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SWE2002 – COMPUTER NETWORKS

Fall Inter Semester 2022-23

LAB ASSESSMENT - V

Submitted by:

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BRANCH
INTEGRATED MTECH (SOFTWARE ENGINEERING)
MTECH5
SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

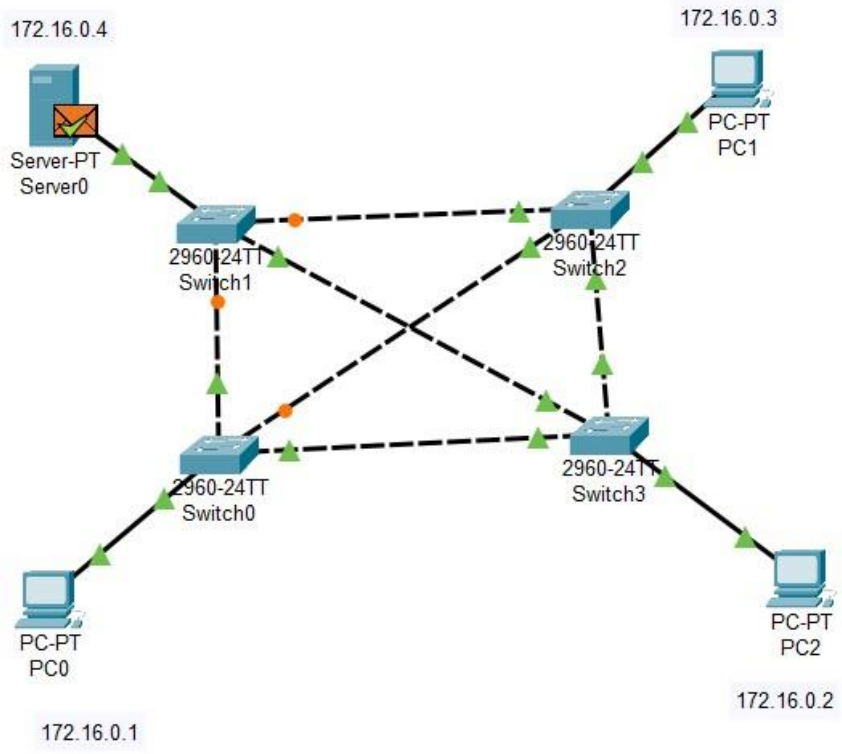
FACULTY
Prof. Sofia Nishath

(a) Design a Client-Server LAN with Mesh Topology using Cisco Packet Tracer and check the PDU transmission between the nodes.

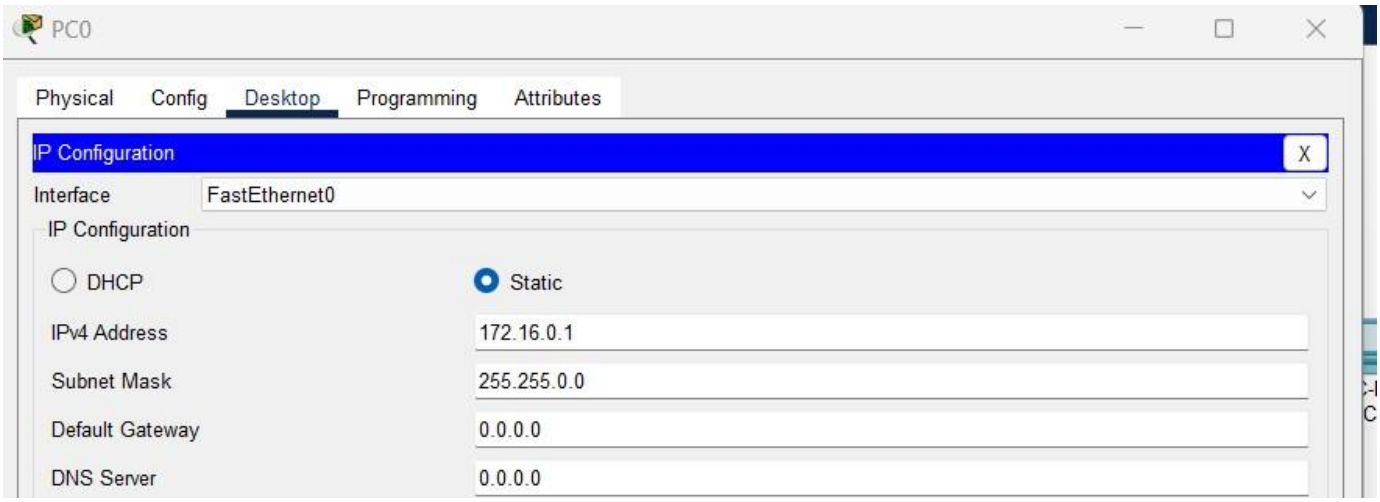
Step-by-Step Procedure :

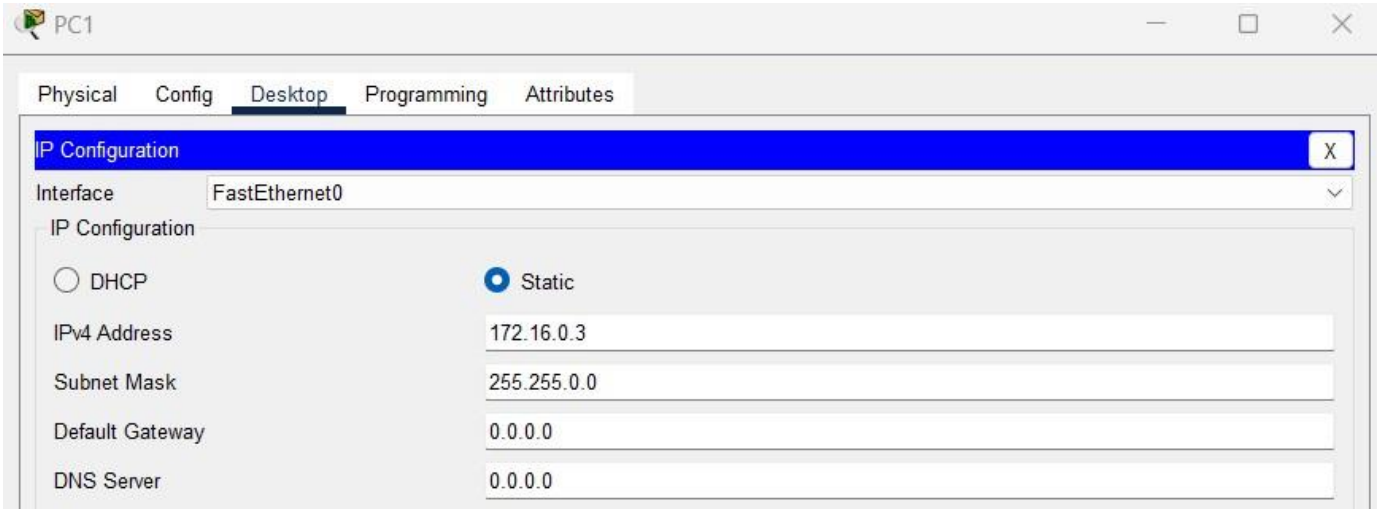
1. Design a circuit in cisco packet tracer with four switches, three PCs and one server and establish a client-server LAN with Mesh Topology.

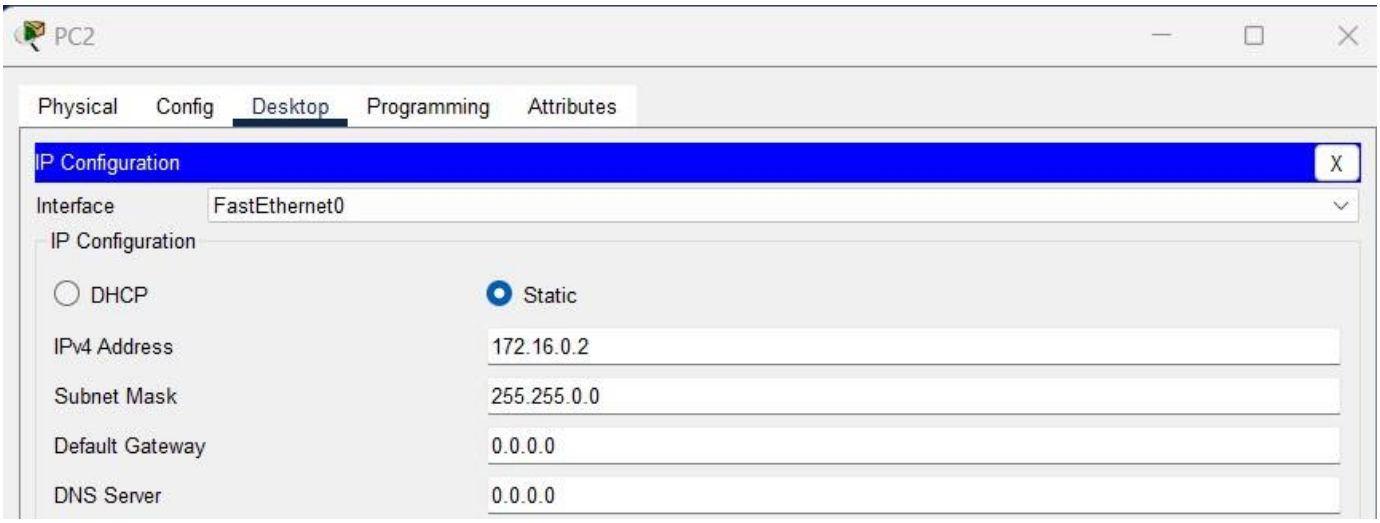
2. Mention the IP addresses of all end devices (i.e., Server and PCs) as a note as shown in below diagram.

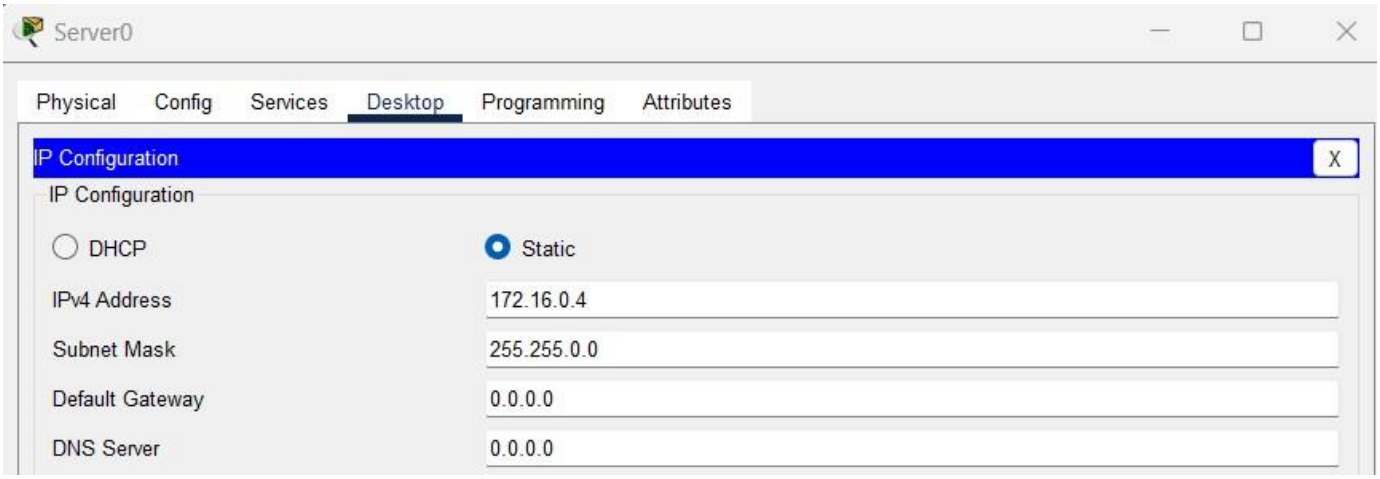


3. Configure the IP addresses of all four end devices present in the circuit.

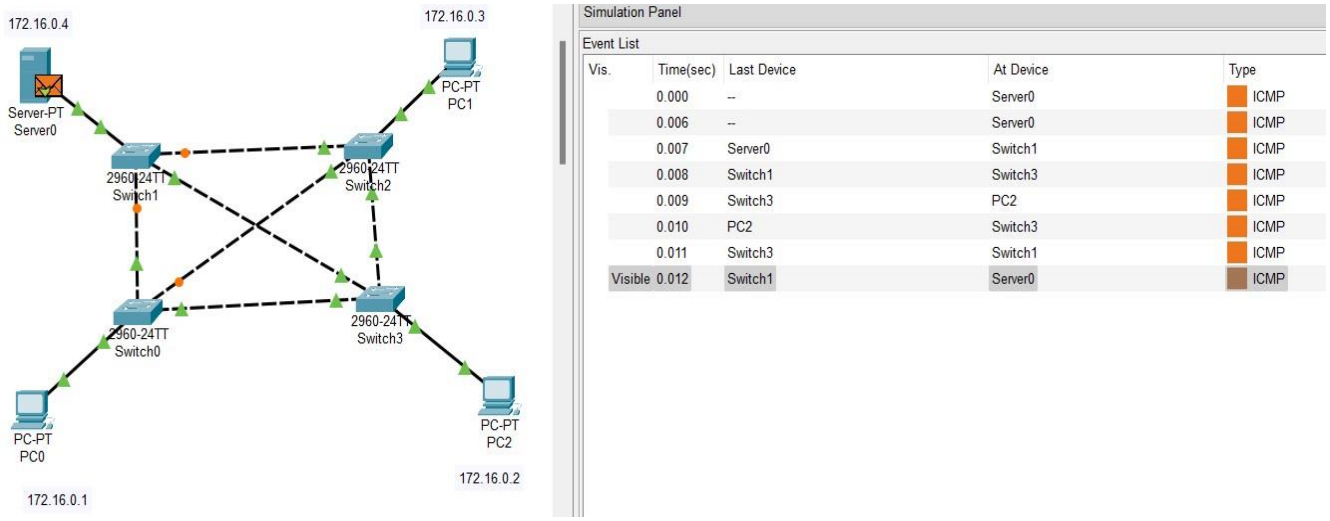



PC1
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.16.0.3
Subnet Mask
255.255.0.0
Default Gateway
0.0.0.0
DNS Server
0.0.0.0

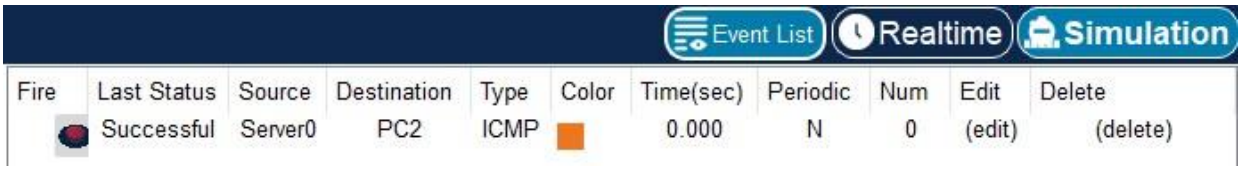

PC2
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.16.0.2
Subnet Mask
255.255.0.0
Default Gateway
0.0.0.0
DNS Server
0.0.0.0


Server0
Physical
Config
Services
Desktop
Programming
Attributes
IP Configuration
X
IP Configuration
DHCP
Static
IPv4 Address
172.16.0.4
Subnet Mask
255.255.0.0
Default Gateway
0.0.0.0
DNS Server
0.0.0.0

4. Send an ICMP packet from Server 0 to PC2 and observe the simulation of it step by step in simulation panel of cisco packet tracer.



