Department of Computer Science and Engineering

Islamic University of Technology (IUT)

A subsidiary organ of OIC

Laboratory Report

CSE 4412: Data Communication and Networking Lab

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Section: SWE

Semester: Summer (4^{th})

Academic Year: 2022-2023

Date of Submission: 01/03/2024

Title: Configuring and Verifying of RIP and OSPF in a network topology.

Objective:

1. Describe the concept of dynamic routing.
2. Explain disadvantages of RIPv1 and improvement in RIPv2.
3. Configure Routing Information Protocol (RIP) in a network topology following given specifications.
4. Describe the concept of OSPF and related terminologies.
5. Explain the advantages of OSPF over RIP.
6. Configure OSPF in a network topology following the given specifications.

Devices/ software Used:

1. Laptop
2. Cisco Packet Tracer

Theory:

(Explain in brief the listed keywords)

1. **Routing Information Protocol (RIP)**
   Ans: RIP is one of the oldest dynamic routing protocols used in computer networks. It's designed to allow routers to exchange routing information periodically within a network. RIP uses hop count as its metric to determine the best route to a destination network. Despite being obsolete in many modern network environments due to its limitations, RIP is still taught and understood because it provides a foundational understanding of dynamic routing protocols.

2. **Forwarding Table used in RIP**
   Ans: In RIP, routers maintain a routing table, also known as a forwarding table, which contains information about reachable destinations in the network. This table includes entries for various networks along with associated metrics (typically hop counts in RIP) that indicate the cost of reaching those destinations. The router consults this table to determine the next hop for forwarding packets towards their destination.

3. **Hop Count as cost**

   Ans: In RIP, the metric used to evaluate the "cost" of reaching a destination network is the hop count. Hop count refers to the number of routers (or hops) that a packet must traverse to reach the destination network. Each hop between routers typically incurs a certain amount of delay and resource consumption, so minimizing hop count generally leads to more efficient routing paths.

4. **Timers in RIP**

   Ans: RIP employs several timers to manage the exchange of routing information and to detect network topology changes. The key timers in RIP include:

   - Update Timer: This timer determines how frequently routers send routing table updates to their neighbors. In RIP, updates are sent every 30 seconds by default.

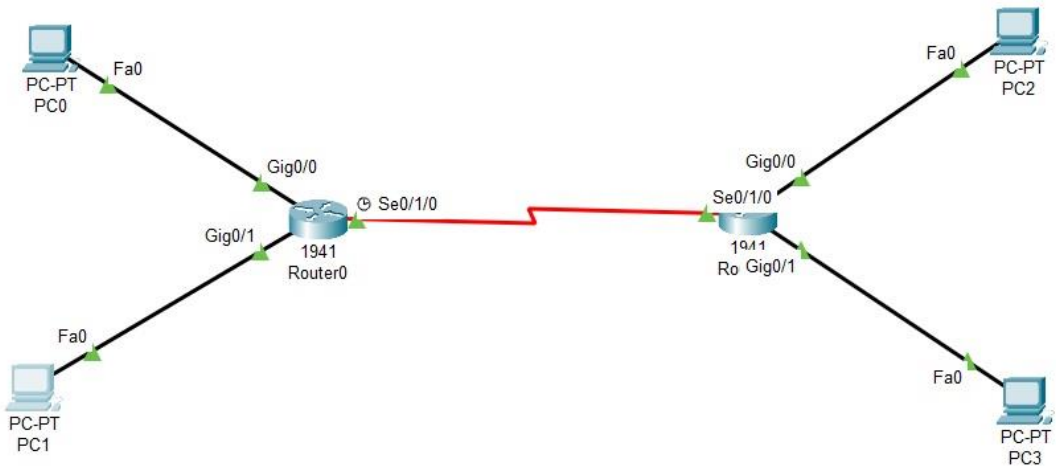
   - Invalid Timer: When a router stops receiving updates about a particular route, it starts the invalid timer. If no updates are received for a route within a certain period (typically three times the update timer), the route is considered invalid.

   - Hold-down Timer: After marking a route as invalid, the router starts the hold-down timer. During this time, the router suppresses any route updates received for the invalid route, preventing potentially incorrect information from being propagated.

   - Flush Timer: Once the hold-down timer expires, indicating that the route is likely stable again, the router starts the flush timer. After the flush timer expires, the route is removed from the routing table if no updates confirming the route's validity are received.

