EAST WEST UNIVERSITY

Department of CSE

Spring 2024

Course name: Data Communications

Course Code: CSE350

Section: 02

Mini Project Report

Project Title: Data communication in a network

Submitted By:
Student's Name: Mim Bin Hossain
Student's ID: 2021-1-60-071

Submitted To:
Md. Khalid Mahbub Khan
Lecturer
Department of CSE

Problem Statement

In a modern networking scenario, ensuring efficient and reliable communication between devices is critical for business operations, academic institutions, and various other sectors. The challenge is to design a network using a limited number of networking devices, specifically three routers and three switches, to connect six PCs in such a way that they can communicate effectively. This design must incorporate the Enhanced Interior Gateway Routing Protocol (EIGRP) to manage the routing of data between different segments of the network. Additionally, the network will utilize a Class C IP address range to assign IP addresses to all hosts and network interfaces.

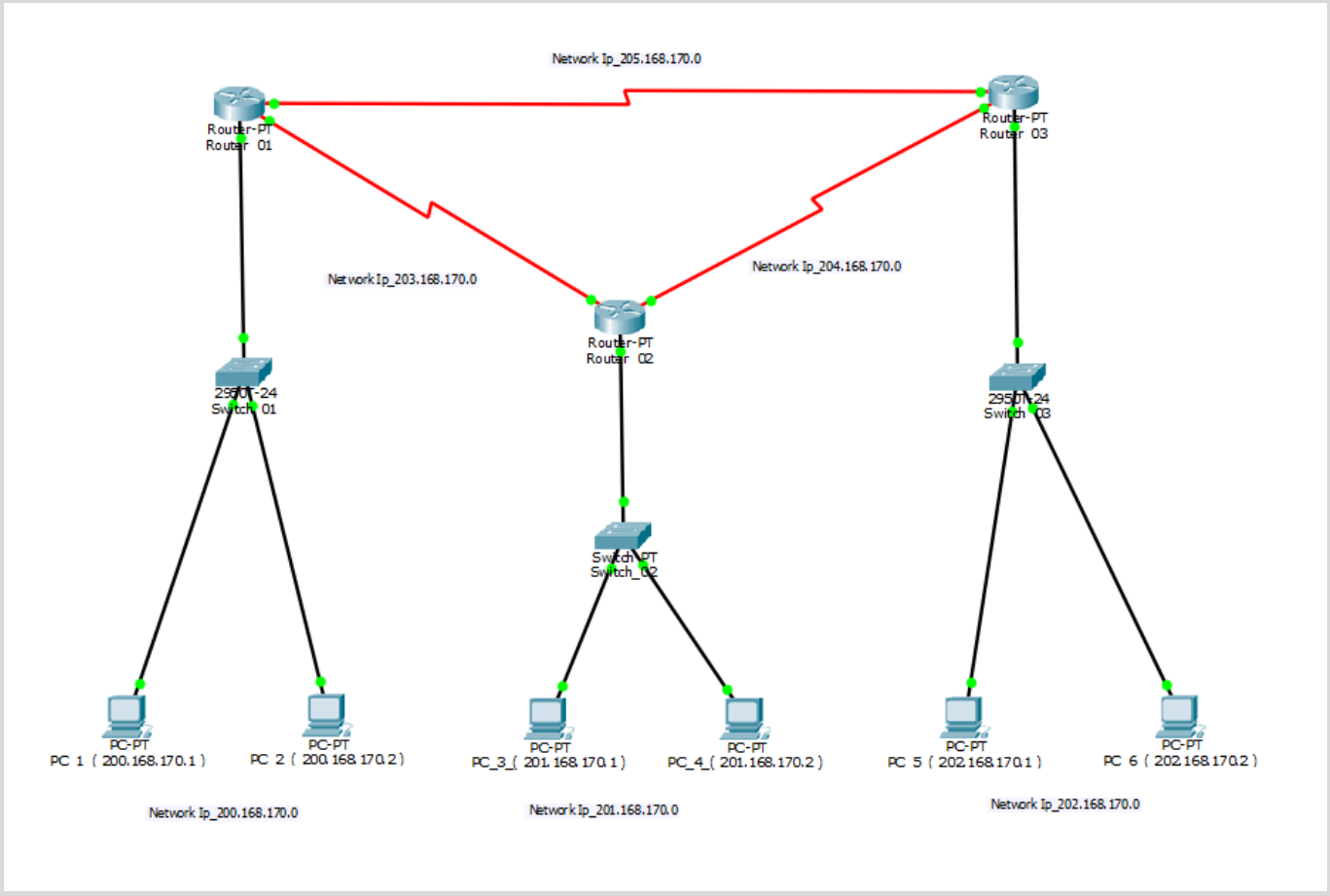
The specific objectives of this project are as follows:-

