UNIVERSITY OF CHAKWAL

DEPARTMENT OF COMPUTER SCIENCE

(Computer Communication Networks CS-324)(LAB)

LAB 09

Dynamic routing
Using EIGRP

1. Introduction:

1.1. EIGRP:

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. This allows for an improved architecture while retaining existing investment in IGRP.

The convergence technology is based on research conducted at SRI International. The Diffusing Update Algorithm (DUAL) is the algorithm used to obtain loop-freedom at every instant throughout a route computation. This allows all routers involved in a topology change to synchronize at the same time. Routers that are not affected by topology changes are not involved in the recompilation. The convergence time with DUAL rivals that of any other existing routing protocol.

EIGRP has been extended to be network-layer-protocol independent, thereby allowing DUAL to support other protocol suites.

1.2. Working of EIGRP:

EIGRP has four basic components:

- Neighbor Discovery/Recovery
- Reliable Transport Protocol
- DUAL Finite State Machine
- Protocol Dependent Modules

Neighbor Discovery/Recovery is the process that routers use to dynamically learn of other routers on their directly attached networks. Routers must also discover when their neighbors become unreachable or inoperative. This process is achieved with low overhead by periodically sending small hello packets. As long as hello packets are received, a router can determine that a neighbor is alive and functioning. Once this is determined, the neighboring routers can exchange routing information. The reliable transport is responsible for guaranteed, ordered delivery of EIGRP packets to all neighbors. It supports intermixed transmission of multicast or unicast packets. Some EIGRP packets must be transmitted reliably and others need not. For efficiency, reliability is provided only when necessary. For example, on a multi-access network that has multicast capabilities, such as Ethernet, it is not necessary to send hellos reliably to all neighbors individually. So EIGRP, sends a single multicast hello with an indication in the packet informing the receivers that the packet need not be acknowledged. Other types of packets, such as updates, require acknowledgment and this is indicated in the packet. The reliable transport has a provision to send multicast packets quickly when there are unacknowledged packets pending. This helps ensure that convergence time remains low in the presence of varying speed links.

The DUAL finite state machine embodies the decision process for all route computations. It tracks all routes advertised by all neighbors. The distance information, known as a metric, is used by DUAL to select efficient loop free paths. DUAL selects routes to be inserted into a routing table based on feasible successors. A successor is a neighboring router used for packet forwarding that has a least cost path to a destination that is guaranteed not to be part of a routing loop. When there are no feasible successors but there are neighbors advertising the destination, a recompilation must occur. This is the process where a new successor is determined. The amount of time it takes to recompute the route affects the convergence time. Even though the recompilation is not processor-intensive, it is advantageous to avoid recompilation if it is not necessary. When a topology change occurs, DUAL will test for feasible successors. If there are feasible successors, it will use any it finds in order to avoid any unnecessary recompilation.

The protocol-dependent modules are responsible for network layer, protocol-specific requirements. For example, the IP-EIGRP module is responsible for sending and receiving EIGRP packets that are encapsulated in IP. IP-EIGRP is responsible for parsing EIGRP packets and informing DUAL of the new information received. IP-EIGRP asks DUAL to make routing decisions and the results of which are stored in the IP routing table. IP-EIGRP is responsible for redistributing routes learned by other IP routing protocols.

2. Tools required:

- CISCO Packet tracer

3. Objective of the Experiment:

- Upon completion of this lab, you will be able to:
- Cable a netwo rk according to the Topology Diagram.

- Erase the startup configuration and reload a router to the default state.
- Perform basic configuration tasks on a router.
- Configure and activate interfaces.
- Configure EIGRP routing on all routers.
- Verify EIGRP routing using show commands.
- Disable automatic summarization.
- Configure manual summarization.
- Configure a static default route.
- Propagate default route to EIGRP neighbors
- Document the EIGRP configuration.

4. Walk through task:

4.1. Create topology:

In this lab activity, you will learn how to configure the routing protocol EIGRP using the network shown in the Topology Diagram.

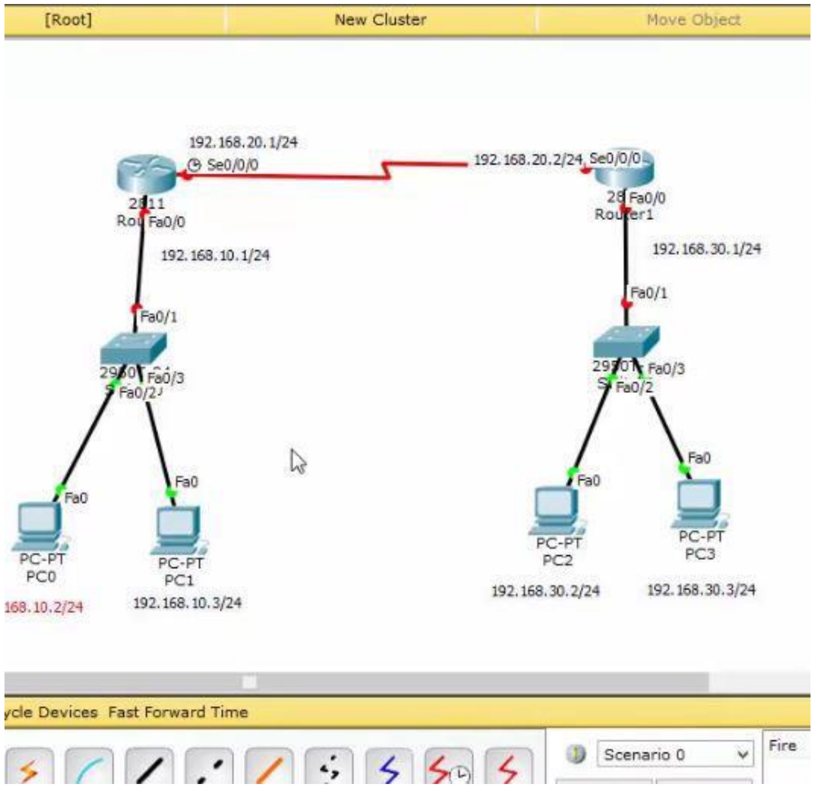


Figure 1: Walk through topology

So first of all, we place all of us require components to make topology as mentioned in above diagram. Like

Figure 2: Devices and placements

Then firstly we add WIC-1T port in our routers by following methods.