Diagram of the experiment

Task #01:



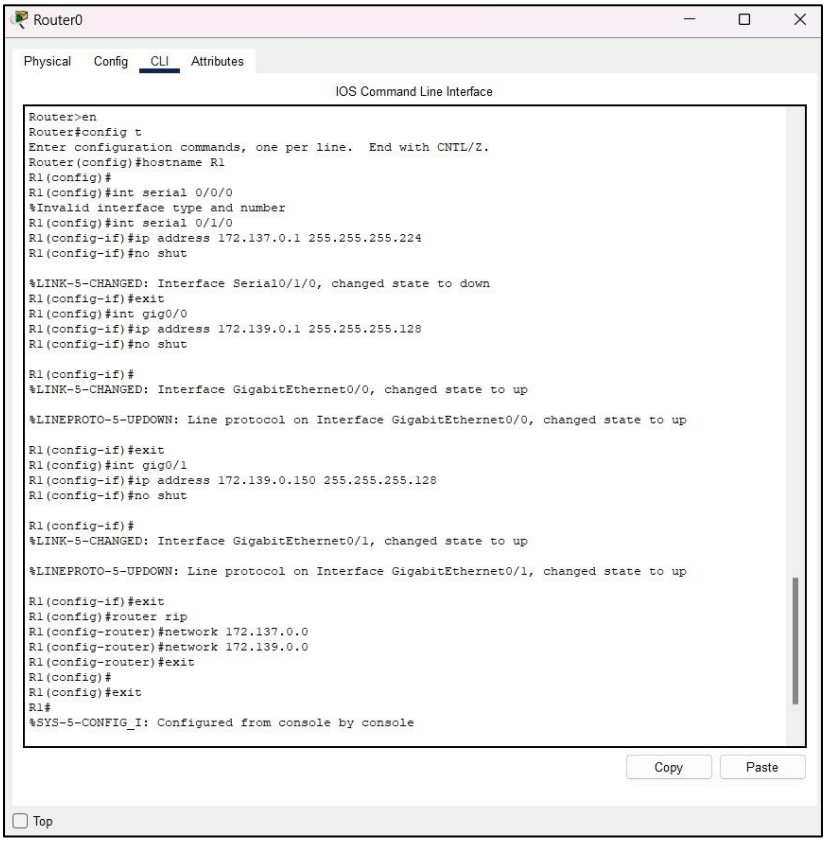
Working Procedure:

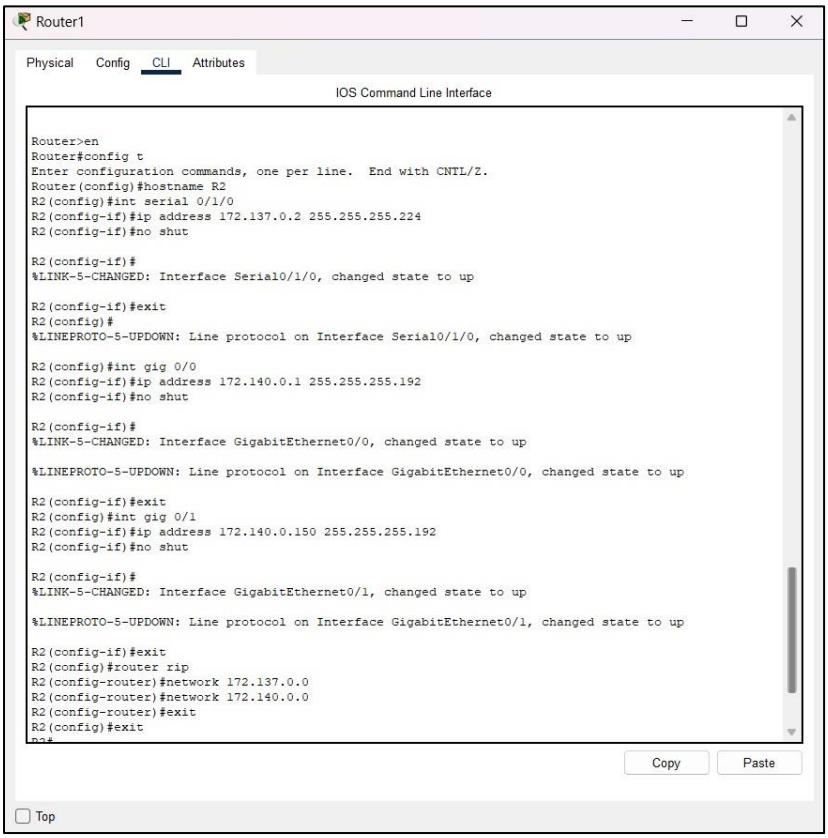
Step 1: Configuring Routers

At first I changed the host name of the routers. Here I am providing codes for R1, then I configured the router. The process for router-2 is similar. To do this, I have used the following commands:

```
En
Config t
Hostname R1
Serial 0/1/0
Ip address 172.137.0.2 255.255.255.224
No shut
exit
Int gig 0/0
Ip address 172.140.0.1 255.255.255.192
No shut
Exit
Int gig 0/1
Ip address 172.140.0.150 255.255.255.192
No shut
Exit
Router rip
Network 172.137.0.0
Network 172.140.0.0
Exit
```

Here are the screenshots:

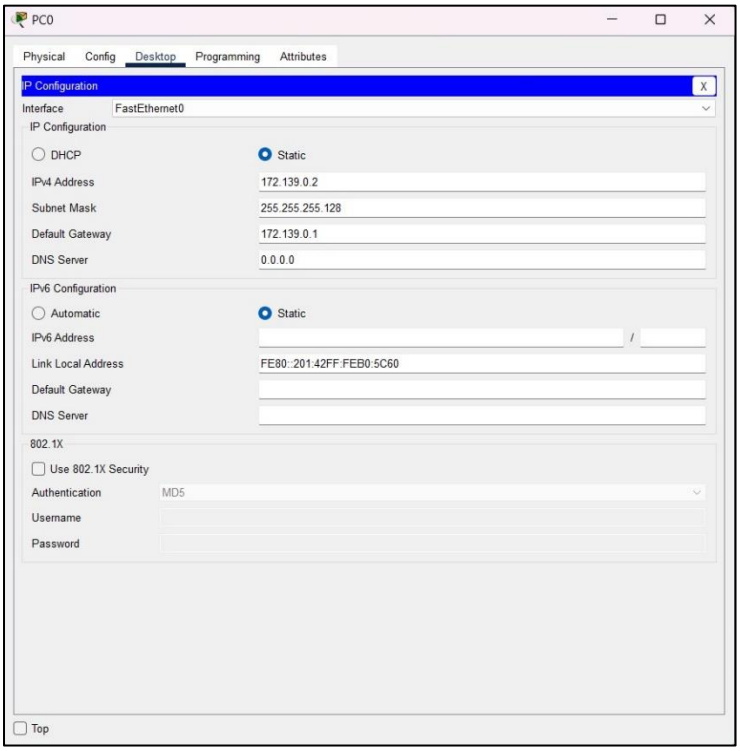


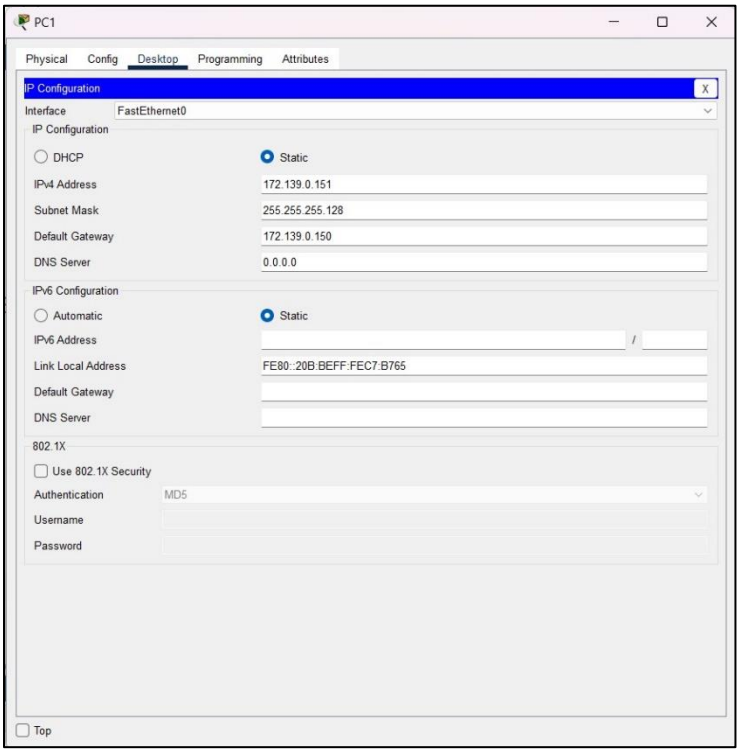


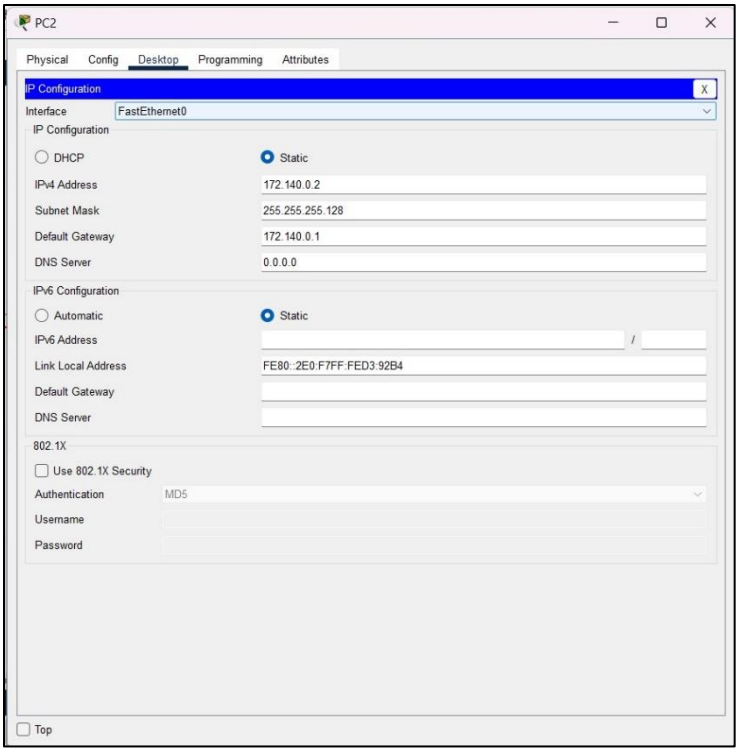
Step 1: Setting Up IPs

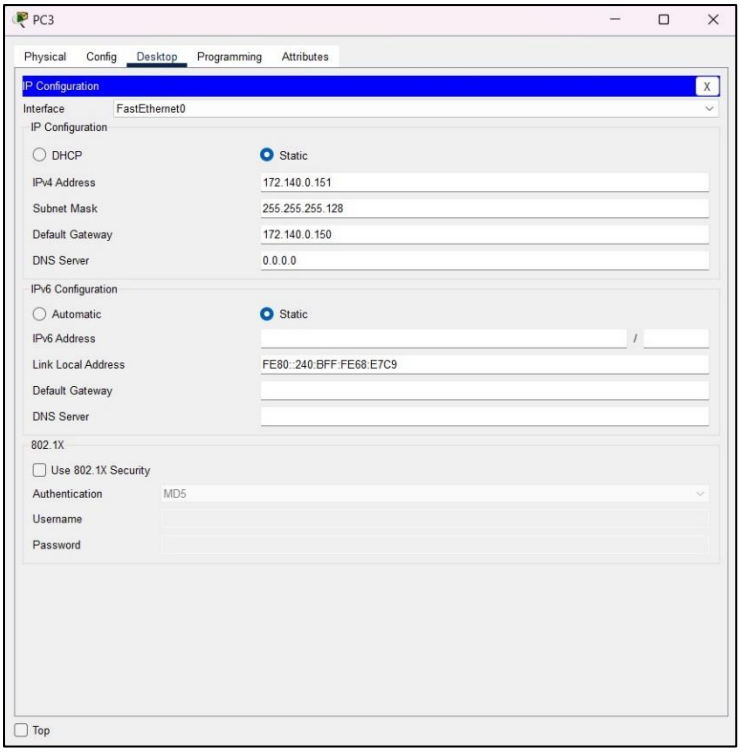
As my ID's last 2 digits are 37, IP addresses are:

Here are the screenshots:



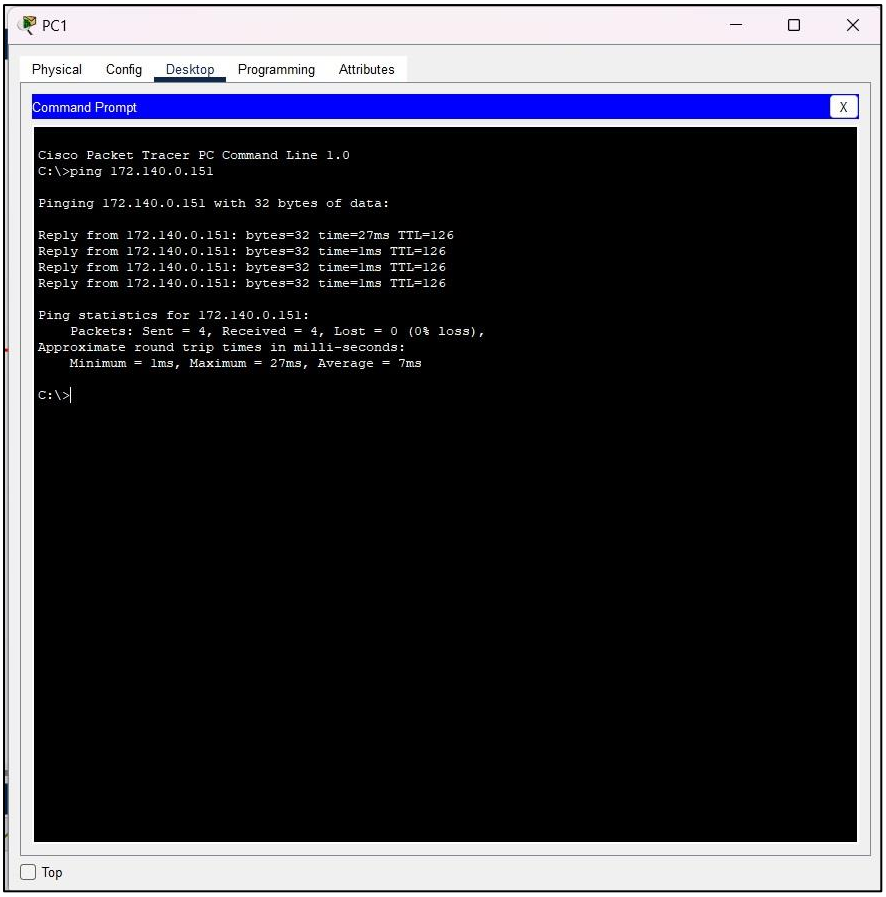



PC2
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.140.0.2
Subnet Mask
255.255.255.128
Default Gateway
172.140.0.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::2E0:F7FF:FED3:92B4
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

