



COMPUTER SCIENCE

Submitted To :

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SUBJECT: COMPUTER NETWORK'S

**Vikas College of Arts, Science &
Commerce**

CERTIFICATE

This is to certify that *Aditya Subhash Nikam*

of class/sec B.Sc.CS has successfully completed the project
entitled COMPUTER NETWORK'S PRACTICALS
to my satisfaction and submitted the same during the
academic year 2022-2023

The project is the result of his/her efforts & endeavors.

.....

Date :

(Signature of the teacher)

Mr. MILIND M PARADKAR SIR

(Name of the teacher)

Practical No 1

Aim: Using, linux-terminal or Windows-cmd, execute following networking commands and note the output: ping, traceroute, netstat, arp, ipconfig, Getmac, hostname, NSLookUp, pathping, SystemInfo

Theory:

- 1) ping: ping is a computer network administration software utility used to test the reachability of a host on an Internet Protocol network. It is available for virtually all operating systems that have networking capability, including most embedded network administration software
- 2) traceroute: The traceroute command (tracert) is a utility designed for displaying the time it takes for a packet of information to travel between a host system and the final destination system. This command returns a list of the hops that the data packets take along their path along their way to the destination
- 3) netstat: The netstat provides statistics about all active connections so you that we can find out which computers or networks a PC is connected to
Some of the netstat commands commonly used are
 - i) netstat -in command
This netstat function shows the state of all configured interfaces.
 - ii) netstat -a command
The netstat -a command shows the state of all sockets.
 - iii) netstat -s
The netstat -s command shows statistics for each protocol (while the netstat -p command shows the statistics for the specified protocol).
 - iv) netstat -r
Another option relevant to performance is the display of the discovered Path Maximum Transmission Unit (PMTU).
- 4) arp: The ARP (Address Resolution Protocol) commands are used to view, display, or modify the details/information in an ARP table/cache.
Some of the common arp commands are as follows
 - i) arp -a: This command is used to display the ARP table for a particular IP address. It also shows all the entries of the ARP cache or table.
 - ii) arp -g: Same as the arp -a command.

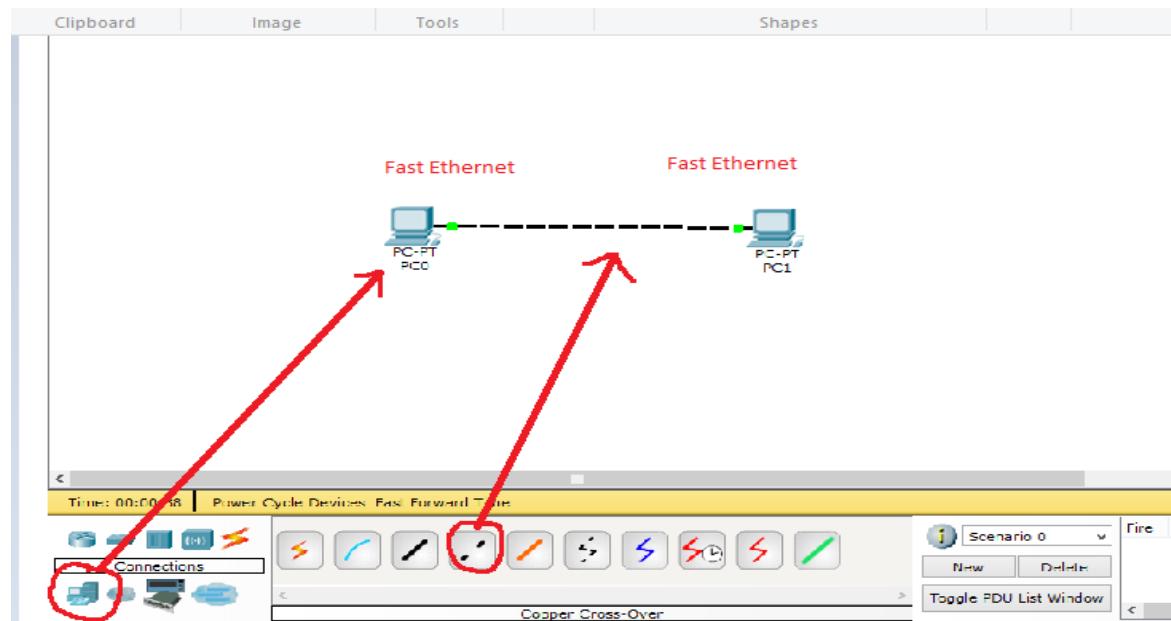
- iii) arp -d: This command is used to delete an entry from the ARP table for a particular interface. To delete an entry, write arp -d command along with the IP address in a command prompt to be deleted.
 - iv) arp -s: This command is used to add the static entry in the ARP table, which resolves the InetAddr (IP address) to the EtherAddr (physical address). To add a static entry in an ARP table, we write arp -s command along with the IP address and MAC address of the device in a command prompt.
- 5) ipconfig: ipconfig (Internet Protocol CONFIGuration) is used to display and manage the IP address assigned to the machine. In Windows, typing ipconfig without any parameters displays the computer's currently assigned IP, subnet mask and default gateway addresses.
- 6) getmac: Getmac is a Windows command used to display the Media Access Control (MAC) addresses for each network adapter in the computer.
- 7) hostname: A hostname is a label that is assigned to a device connected to a computer network and it is used to identify the device.
- 8) NSlookUp: Using this command we can find the corresponding IP address or domain name system record. The user can also enter a command for it to do a reverse DNS lookup and find the host name for an IP address that is specified.
- 9) Pathping: This command sends multiple echo Request messages to each router between a source and destination, over a period of time, and then computes results based on the packets returned from each router. It can be used to find the routers or links having network problems.
- 10) SystemInfo: This command is used to display detailed configuration information about a computer and its operating system, including operating system configuration, security information, product ID, and hardware properties

Practical No 2

Aim: Using Packet Tracer, create a basic network of two computers using appropriate network wire through Static IP address allocation and verify connectivity

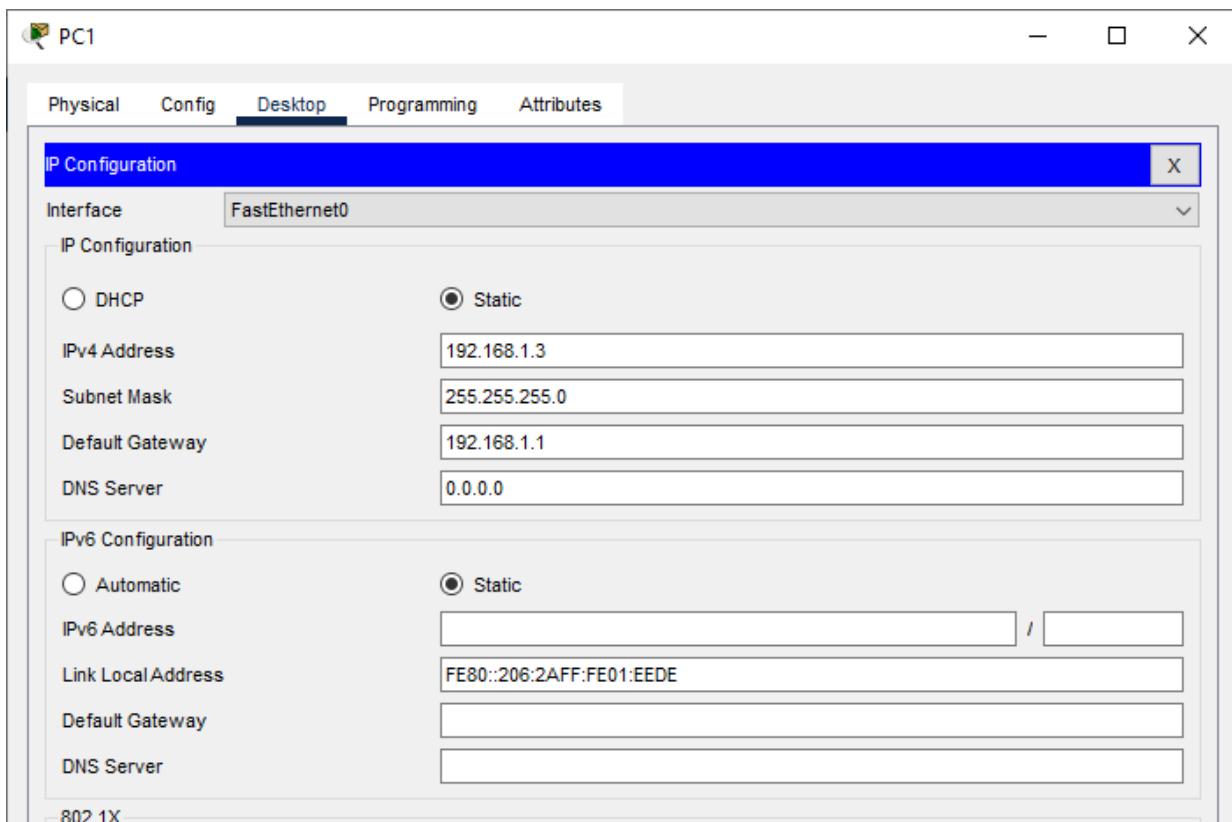
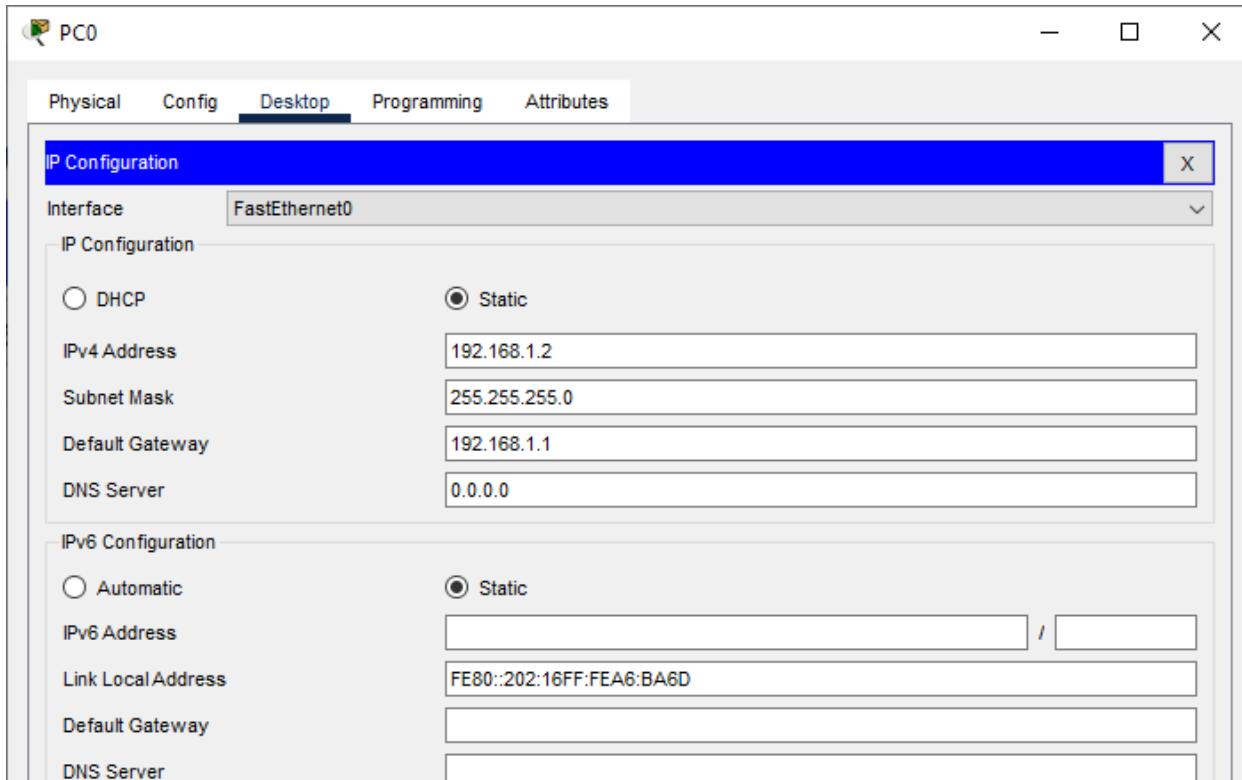
Theory:

We use the following network to verify the connectivity using Cisco packet tracer

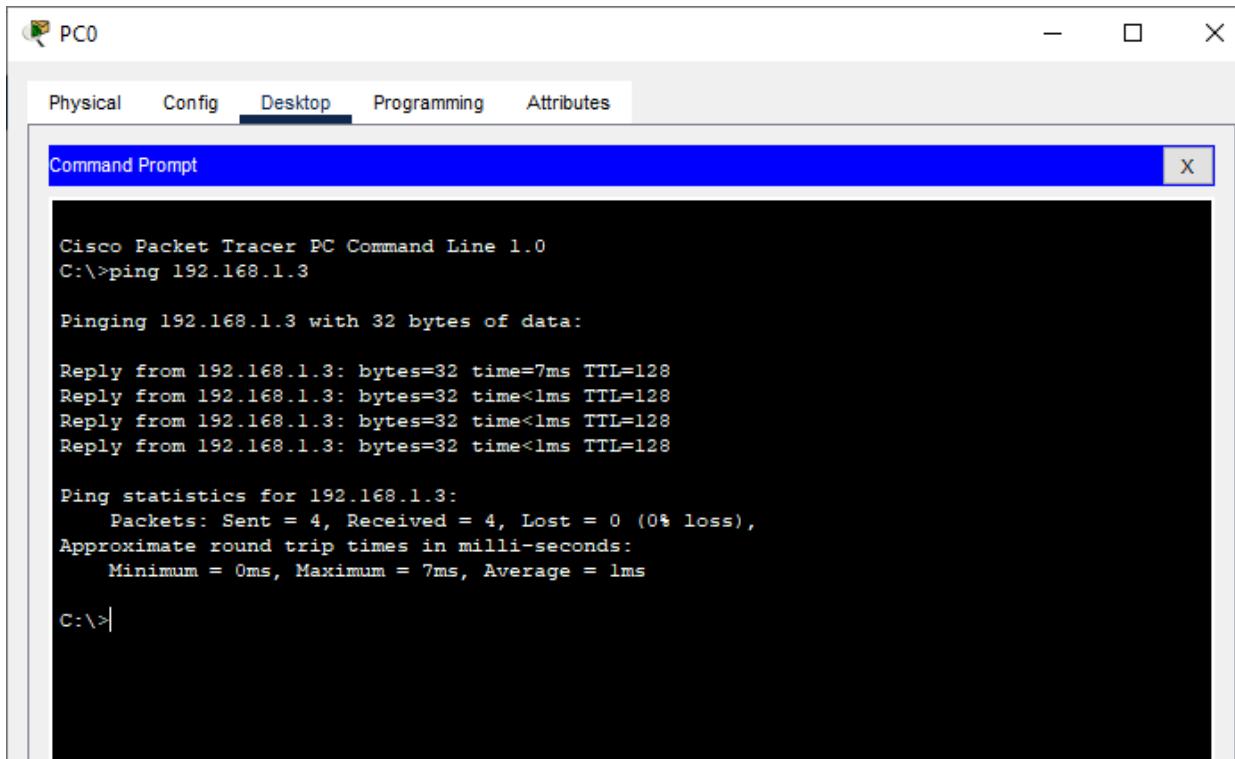


Now we set the ip address of the devices as follows

Host name	ip Address	Default Gateway
PC0	192.168.1.2	192.168.1.1
PC1	192.168.1.3	192.168.1.1



In order to check the connectivity we send a ping command from PC0 to PC1 as follows



```
Cisco Packet Tracer PC Command Line 1.0
C:>ping 192.168.1.3

Pinging 192.168.1.3 with 32 bytes of data:

Reply from 192.168.1.3: bytes=32 time=7ms TTL=128
Reply from 192.168.1.3: bytes=32 time<1ms TTL=128
Reply from 192.168.1.3: bytes=32 time<1ms TTL=128
Reply from 192.168.1.3: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 7ms, Average = 1ms

C:>
```

Result:

Hence the Connectivity between the PCs has been verified.