1. Select router then an interface appears.
2. Off router
3. Search WIC_1T port from left panel select them drag and drop over here
4. Then restart the router
5. Repeat these steps on all routers its compulsory because if you don't do this then we don't have option to connect routers with each other by serial DCE cable.

You work like below.

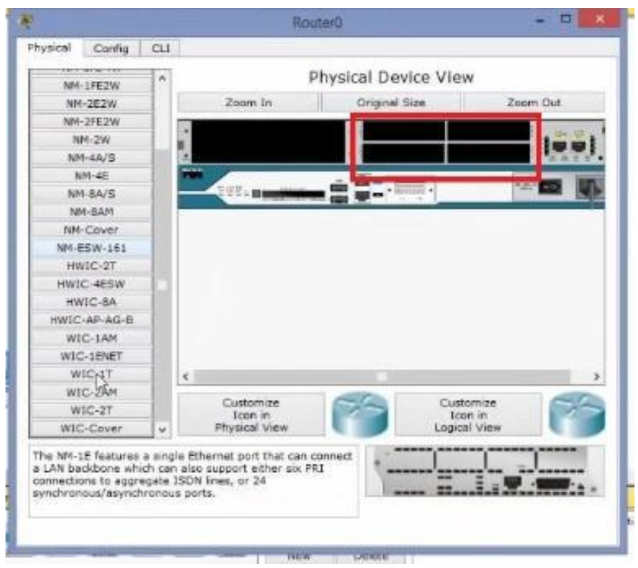


Figure 3: Turned off router with empty ports

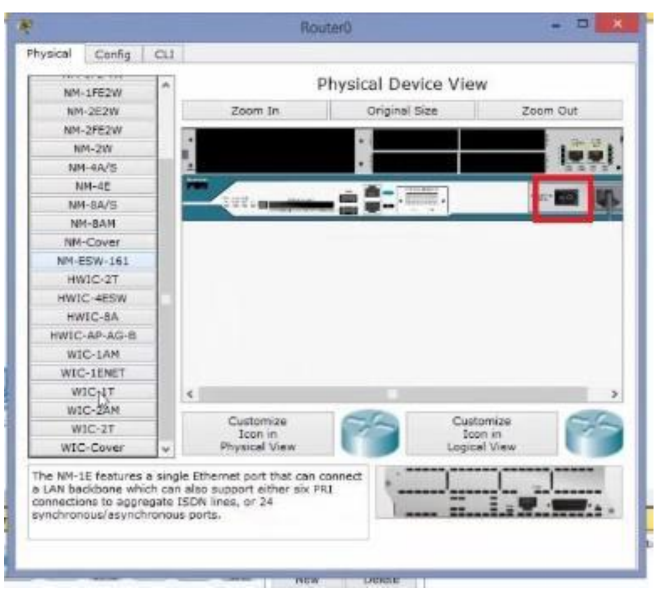


Figure 4: Router power button

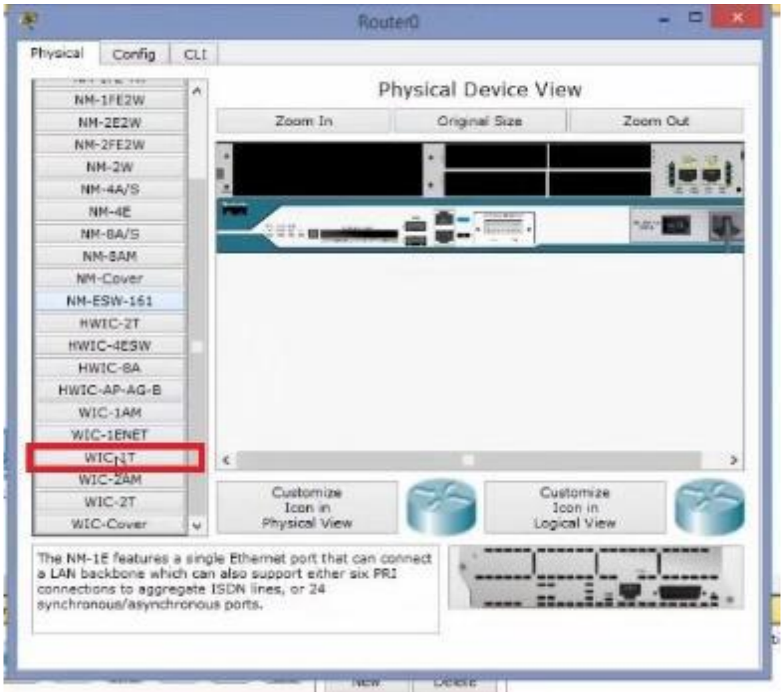


Figure 5: Select WIC-1T

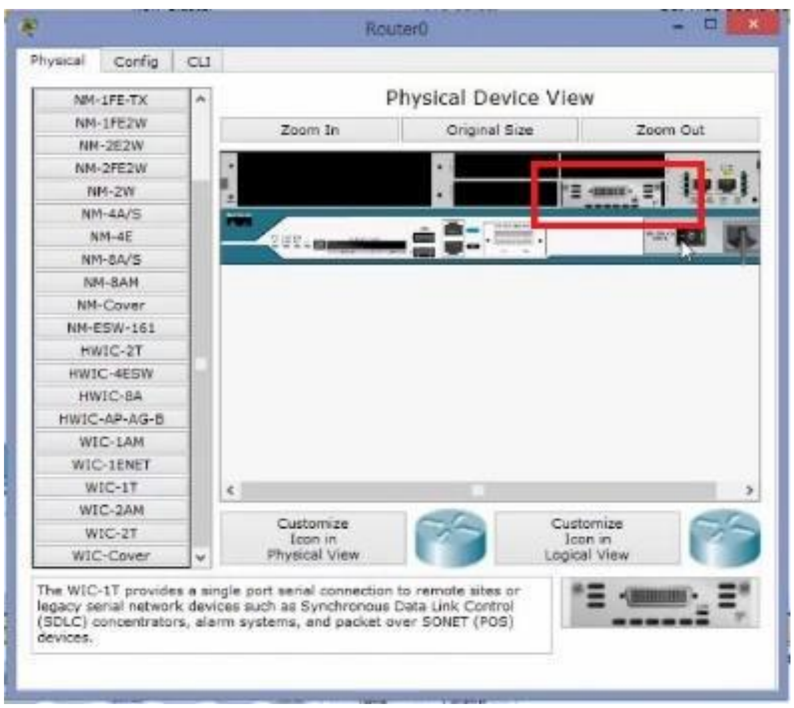