5. The simulation of ICMP packet from Server 0 to PC2 is successful , and Server 0 received acknowledgement from PC2 successfully.



(b) Configure ARP using CPT

Step-by-Step procedure :

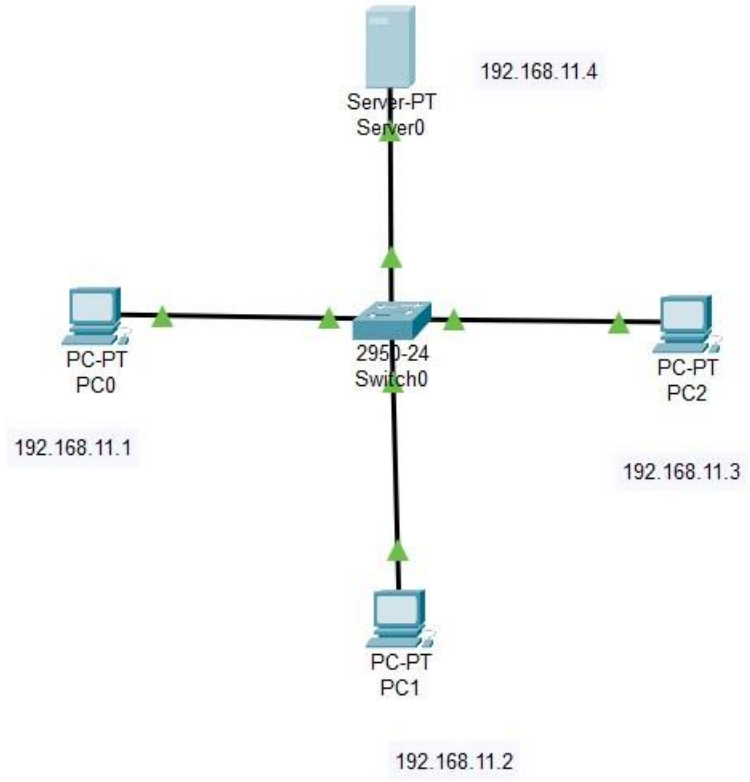
1. Design a circuit in cisco packet tracer with one switch, three PCs and one server.

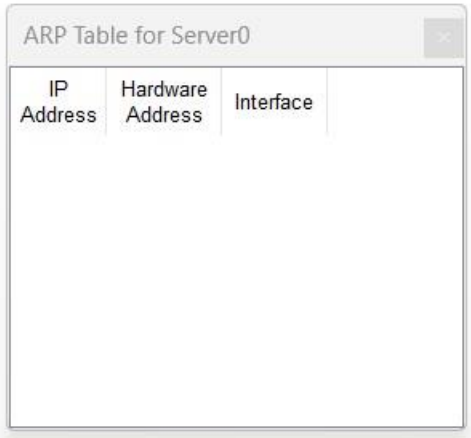
2. Mention the IP addresses of all end devices (i.e., Server and PCs) as a note as shown in below diagram.

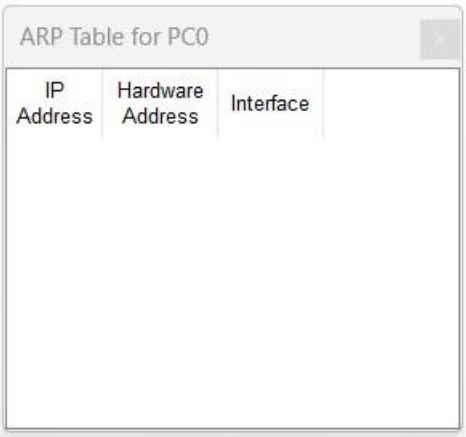
3. Click on inspect icon >> Click on PC0 >> Select ARP Table

4. Click on inspect icon >> Click on Server0 >> Select ARP Table

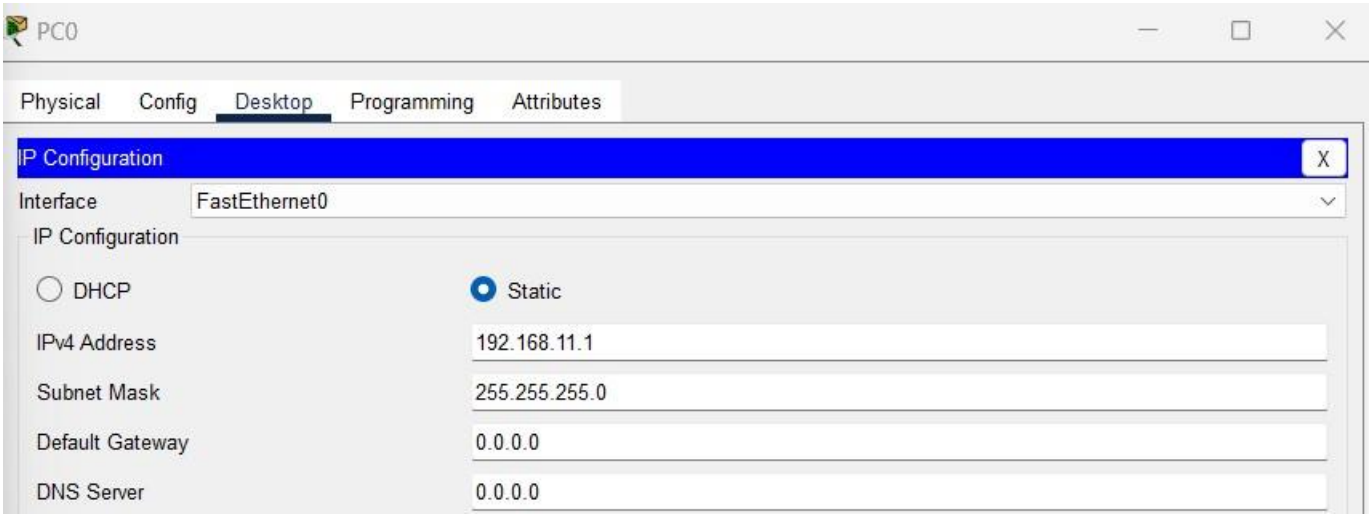
5. As you can see below both the ARP Tables are initially empty.

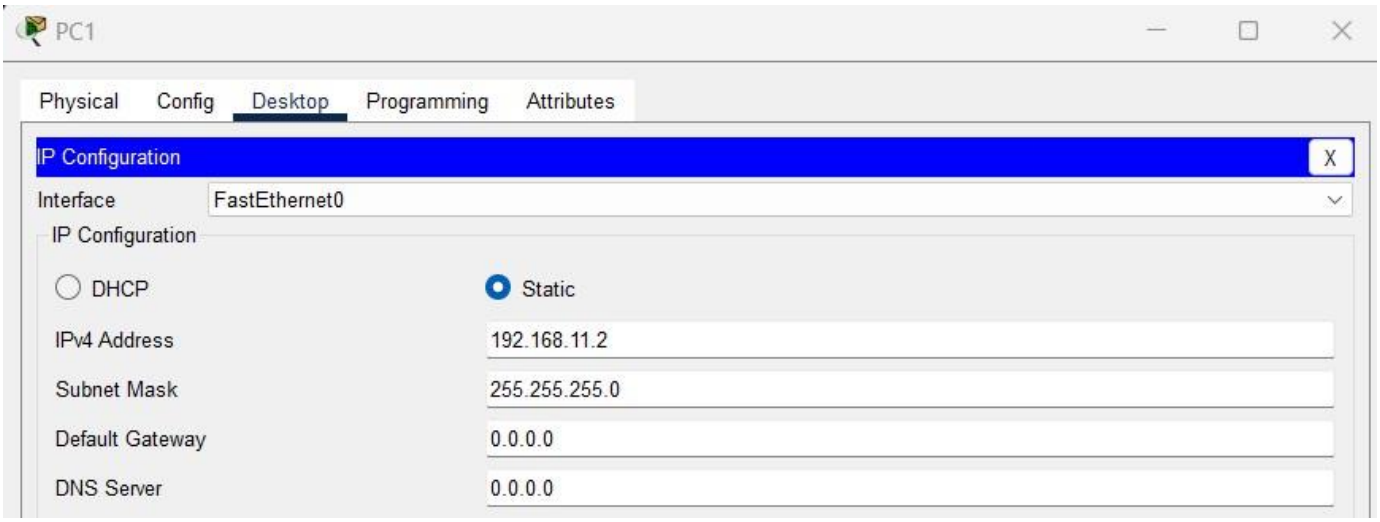


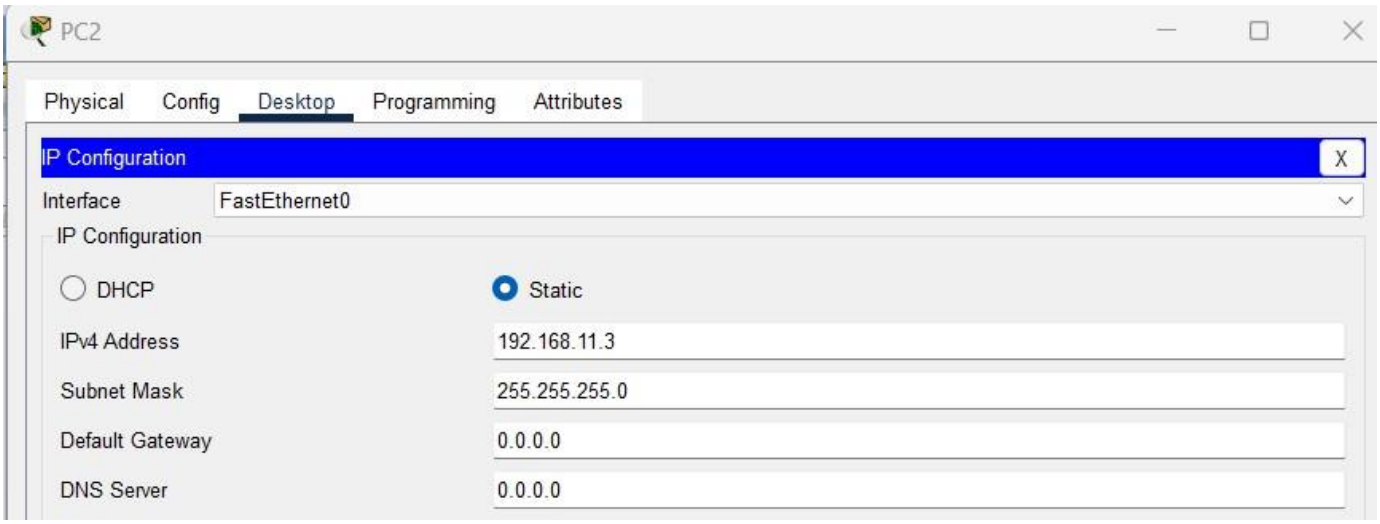




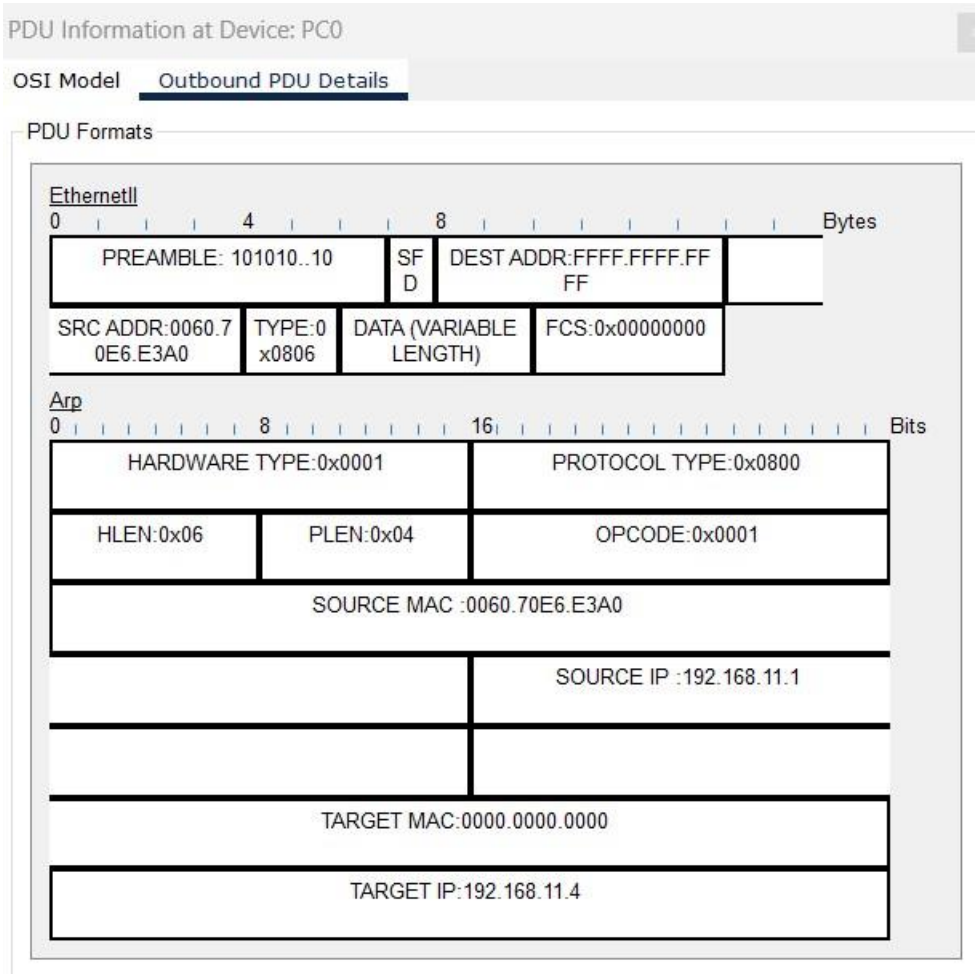
6. Configure all the end devices as given below.