Practical No 3

Aim: Using Packet Tracer, create a basic network of one server and two computers using appropriate network wire. Use Dynamic IP address allocation and show connectivity

Theory:

For assigning ip addresses dynamically we use the DHCP protocol

Dynamic Host Configuration Protocol (DHCP) is a client/server protocol that automatically provides an Internet Protocol (IP) host with its IP address and other related configuration information such as the subnet mask and default gateway.

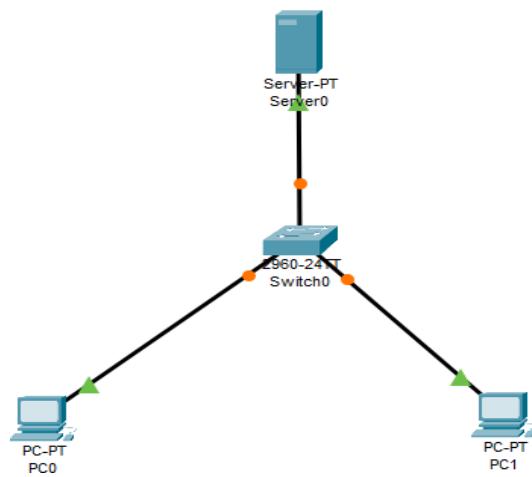
The DHCP server maintains a pool of IP addresses and leases an address to any DHCP-enabled client when it starts up on the network. Because the IP addresses are dynamic (leased) rather than static (permanently assigned), addresses no longer in use are automatically returned to the pool for reallocation.

DHCP provides the following benefits.

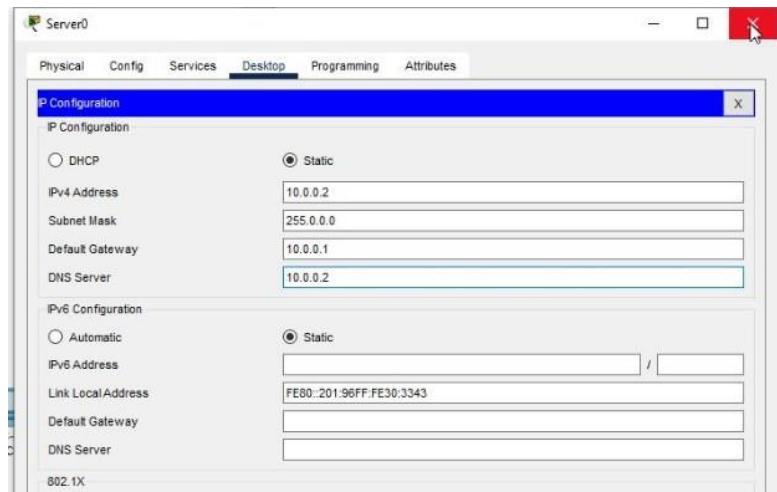
- 1) Reliable IP address configuration. DHCP minimizes configuration errors caused by manual IP address configuration, such as typographical errors, or address conflicts caused by the assignment of an IP address to more than one computer at the same time.
- 2) Reduced network administration. DHCP includes the following features to reduce network administration

DHCP runs at the application layer of the Transmission Control Protocol/IP(TCP/IP) stack to dynamically assign IP addresses to DHCP clients and to allocate TCP/IP configuration information to DHCP clients. This includes subnet mask information, default gateway IP addresses and domain namesystem (DNS) addresses.

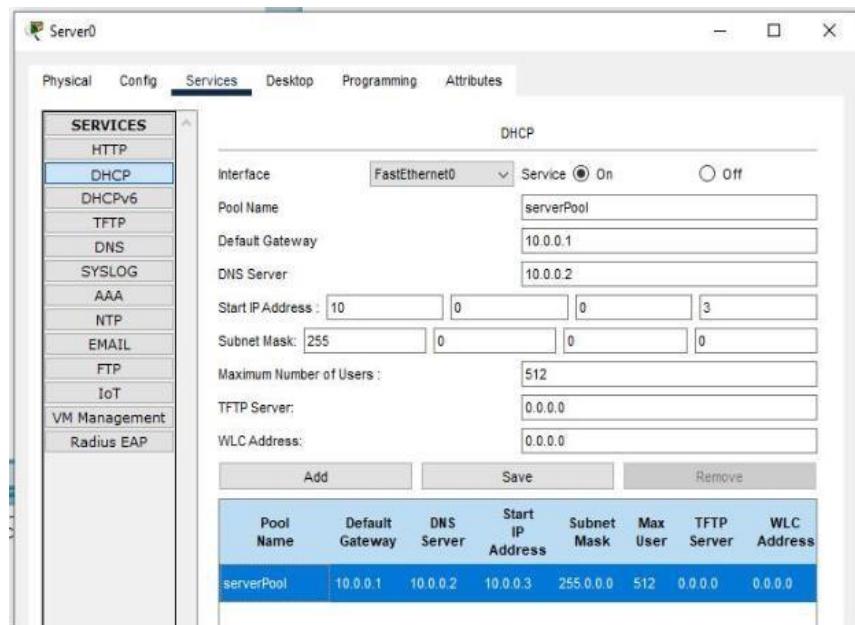
We use the following topology for the present case



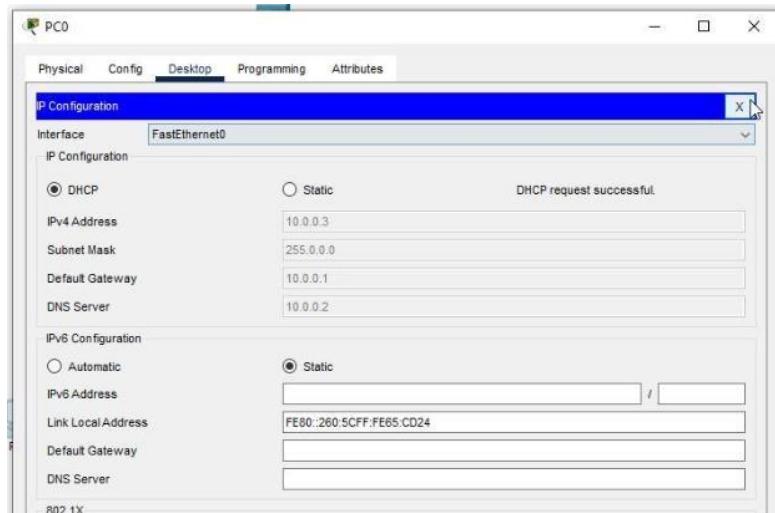
Configuring the Server:

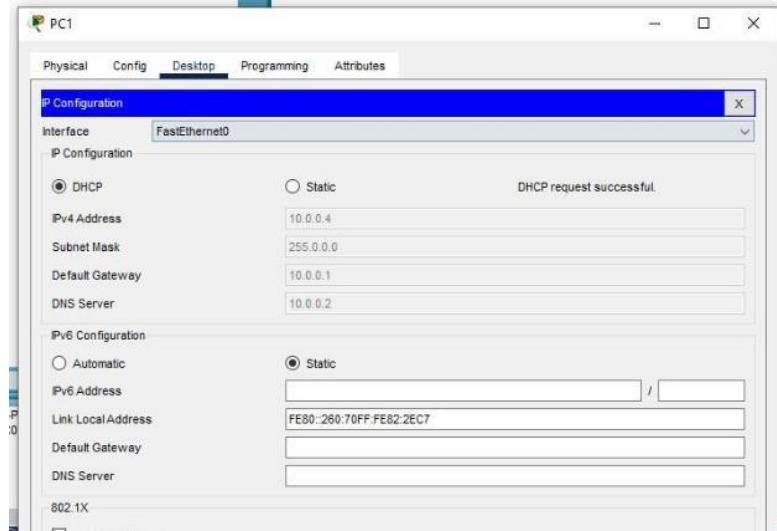


Enabling and setting the DHCP Service on the Server:

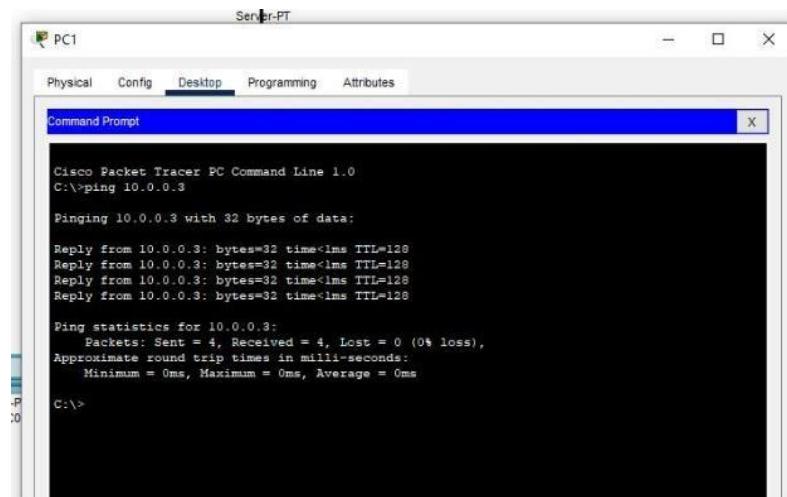


Verifying the Dynamic Addressing on both the PCs:





Checking the connectivity:



Result:

Hence the Connectivity between the PCs has been verified.

Practical No 4

Aim: Using Packet Tracer, create a basic network of one server and two computers and two mobile / movable devices using appropriate network wire. And verify the connectivity

Theory:

A Wireless Access Point (WAP) is a networking device that allows wireless- capable devices to connect to a wired network. Instead of using wires and cables to connect every computer or device in the network, installing WAPs is a more convenient, more secure, and cost-efficient alternative.

Setting up a wireless network provides a lot of advantages and benefits for you and your small business.

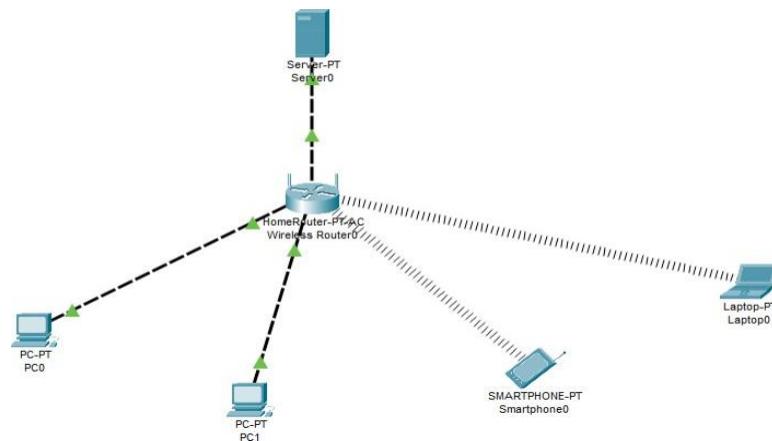
- 1) It is easier to set up compared to setting up a wired network.
- 2) It is more convenient to access.
- 3) It is less complicated to add new users in the network.
- 4) It gives users more flexibility to stay online even when moving from one area in the office to another.
- 5) Guest users can have Internet access by just using a password.
- 6) Wireless network protection can be set up even if the network is visible to the public by configuring maximum wireless security.
- 7) Segmentation of users, such as guests and employees, is possible by creating Virtual Local Area Networks (VLANs) to protect your network resources and assets.

There are different purposes of setting up a wireless network using a WAP.

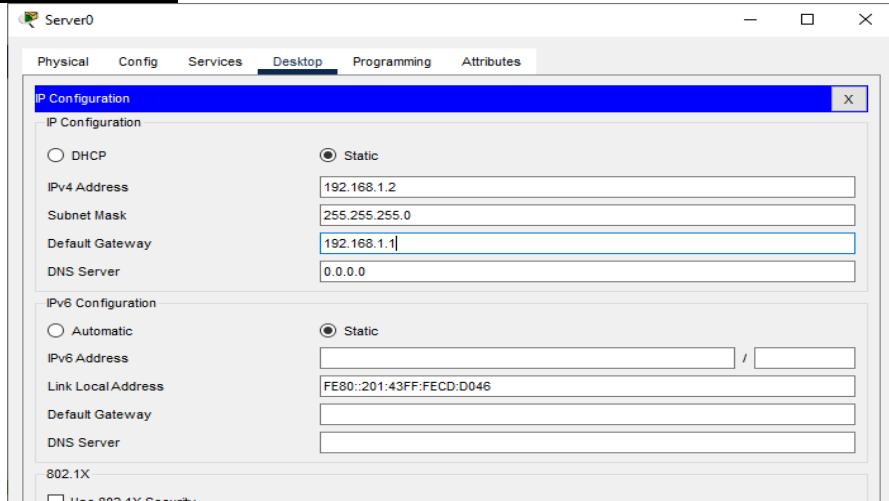
With a WAP, the following can be done:

- 1) Create a wireless network within your existing wired network.
- 2) Extend the signal range and strength of your wireless network to provide complete wireless coverage and get rid of dead spots especially in larger office spaces or buildings.
- 3) Accommodate wireless devices within a wired network.
- 4) Configure the settings of your wireless access points in one device.