Figure 6: Place WIC-1T port in one of the empty ports

Turn on the router

Figure-7: Turn on the router

Connect routers with each other by serial-DCE cable.

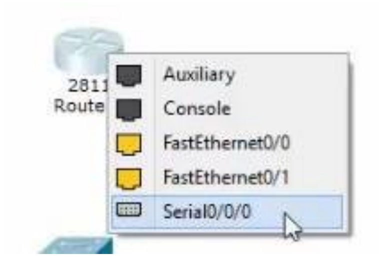


Figure 8: Connect using serial wire with Serial0/0/0 port on the router

Connect router with switch and switch with PC's using Copper Straight-Through Cable.

Figure 9: connect switch with PC using Fast Ethernet port

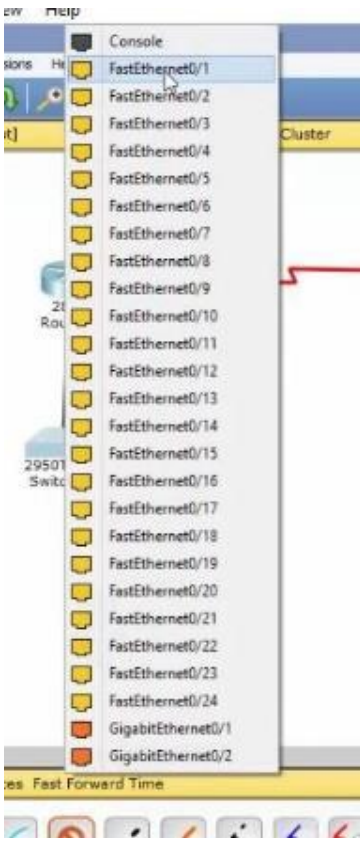


Figure 10: connect switch with PC using Fast Ethernet port

All connections build like this.

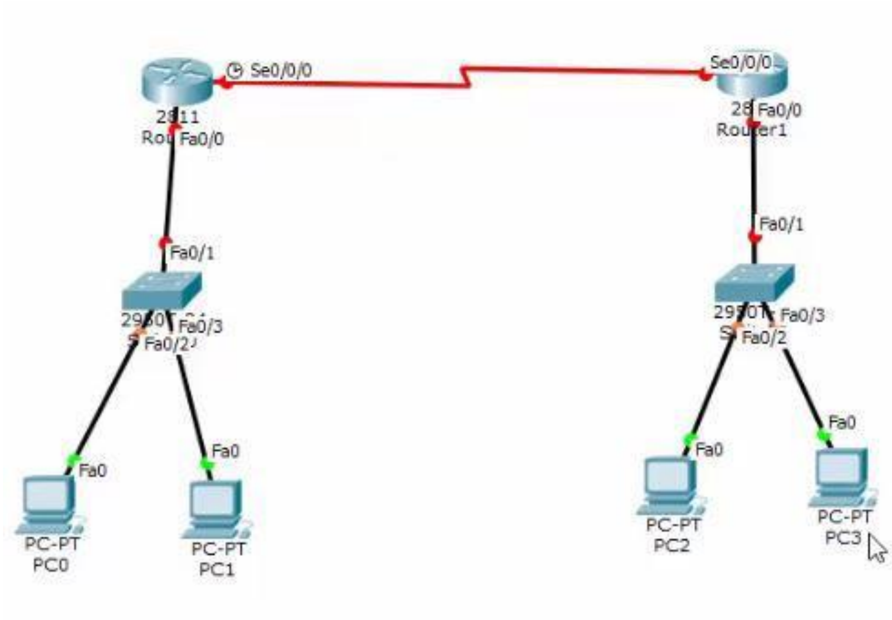


Figure 11: connection build

Label our topology like this.