- Design a network topology that effectively uses the given networking devices (three routers and three switches).
- Assign appropriate IP addresses from a Class C network to all devices.
- Configure EIGRP on the routers to enable efficient routing of data between different segments of the network.
- Demonstrate the successful communication (PING operation) between 1 no. PC from the first router and 6 no. PC from the third router.
- Provide a detailed explanation of the network design, including IP addressing and EIGRP configuration.
- Verify the network setup by conducting and documenting the PING operation between the specified PCs.

Requirements:

- Cisco packet tracer software (version 8.2.1)
- Straight through cable
- Serial DCE cable
- Three (03) routers
- Three (03) switches
- Six (06) PCs

Design:



Network Topology

In the network topology above i have used the six Network & Host Ip Addresses as shown below:

Network Ip Addresses:-	Host Ip Addresses:-
200.168.170.0	**200.168.170.1**
201.168.170.0	**200.168.170.2**
202.168.170.0	**201.168.170.1**
203.168.170.0	**201.168.170.2**
204.168.170.0	**202.168.170.1**
205.168.170.0	**202.168.170.2**

The network is designed as follows:

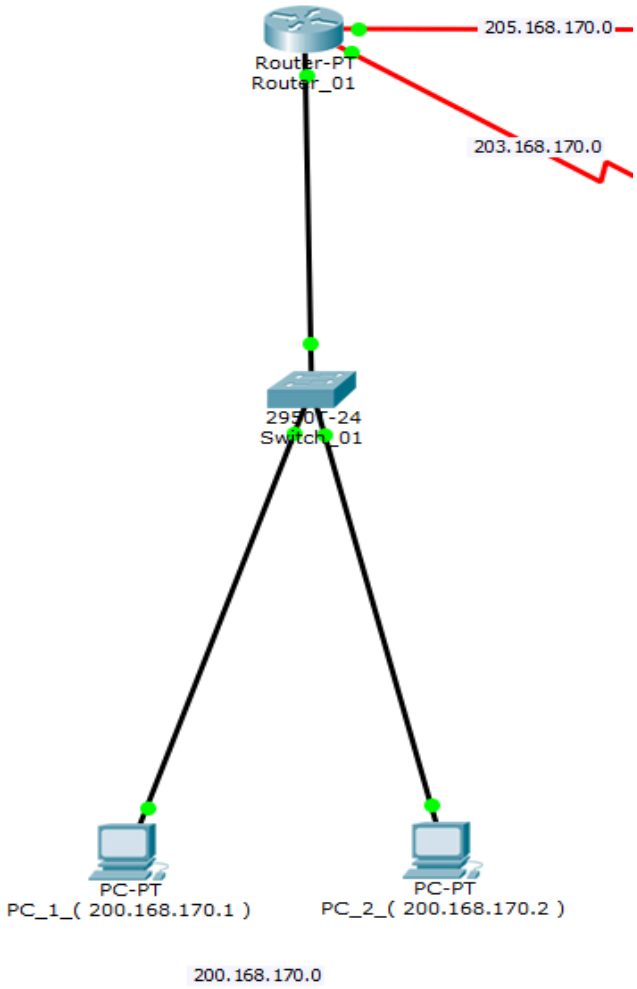
1) **IP Addressing Scheme:-**
    - Use the Class C IP address range 200.168.170.0/24 to 205.168.170.0/24
    - Set the default gateway on each PC to the corresponding router interface IP