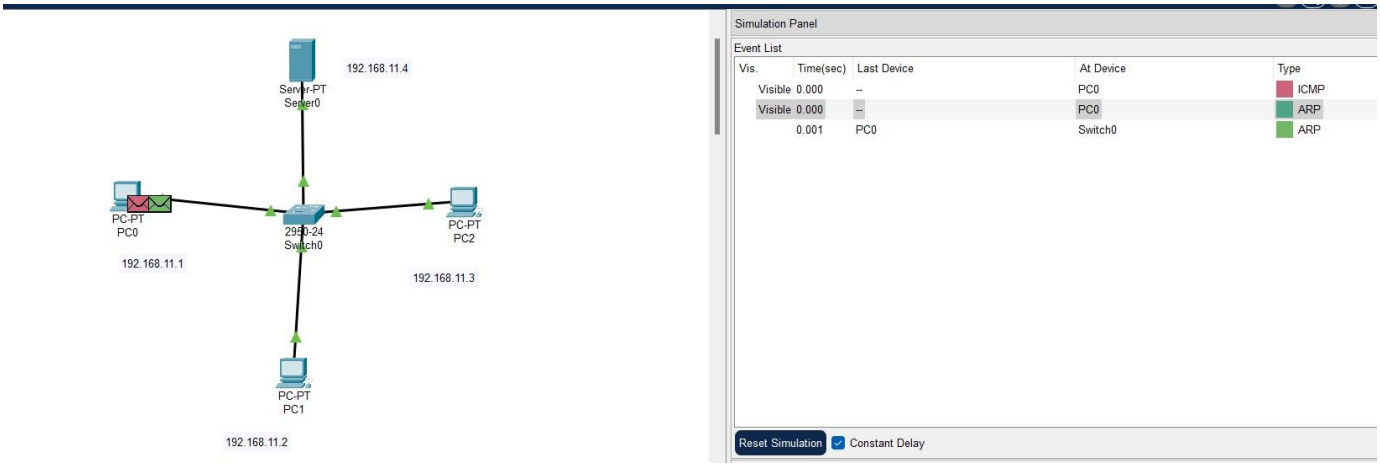




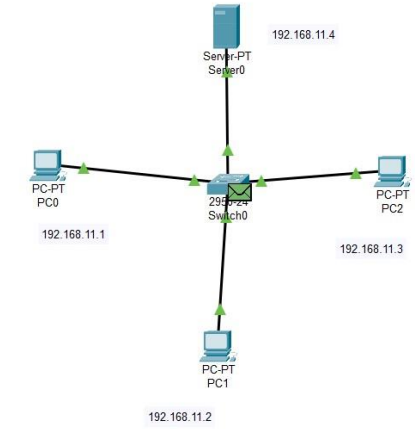
7. Click on PC0 >> PDU information >> Outbound PDU Details. You can see that we have the target IP and by configuring ARP we are going to fetch the MAC or hardware address of target i.e., Server 0.

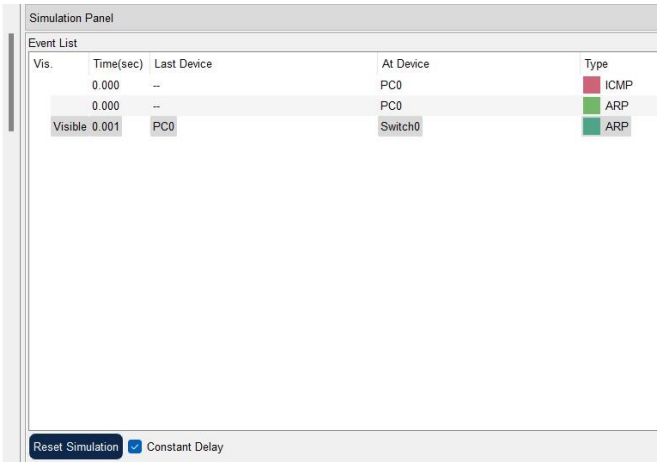


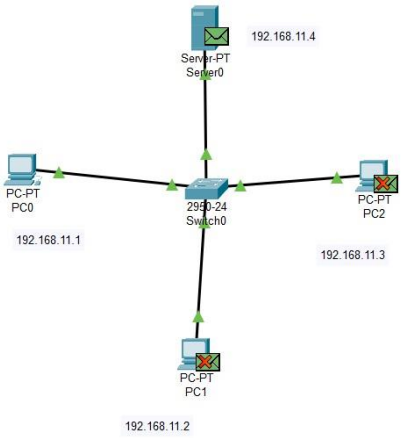
8. Now you have an ICMP packet and an ARP packet at source i.e., PC0

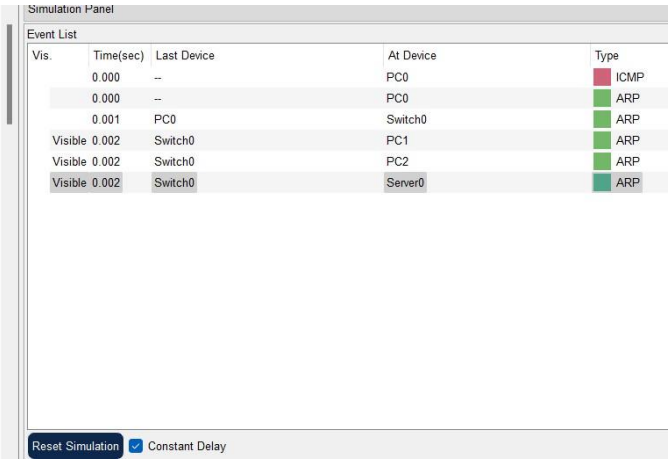


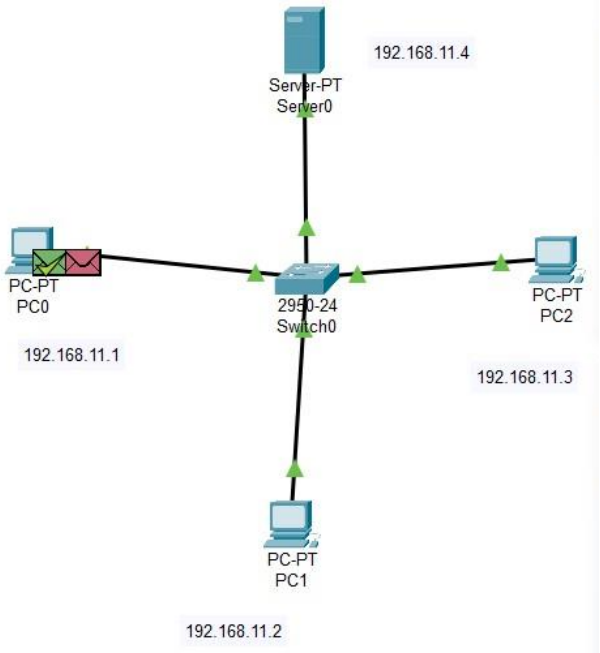
9. Now open simulation view and start simulating, ICMP packet will send ping requests to all the end devices and bring back acknowledgement to source.





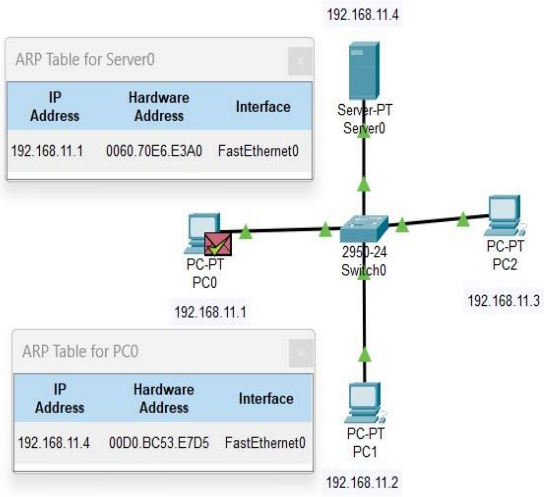


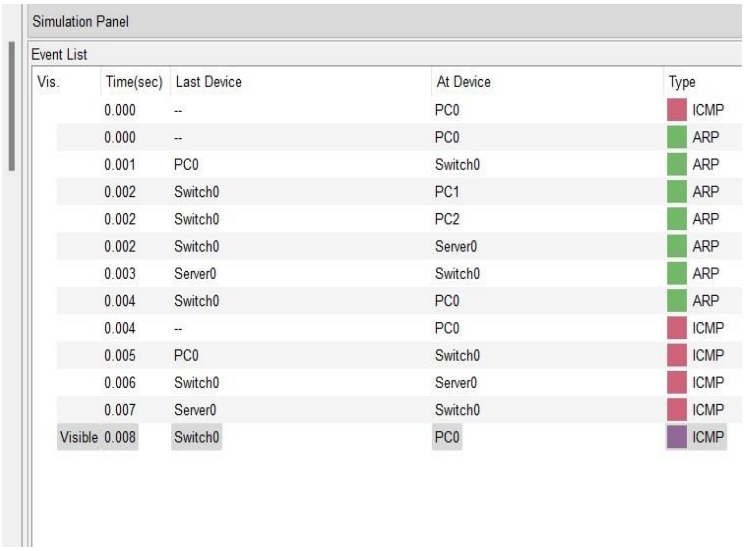




10. Now simulate ARP packet, it fetches the target MAC address i.e., hardware address of Server 0.

11. As a result, we can observe the unknown MAC address of Server 0 in ARP table of Server 0 by the ARP configuration.



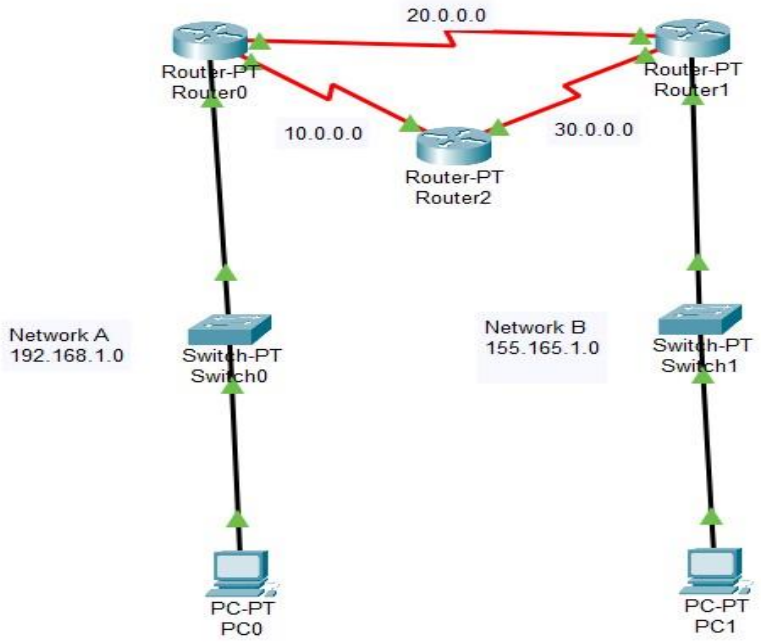


(c) Design a network with OSPF using CPT

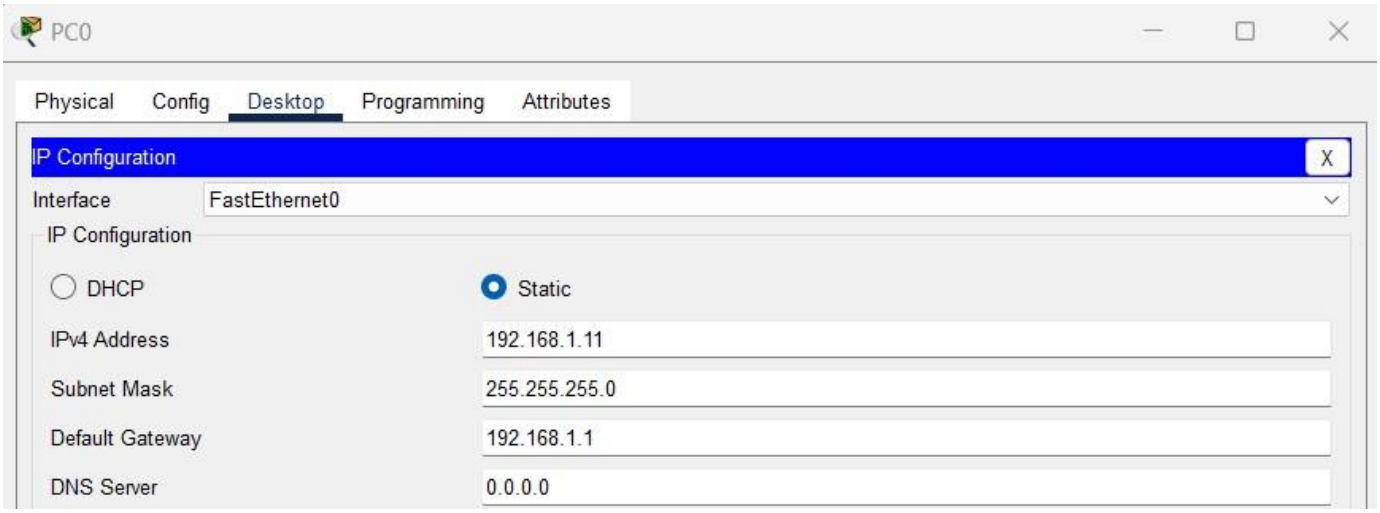
<u>Step-by-Step procedure</u> :