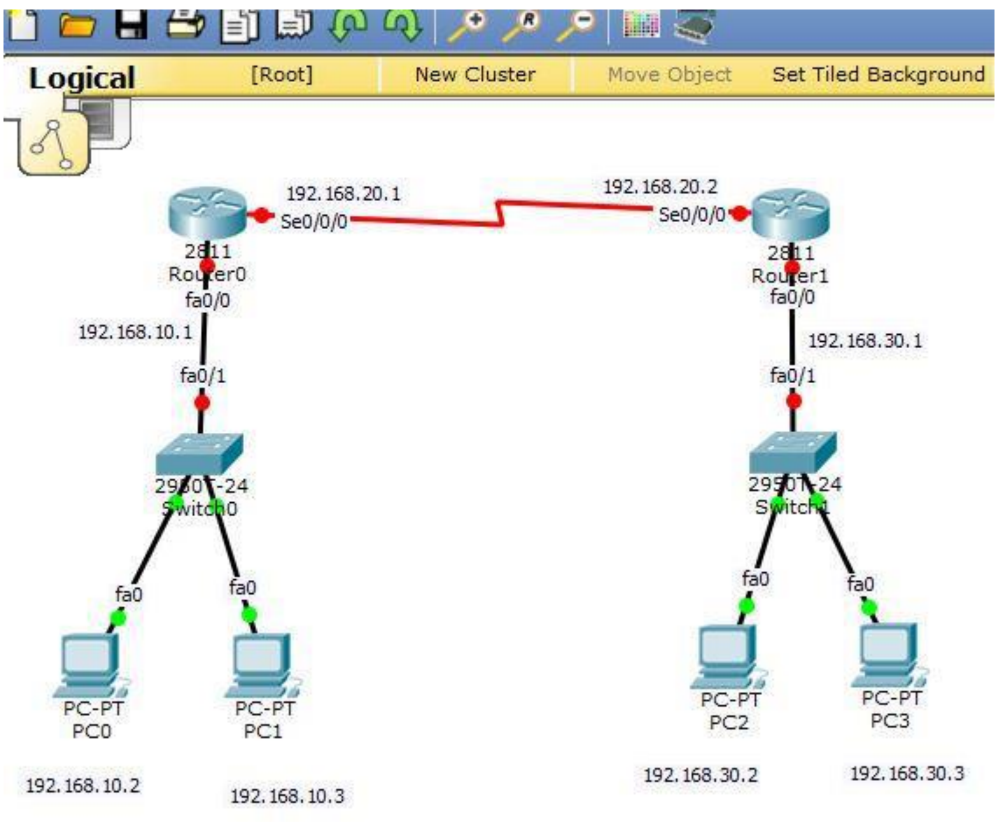


Figure 12: labeled topology

Start configurations.

1. Click on router

2. Enter following commands

    - Enable
    - Configure terminal
    - Interface fastEthernet 0/0
    - ip address 192.168.10.1 255.255.255.0
    - no shutdown
    - exit

3. Enter following commands on router 0

    - Interface serial 0/0/0
    - Ip address 192.168.20.1 255.255.255.0
    - Clock rate 128000
    - No shutdown

Like below

```
Router(config)#interface serial 0/0/0
Router(config-if)#ip address 192.168.20.1 255.255.255.0
Router(config-if)#clock rate 128000
Router(config-if)#no shutdown
```

Figure 13: router commands

4. Then reenter all of above commands on router 1 like below

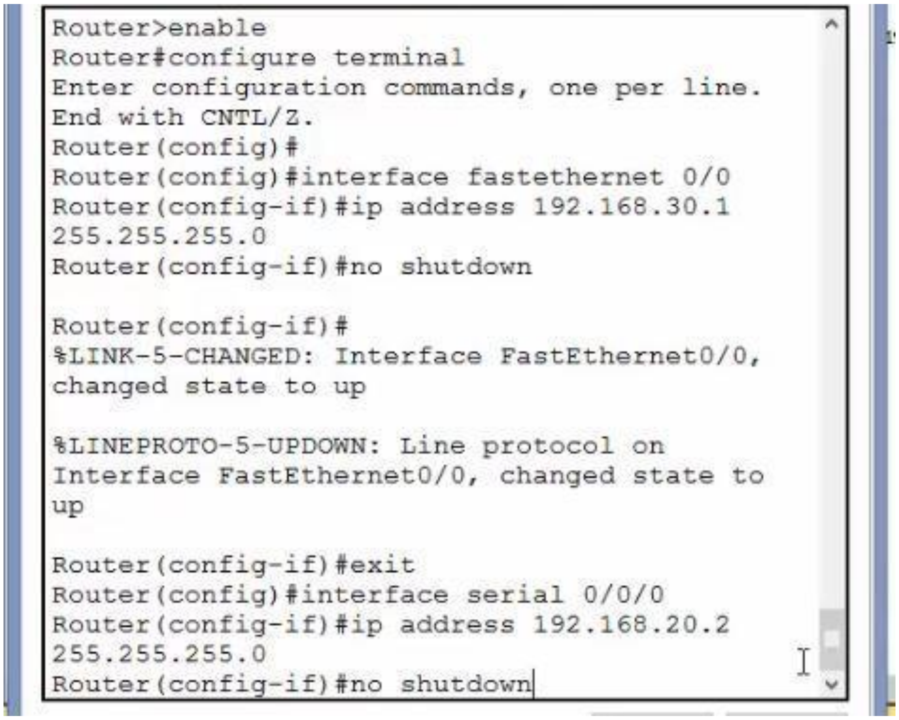


Figure 14: router commands

Now configure EIGRP protocols commands to configure EIGRP Protocol.

