EAST WEST UNIVERSITY

Course name: Data Communications

Course Code: CSE350

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Topic: Routing Configurations & Protocols

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Routing Configuration

Routing configuration refers to setting up and managing the protocols and policies that determine how data packets are forwarded between different networks. It involves configuring routers and other network devices to ensure that data takes the most efficient path to reach its destination. This process includes defining routes, setting up routing tables, and implementing static and dynamic routing methods. Proper routing configuration is essential for optimizing network performance, ensuring reliable communication, and maintaining network security by preventing unauthorized access and routing loops. Additionally, it plays a critical role in scalability, allowing networks to adapt to growth and changes in topology without manual intervention.

Design

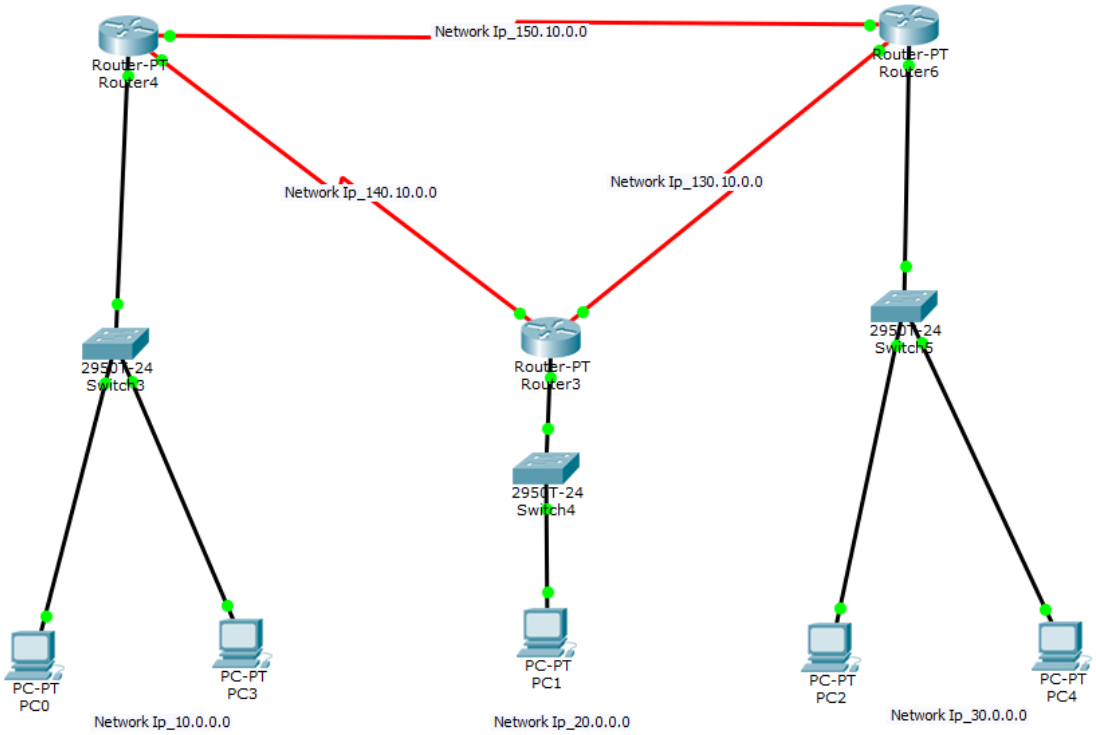


Figure 1: Network Topology

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

Network IP	Host Ip
10.0.0.0	10.10.10.1
20.0.0.0	10.10.10.2
30.0.0.0	20.10.10.1
130.10.0.0	30.10.10.1
140.10.0.0	30.10.10.2
150.10.0.0	-

Table 1: Network & Host IP Addresses

Routing Protocols

Routing protocols choose the most efficient route for data to take across a network. Some typical routing protocols are as follows:

No	Routing Protocols Name
1	Routing Information Protocol (RIP)
2	Open Shortest Path First (OSPF)
3	Enhanced Interior Gateway Routing Protocol(EIGRP)
4	Border Gateway Protocol (BGP)
5	Interior Gateway Routing Protocol (IGRP)
6	Intermediate System to Intermediate System (IS-IS)

Table 2: List of Common Routing Protocols

RIP (Routing Information Protocol)

RIP (Routing Information Protocol): An older distance-vector routing protocol that determines the best path to a destination by counting the number of hops (intermediate routers) along the route. The route with the fewest hops is chosen as the best path. RIP is simple and easy to configure but has limitations, such as a maximum hop count of 15, making it less suitable for larger networks.