2) **Router and Switch Configuration:-**
    - Router_01 connected to Switch_01
    - Router_02 connected to Switch_02
    - Router_03 connected to Switch_03

3) **PC Configuration:-**
    - PC_1 connected to Switch_01
    - PC_2 connected to Switch_01
    - PC_3 connected to Switch_02
    - PC_4 connected to Switch_02
    - PC_5 connected to Switch_03
    - PC_6 connected to Switch_03

4) **Inter-Router Connections:-**
    - Router_01 to Router_02
    - Router_01 to Router_03
    - Router_02 to Router_03.

Each Network Design, Configuration & Routing Algorithm:



Router_01

We can see here that I used three (03) Network IP Addresses 200.168.170.0 , 203.168.170.0 and 205.168.170.0 and the Host IP Addresses of numbers are two (02) 200.168.170.1 and 200.168.170.2. One Switch.

Configuration of Router_01:

interface fa0/0
ip address 200.168.170.254 255.255.255.0
no shut
do wr
exit

```
Router>enable
Router#config
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip address 200.168.170.254 255.255.255.0
Router(config-if)#no shut
Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#exit
```

interface se2/0
ip address 205.168.170.1 255.255.255.0
clock rate 6400
no shut
do wr
exit

```
Router(config)#interface se2/0
Router(config-if)#ip address 205.168.170.1 255.255.255.0
Router(config-if)#clock rate 6400
Unknown clock rate
Router(config-if)#no shut
Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#exit
```

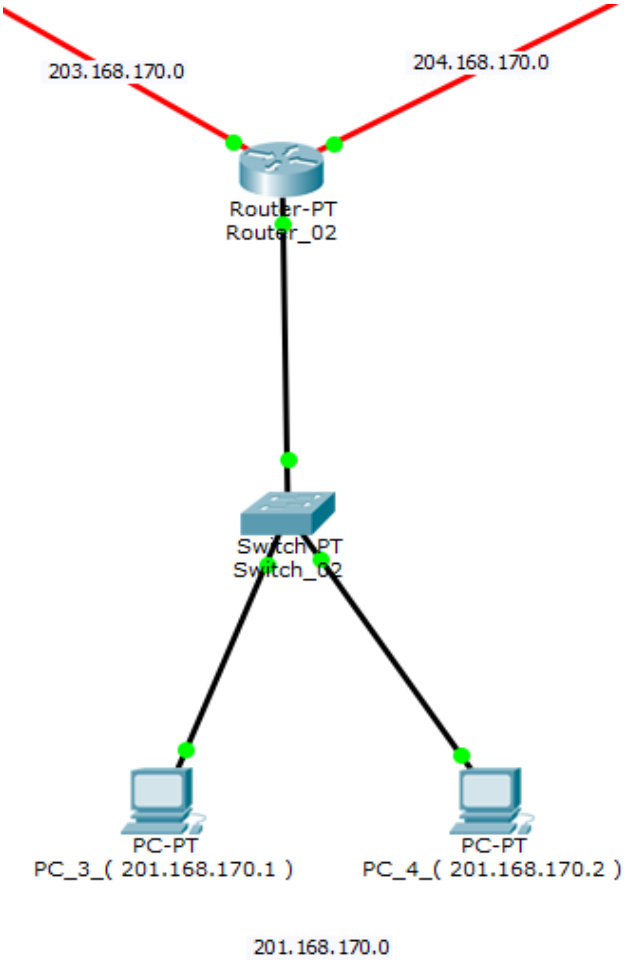
interface se3/0
ip address 203.168.170.1 255.255.255.0
clock rate 6400
no shut
do wr
exit

```
Router(config)#interface se3/0
Router(config-if)#ip address 203.168.170.1 255.255.255.0
Router(config-if)#clock rate 6400
Unknown clock rate
Router(config-if)#no shut
Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#exit
```