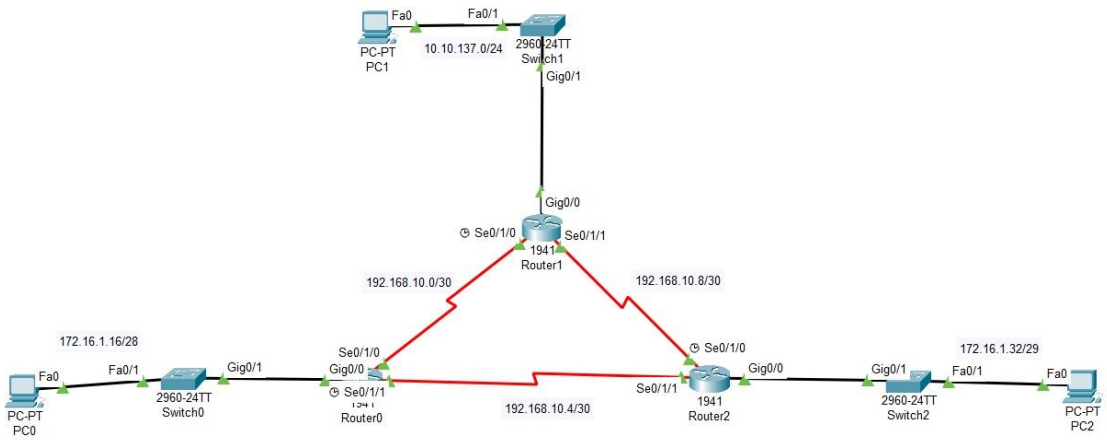

PC3
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.140.0.151
Subnet Mask
255.255.255.128
Default Gateway
172.140.0.150
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::240:BFF:FE68:E7C9
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

Step 3: Using the ping command from the Terminal

Here are the screenshot of sending packets to another PC:



Task 2



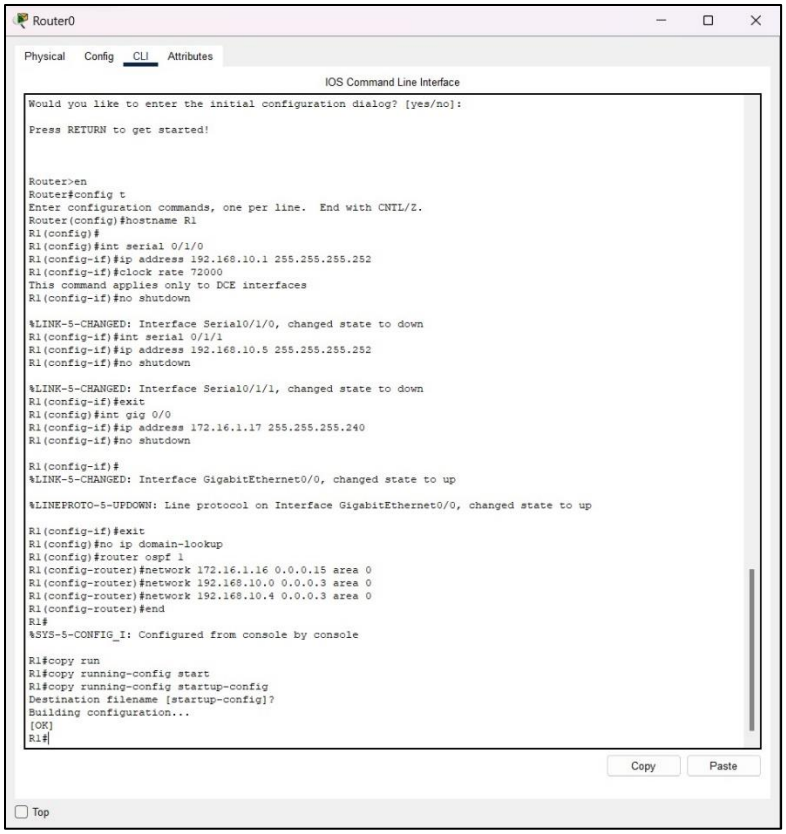
Working Procedure

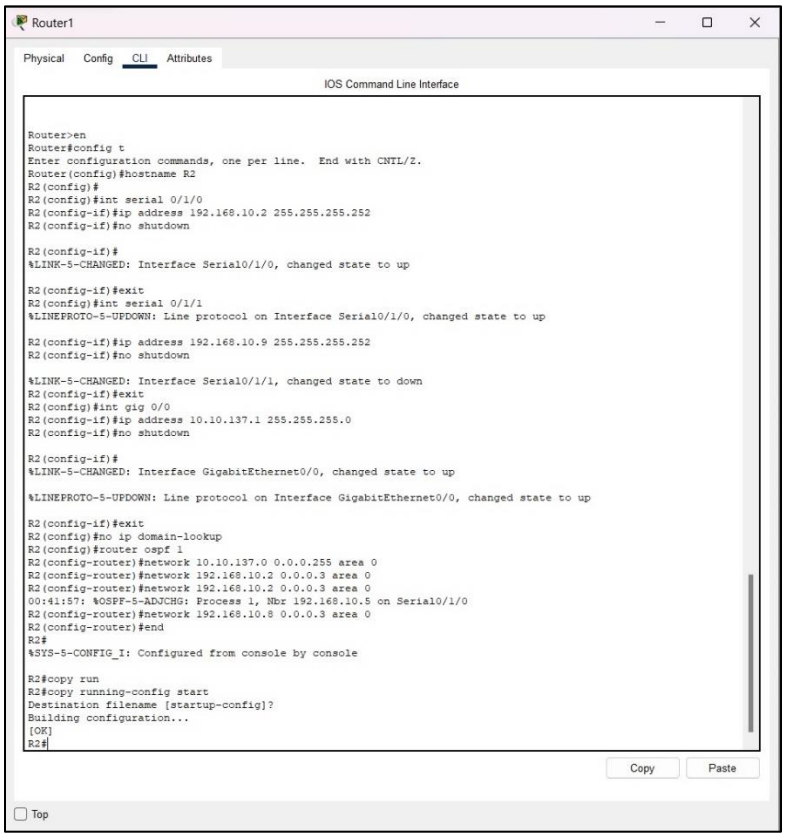
Step-1: Router Configuration

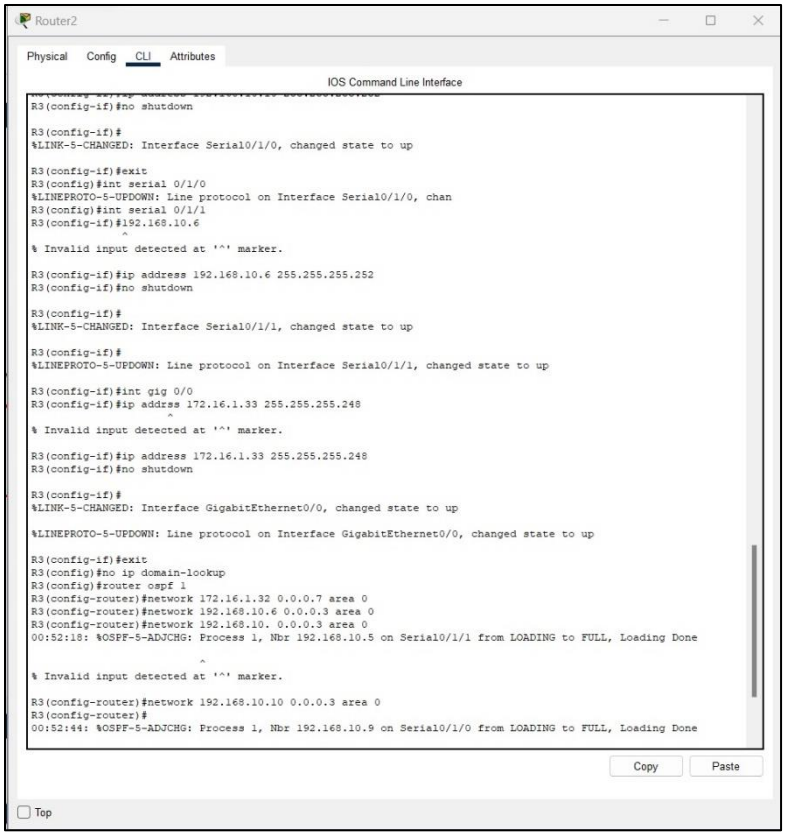
At first I changed the host name of the routers. Here I am providing codes for R1, then I configured the router. The process for router-2 is similar. To do this, I have used the following commands:

```
En
Config t
Hostname R1
Int serial 0/1/0
Ip address 192.168.10.1 255.255.255.252
No shutdown
Int serial 0/1/1
Ip address 192.168.10.5 255.255.255.252
No shutdown
Int gig 0/0
Ip address 172.16.1.17 255.255.255.240
No shutdown
Exit
No ip domain-lookup
Network 172.16.1.16 0.0.0.15 area 0
Network 192.168.10.0 0.0.0.3 area 0
Network 192.168.10.4 0.0.0.3 area 0
end
```

Here are the screen shots:


Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
Would you like to enter the initial configuration dialog? [yes/no]:
Press RETURN to get started!
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#
R1(config)#int serial 0/1/0
R1(config-if)#ip address 192.168.10.1 255.255.255.252
R1(config-if)#clock rate 72000
This command applies only to DCE interfaces
R1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
R1(config-if)#int serial 0/1/1
R1(config-if)#ip address 192.168.10.5 255.255.255.252
R1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
R1(config-if)#exit
R1(config)#int gig 0/0
R1(config-if)#ip address 172.16.1.17 255.255.255.240
R1(config-if)#no shutdown
R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
R1(config-if)#exit
R1(config)#no ip domain-lookup
R1(config)#router ospf 1
R1(config-router)#network 172.16.1.16 0.0.0.15 area 0
R1(config-router)#network 192.168.10.0 0.0.0.3 area 0
R1(config-router)#network 192.168.10.4 0.0.0.3 area 0
R1(config-router)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#copy run
R1#copy running-config start
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
Copy
Paste
Top