OSPF (Open Shortest Path First)

OSPF (Open Shortest Path First) is a link-state routing protocol used in Internet Protocol (IP) networks to find the most efficient path for data to travel. It does this by creating a map of the network, which allows it to determine the shortest path to a destination using the Dijkstra algorithm.

EIGRP (Enhanced Interior Gateway Routing Protocol)

A Cisco proprietary protocol that is a hybrid of distance-vector and link-state routing protocols. EIGRP combines the advantages of both types by using distance-vector techniques to share routing information and link-state techniques to calculate the most efficient route. It is known for its fast convergence, scalability, and efficient use of network resources, making it suitable for large, complex networks.

Each Network Design, Configuration & Routing Algorithm

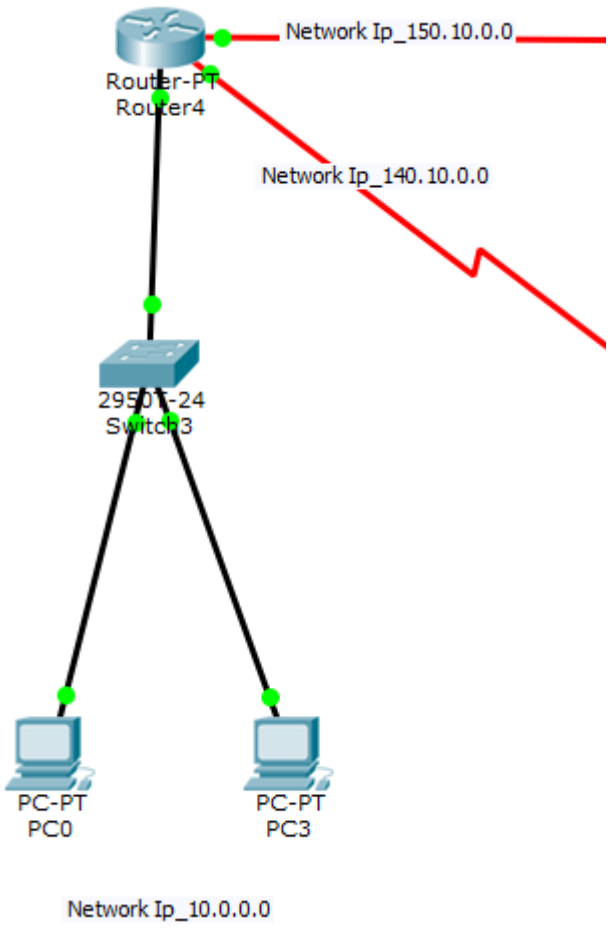


Figure 2: Router4

We can see here that I used three (03) Network IP Addresses 150.10.0.0, 140.10.0.0 & 10.0.0.0, and the Host IP Addresses of the numbers are two (02).

- **Configuration of Router4**

```
interface fa0/0
ip address 10.10.10.254 255.0.0.0
no shut
do wr
exit


interface se3/0
ip address 150.10.10.1 255.255.0.0
clock rate 6400
no shut
do wr
exit


interface se2/0
ip address 140.10.10.1 255.255.0.0
clock rate 6400
no shut
do wr
exit
```

- **RIP Routing Protocol**

```
router rip
network 10.0.0.0
network 140.10.0.0
network 150.10.0.0
exit
```

- **OSPF Routing Protocol**

```
router ospf 1
network 10.0.0.0 0.255.255.255 area 1
network 140.10.0.0 0.0.255.255 area 1
network 150.10.0.0 0.0.255.255 area 1
exit
```

- **EIGRP Routing Protocol**

```
router eigrp 1
network 10.0.0.0 0.255.255.255
network 140.10.0.0 0.0.255.255
network 150.10.0.0 0.0.255.255
exit
```