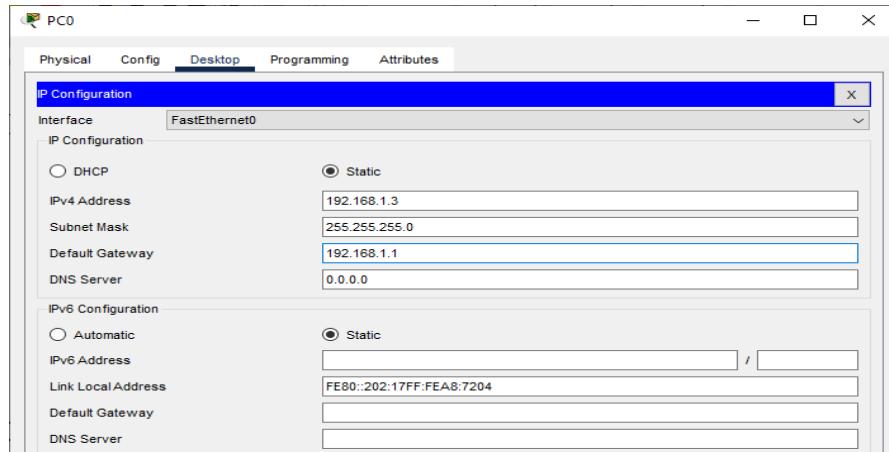
For the present case we use the following topology



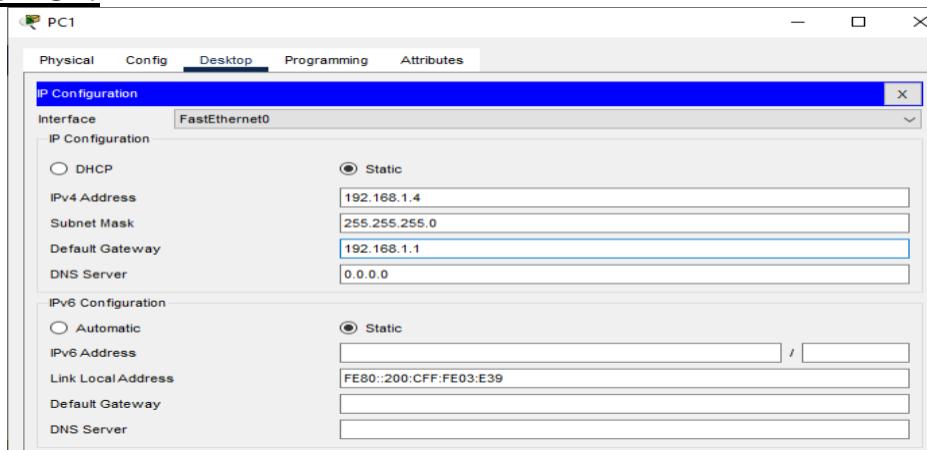
Configure the Server:



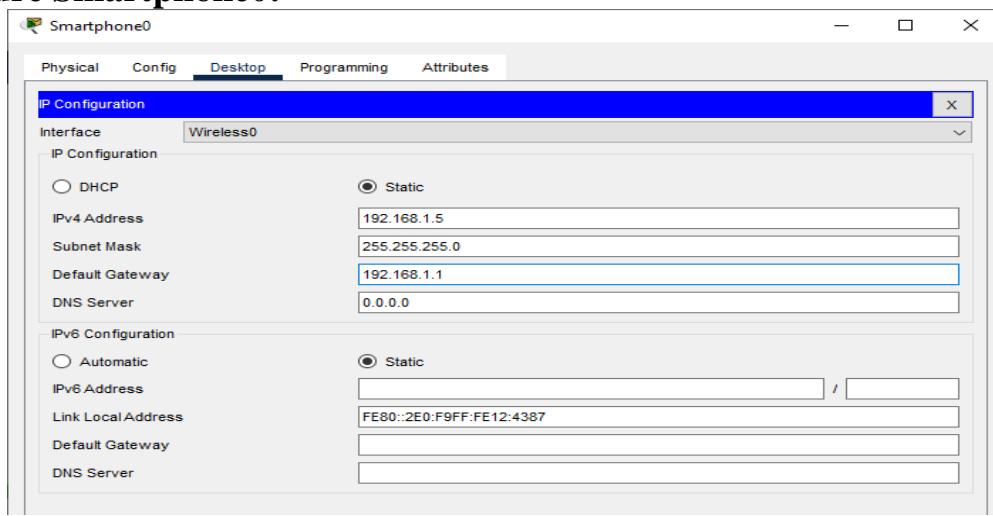
Configure PC0:



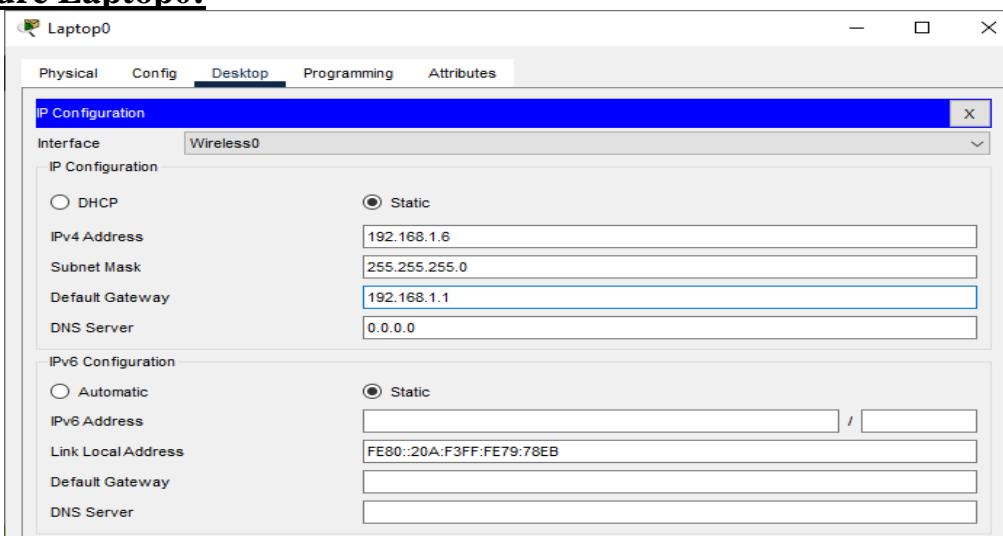
Configure PC1:



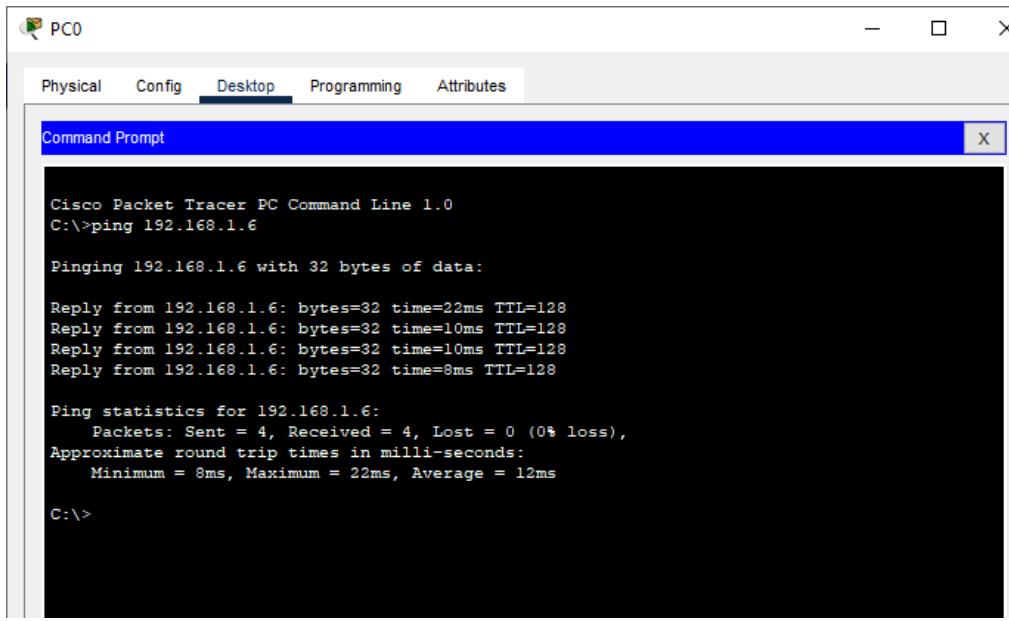
Configure Smartphone0:



Configure Laptop0:



Checking the connectivity (pinging laptop0 from PC0):



The screenshot shows a Cisco Packet Tracer interface titled "PC0". The "Desktop" tab is selected in the top navigation bar. A "Command Prompt" window is open, displaying the output of a ping command. The output is as follows:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.6

Pinging 192.168.1.6 with 32 bytes of data:

Reply from 192.168.1.6: bytes=32 time=22ms TTL=128
Reply from 192.168.1.6: bytes=32 time=10ms TTL=128
Reply from 192.168.1.6: bytes=32 time=10ms TTL=128
Reply from 192.168.1.6: bytes=32 time=8ms TTL=128

Ping statistics for 192.168.1.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 8ms, Maximum = 22ms, Average = 12ms