Routing Algorithm of Router_01:

router eigrp 1
network 200.168.170.0 0.0.0.255
network 203.168.170.0 0.0.0.255
network 205.168.170.0 0.0.0.255
exit

```
Router(config)#router eigrp 1
Router(config-router)#network 200.168.170.0 0.0.0.255
Router(config-router)#network 203.168.170.0 0.0.0.255
Router(config-router)#network 205.168.170.0 0.0.0.255
Router(config-router)#exit
```



Router_02

We can see here that I used three (03) Network IP Addresses 201.168.170.0 , 203.168.170.0 and 204.168.170.0 and the Host IP Addresses of numbers are two (02) 201.168.170.1 and 201.168.170.2. One Switch.

Configuration of Router_02:

interface fa0/0
ip address 201.168.170.254 255.255.255.0
no shut
do wr
exit

```
Router>enable
Router#config
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip address 201.168.170.254 255.255.255.0
Router(config-if)#no shut
Router(config-if)#do wr
Building configuration...
[OK]
```

interface se2/0
ip address 203.168.170.2 255.255.255.0
no shut
do wr
exit

```
Router(config-if)#exit
Router(config)#interface se2/0
Router(config-if)#ip address 203.168.170.2 255.255.255.0
Router(config-if)#no shut
Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#exit
```

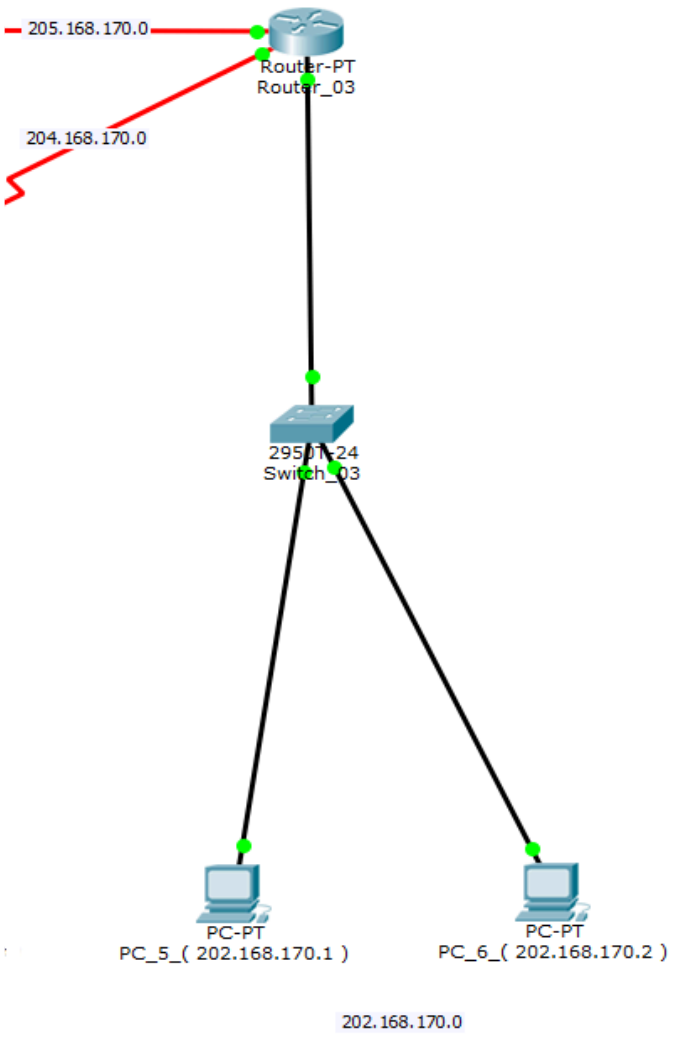
interface se3/0
ip address 204.168.170.1 255.255.255.0
clock rate 6400
no shut
do wr
exit

```
Router(config)#interface se3/0
Router(config-if)#ip address 204.168.170.1 255.255.255.0
Router(config-if)#clock rate 6400
Unknown clock rate
Router(config-if)#no shut
Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#exit
```