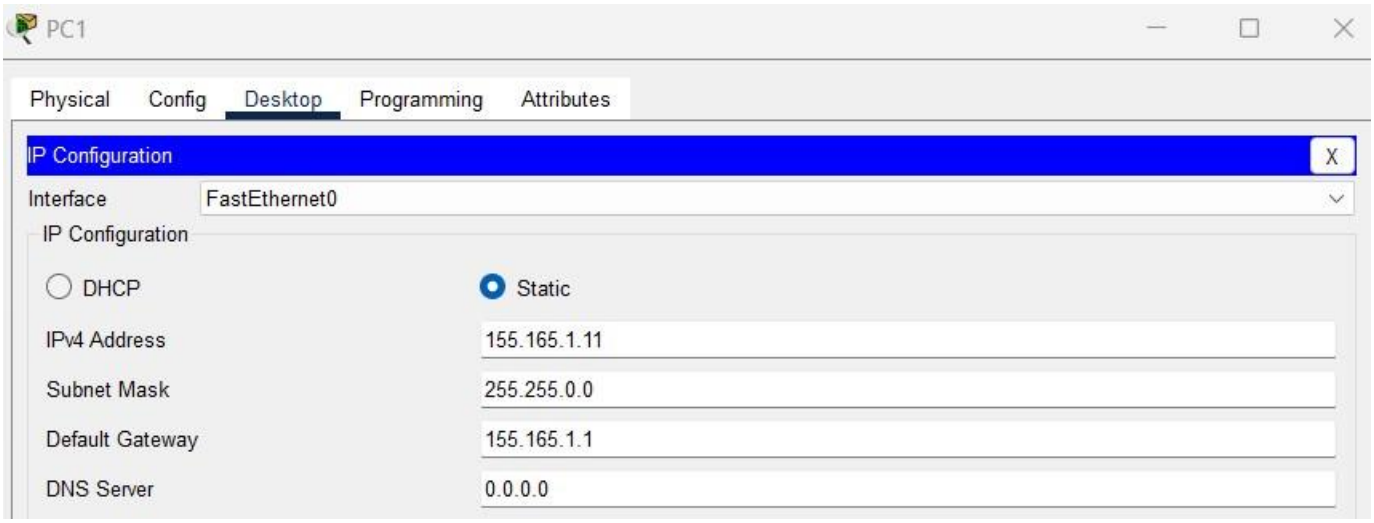
1. Design a circuit in cisco packet tracer with two switches, two PCs and three routers to find the shortest path for a packet to travel.

2. Mention the IP addresses of all devices as a note as shown in below diagram.

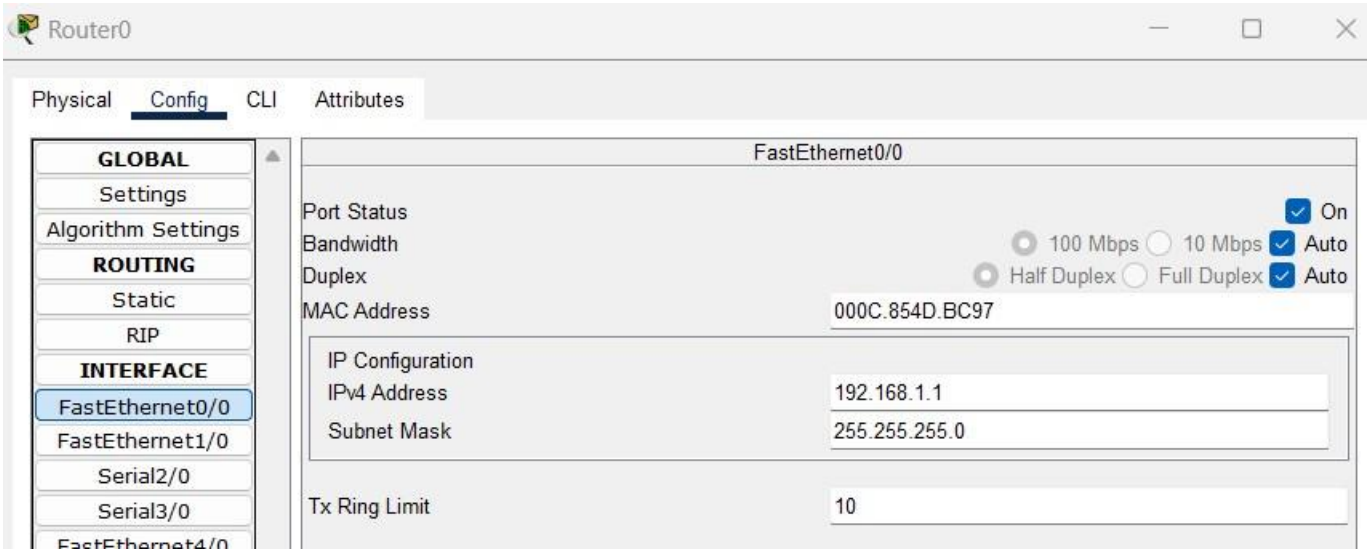


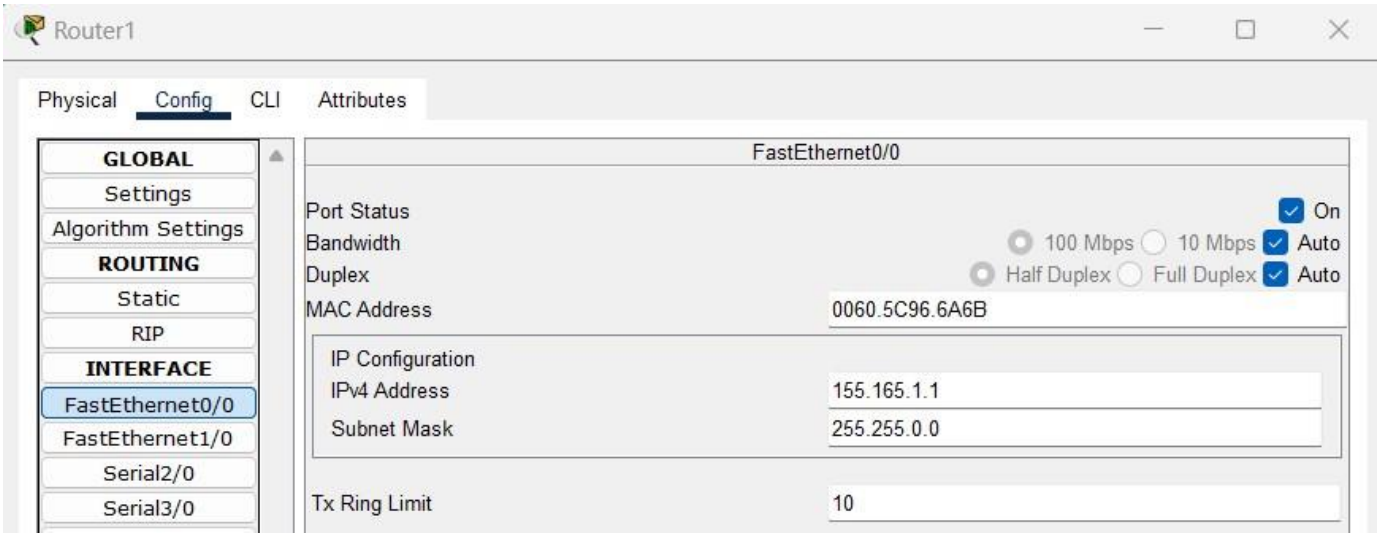
3. Configure the IP addresses and default gateways of both the PCs.

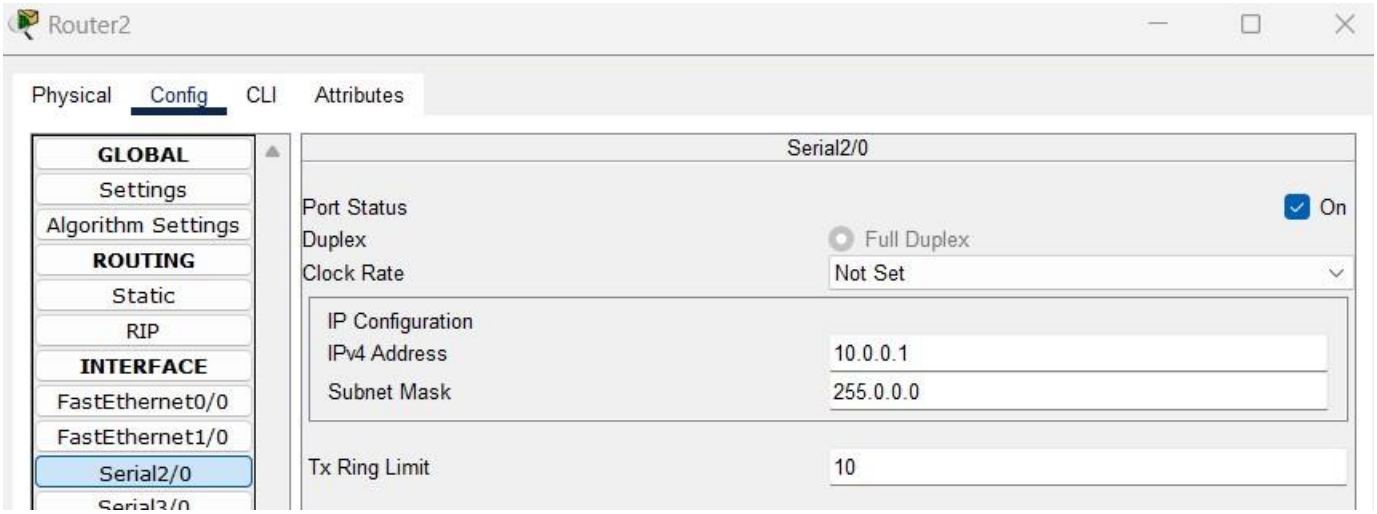


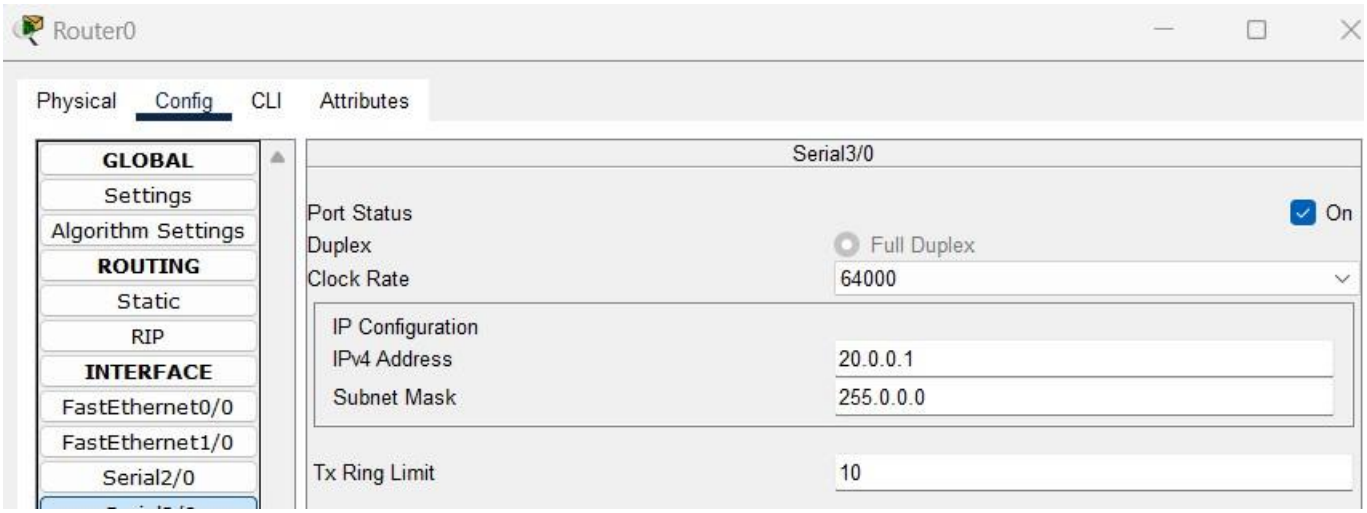


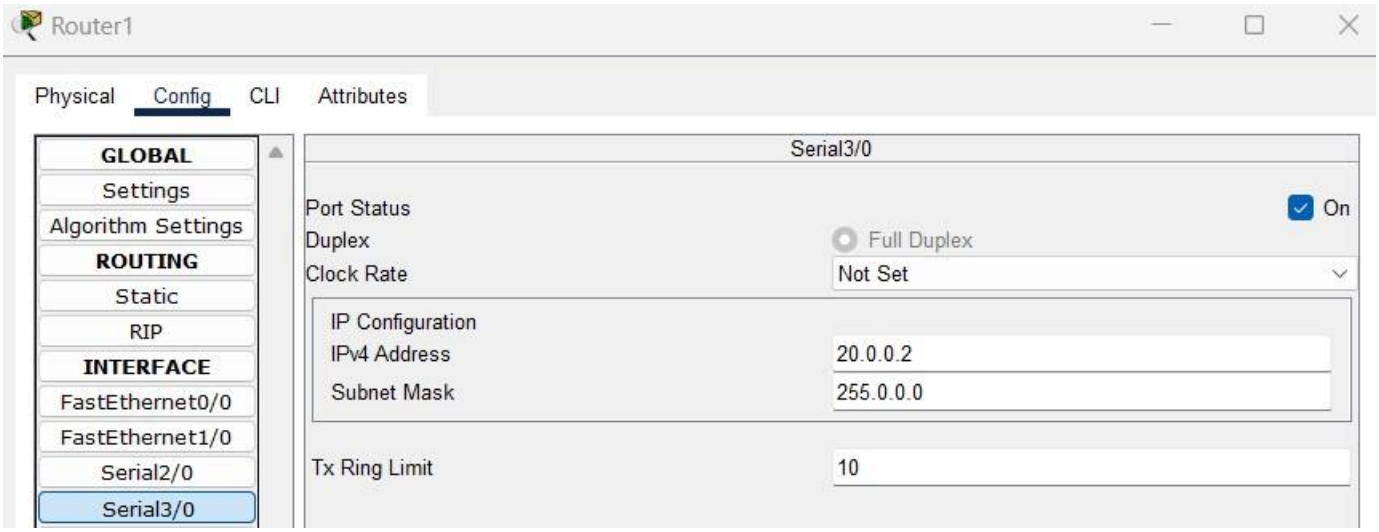
4. Configure the routers.