C:\>
```

Similarly the ping message can be checked for all the devices

Result:

Hence the Connectivity of the network has been verified.

Practical No 5

Aim: Using Packet Tracer to create a network with three routers with RIPv1 and each router associated network will have minimum three PC and show the connectivity

Theory:

RIP is one of the dynamic routing protocols and the first distance-vector routing protocol that uses the hop count as a routing metric. A lower hop count is preferred.

Each router between the source and destination network is counted as one hop. RIP prevents routing loops by imposing a maximum number of hops on the path between source and destination.

In RIP, Every 30 seconds, each router broadcasts its entire routing table to its nearest neighbors.

Pros and Cons of RIP Protocol

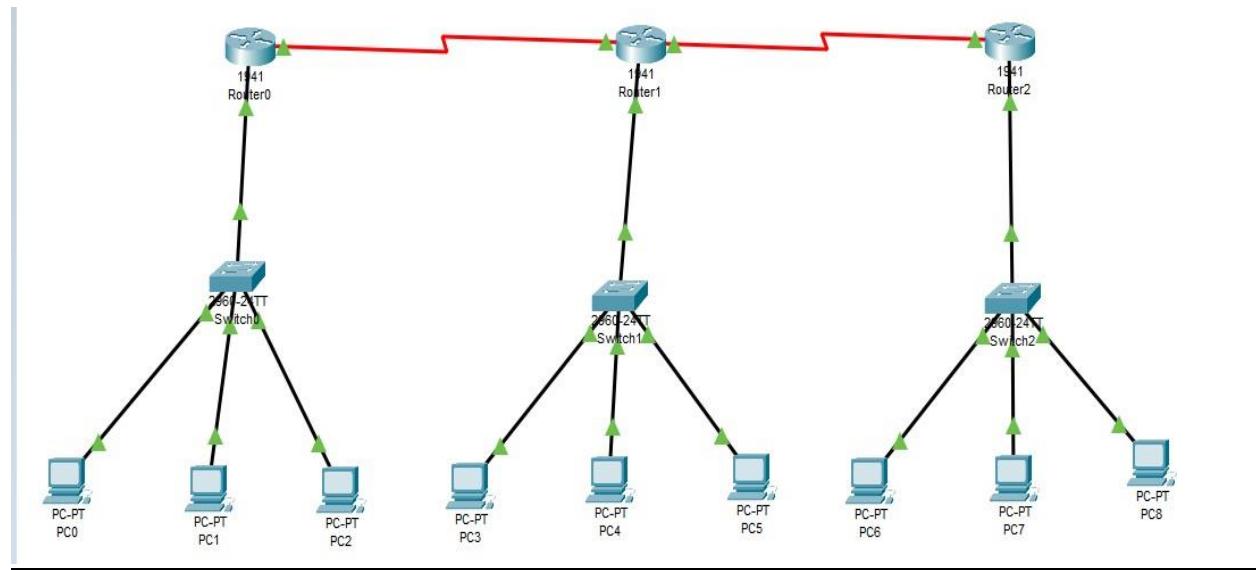
Pros:

1. The RIP protocol is ideal for small networks since it is simple to learn and configure.
2. RIP routing is guaranteed to work with nearly all routers.
3. When the network topology changes, RIP does not require an update.

Cons:

1. RIP does not support variable length subnet masks
2. RIP transmits updates every 30 seconds, which cause traffic and consumes bandwidth.
3. RIP hop counts are restricted to 15, hence any router beyond that distance is deemed infinity and becomes unreachable.
4. The rate of convergence is slow in RIP compared to other routing protocols. When a link fails, finding alternate network paths takes a long time.
5. RIP does not support multiple paths on the same route, which may result in extra routing loops.

We use the following topology for the present case

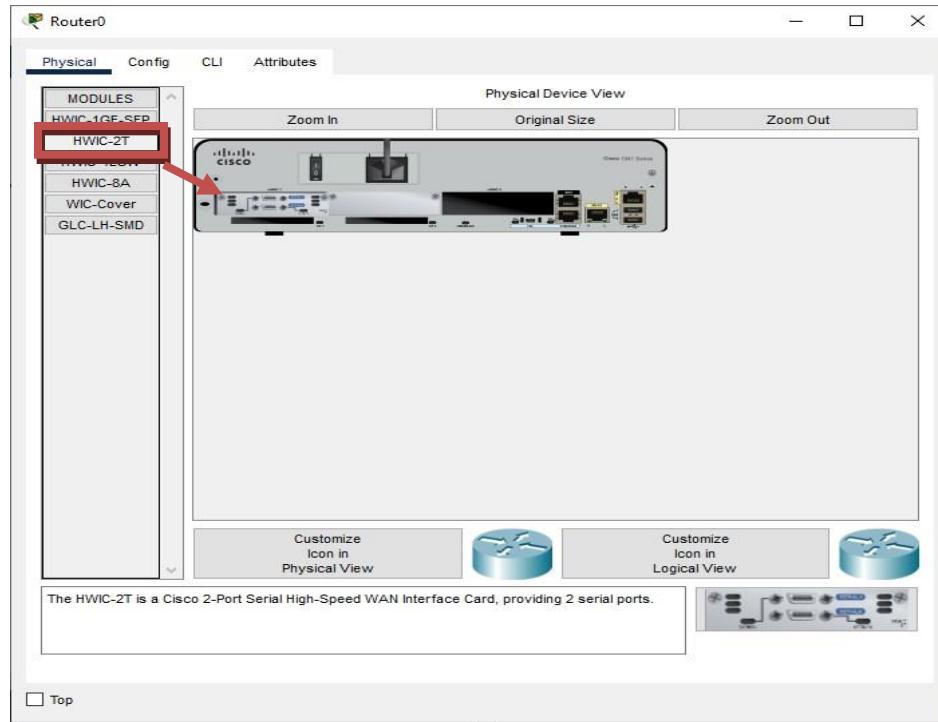


We configure the above network using the following IP addresses

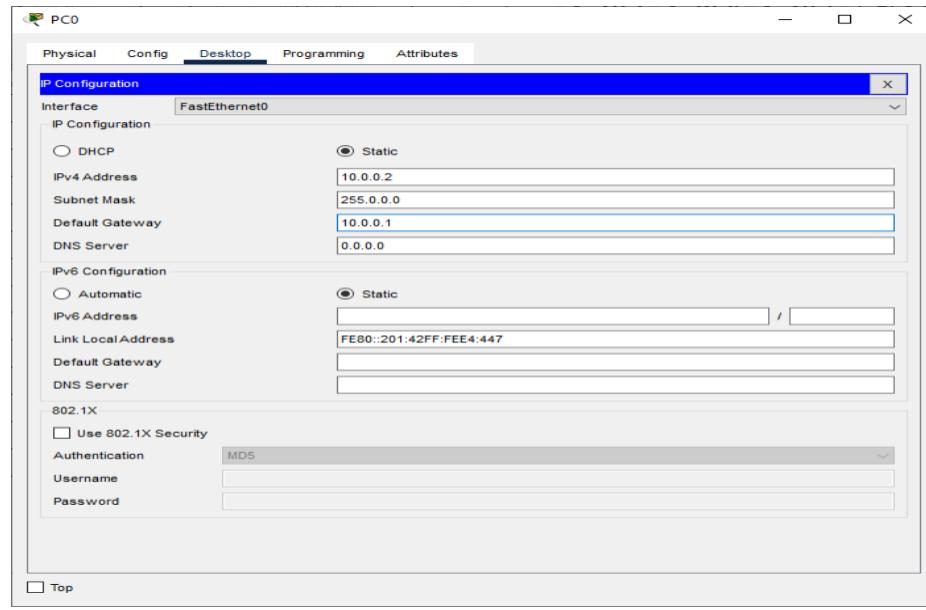
Host	Interface	IP address	Network Address	Default Gateway
Router 0	G0/0	10.0.0.1	10.0.0.0	
	S0/1/0	192.168.0.1	192.168.0.0	
Router 1	G0/0	20.0.0.1	20.0.0.0	
	S0/1/0	192.168.0.2	192.168.0.0	
	S0/1/1	192.168.1.1	192.168.1.0	
Router 2	G0/0	30.0.0.1	30.0.0.0	
	S0/1/1	192.168.1.2	192.168.1.0	
PC0	FastEthernet 0	10.0.0.2	10.0.0.0	10.0.0.1
PC1	FastEthernet 0	10.0.0.3	10.0.0.0	10.0.0.1
PC2	FastEthernet 0	10.0.0.4	10.0.0.0	10.0.0.1
PC3	FastEthernet 0	20.0.0.2	20.0.0.0	20.0.0.1
PC4	FastEthernet 0	20.0.0.3	20.0.0.0	20.0.0.1
PC5	FastEthernet 0	20.0.0.4	20.0.0.0	20.0.0.1

PC6	FastEthernet 0	30.0.0.2	30.0.0.0	30.0.0.1
PC7	FastEthernet 0	30.0.0.3	30.0.0.0	30.0.0.1
PC8	FastEthernet 0	30.0.0.4	30.0.0.0	30.0.0.1

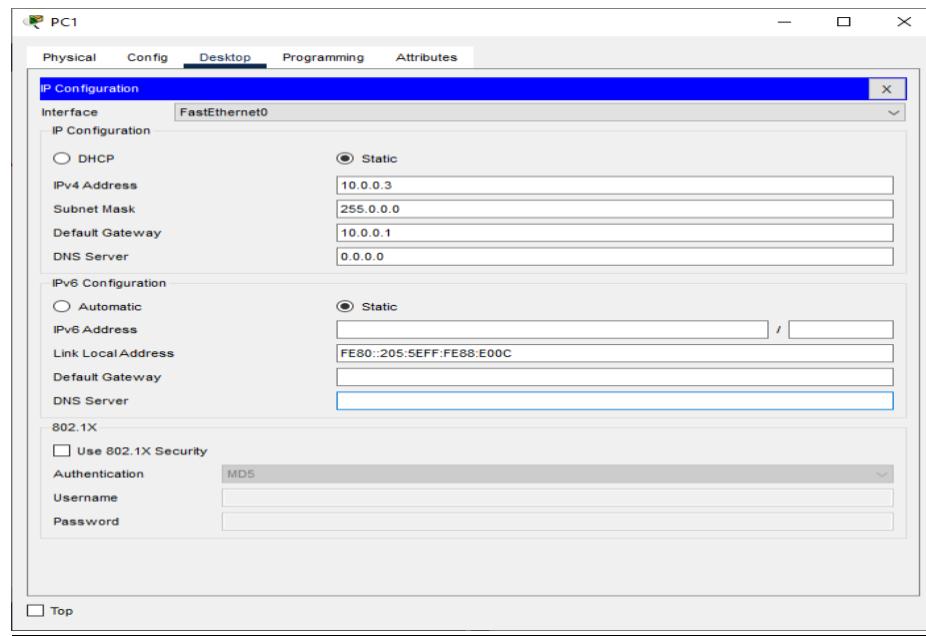
Adding Serial Interface in each Router



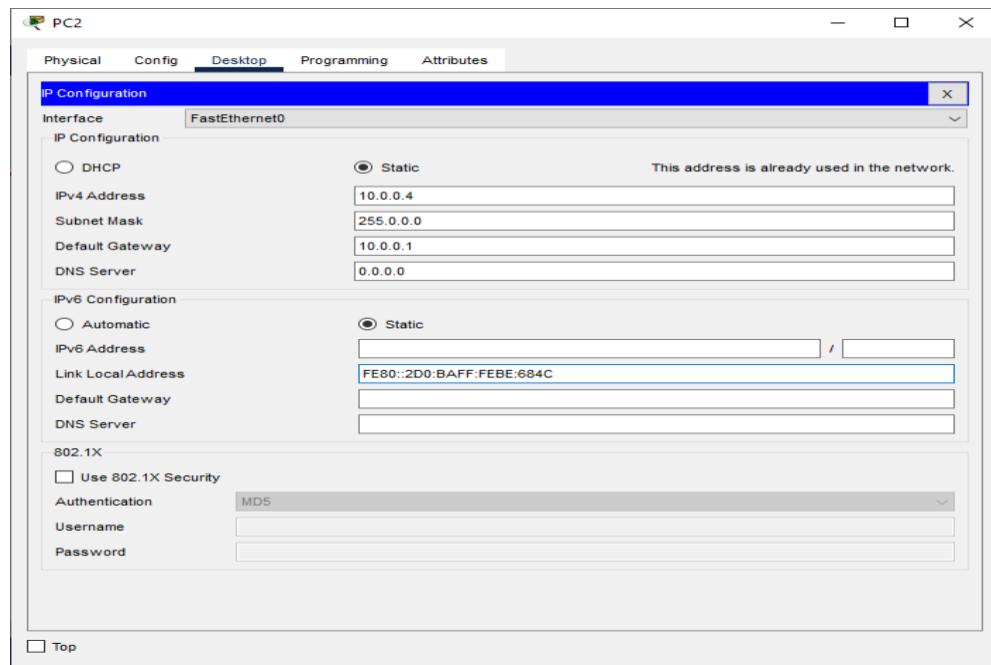
Configuring PC0:

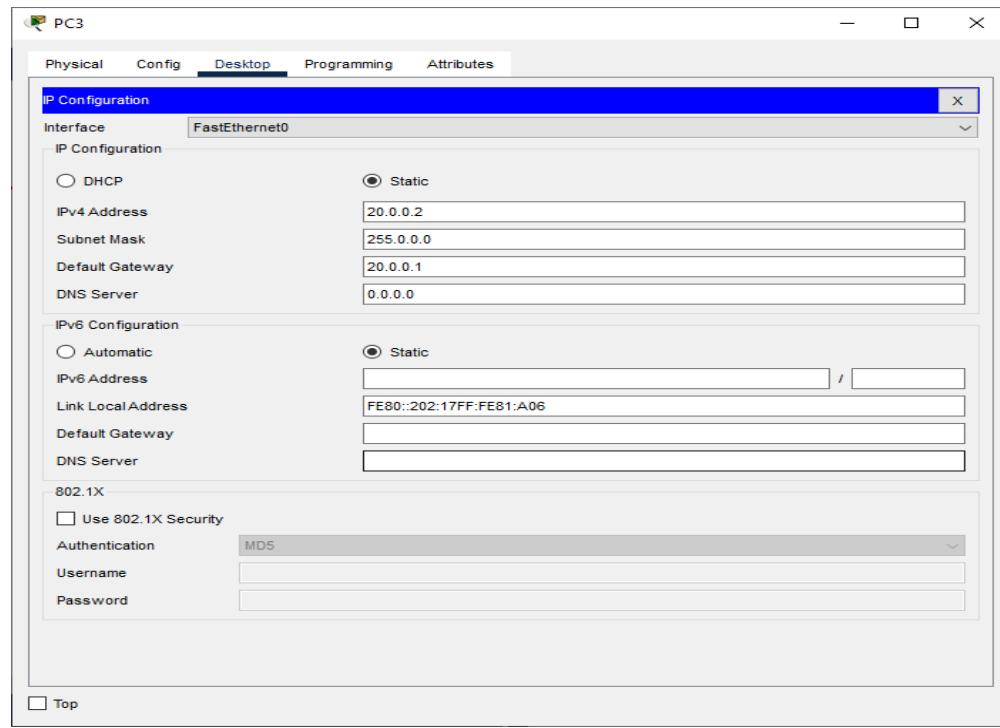


Configuring PC1:

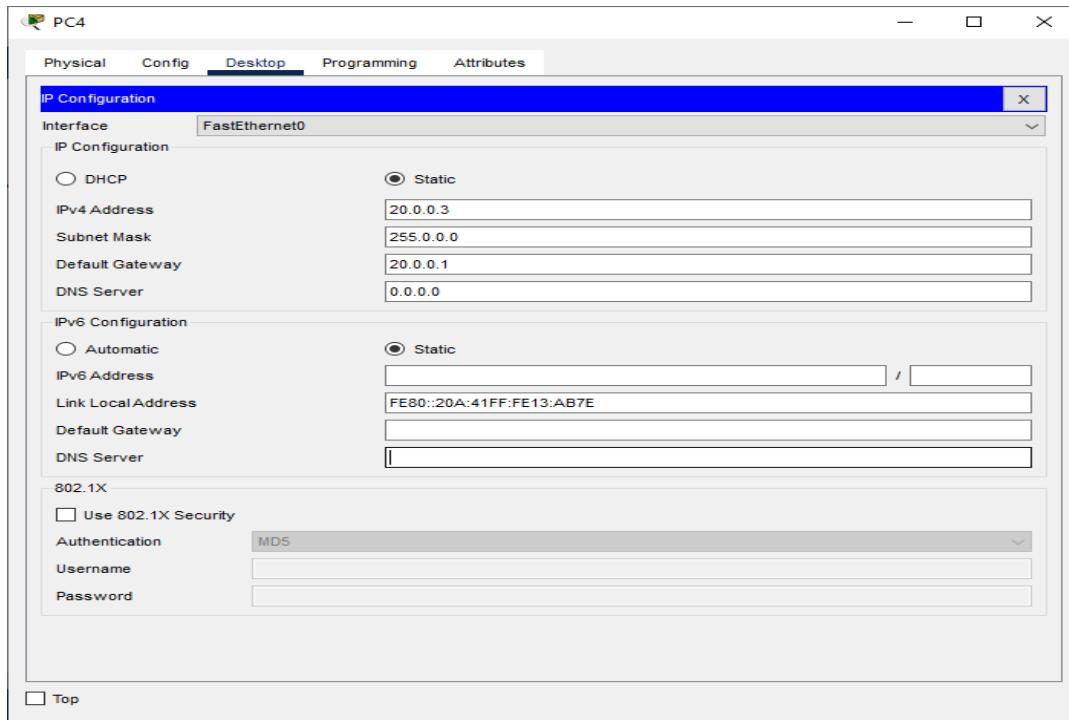


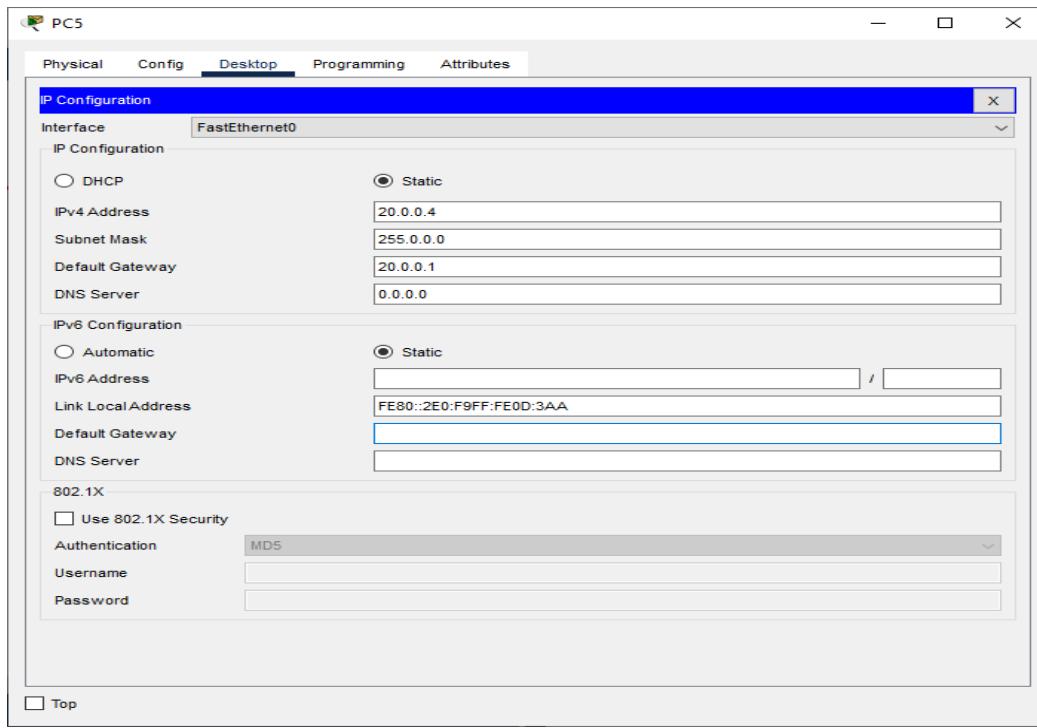
Configuring PC2:



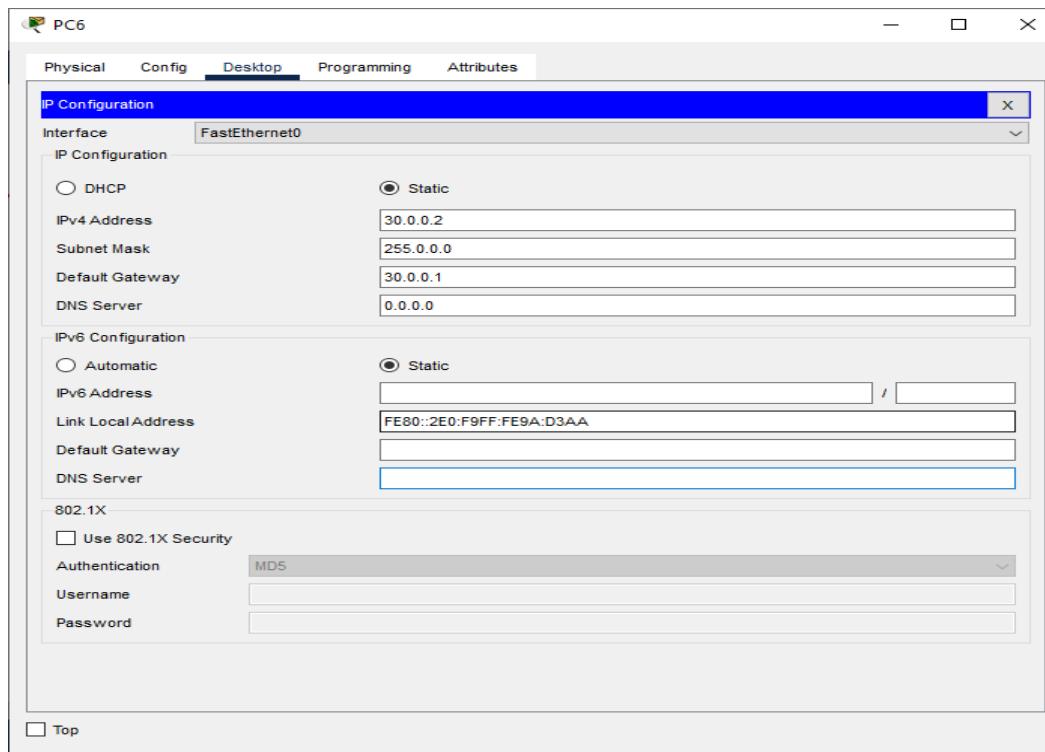


Configuring PC4:

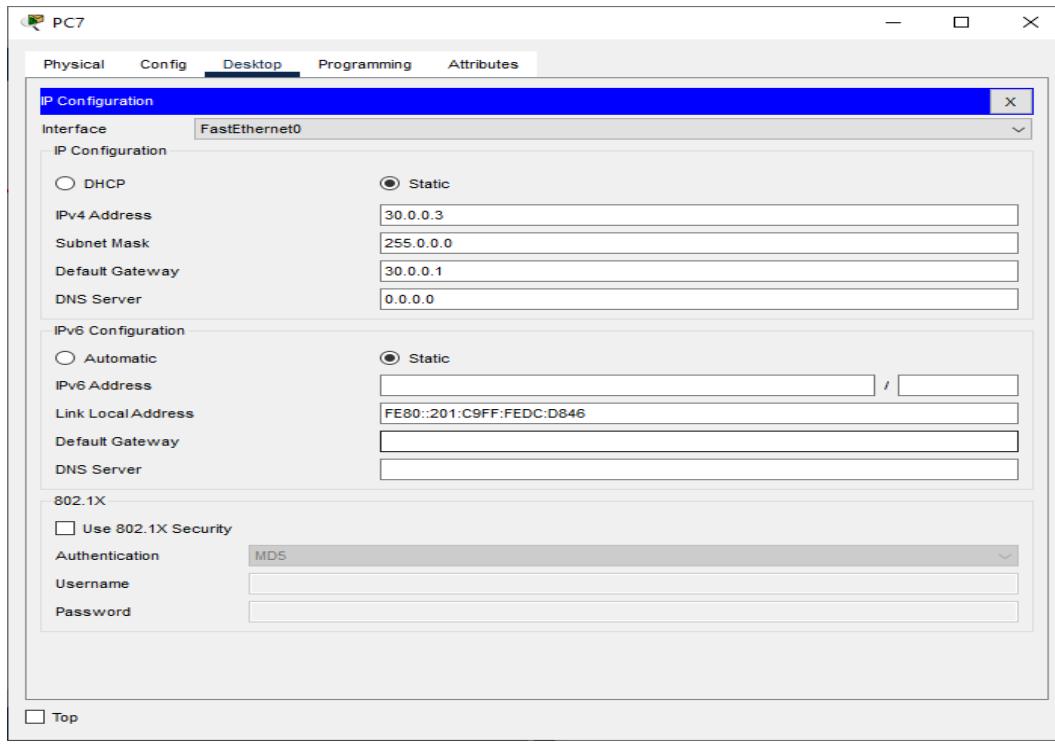




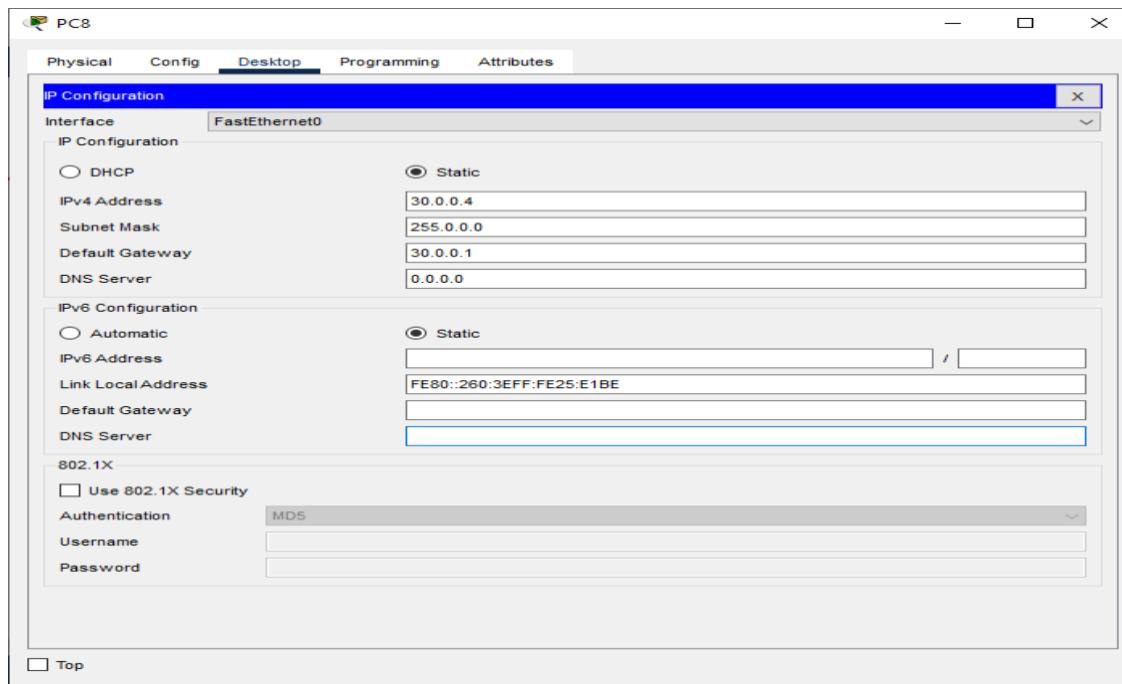
Configuring PC6:



Configuring PC7:



Configuring PC8:



Configuring Router 0 (using the CLI mode)