Routing Algorithm of Router_02:

router eigrp 1
network 201.168.170.0 0.0.0.255
network 203.168.170.0 0.0.0.255
network 204.168.170.0 0.0.0.255
exit

```
Router(config)#router eigrp 1
Router(config-router)#network 201.168.170.0 0.0.0.255
Router(config-router)#network 203.168.170.0 0.0.0.255
Router(config-router)#network 204.168.170.0 0.0.0.255
Router(config-router)#exit
```



Router_03

We can see here that I used three (03) Network IP Addresses 202.168.170.0 , 204.168.170.0 and 205.168.170.0 and the Host IP Addresses of numbers are two (02) 202.168.170.1 and 202.168.170.2. One Switch.

Configuration of Router_03:

interface fa0/0
ip address 202.168.170.254 255.255.255.0
no shut
do wr
exit

```
Router>enable
Router#config
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip address 202.168.170.254 255.255.255.0
Router(config-if)#no shut
Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#exit
```

interface se3/0
ip address 204.168.170.2 255.255.255.0
no shut
do wr
exit

```
Router(config)#interface se3/0
Router(config-if)#ip address 204.168.170.2 255.255.255.0
Router(config-if)#no shut
Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#exit
```

interface se2/0
ip address 205.168.170.2 255.255.255.0
no shut
do wr
exit

```
Router(config)#interface se2/0
Router(config-if)#ip address 205.168.170.2 255.255.255.0
Router(config-if)#no shut
Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#exit
```

Routing Algorithm of Router_03:

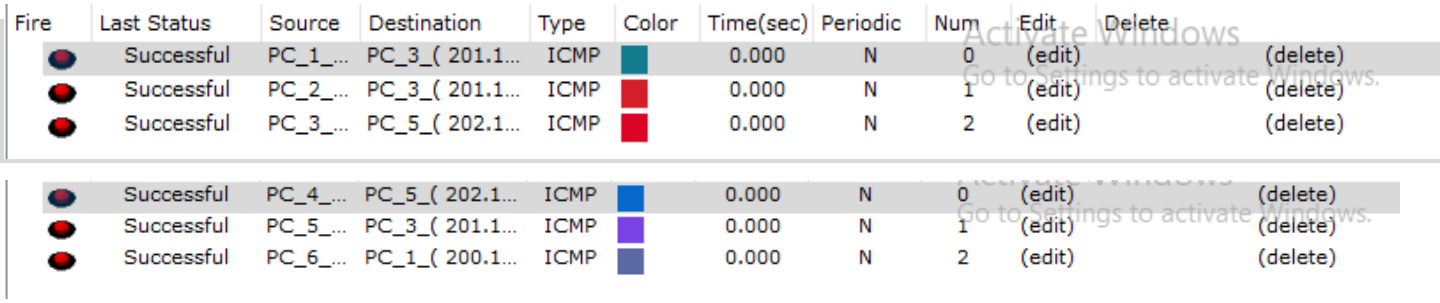
router eigrp 1
network 202.168.170.0 0.0.0.255
network 204.168.170.0 0.0.0.255
network 205.168.170.0 0.0.0.255
exit

```
Router(config)#router eigrp 1
Router(config-router)#network 202.168.170.0 0.0.0.255
Router(config-router)#network 204.168.170.0 0.0.0.255
Router(config-router)#network 205.168.170.0 0.0.0.255
Router(config-router)#exit
```

Experimental Results:

1) PDU Operation:

A Protocol Data Unit (PDU) is a term used in telecommunications and computer networking to refer to a unit of data specified in a protocol of a given layer. PDUs contain the necessary information that the protocols at each layer use to transmit data across a network.