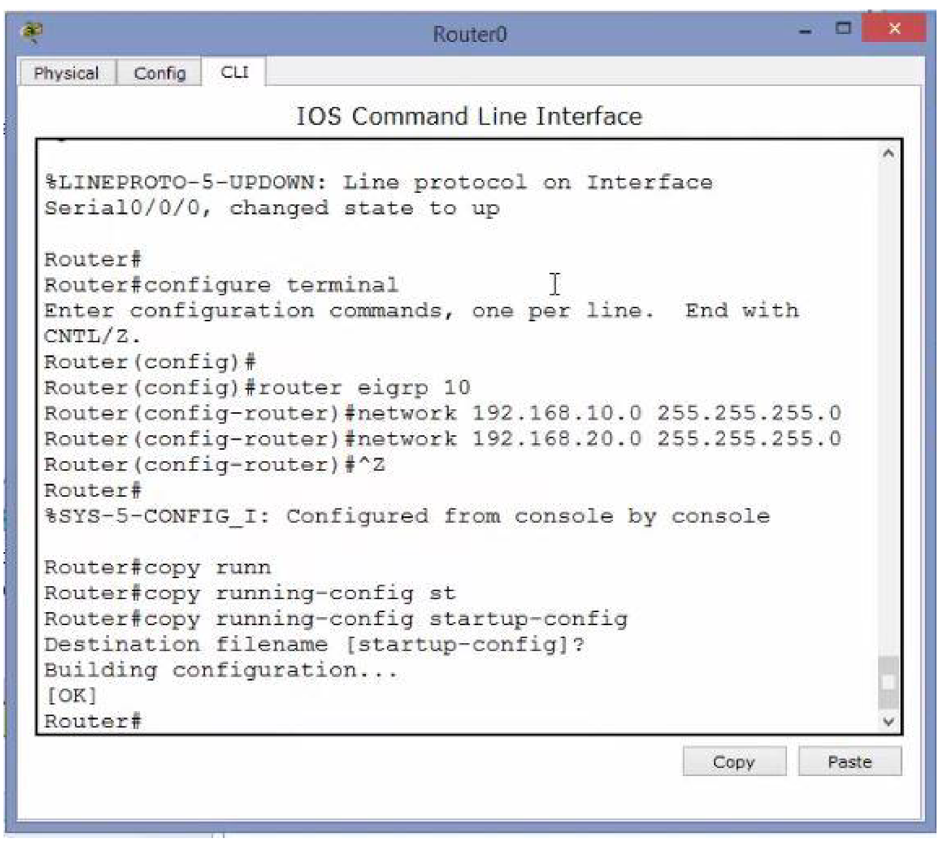
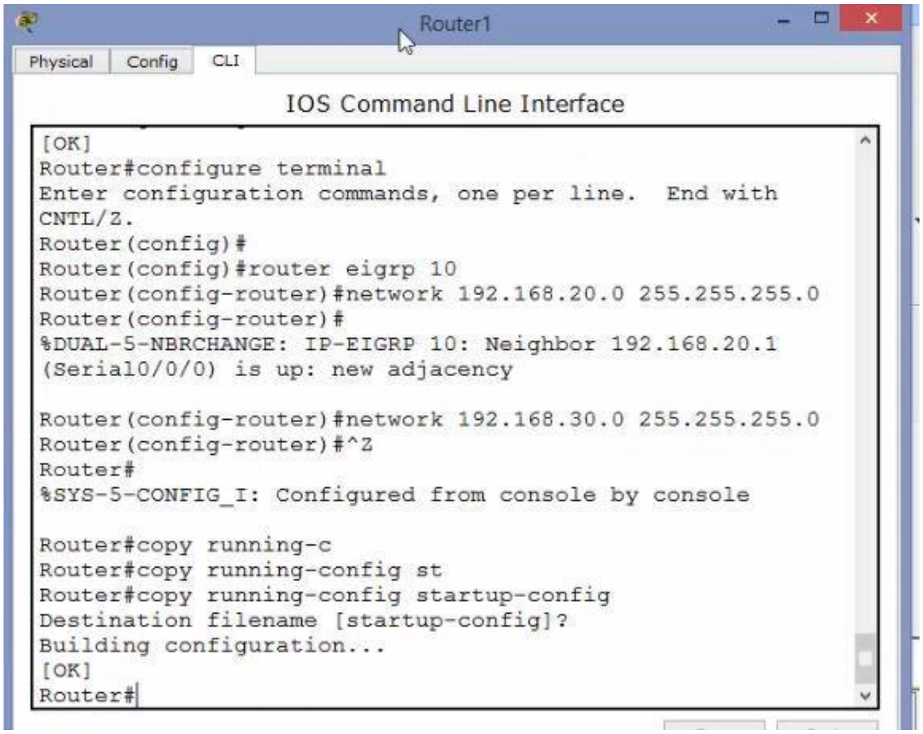


Figure 15: EIGRP commands




```
[OK]
Router#configure terminal
Enter configuration commands, one per line.  End with
CNTL/Z.
Router(config)#
Router(config)#router eigrp 10
Router(config-router)#network 192.168.20.0 255.255.255.0
Router(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 10: Neighbor 192.168.20.1
(Serial0/0/0) is up: new adjacency

Router(config-router)#network 192.168.30.0 255.255.255.0
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#copy running-c
Router#copy running-config st
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
```