```
Router>en
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gigabitEthernet 0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface serial 0/1/0
Router(config-if)#ip address 192.168.0.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
Router#
```

Configuring Router 1 (using the CLI mode)

```
Router>enable
Router#configure terminal
Router(config)#interface gigabitEthernet 0/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#exit

Router(config)#interface serial 0/1/0
Router(config-if)#ip address 192.168.0.2 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit

Router(config)#interface serial 0/1/1
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shutdown
```

Configuring Router 2 (using the CLI mode)

```
Router>enable  
Router#configure terminal  
Router(config)#interface gigabitEthernet 0/0  
Router(config-if)#ip address 30.0.0.1 255.0.0.0  
Router(config-if)#no shutdown  
Router(config-if)#exit  
  
Router(config)#interface serial 0/1/1  
Router(config-if)#ip address 192.168.1.2 255.255.255.0  
Router(config-if)#no shutdown
```

Setting the RIPv1 on Router 0

```
Router>enable  
Router#configure terminal  
Router(config)#router rip  
Router(config-router)#network 10.0.0.0  
Router(config-router)#network 192.168.0.0  
Router(config-router)#exit
```

Setting the RIPv1 on Router 1

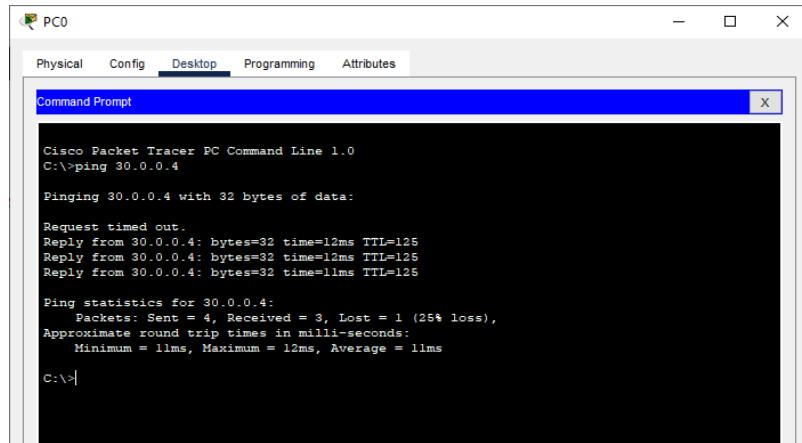
```
Router>enable  
Router#configure terminal  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#router rip  
Router(config-router)#network 192.168.0.0  
Router(config-router)#network 20.0.0.0  
Router(config-router)#network 192.168.1.0  
Router(config-router)#exit  
Router(config)#  
Router#
```

Setting the RIPv1 on Router 2

```
Router>enable  
Router#configure terminal  
Router(config)#router rip  
Router(config-router)#network 192.168.1.0  
Router(config-router)#network 30.0.0.0  
Router(config-router)#exit  
Router(config)#
```

Checking the connectivity by using the ping command

Pinging PC8 (ip address 30.0.0.4) from PC0



```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 30.0.0.4

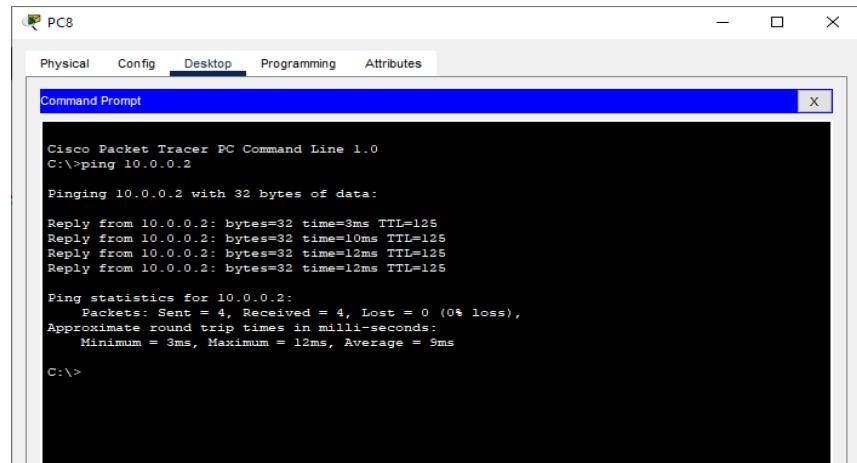
Pinging 30.0.0.4 with 32 bytes of data:

Request timed out.
Reply from 30.0.0.4: bytes=32 time=12ms TTL=125
Reply from 30.0.0.4: bytes=32 time=12ms TTL=125
Reply from 30.0.0.4: bytes=32 time=11ms TTL=125

Ping statistics for 30.0.0.4:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 12ms, Average = 11ms

C:\>
```

Pinging PC0 (ip address 10.0.0.2) from PC8



```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=3ms TTL=125
Reply from 10.0.0.2: bytes=32 time=10ms TTL=125
Reply from 10.0.0.2: bytes=32 time=12ms TTL=125
Reply from 10.0.0.2: bytes=32 time=12ms TTL=125

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 3ms, Maximum = 12ms, Average = 9ms

