?

_____

3.3.3 Is there a load-balancing route in the routing table? _____

3.3.4 What is the feasible distance (FD) of this route? _____

3.5 Why are the FDs on all the routers the same value? _____

3.6 From Finland type `show ip eigrp topology`. Find the entry for the 192.168.42.84 network.

3.6.1 How many successors does this route have? _____

3.6.2 What type of route is this in the routing table? _____

3.6.3 Do the other routers have any routes with 2 successors? _____

3.7 From each router copy and paste `show ip eigrp topology` and `show ip route` to notepad. Call this **Lab 10- EIGRP with auto-summary.txt**

Part 4: Disable Auto-summary

4.1 Turn off auto summary on all 3 routers.

4.1.1 What happens immediately after you disable auto-summary? _____

4.2 View the routing tables.

4.2.1 Are all the networks present in the routing tables? (There should be 9 routes in total.) _____

4.2.2 Is there still a load-balancing route in the routing table? _____

4.2.3 Which router is still load-balancing? _____

4.3 From each router copy and paste `show ip eigrp topology` and `show ip route` to notepad. Call this **Lab 10- EIGRP with no auto-summary.txt**

Check point #2

- Test for connectivity. All should work.
  - Results of a live Traceroute PC A to PC C
  - Results of a live Traceroute PC C to PC E (VMware)
- Have all 3 routers EIGRP routing configurations ready for viewing (in a text file), showing the **no auto-summary.**

Part 5: Adjusting the Bandwidth

5.2 Adjust the bandwidth on the serial links to the following values.

5.2.1 Serial link between Finland and Norway – 1544 kbps

5.2.2 Serial link between Norway and Sweden – 1024 kbps

5.2.3 Serial link between Sweden and Finland– 254 kbps

Note: **The bandwidth settings need to be configured on both ends of the serial cable.**

5.3 **Verify** that the bandwidth settings on your serial links have been set.

Part 6: Successor and Feasible Successor.

Using `show ip route` and `show ip eigrp topology` answer the following questions.

6.1 From the Finland.

6.1.1 Is there a route to the 172.30.18.0/23 network (Network E)? _____

6.1.2 Is this a successor or a feasible successor route? _____

6.1.3 What is the IP address and name of the successor router for this route? _____
(**Why is this the successor???)**

6.1.4 What is the FD for this route? _____

6.1.5 What is the successor router's RD for this route? _____

6.1.6 Is there a feasible successor route to this network? _____

6.1.7 What command can you use to tell? _____

6.1.8 What would be the feasible distance to 172.30.18.0 if Sweden became the successor?
_____

6.1.9 What would happen if the link between Finland and Norway goes down?
_____

6.1.10 Will packets still get to the 172.30.18.0 network? _____

6.2 From the Norway.

6.2.1 Is there a route to the 172.30.18.0/23 network (Network E)? _____

6.2.2 Is this a successor or a feasible successor route? ___ _____

6.2.3 What is the IP address and name of the successor router for this route? _____

6.2.4 What is the FD for this route? _____

6.2.5 Does this match the successor router's RD from question 6.1.5? _____ _____

6.2.6 What is the successor router's RD for this route? _____

6.2.7 Is there a feasible successor route to this network? _____ _____

6.2.8 What would happen if the link between Norway and Sweden goes down? _____

6.2.9 Will packets still get to the 172.30.18.0 network? _____

6.3 From the Sweden router:

6.3.1 Check the routing table. Is there a route to the 172.30.18.0 network? _____

6.3.2 What is the FD for this route? _____

6.3.2 What command to you use to find this? _____

Part 7 – Propagating a Default route

7.1 On the Finland router add a default static route. Use the loopback interface as the exit interface.

7.2 Using EIGRP, share this route with the other routers.

7.2.1 What is the command to do so? _____

7.3 Verify that you have the default route on the other routers.

7.3.1 What is the administrative distance for this route? _____

7.3.2 What does this value mean? _____

7.4 Copy and paste the running-configs to notepad. Call this Lab 10- Complete EIGRP configs.txt

Check point #3

Have open and on display so that the lab instructor can verify the following:

- Running configuration (in a text file, each router labeled).
  - Bandwidth settings on each serial link.
- Routing Table (in a text file, each router labeled)).
  - Default route being propagated.

******* Do not turn-off your router until everyone in your group has been signed-off.******

Complete bonus or skip to Part 9.

Part 8: Bonus – EIGRP Composite Metric

EIGRP uses the following values in its composite metric to calculate the preferred path to a network, bandwidth, delay, reliability and load. By default, only bandwidth and delay are used to calculate the metric. Cisco recommends that reliability and load are not used unless the administrator has an explicit need to do so.
The Composite Metric Formula is:
(Reference bandwidth/ bandwidth kbps)* 256 + (delays / 10) * 256 = EIGRP metric

Reference bandwidth = 10,000,000
Bandwidth = Slowest bandwidth in path to destination
Delays = Sum of all delays to destination

* When you calculate (Reference bandwidth/ bandwidth kbps)* 256, if there is a remainder drop it.
For example 98.345 becomes 98.

You are going to calculate the metric for 172.30.16.0/23 route on Sweden.

8.1 What is the FD for the 172.30.16.0 route on Sweden? _____

8.2 What path will packets take from Sweden to the 172.30.16.0/23 network? _____

8.3 Looking at this path, what is the slowest bandwidth? _____

8.4 Using the `show interface` command, record the delay on each of the links to the 172.30.16.0/23 network:
Link 1: _____
Link 2: _____
Link 3: _____ (You may not have a 3rd link.)
* There is a delay on the fastethernet and loopback interfaces.

8.5 Plug in the values that you have gathered into the formula above. If you have done it right it should match the value in 8.1. Keep trying until you get it.

Show your work below:

Check point #4 - Bonus

- Metric Calculation

Part 9 – Clearing the Router

While in Exec mode, type **`erase startup-config`** command and answer yes when prompted.

9.1 Now type Show startup-config

Check POINT #4

- ❑ Have the lab instructor confirm that the routers are cleared.