Figure 16: EIGRP commands

Then your topology like below

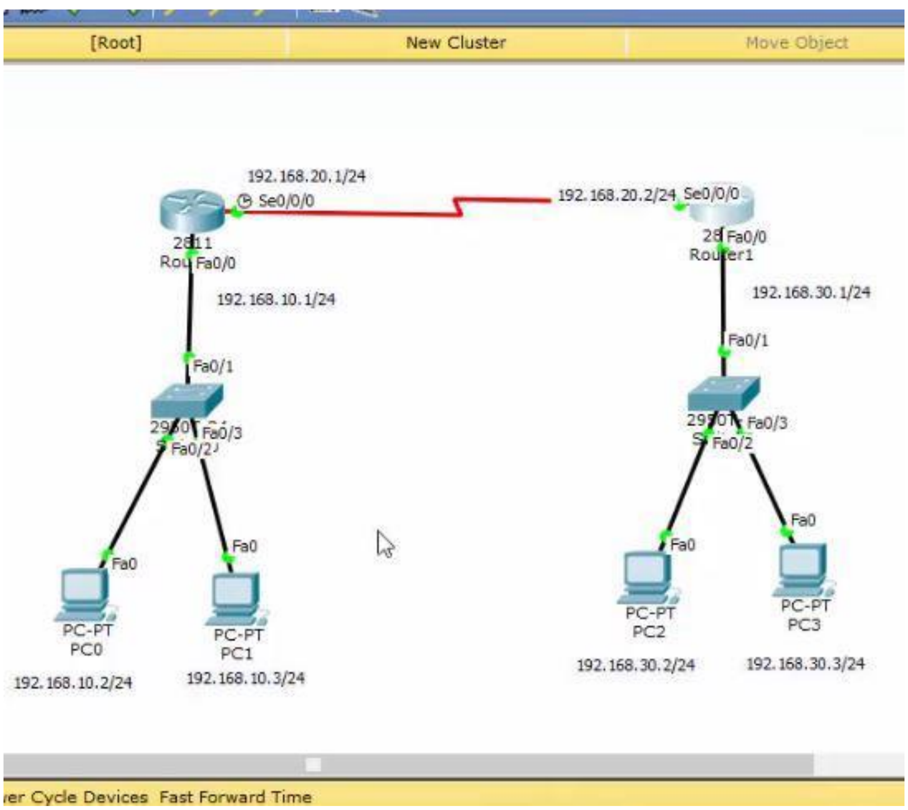


Figure 17: complete topology

Then Enter IP addresses Subnet mask and their Default Gateways in PC's

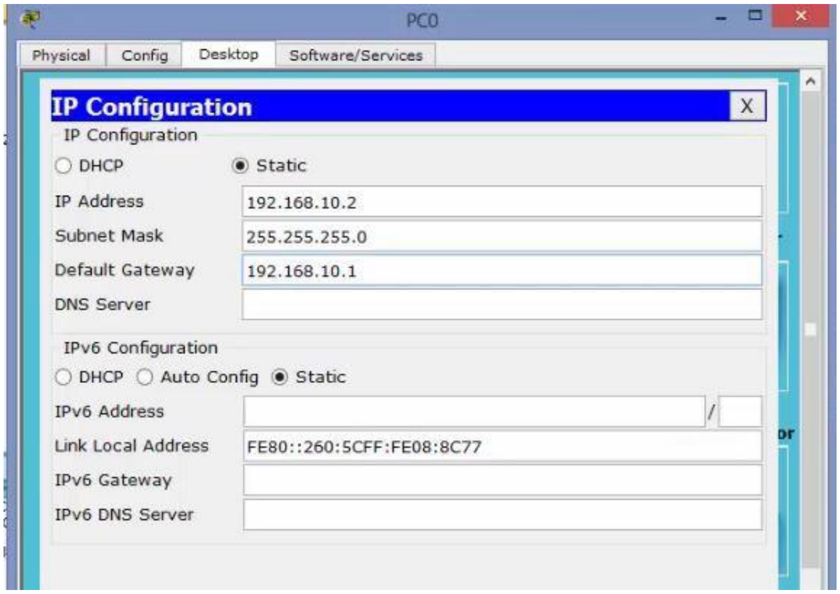


Figure 18: IP configuration on PC 0