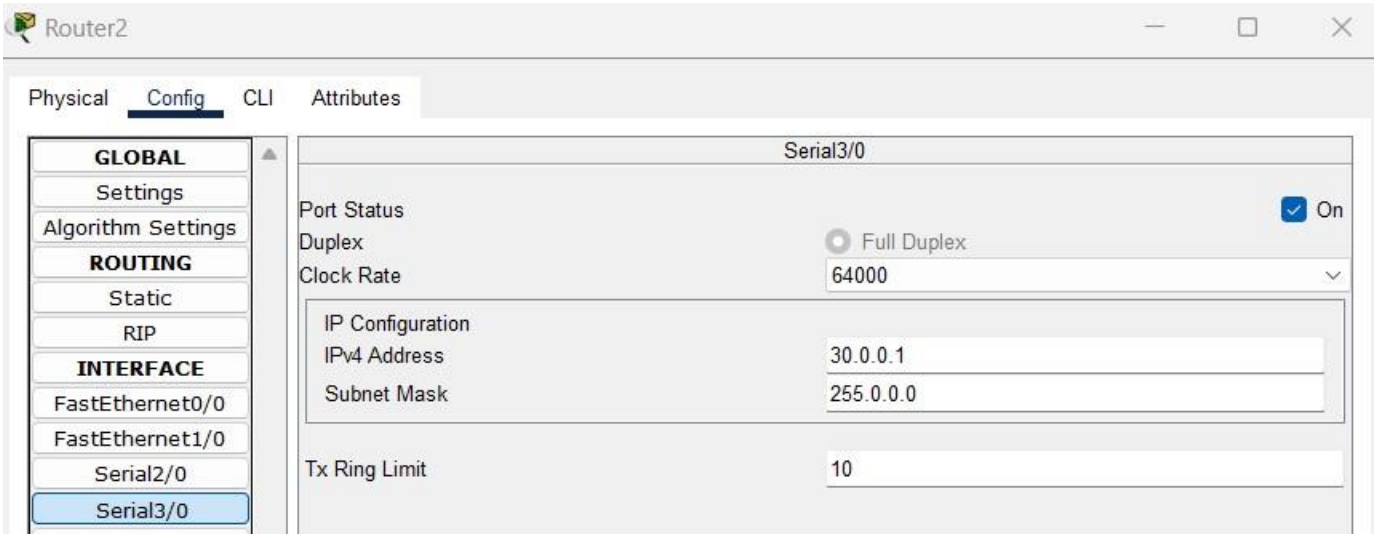


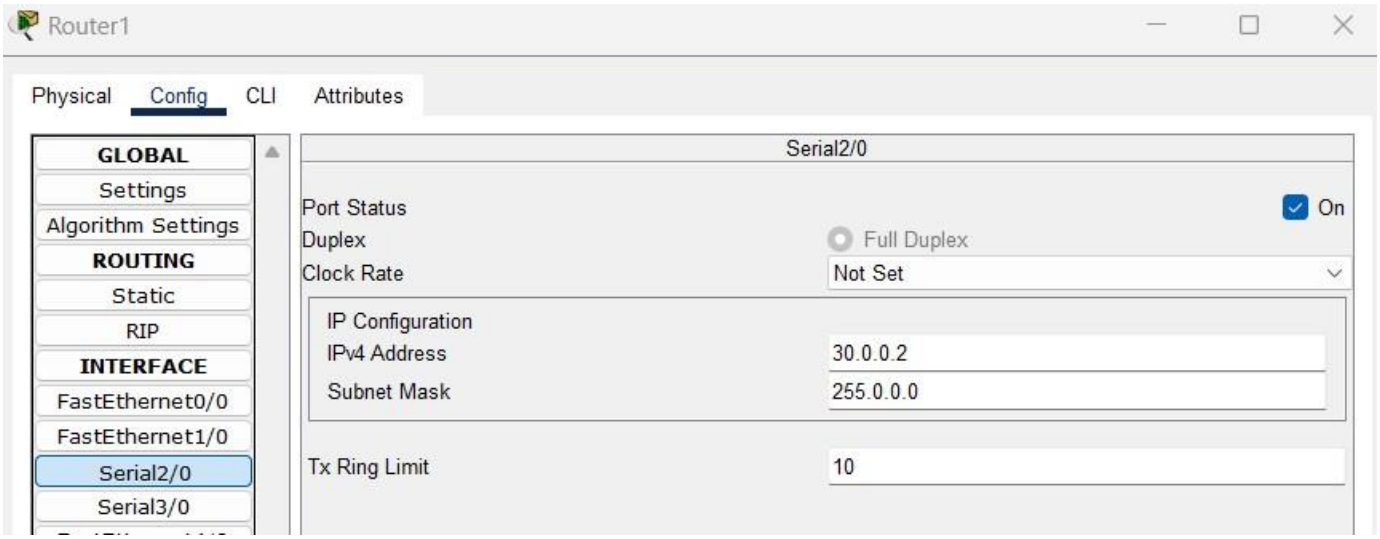



Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial2/0
Port Status
On
Duplex
Full Duplex
Clock Rate
Not Set
IP Configuration
IPv4 Address
10.0.0.1
Subnet Mask
255.0.0.0
Tx Ring Limit
10


Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
Port Status
On
Duplex
Full Duplex
Clock Rate
64000
IP Configuration
IPv4 Address
20.0.0.1
Subnet Mask
255.0.0.0
Tx Ring Limit
10

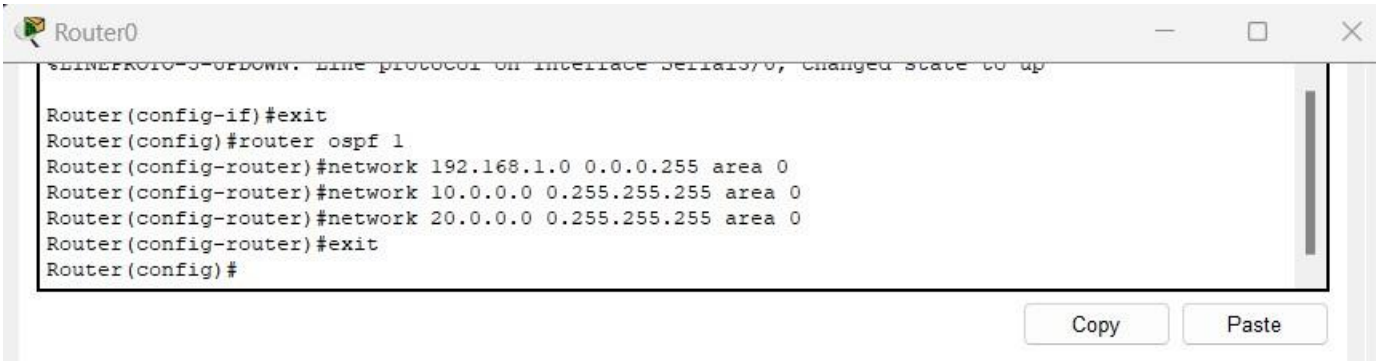

Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
Port Status
On
Duplex
Full Duplex
Clock Rate
Not Set
IP Configuration
IPv4 Address
20.0.0.2
Subnet Mask
255.0.0.0
Tx Ring Limit
10