C:\>
```

Result:

Hence the RIPv1 has been studied and verified through the given network

Practical No 6

Aim: Using Packet Tracer to create a network with three routers with RIPv2 and each router associated network will have minimum three PC and show the connectivity

Theory:

RIPv2 is an enhancement to the original RIP protocol developed in 1994. RIPv2 is also a distance vector routing protocol but has a few enhancements to make it more efficient than RIPv1.

RIPv2 is more efficient than RIPv1, but is not suitable for larger, more complex networks. It simply provides more flexibility on smaller networks.

RIPv2 uses the same routing metric as RIPv1, the hop count. Updates with RIPv2 are sent via multicasts and not broadcasts. RIPv2 can also be configured to do classless routing. When configured for classless routing, RIPv2 will transmit subnet masks when it sends routing updates. This allows for the use of subnetting and discontiguous networks.

RIPv2 allows for authentication to be required for updates. When authentication is enabled, each router is configured with the RIP update password. The password sent with the RIP update must match the password configured on the destination router. If the passwords do not match, then the receiving router will not process the update.

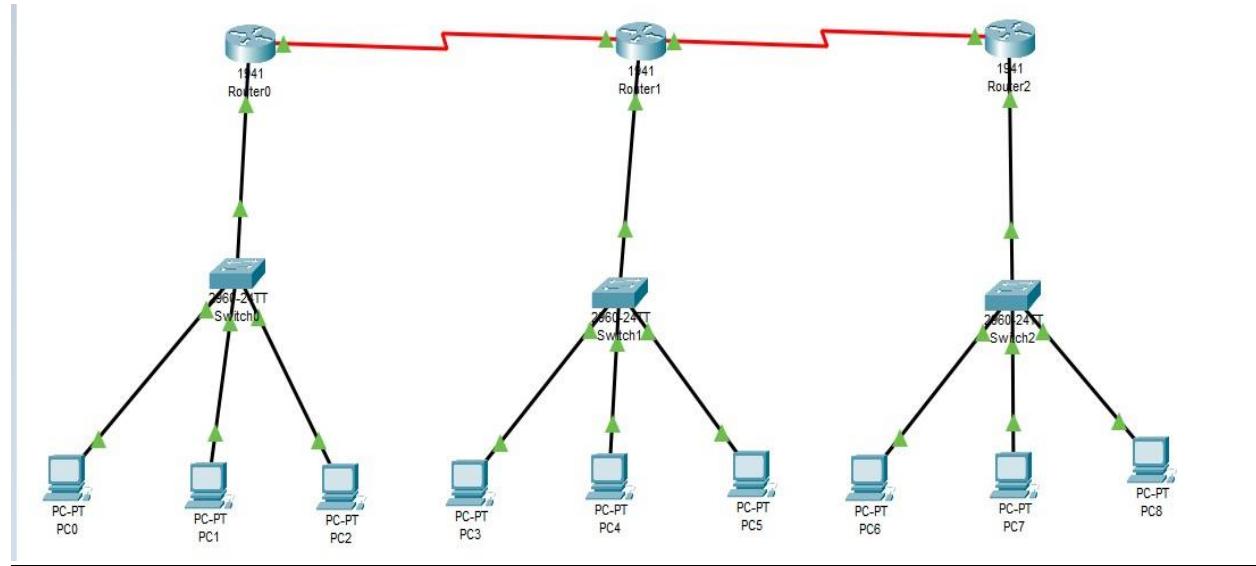
Advantages of RIPv2

- 1) It's a standardized protocol.
- 2) It's VLSM compliant.
- 3) Provides fast convergence.
- 4) It sends triggered updates when the network changes.
- 5) Works with snapshot routing – making it ideal for dial networks.

Disadvantage of RIPv2

- 1) Max hop count of 15, due to the ‘count-to-infinity’ vulnerability.
- 2) No concept of neighbors.
- 3) Exchanges entire table with all neighbors every 30 seconds (except in the case of a triggered update).

We use the following topology for the present case

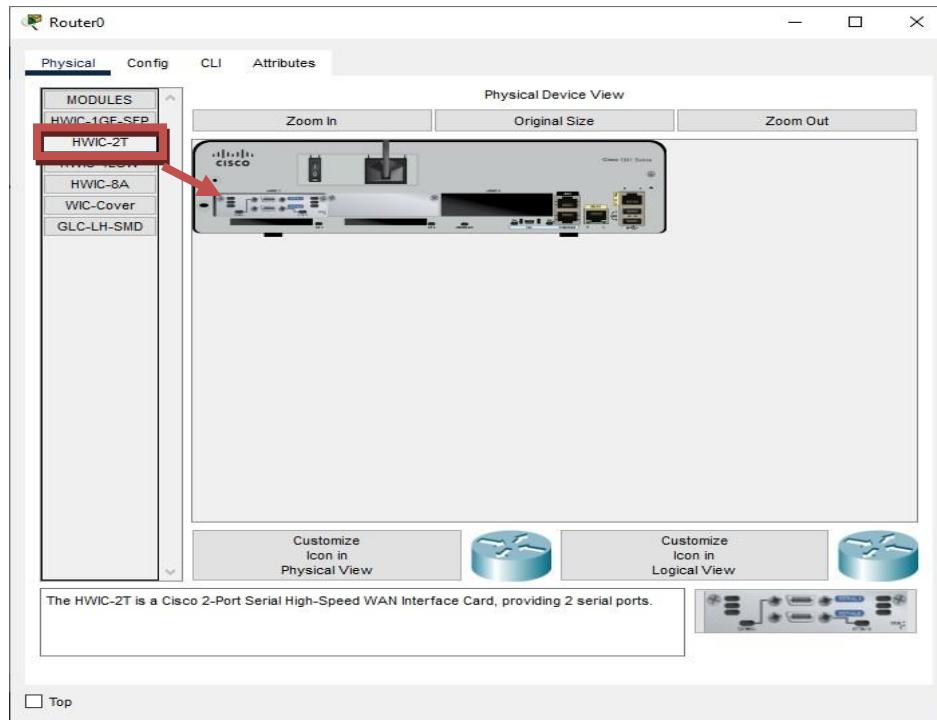


We configure the above network using the following IP addresses

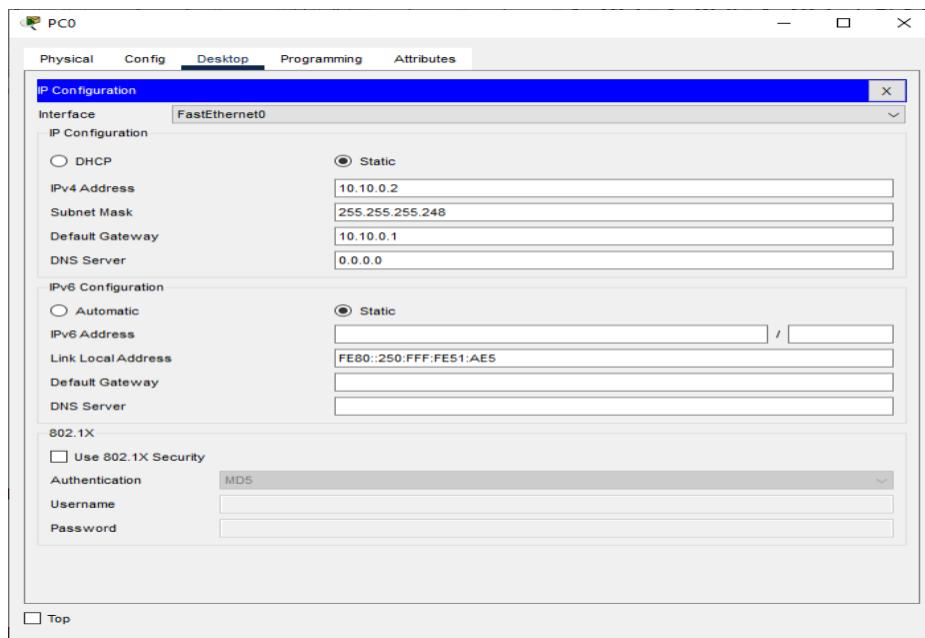
Host	Interface	IP address	Subnet Mask	Network Address	Default Gateway