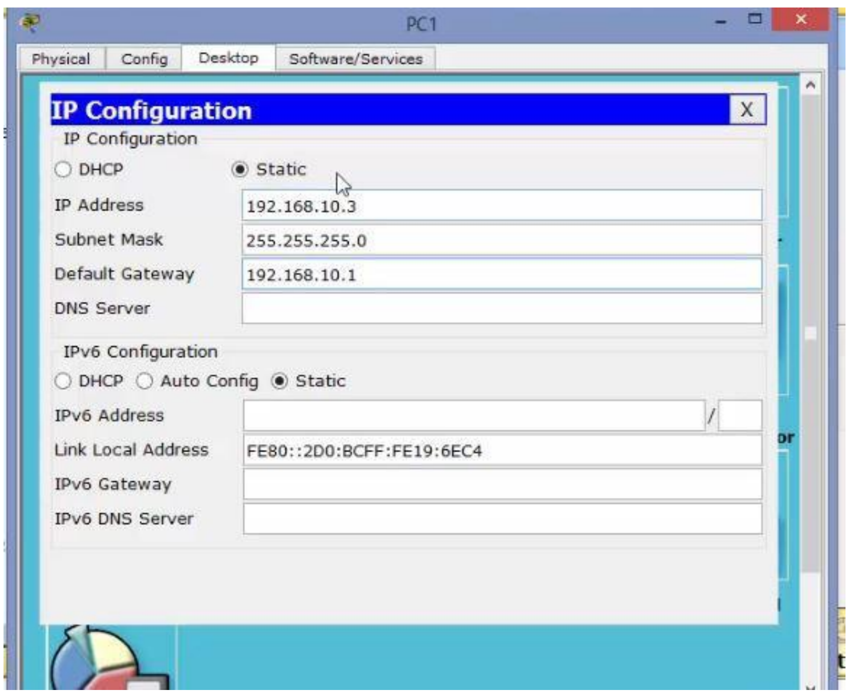


Figure 19: IP configuration on PC 1

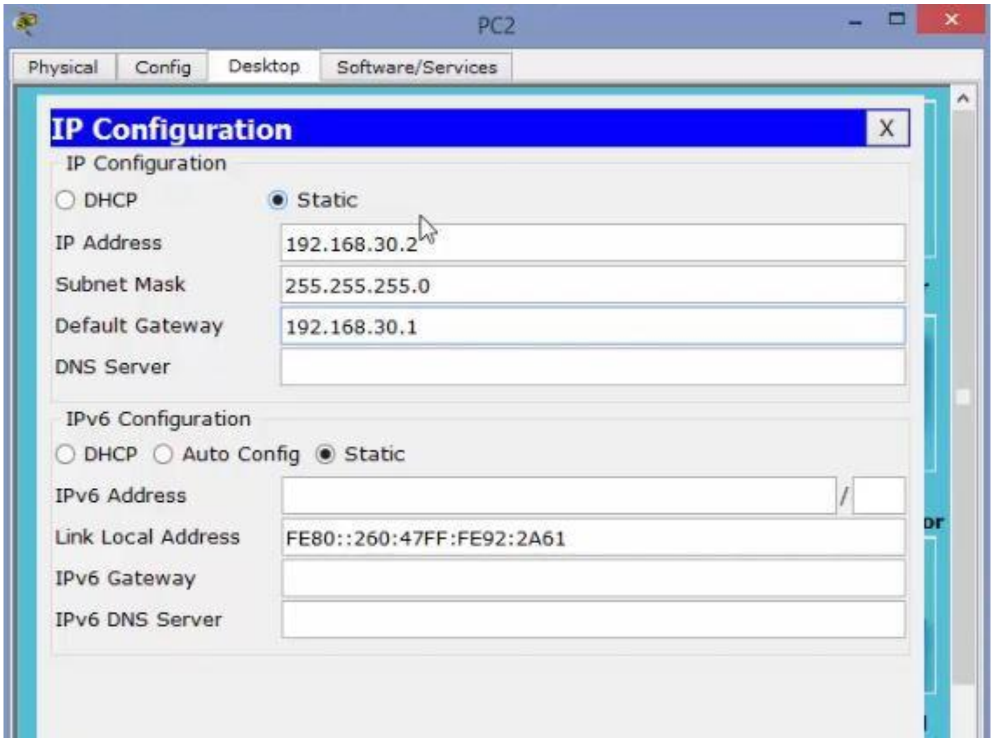


Figure 20: IP configuration on PC 2

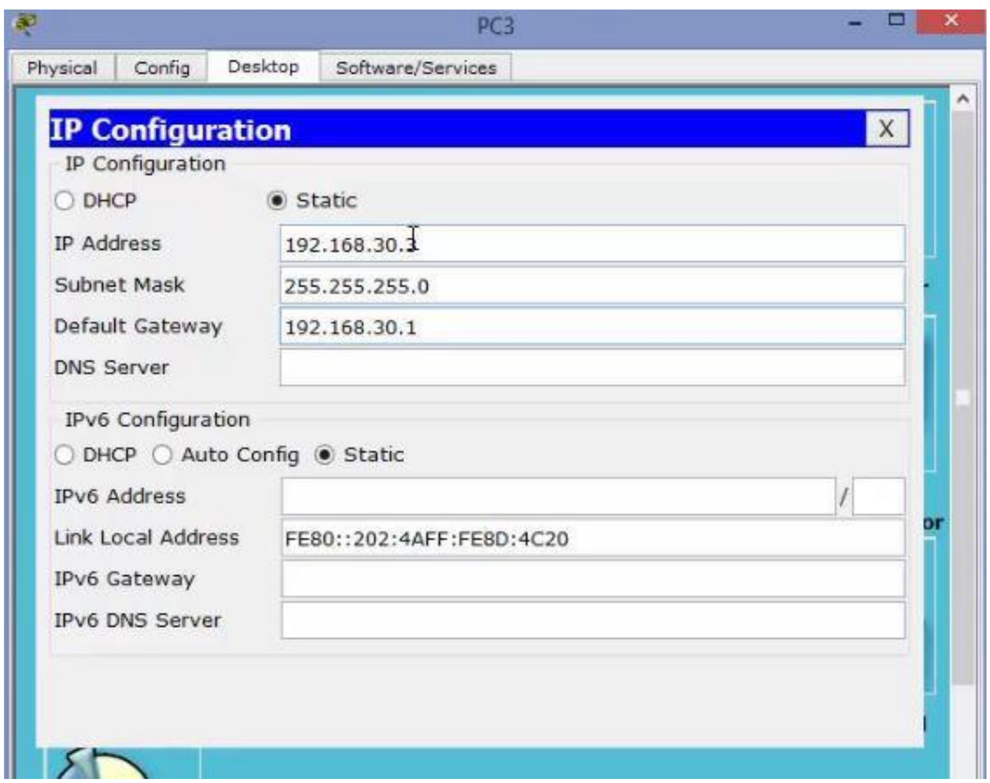


Figure 21: IP configuration on PC 3

Then Final Evaluation by ping

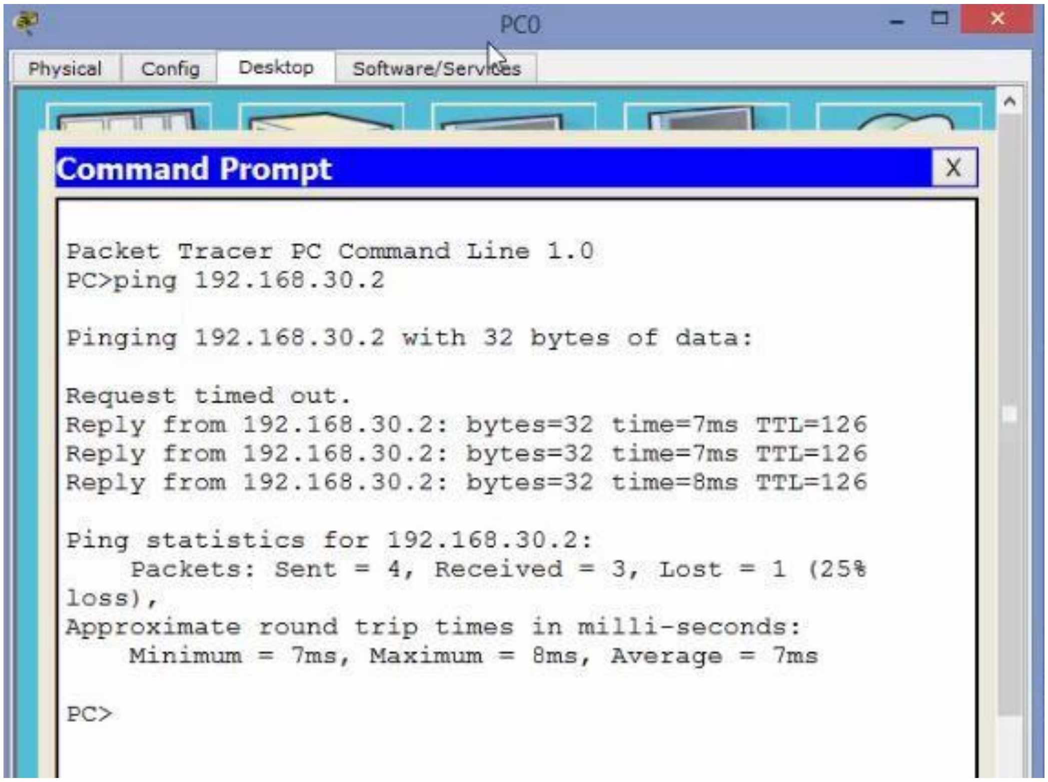