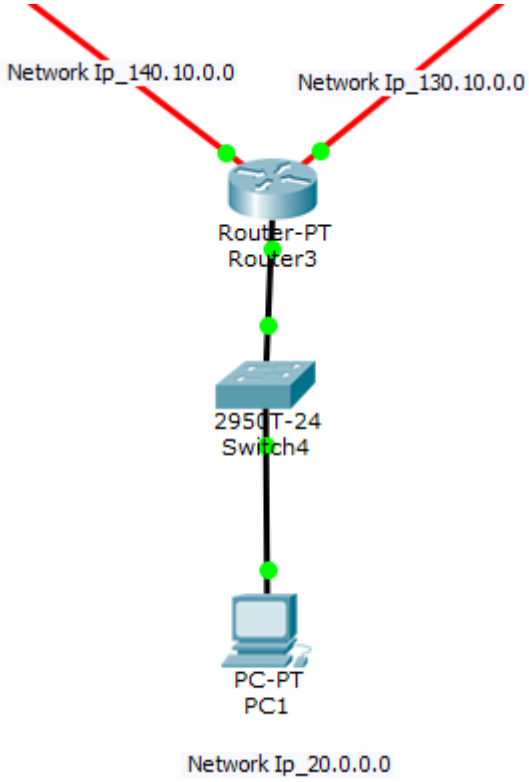


Figure 3: Router3

We can see here that I used three (03) Network IP Addresses 130.10.0.0, 140.10.0.0 & 20.0.0.0, and the Host IP Addresses of the number is one (01).

- **Configuration of Router3**

```
interface fa0/0
ip address 20.10.10.254 255.0.0.0
no shut
do wr
exit

interface se2/0
ip address 140.10.10.2 255.255.0.0
no shut
do wr
exit
```

```
interface se3/0
ip address 130.10.10.2 255.255.0.0
clock rate 6400
no shut
do wr
exit
```

- **RIP Routing Protocol**

```
router rip
network 20.0.0.0
network 130.10.0.0
network 140.10.0.0
exit
```

- **OSPF Routing Protocol**

```
router ospf 1
network 20.0.0.0 0.255.255.255 area 1
network 130.10.0.0 0.0.255.255 area 1
network 140.10.0.0 0.0.255.255 area 1
exit
```

- **EIGRP Routing Protocol**

```
router eigrp 1
network 20.0.0.0 0.255.255.255
network 130.10.0.0 0.0.255.255
network 140.10.0.0 0.0.255.255
exit
```

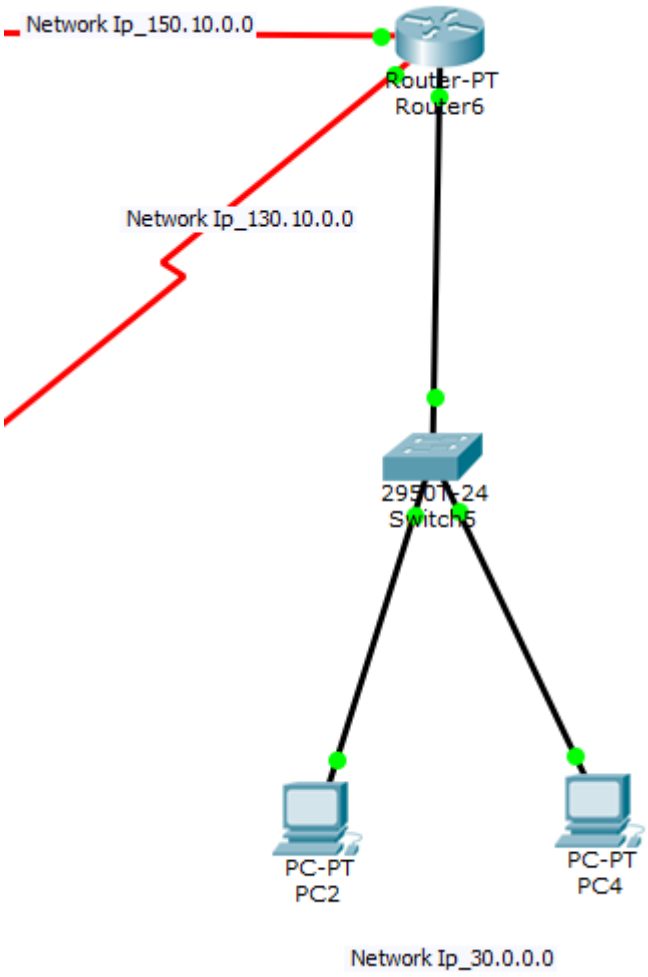


Figure 4: Router6

I used three (03) Network IP Addresses 150.10.0.0, 130.10.0.0 & 30.0.0.0, and the Host IP Addresses of the numbers are two (02).