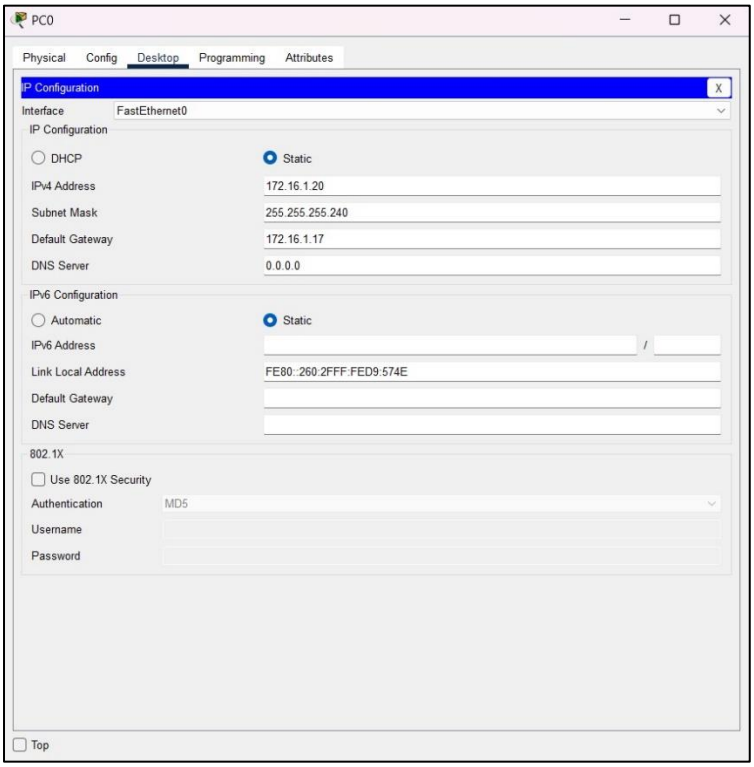

Router1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R2
R2(config)#
R2(config)#int serial 0/1/0
R2(config-if)#ip address 192.168.10.2 255.255.255.252
R2(config-if)#no shutdown
R2(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
R2(config-if)#exit
R2(config)#int serial 0/1/1
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
R2(config-if)#ip address 192.168.10.9 255.255.255.252
R2(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
R2(config-if)#exit
R2(config)#int gig 0/0
R2(config-if)#ip address 10.10.137.1 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
R2(config-if)#exit
R2(config)#no ip domain-lookup
R2(config)#router ospf 1
R2(config-router)#network 10.10.137.0 0.0.0.255 area 0
R2(config-router)#network 192.168.10.2 0.0.0.3 area 0
R2(config-router)#network 192.168.10.2 0.0.0.3 area 0
00:41:57: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.5 on Serial0/1/0
R2(config-router)#network 192.168.10.8 0.0.0.3 area 0
R2(config-router)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console
R2#copy run
R2#copy running-config start
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
Copy
Paste
Top