Figure 22: Ping from PC 0

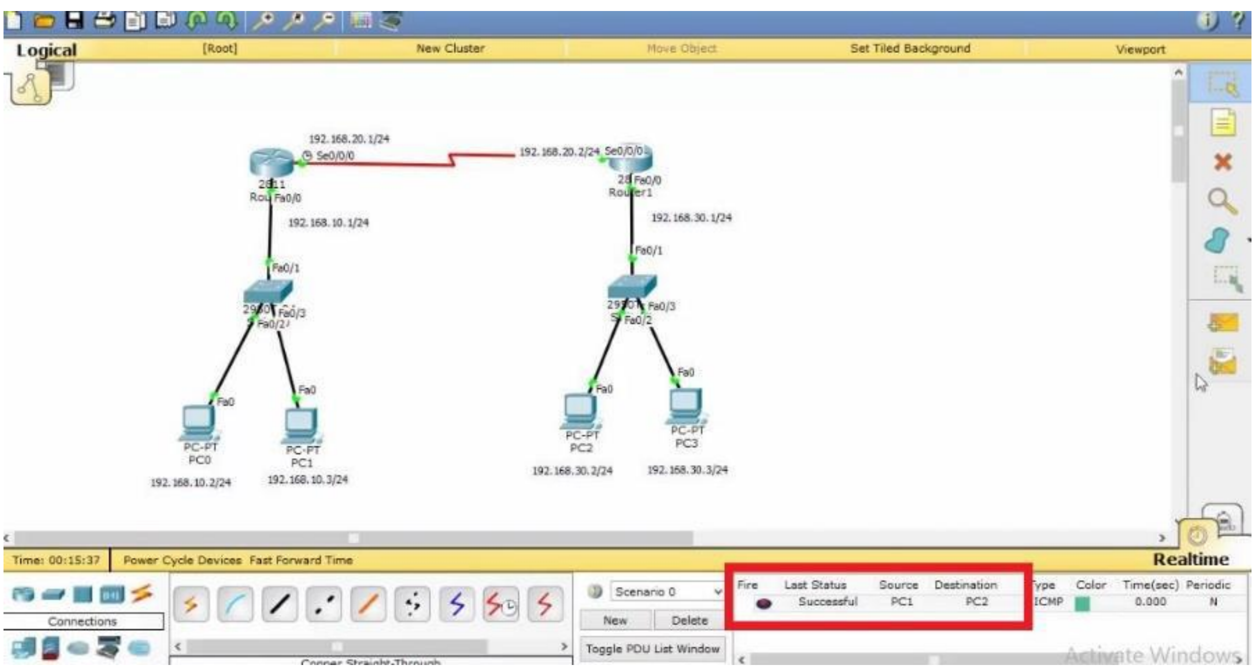


Figure 23: IP Successful PDU

5. Practice tasks:

5.1 Task 1:

Make topology given below and configure EIGRP dynamic routing in it and shows results to the instructor.

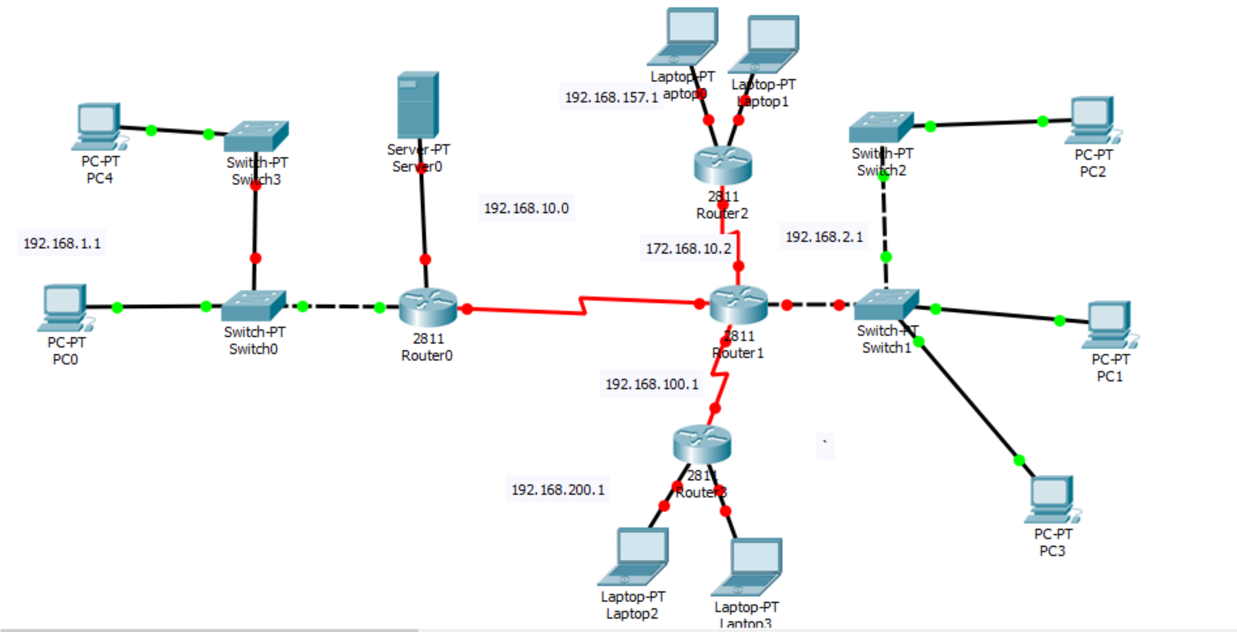


Figure 24: Practice Task 1