- **Configuration of Router6**

```
interface fa0/0
ip address 30.10.10.254 255.0.0.0
no shut
do wr
exit
```

```
interface se2/0
ip address 150.10.10.2 255.255.0.0
no shut
do wr
exit

interface se3/0
ip address 130.10.10.2 255.255.0.0
no shut
do wr
exit
```

- **RIP Routing Protocol**

```
router rip
network 30.0.0.0
network 130.10.0.0
network 150.10.0.0
exit
```

- **OSPF Routing Protocol**

```
router ospf 1
network 30.0.0.0 0.255.255.255 area 1
network 130.10.0.0 0.0.255.255 area 1
network 150.10.0.0 0.0.255.255 area 1
exit
```

- **EIGRP Routing Protocol**

```
router eigrp 1
network 30.0.0.0 0.255.255.255
network 130.10.0.0 0.0.255.255
network 150.10.0.0 0.0.255.255
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	PC1	PC2	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC1	PC3	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	2	(edit)	(delete)
	Successful	PC2	PC3	ICMP		0.000	N	3	(edit)	(delete)

All networks are ping successfully.

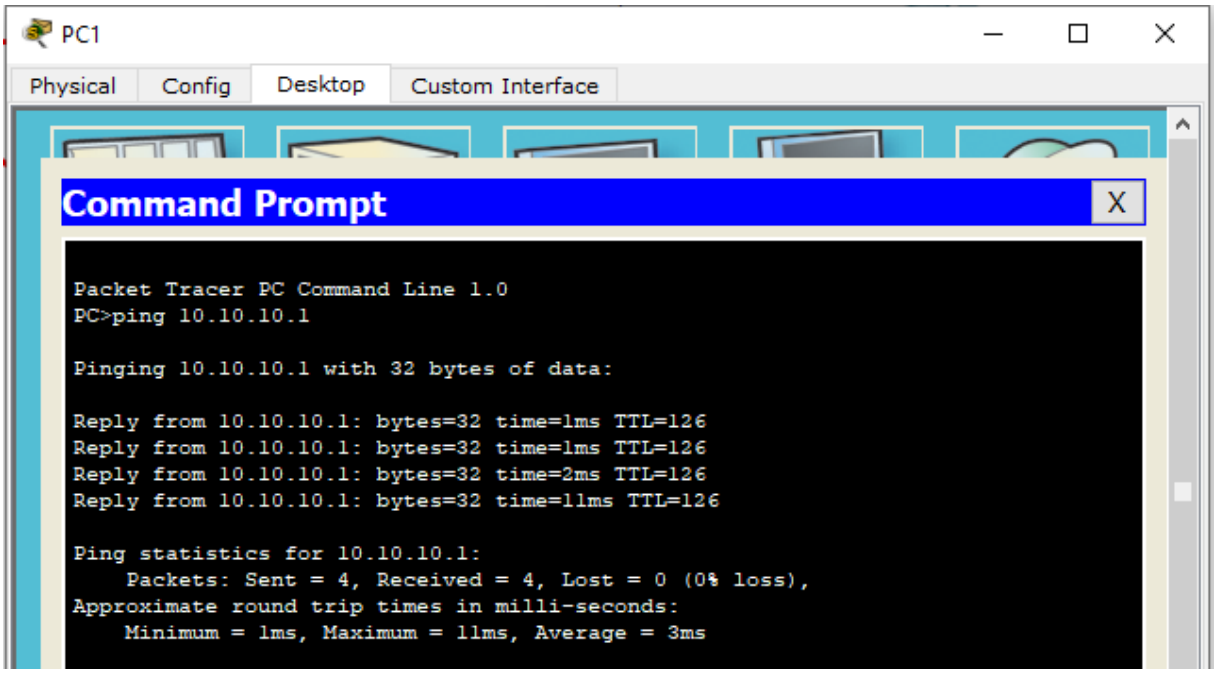
2) Ping Operation: Ping (Packet Internet Groper) is a network utility used to test the reachability of a host on an IP network and to measure the round-trip time for messages sent from the originating host to a destination computer. The basic function of the ping command is to send a series of Internet 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 PC1(20.10.10.1) Router3 router to PC0(10.10.10.1) Router4.

Steps:-

- Open the command prompt on PC1
- Execute the command: ping 10.10.10.1

- Observe the ping results

- The ping command should display successful replies from PC0, indicating that ICMP packets have traversed the network from PC1 to PC0 and back without issues.



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

THE END ..... THANK YOU FOR READING