Router 0	G0/0	10.10.0.1	255.255.255.248	10.10.0.0	
	S0/1/0	192.168.0.1	255.255.255.252	192.168.0.0	
Router 1	G0/0	10.20.0.1	255.255.255.248	10.20.0.0	
	S0/1/0	192.168.0.2	255.255.255.252	192.168.0.0	
	S0/1/1	192.168.1.1	255.255.255.252	192.168.1.0	
Router 2	G0/0	10.30.0.1	255.255.255.248	10.30.0.0	
	S0/1/1	192.168.1.2	255.255.255.252	192.168.1.0	
PC0	FastEthernet 0	10.10.0.2	255.255.255.248	10.10.0.0	10.10.0.1
PC1	FastEthernet 0	10.10.0.3	255.255.255.248	10.10.0.0	10.10.0.1
PC2	FastEthernet 0	10.10.0.4	255.255.255.248	10.10.0.0	10.10.0.1
PC3	FastEthernet 0	10.20.0.2	255.255.255.248	10.20.0.0	10.20.0.1
PC4	FastEthernet 0	10.20.0.3	255.255.255.248	10.20.0.0	10.20.0.1
PC5	FastEthernet	10.20.0.4	255.255.255.248	10.20.0.0	10.20.0.1

	0				
PC6	FastEthernet 0	10.30.0.2	255.255.255.248	10.30.0.0	10.30.0.1
PC7	FastEthernet 0	10.30.0.3	255.255.255.248	10.30.0.0	10.30.0.1
PC8	FastEthernet 0	10.30.0.4	255.255.255.248	10.30.0.0	10.30.0.1

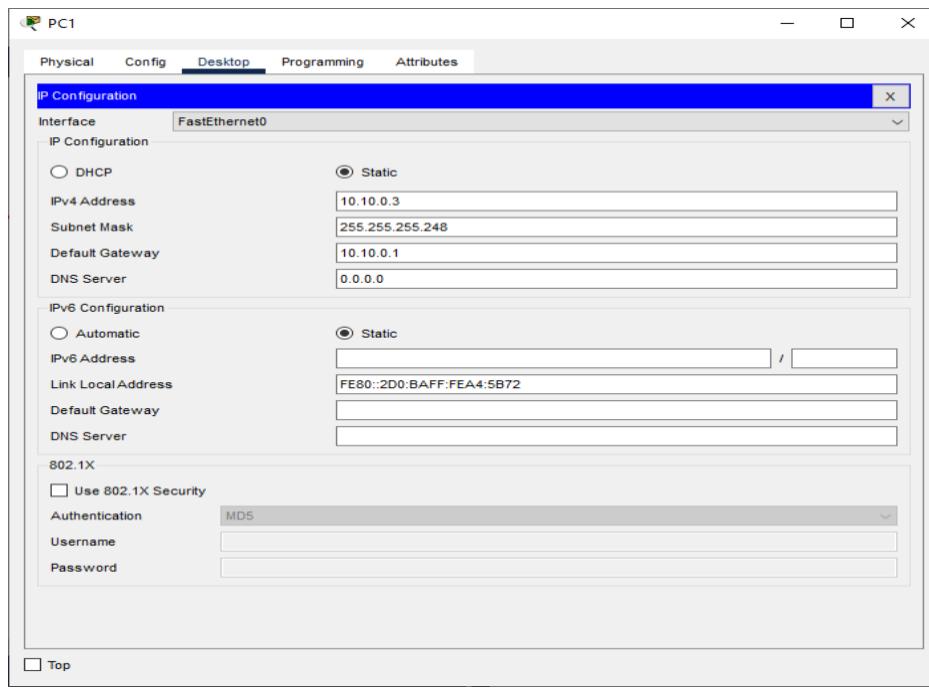
Adding Serial Interface in each Router



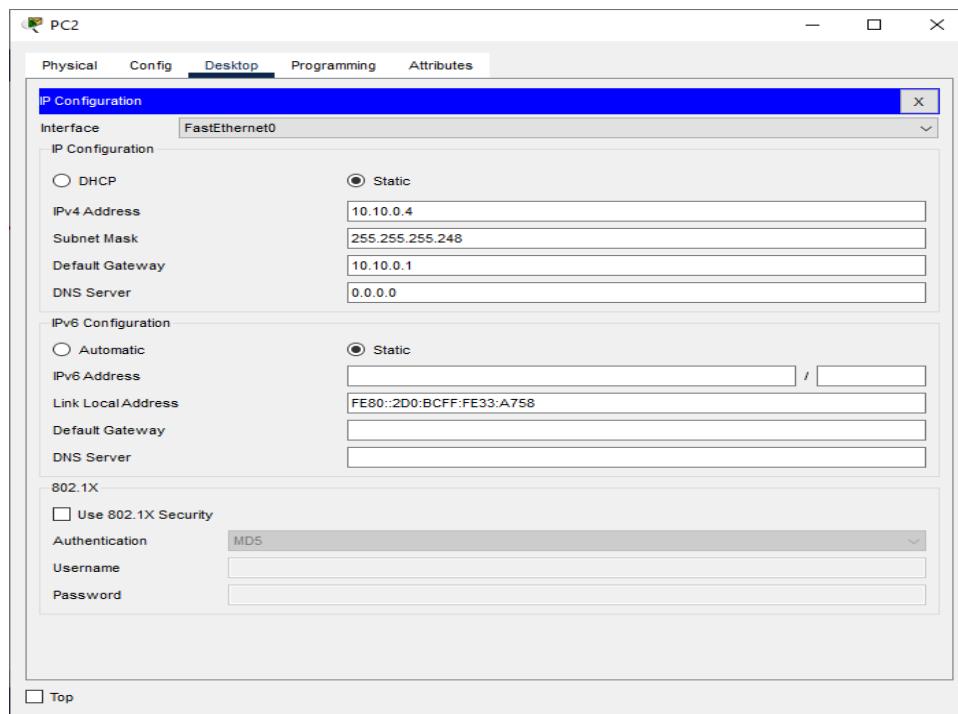
Configuring PC0:



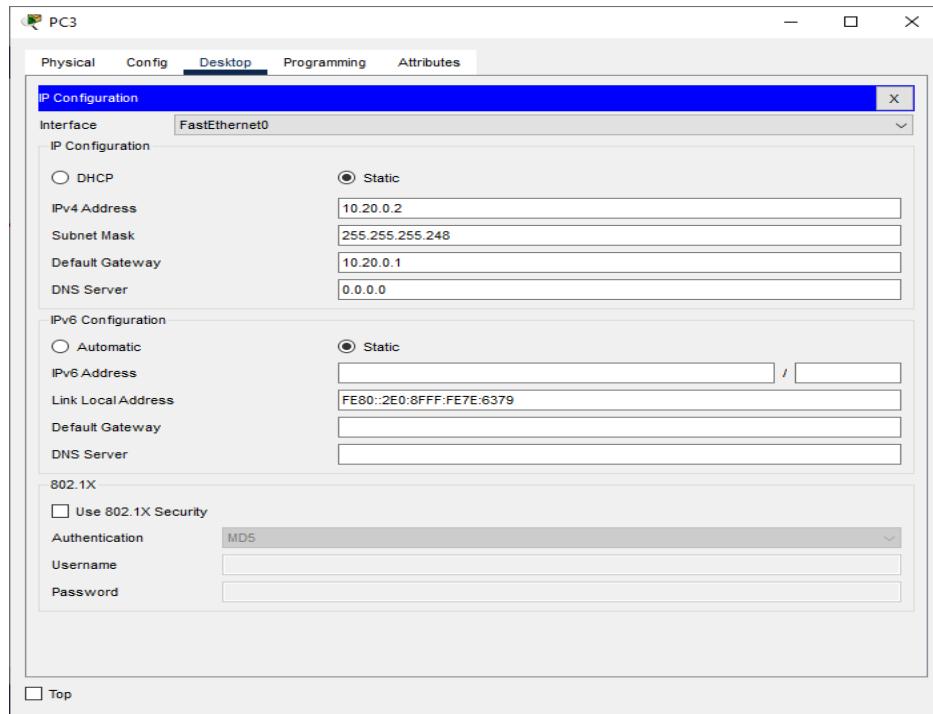
Configuring PC1:



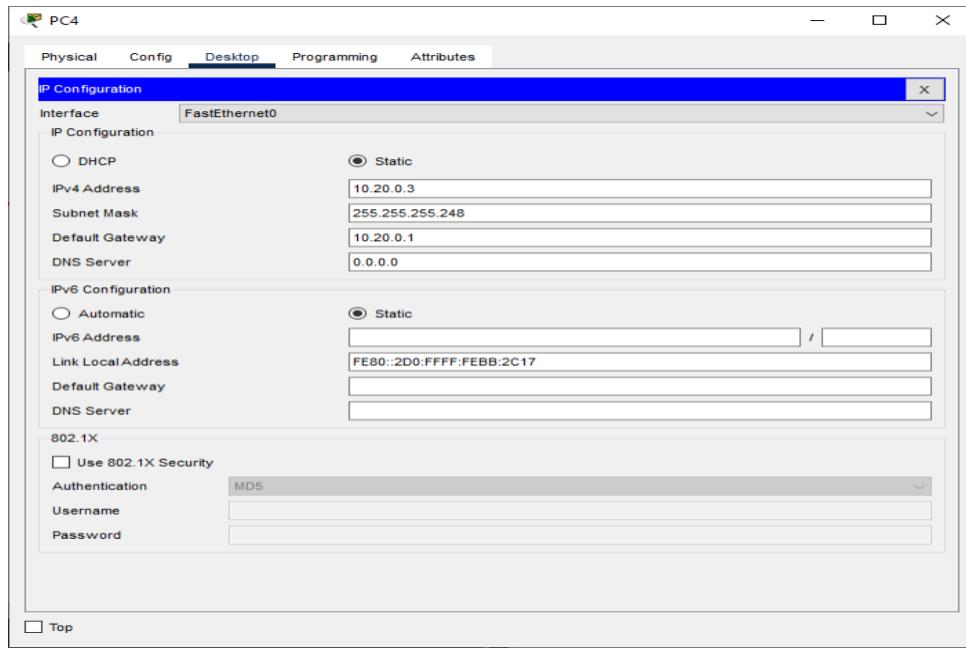
Configuring PC2:

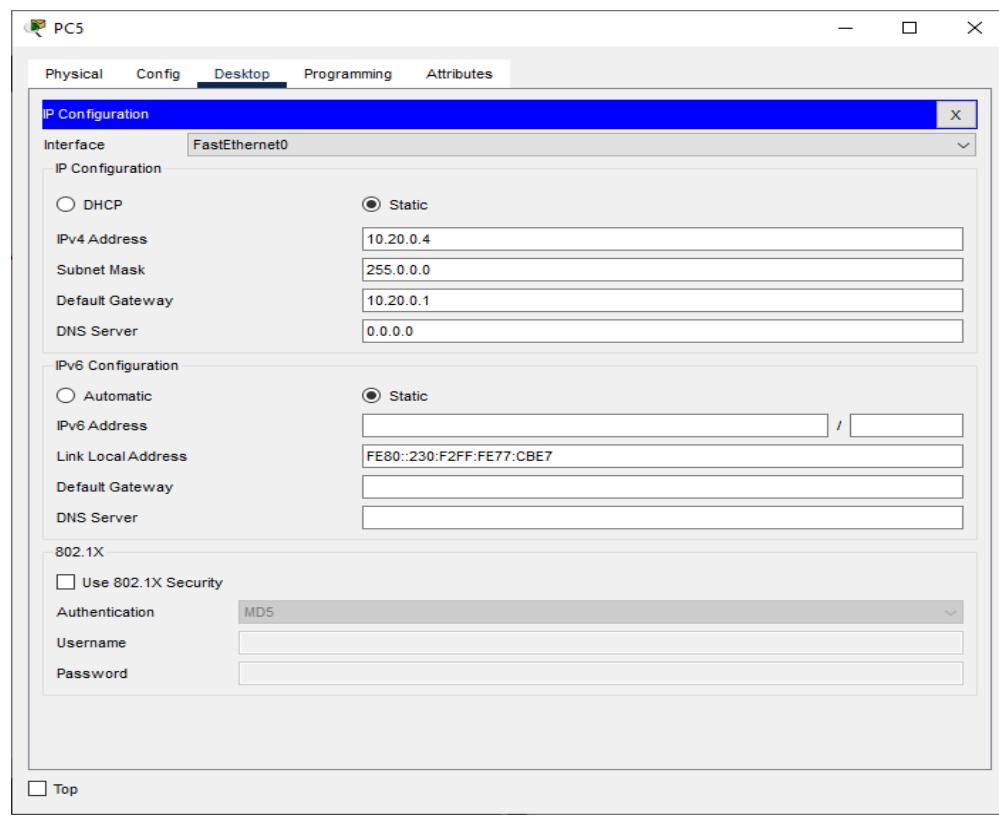


Configuring PC3:

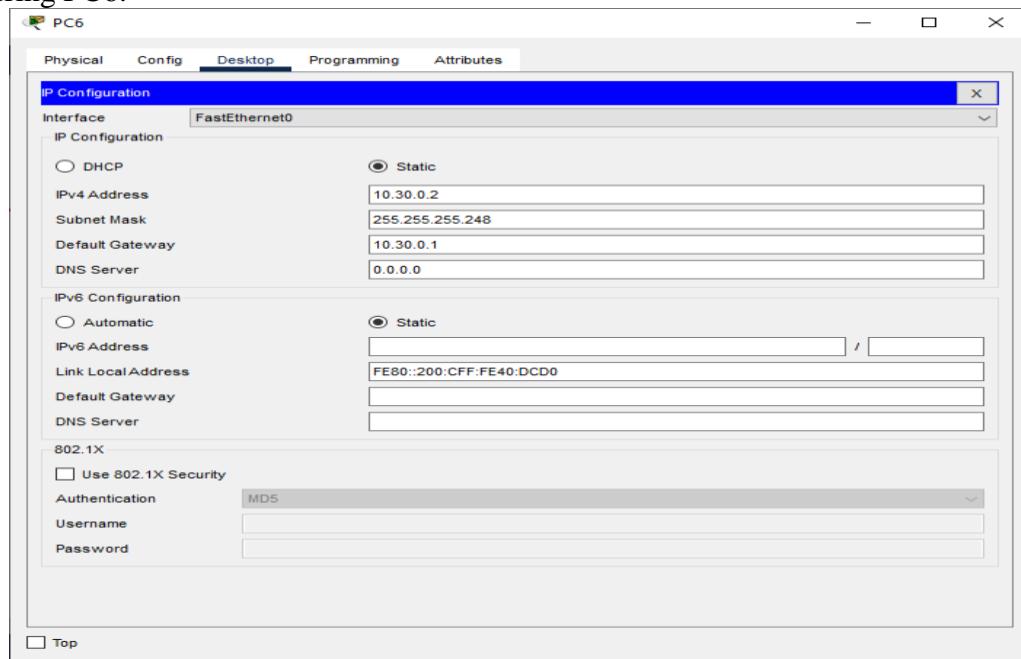


Configuring PC4:

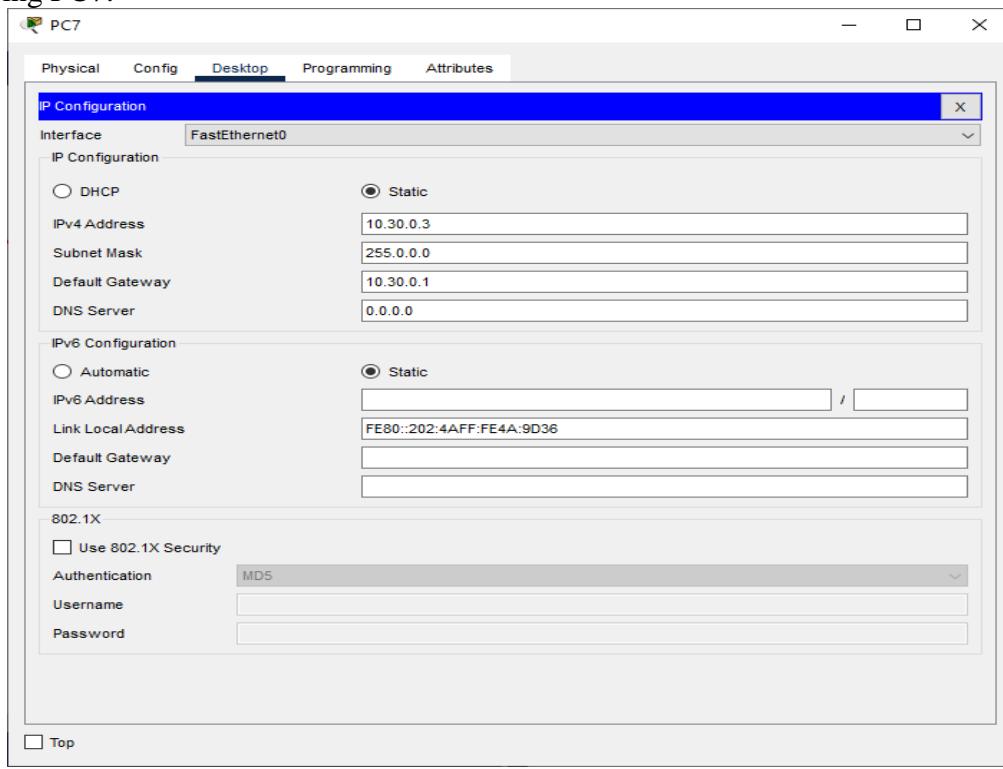




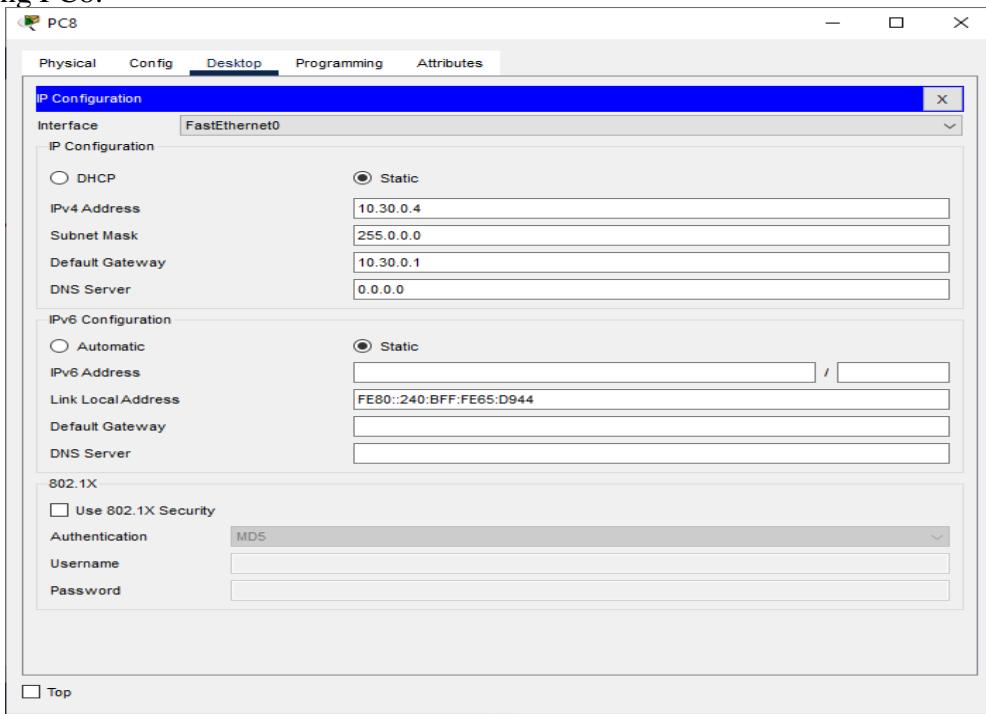
Configuring PC6:



Configuring PC7:

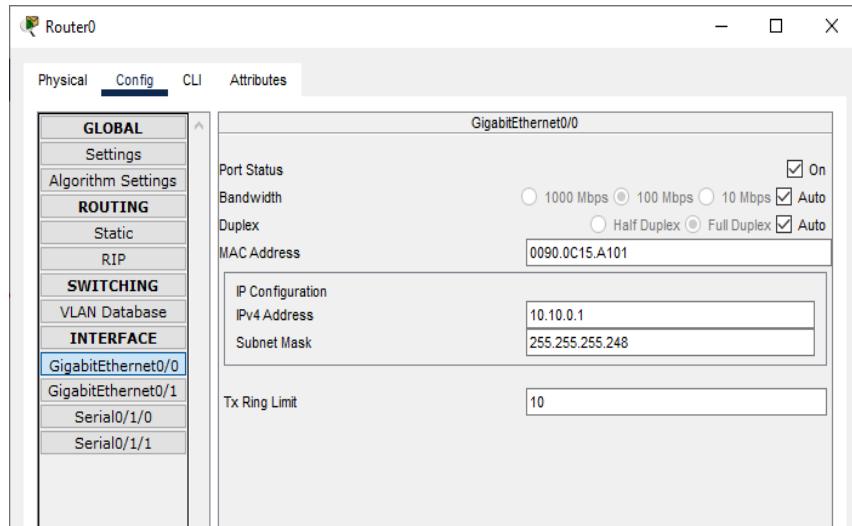


Configuring PC8:

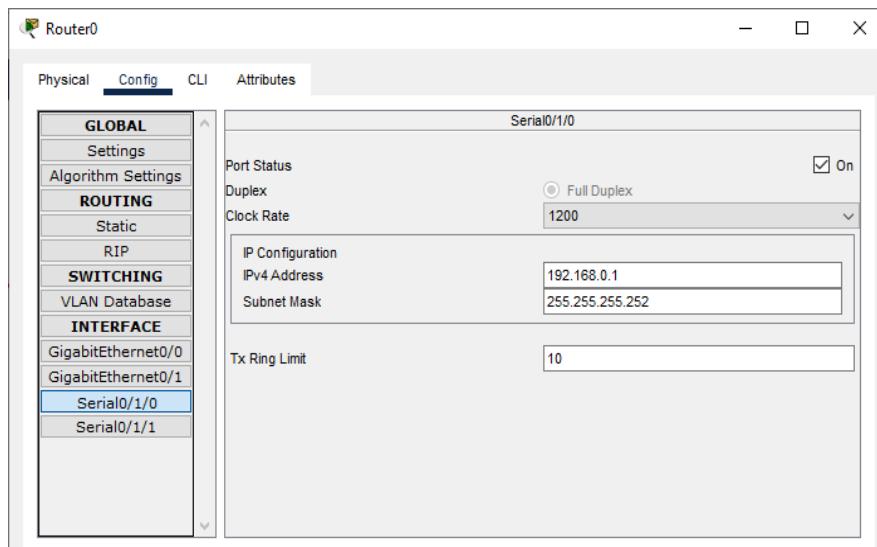


Configuring IP addresses on Router 0

i) Interface G0/0

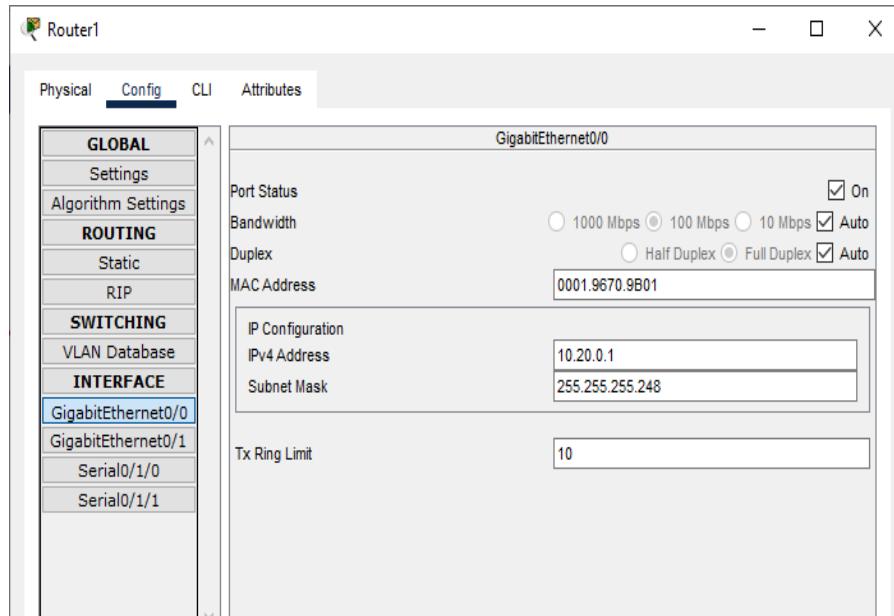


ii) Interface S0/1/0

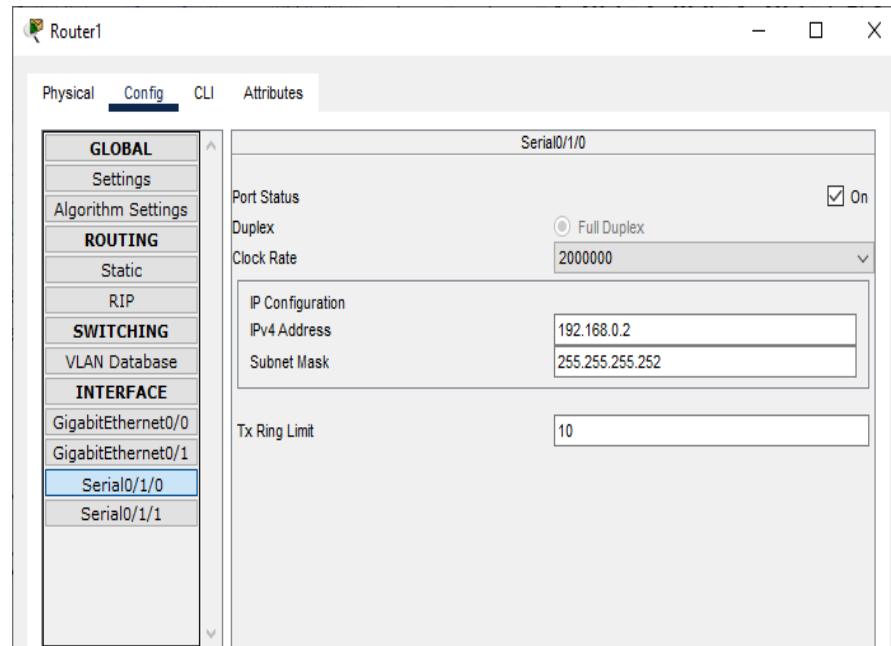


Configuring IP addresses on Router 1

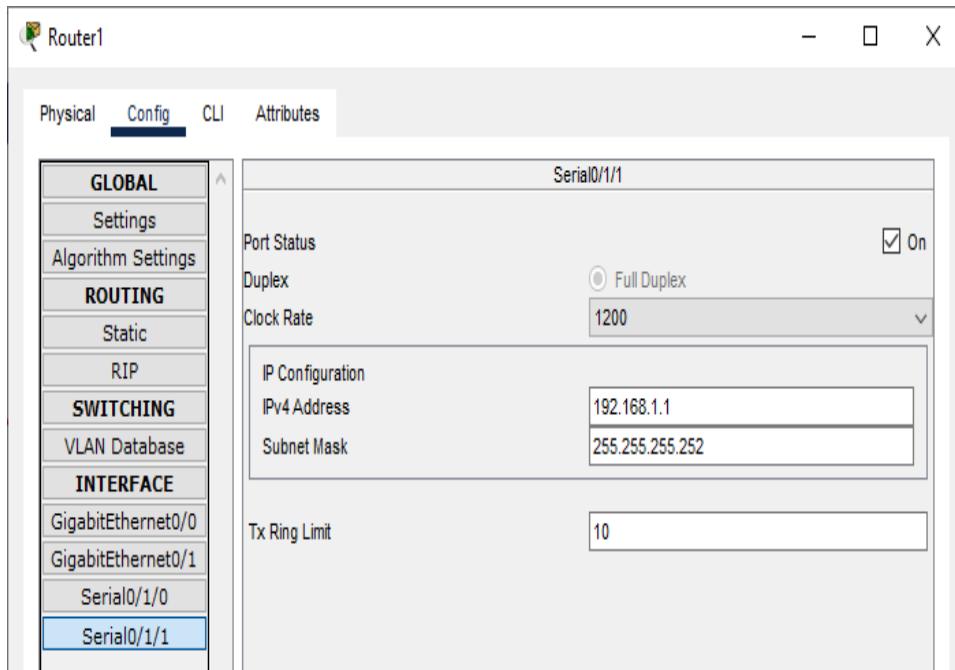
i) Interface G0/0



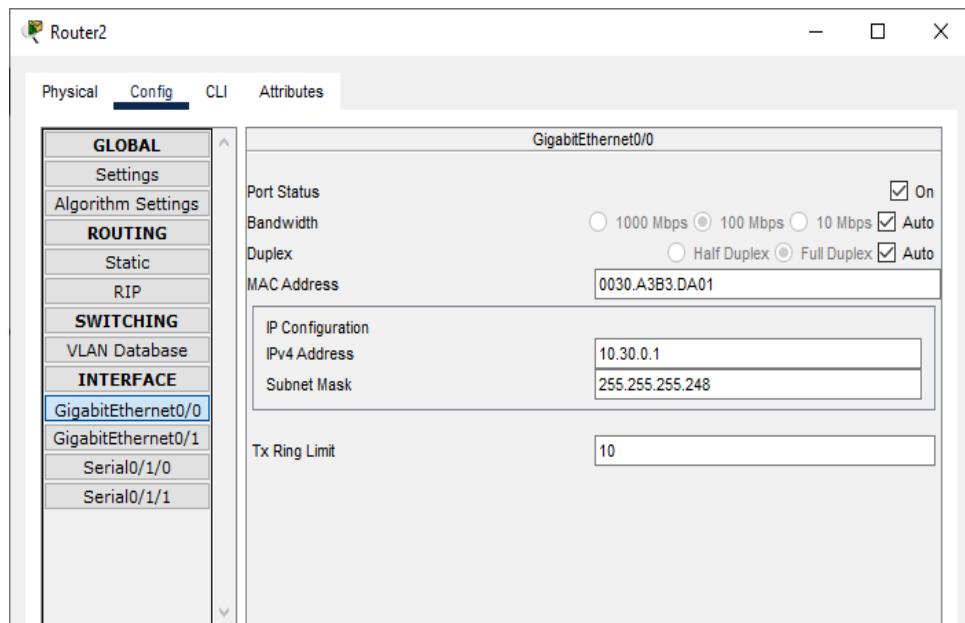
ii) Interface S0/1/0



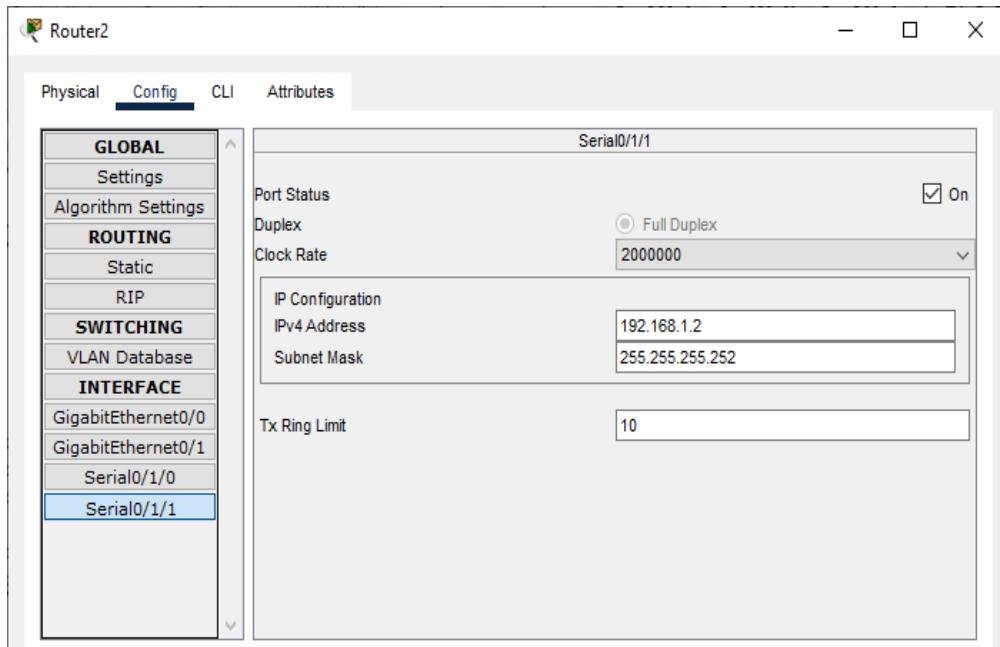
iii) Interface S0/1/1

Configuring IP addresses on Router 2

i) Interface G0/0



ii) Interface S0/1/1

**Configuring Router 0 for RIPv2 (using the CLI mode)**