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC_1_...	PC_3_(201.1...	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC_2_...	PC_3_(201.1...	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC_3_...	PC_5_(202.1...	ICMP		0.000	N	2	(edit)	(delete)
	Successful	PC_4_...	PC_5_(202.1...	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC_5_...	PC_3_(201.1...	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC_6_...	PC_1_(200.1...	ICMP		0.000	N	2	(edit)	(delete)

All networks are ping successfully.

2) Ping Operation:

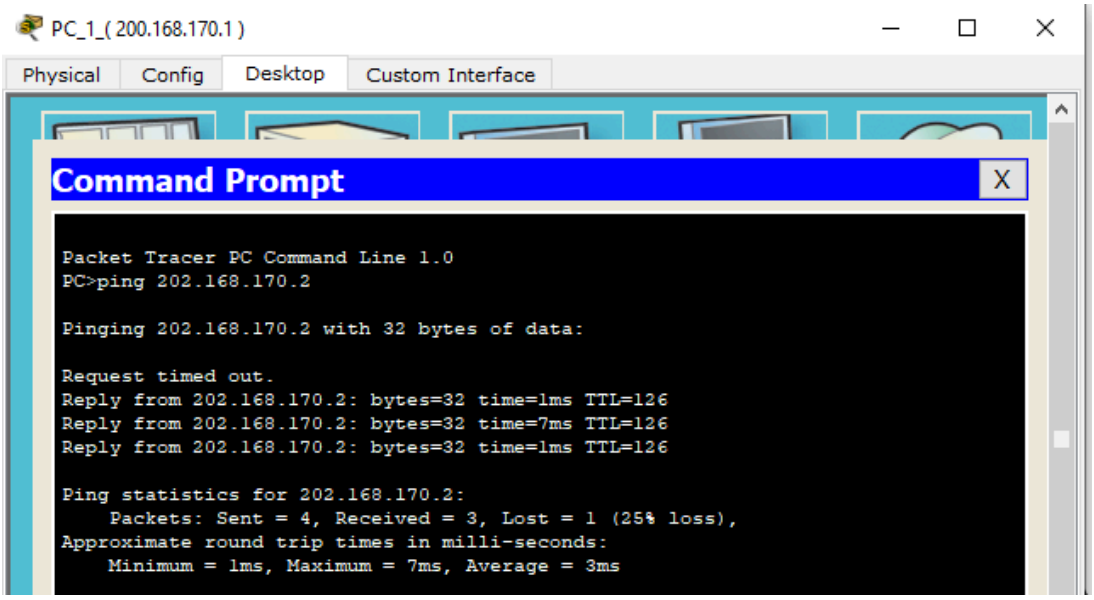
Ping (Packet Internet Groper) is a network utility used to test the reachability of a host on an IP network and to measure the round-trip time for messages sent from the originating host to a destination computer. The basic function of the ping command is to send a series of Internet Control Message Protocol (ICMP) Echo Request messages to a target host and wait for ICMP Echo Reply messages.

After configuring the network as described, the ping command is used to test connectivity. The primary test is to ping from PC_1_(200.168.170.1) first router to PC_6_(202.168.170.2) third router.

Steps:-

- Open the command prompt on PC_1
- Execute the command: ping 202.168.170.2
- Observe the ping results
- The ping command should display successful replies from PC_6, indicating that ICMP packets have traversed the network from PC_1 to PC_6 and back without issues.

Results:



This output shows successful communication with the target host, indicating that the network is functioning correctly between the two points.

Conclusion:

The project demonstrates the successful design and implementation of a small network using three routers, three switches, and six PCs with EIGRP as the routing protocol. The network is configured with a Class C IP addressing scheme and is verified through a successful ping operation between two endpoints (PC_1 and PC_6).

The use of EIGRP ensures efficient routing with fast convergence times and robustness. This experiment highlights the practicality of EIGRP in a small network setup and provides a foundational understanding of network design and configuration.

Through this project, we have achieved a fully functional network where all devices can communicate effectively, fulfilling the requirements and demonstrating the reliability of EIGRP in dynamic routing environments.