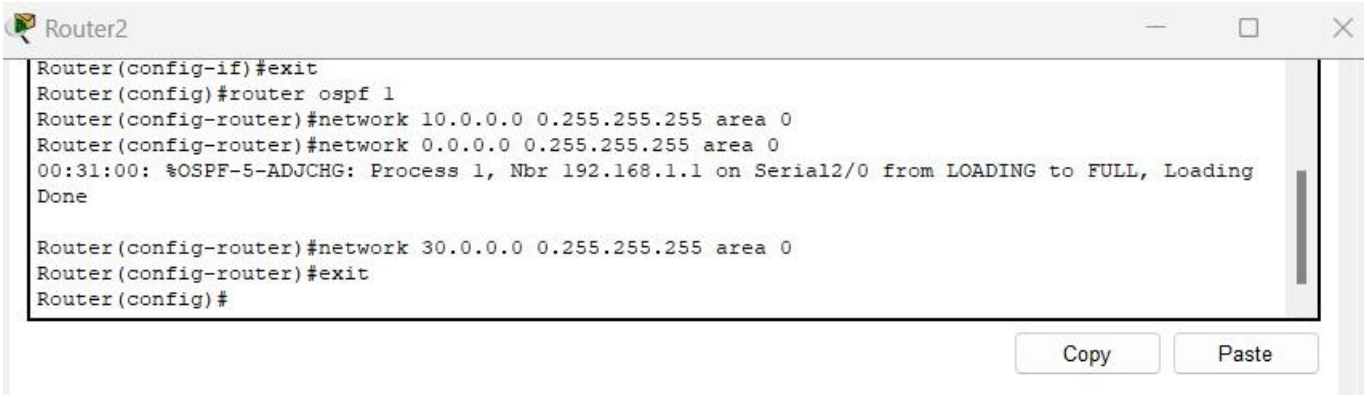


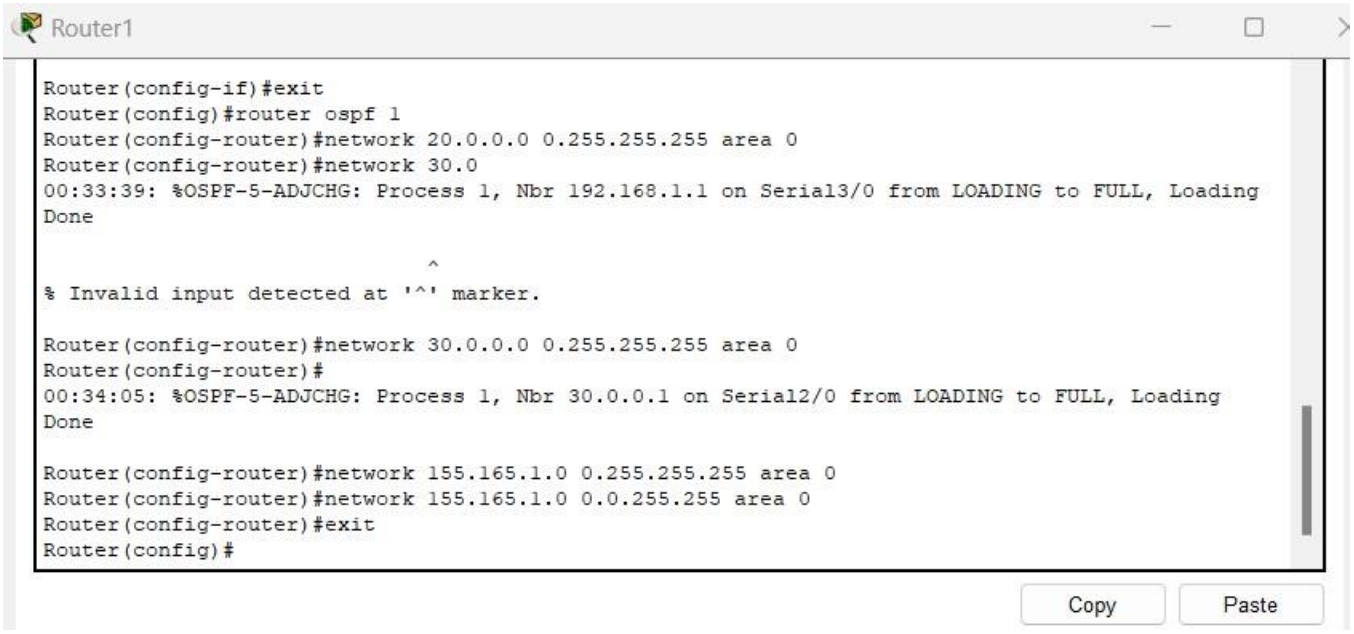


5. Open CLI of all three routers and establish OSPF.

6. Specify the networks connected to each router with syntax “network-IP address-wildcard mask-area 0”.



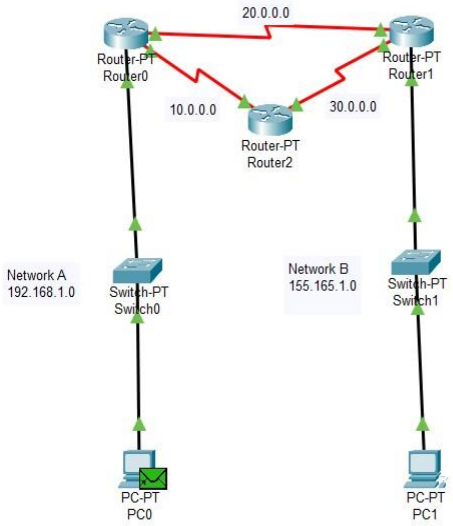


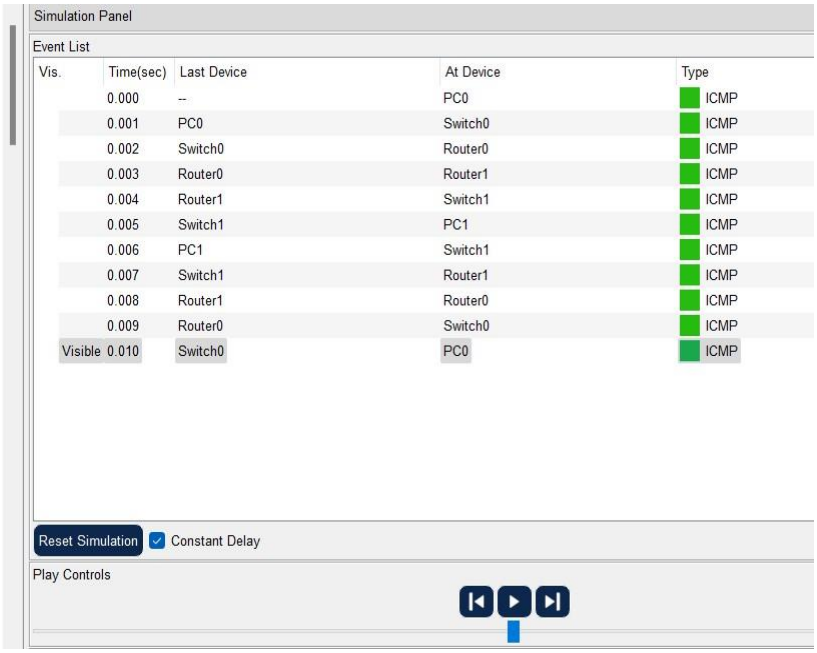


7. Now send an ICMP packet from PC0 to PC1 and ssimulate.

8. The path of the packet is PC0 >> Router 0 >> Router 1 >> PC1 >> Router 1 >> Router 0 >> PC0

9. As a result, the above path is the shortest path as the ICMP packet didn't travelled through Router 2.

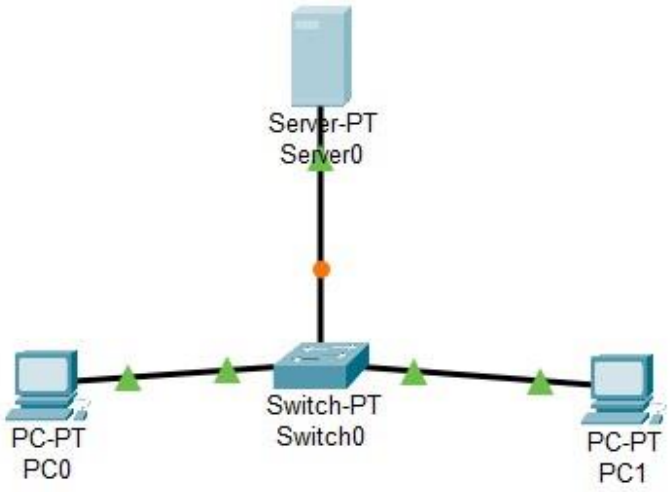




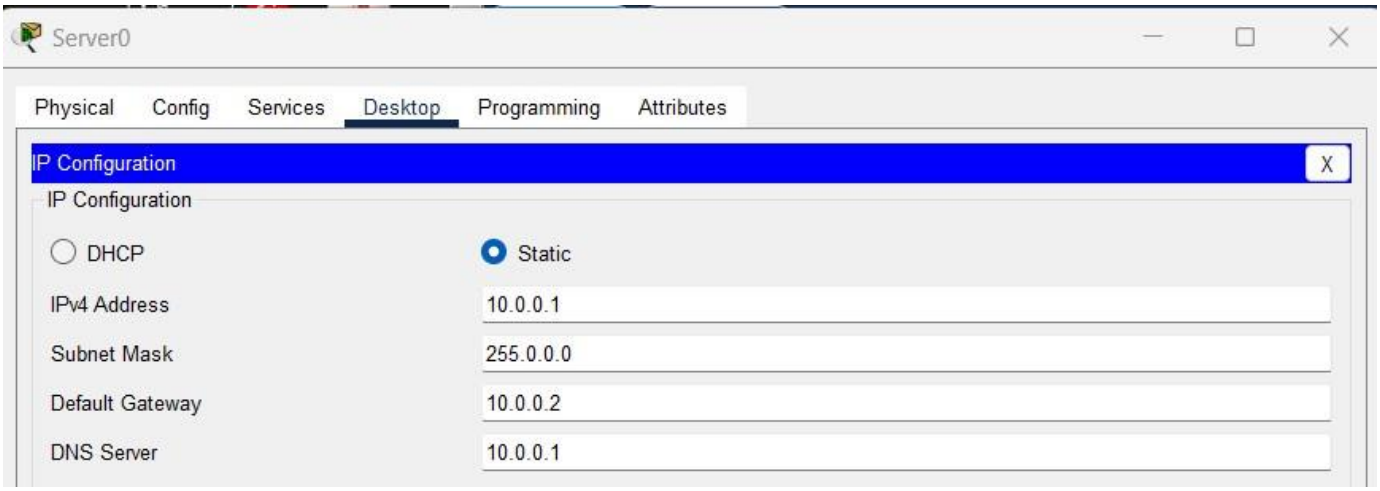
(d) Implement a Packet Tracer script that configures a DHCP server and multiple DHCP clients. The DHCP server should provide IP addresses, subnet masks, and default gateways to the clients dynamically.

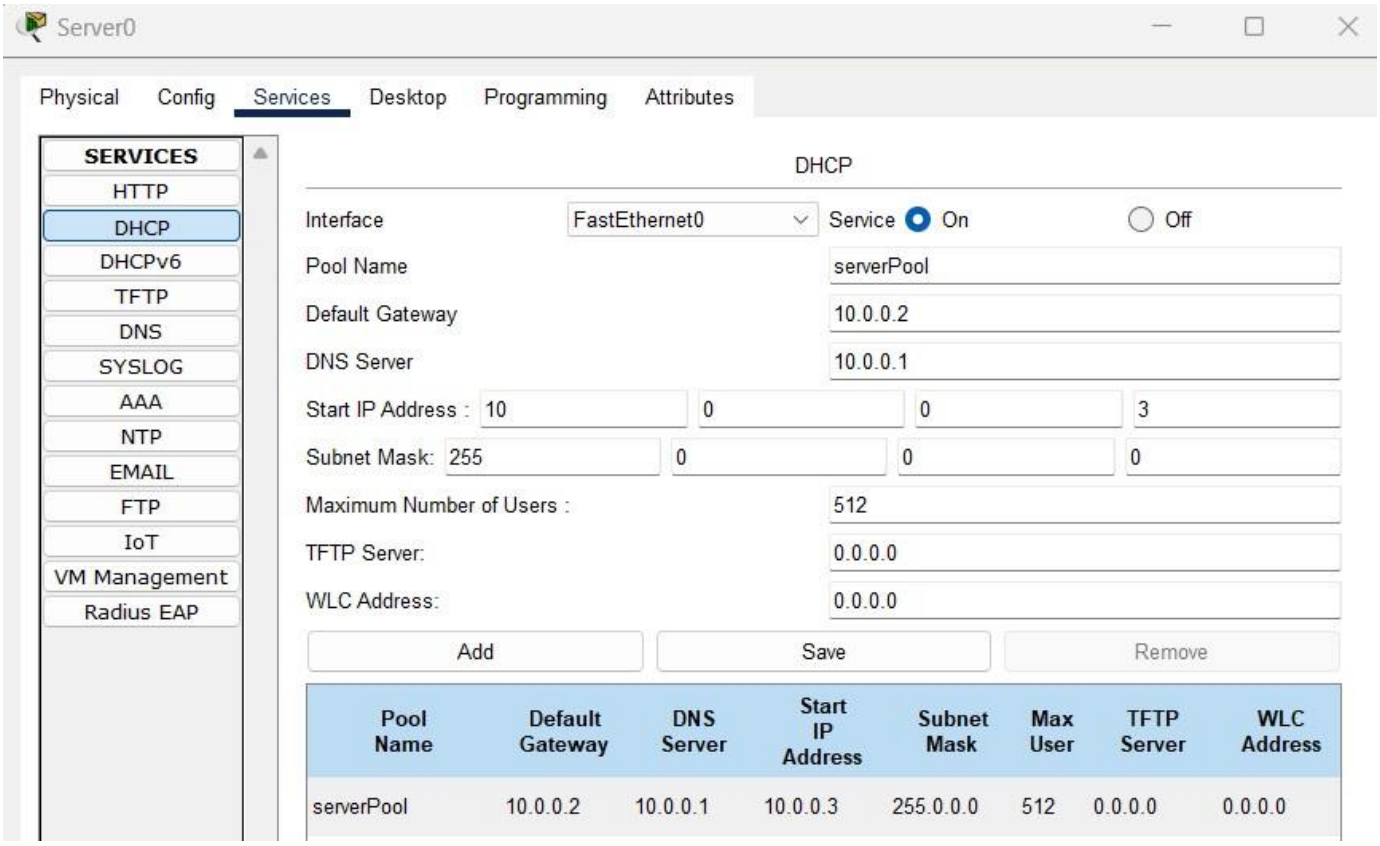
<u>Step-by-Step procedure</u> :

1. Design a circuit in cisco packet tracer with one switch, two PCs and one server as given below.

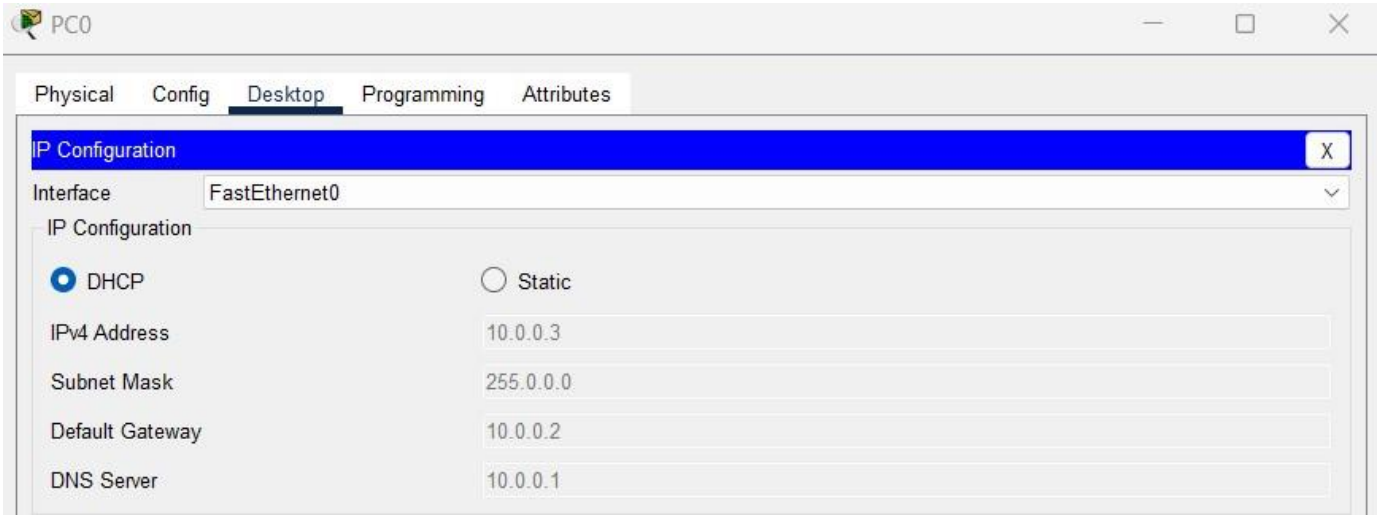


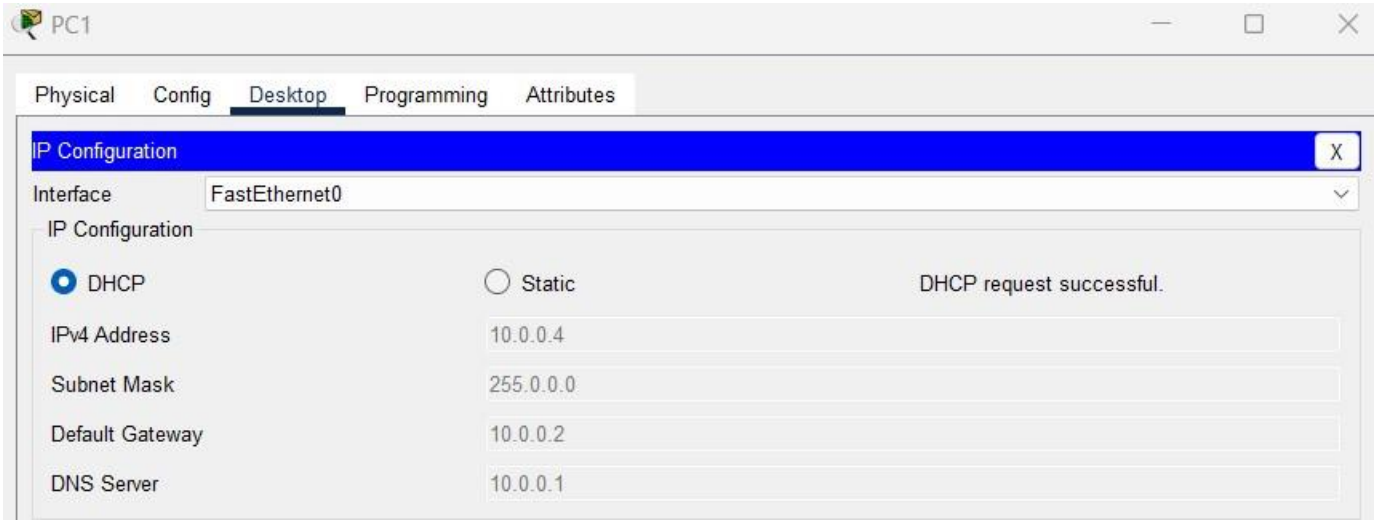
2. Do the below DHCP configuration for Server 0, so that server will allot the IP addresses , Default gateways and DNS Server to PC0 and PC1 dynamically.