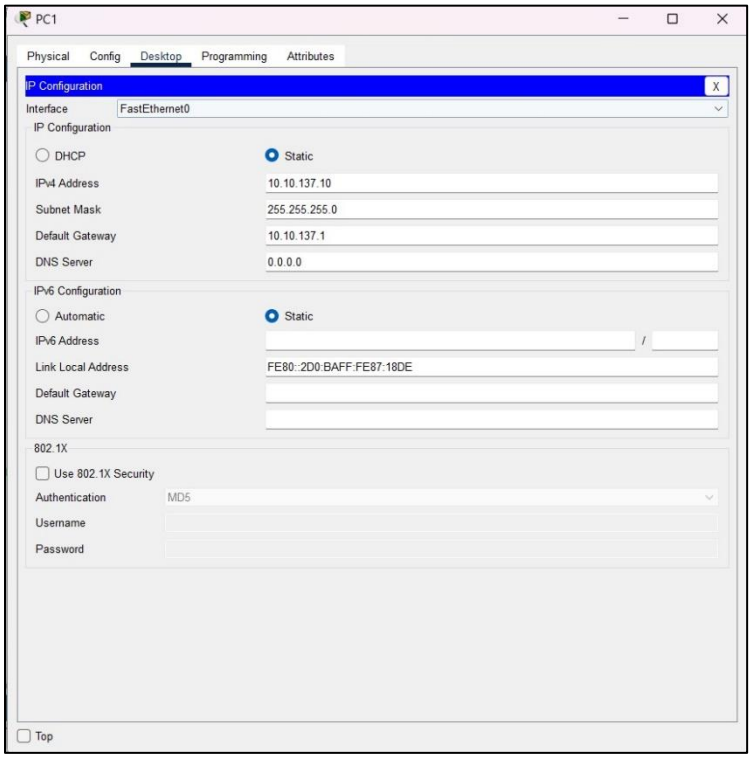

Router2
Physical
Config
CLI
Attributes
IOS Command Line Interface
R3(config-if)#no shutdown
R3(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
R3(config-if)#exit
R3(config)#int serial 0/1/0
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, chan
R3(config)#int serial 0/1/1
R3(config-if)#192.168.10.6
^
% Invalid input detected at '^' marker.
R3(config-if)#ip address 192.168.10.6 255.255.255.252
R3(config-if)#no shutdown
R3(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up
R3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up
R3(config-if)#int gig 0/0
R3(config-if)#ip addrss 172.16.1.33 255.255.255.248
^
% Invalid input detected at '^' marker.
R3(config-if)#ip address 172.16.1.33 255.255.255.248
R3(config-if)#no shutdown
R3(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
R3(config-if)#exit
R3(config)#no ip domain-lookup
R3(config)#router ospf 1
R3(config-router)#network 172.16.1.32 0.0.0.7 area 0
R3(config-router)#network 192.168.10.6 0.0.0.3 area 0
R3(config-router)#network 192.168.10. 0.0.0.3 area 0
00:52:18: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.5 on Serial0/1/1 from LOADING to FULL, Loading Done
^
% Invalid input detected at '^' marker.
R3(config-router)#network 192.168.10.10 0.0.0.3 area 0
R3(config-router)#
00:52:44: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.9 on Serial0/1/0 from LOADING to FULL, Loading Done
Copy
Paste
Top

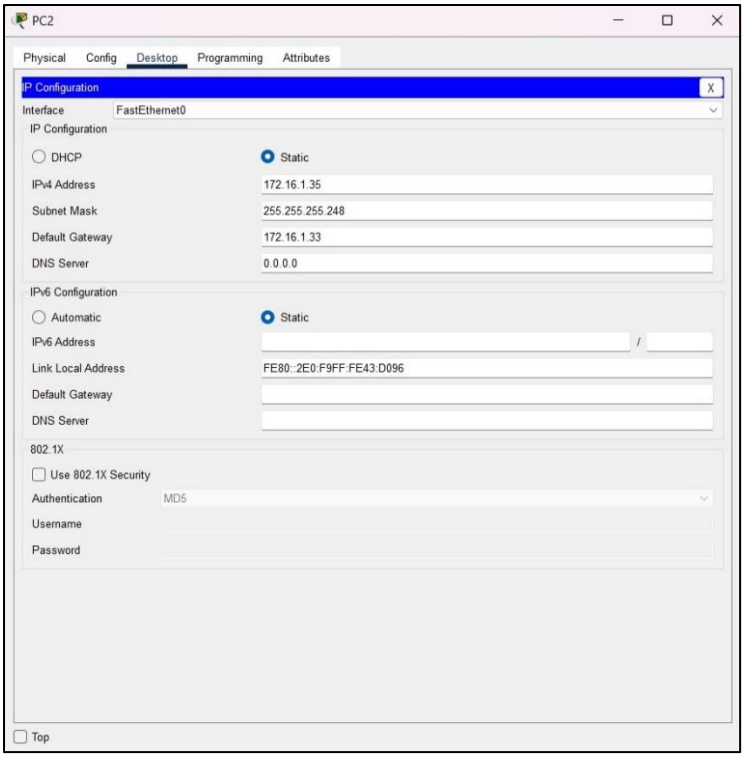
Step 2: Setting Up IPs

As my ID's last 2 digits are 37, IP addresses are:

Here are the screenshots:

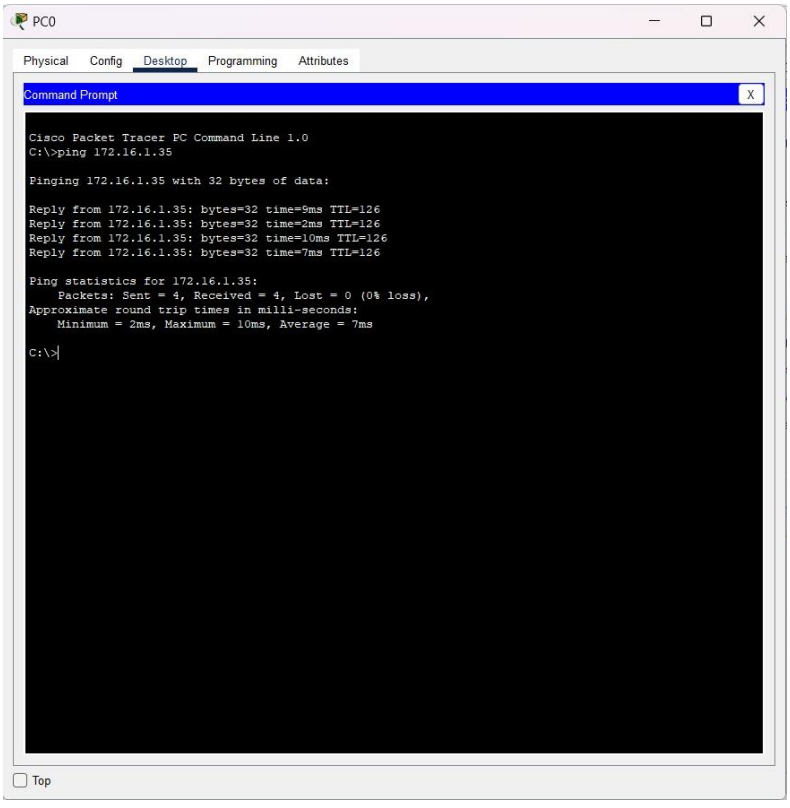






Step 3: Using the ping command from the Terminal

Here are the screenshot of sending packets to another PC:



Challenges (if any):

No challenges faced.