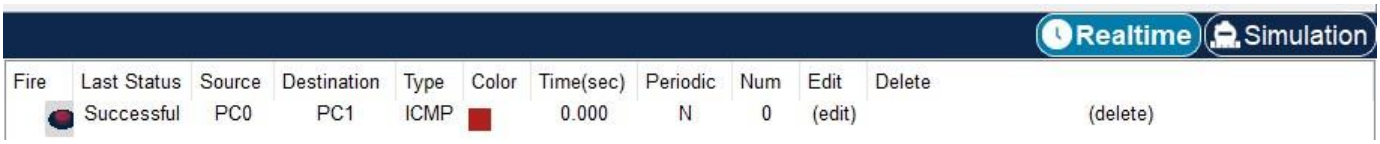


3. Configure PC0 and PC1 from Static to DHCP.





4. Send a packet from PC0 to PC1 , the transmission will be successful.

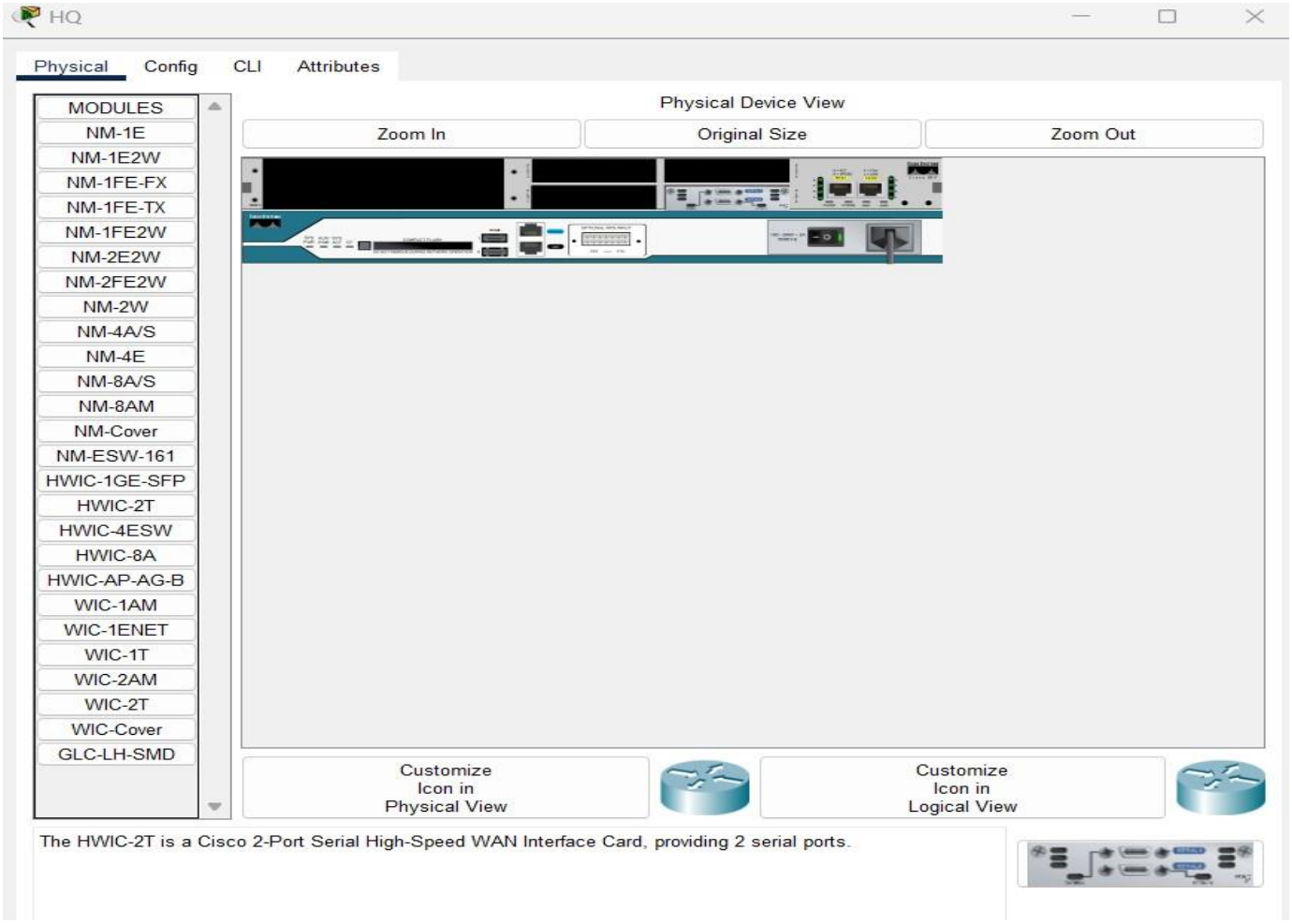


(e) Write a Packet Tracer script that simulates a network with a virtual private network (VPN) connection. Configure a VPN tunnel between two routers and verify the connectivity between the networks.

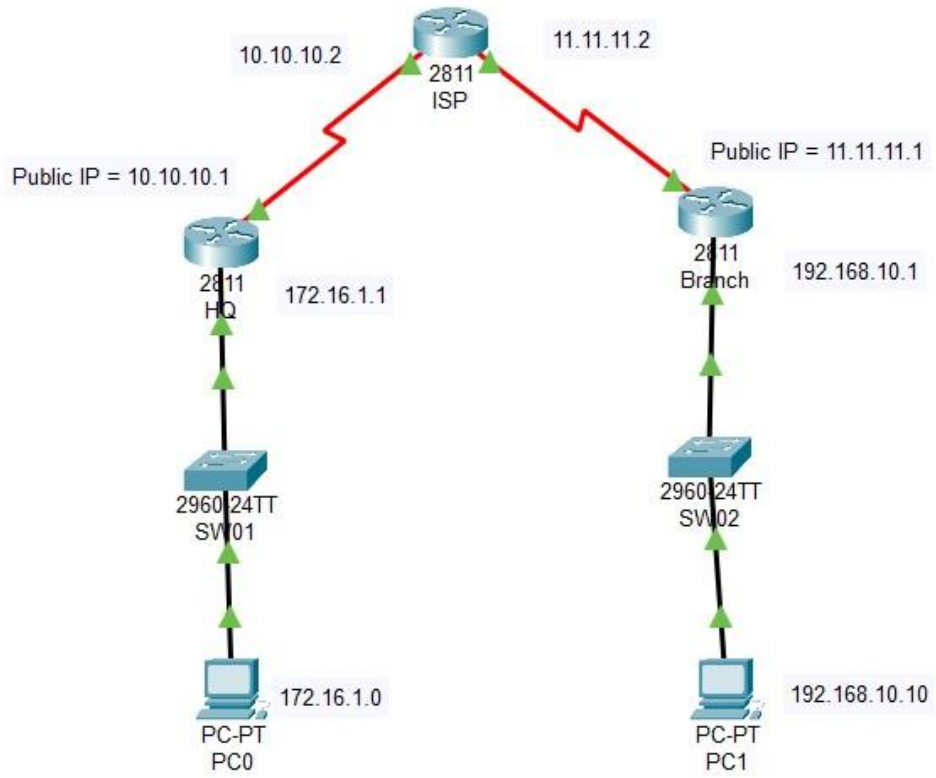
<u>Step-by-Step procedure</u> :

1. Take 3 routers and rename them as HQ (headquarters) , Branch and ISP. We are going to establish a VPN tunnel between HQ and Branch routers with the help of ISP.

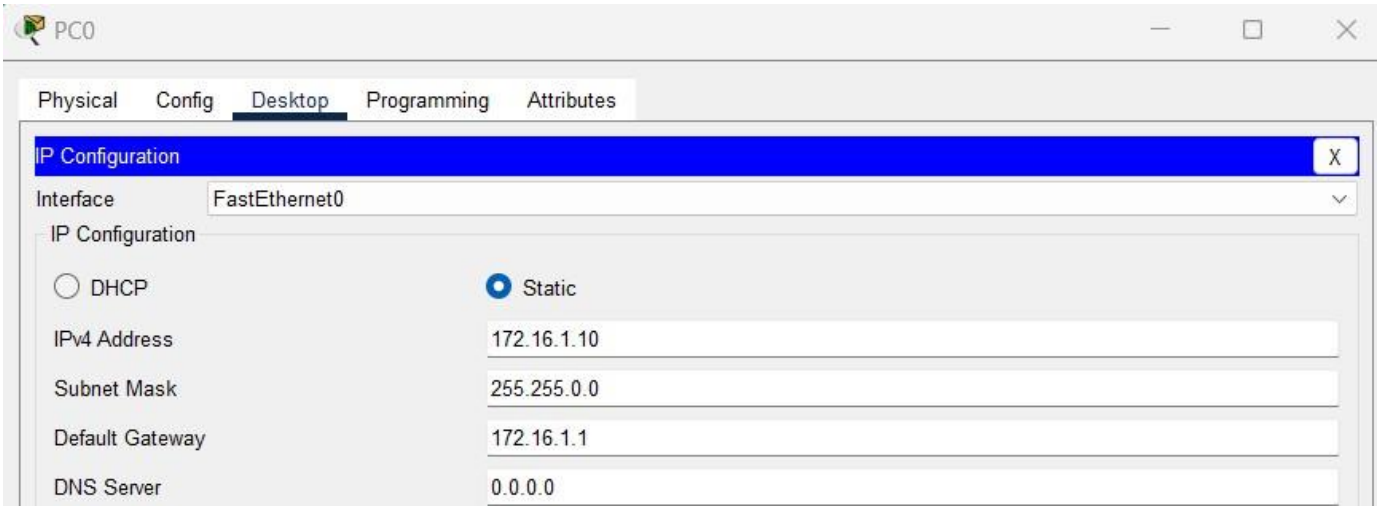
2. Configure each router HWIC-2T card and turn on the router in physical view.

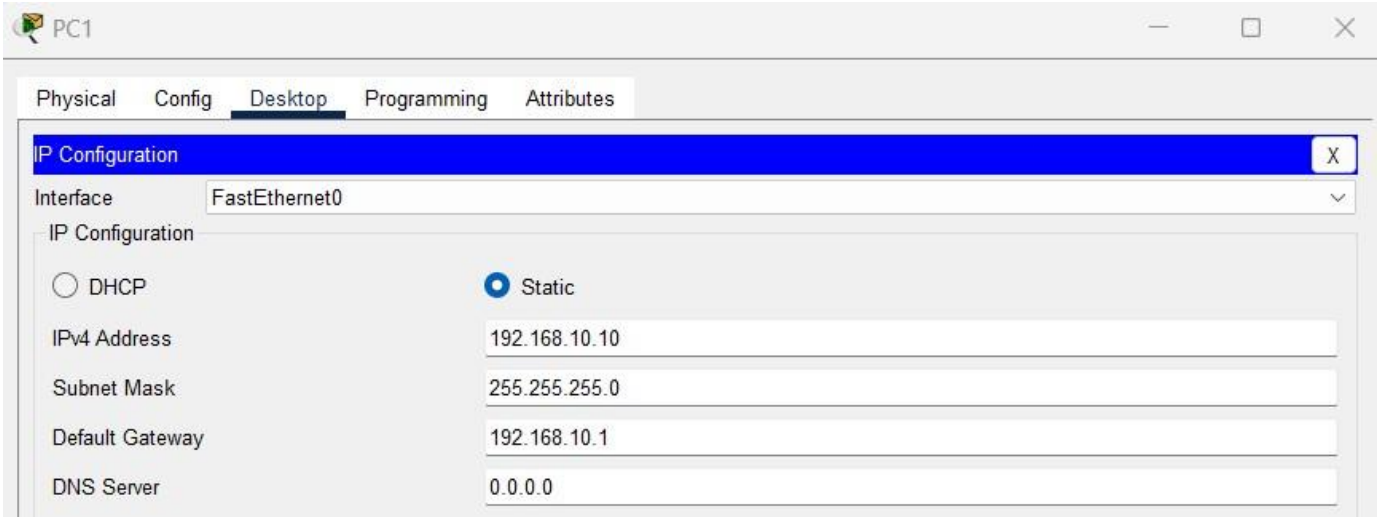


3. Design a circuit and mention the IP addresses as a note as in given below diagram.

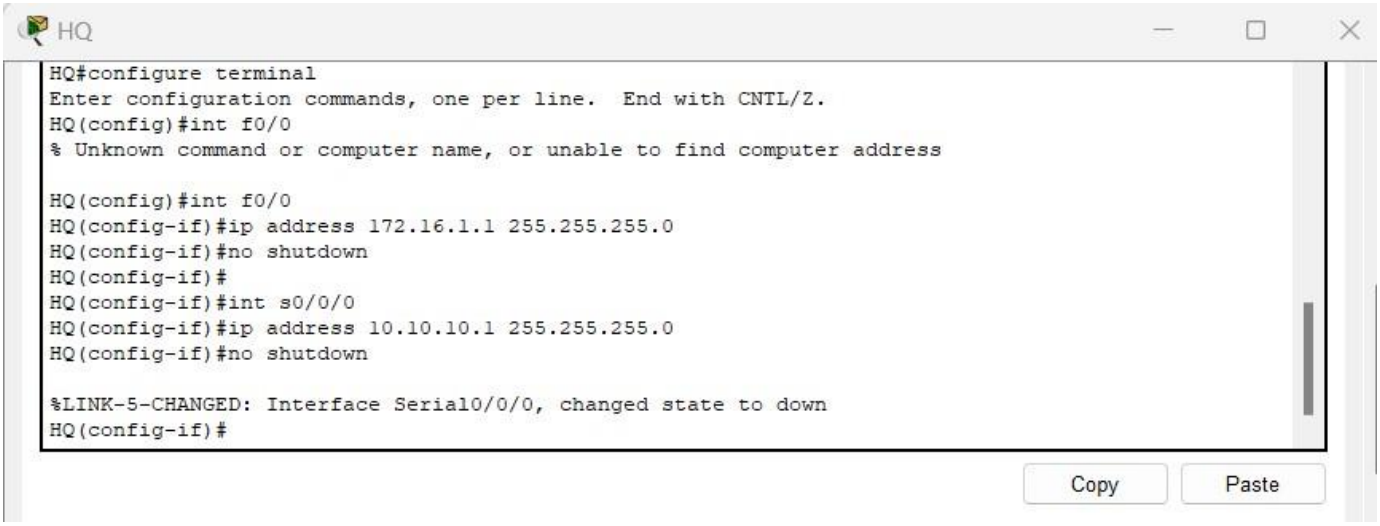


4. Configure PC0 and PC1.





5. Configure all three routers in CLI.



Branch

```
Would you like to enter the initial configuration dialog? [yes/no]: n


Press RETURN to get started!



Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Branch
Branch(config)#int f0/0
Branch(config-if)#ip address 192.168.10.1 255.255.255.0
Branch(config-if)#no shutdown

Branch(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Branch(config-if)#int s0/0/0
Branch(config-if)#ip address 11.11.11.1 255.255.255.0
Branch(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
Branch(config-if)#
```

ISP

Physical Config CLI Attributes

IOS Command Line Interface

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname ISP
ISP(config)#config-register t
%Invalid hex value
ISP(config)#int s0/0/0
ISP(config-if)#ip address 10.10.10.2 255.255.255.0
ISP(config-if)#no shutdown

ISP(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

ISP(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

ISP(config-if)#int s0/0/1
ISP(config-if)#ip address 11.11.11.2 255.255.255.0
ISP(config-if)#no shutdown

ISP(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up
```

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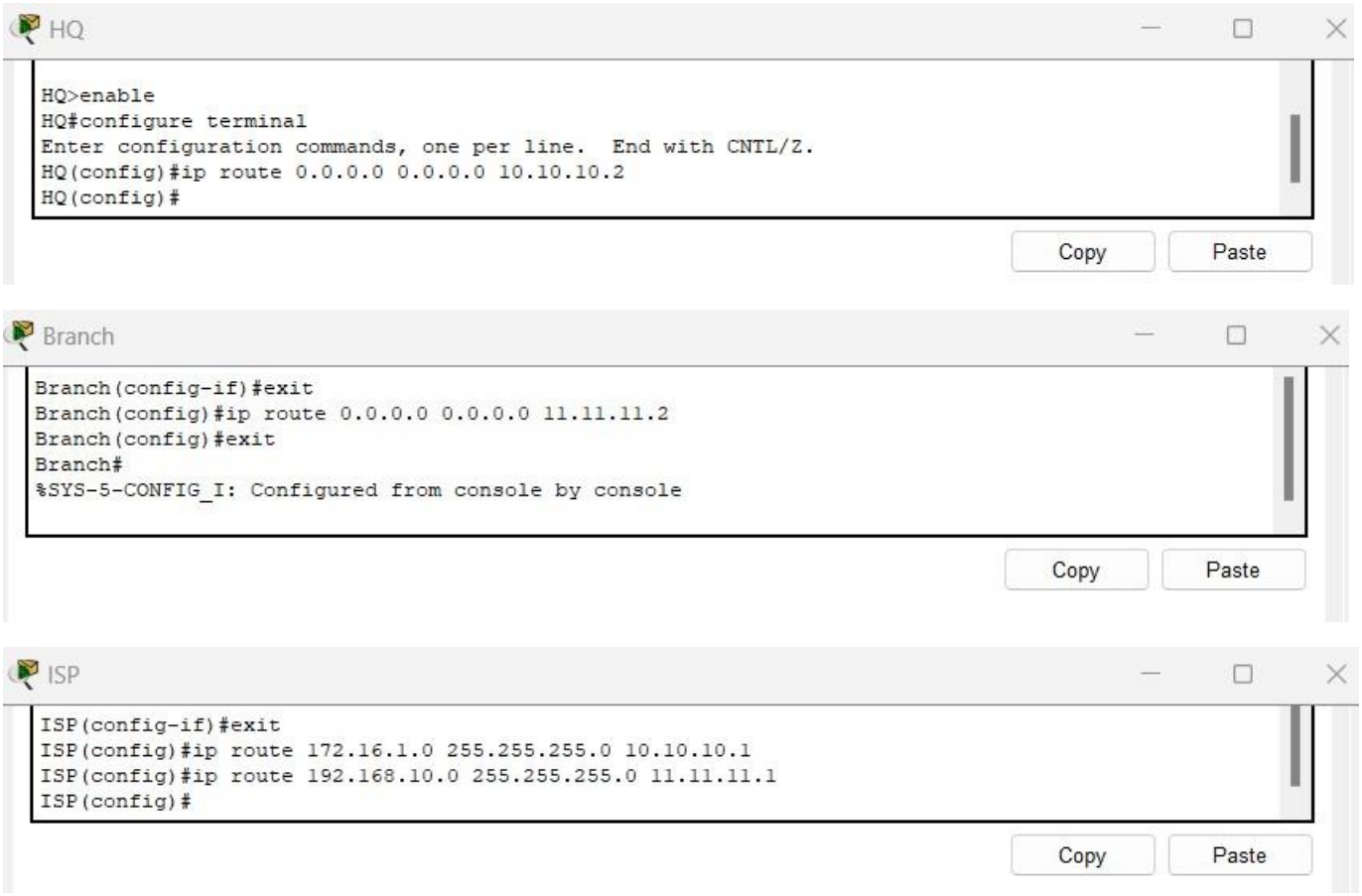
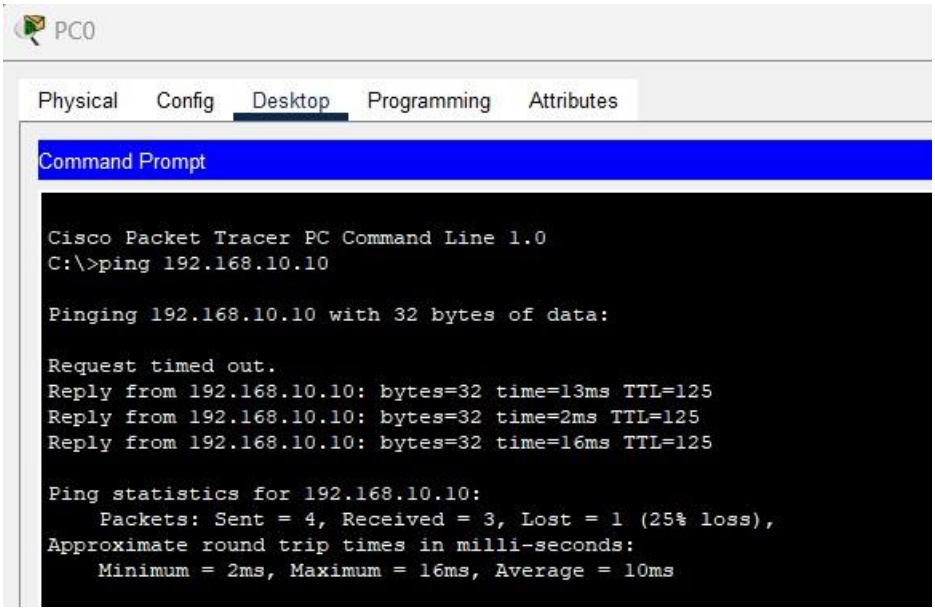
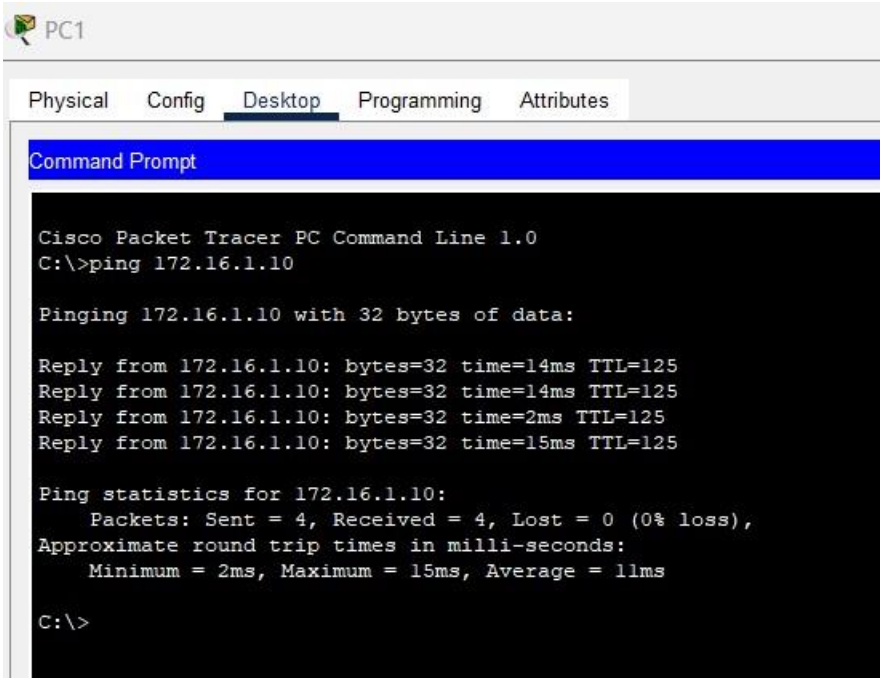
6. Configure default router on HQ and Branch , static router from ISP.



7. Ping PC0 and PC1 in command prompt





8. Configure ISAKMP policy for HQ and Branch routers.

9. Define IPsec Transform set.

10. Create Access list

11. Create Crypto Map for IPsec.

12. Apply the crypto map.

HQ

Physical Config CLI Attributes

IOS Command Line Interface

```
HQ>enable
HQ#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
HQ(config)#ip route 0.0.0.0 0.0.0.0 10.10.10.2
HQ(config)#
HQ(config)#
HQ(config)#crypto isakmp policy 20
HQ(config-isakmp)#authentication pre-share
HQ(config-isakmp)#encryption 3des
HQ(config-isakmp)#hash md5
HQ(config-isakmp)#group 1
HQ(config-isakmp)#lifetime 3600
HQ(config-isakmp)#exit
HQ(config)#crypto isakmp key cisco123 address 11.11.11.1
HQ(config)#crypto ipsec transform-set myset esp-3des esp-md5-hmac
HQ(config)#access-list 100 permit ip 172.16.1.0 0.0.0.255 192.168.10.0 0.0.0.255
HQ(config)#crypto map mymap 20 ipsec-isakmp
% NOTE: This new crypto map will remain disabled until a peer
        and a valid access list have been configured.
HQ(config-crypto-map)#set peer 11.11.11.1
HQ(config-crypto-map)#set transform-set myset
HQ(config-crypto-map)#match address 100
HQ(config-crypto-map)#exit
HQ(config)#int s0/0/0
HQ(config-if)#crypto map mymap
*Jan  3 07:16:26.785: %CRYPTO-6-ISAKMP_ON_OFF: ISAKMP is ON
HQ(config-if)#
```

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Branch

```
Branch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Branch(config)#crypto isakmp policy 20
Branch(config-isakmp)#authentication pre-share
Branch(config-isakmp)#encryption 3des
Branch(config-isakmp)#hash md5
Branch(config-isakmp)#group 1
Branch(config-isakmp)#lifetime 3600
Branch(config-isakmp)#exit
Branch(config)#crypto isakmp key cisco123 address 10.10.10.1
Branch(config)#crypto ipsec transform-set myset esp-3des esp-md5-hmac
Branch(config)#access-list 100 permit ip 192.168.10.0 0.0.0.255 172.16.1.0 0.0.0.255
Branch(config)#crypto map mymap 20 ipsec-isakmp
% NOTE: This new crypto map will remain disabled until a peer
        and a valid access list have been configured.
Branch(config-crypto-map)#set peer 10.10.10.1
Branch(config-crypto-map)#set transform-set myset
Branch(config-crypto-map)#match address 100
Branch(config-crypto-map)#exit
Branch(config)#int s0/0/0
Branch(config-if)#crypto map mymap
*Jan  3 07:16:26.785: %CRYPTO-6-ISAKMP_ON_OFF: ISAKMP is ON
Branch(config-if)#
```

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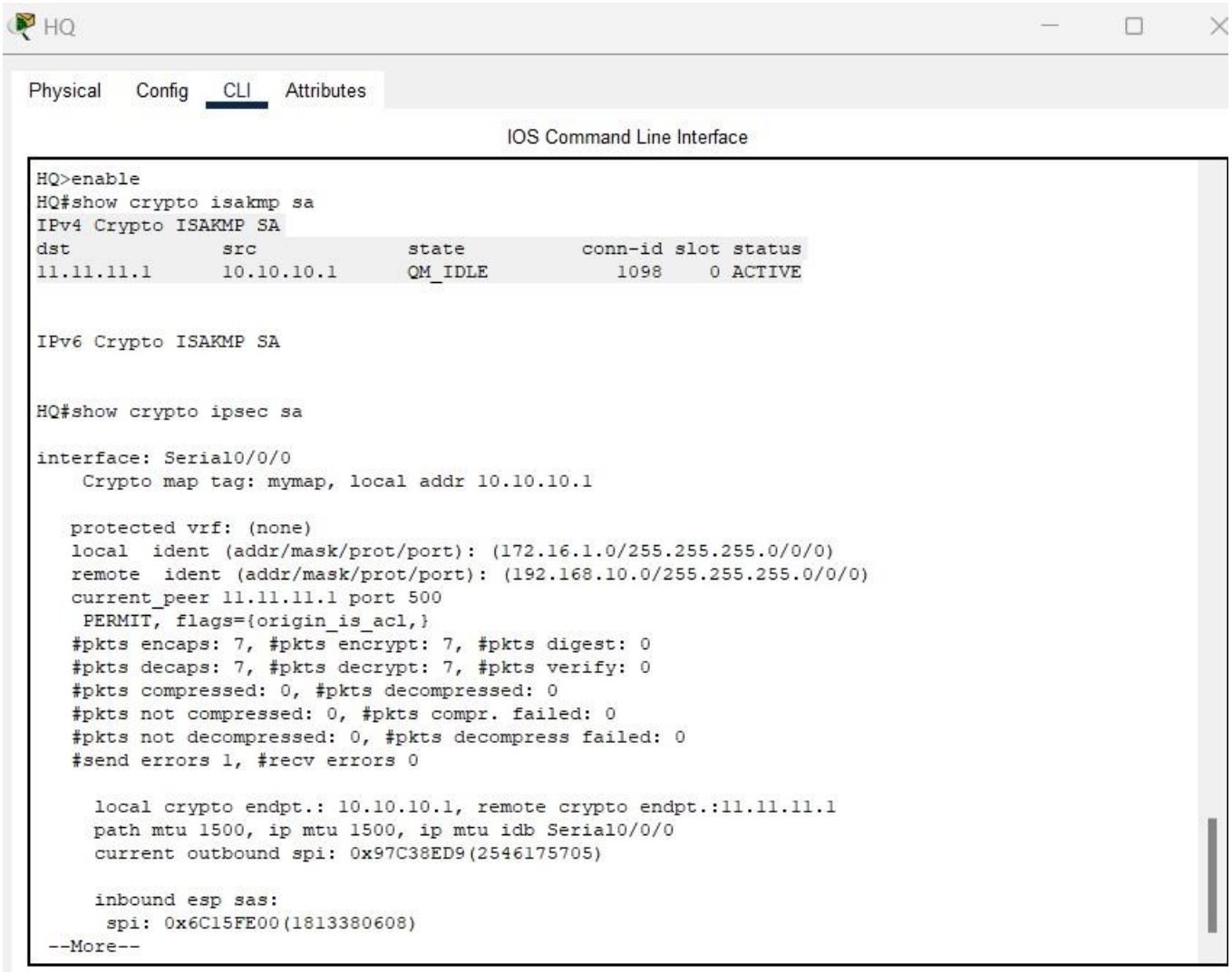
13. Test and Verify VPN.



14. Now we can see that VPN tunnel is established between HQ and Branch routers , and the status is ACTIVE.