```

Router>enable
Router#configure terminal
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 10.10.0.0
Router(config-router)#network 192.168.0.0
Router(config-router)#exit
Router(config)#

```

Configuring Router 1 for RIPv2 (using the CLI mode)

```

Router>enable
Router#configure terminal
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 10.20.0.0
Router(config-router)#network 192.168.0.0
Router(config-router)#network 192.168.1.0
Router(config-router)#exit
Router(config)#

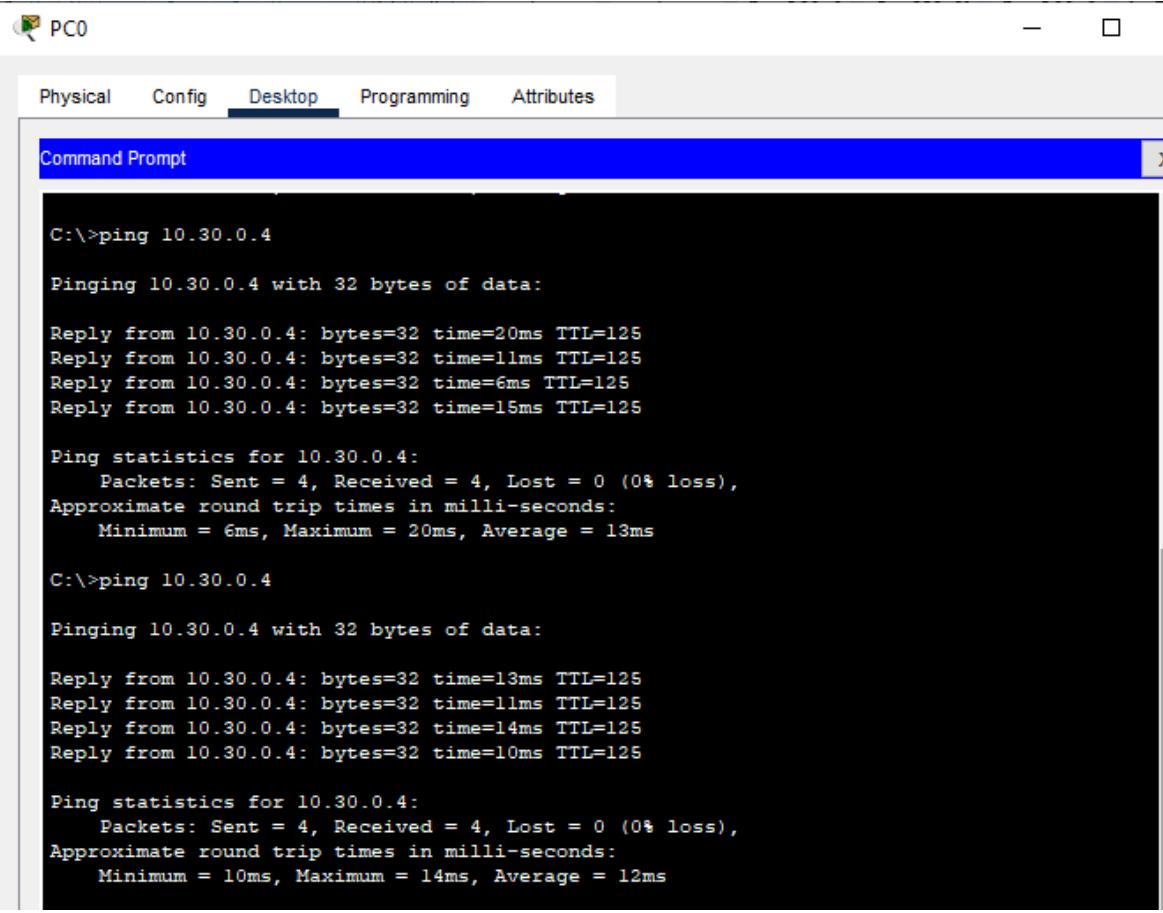
```

Configuring Router 2 for RIPv2 (using the CLI mode)

```
Router>enable  
Router#configure terminal  
Router(config)#router rip  
Router(config-router)#version 2  
Router(config-router)#network 10.30.0.0  
Router(config-router)#network 192.168.1.0  
Router(config-router)#exit  
Router(config)#
```

Checking the connectivity by using the ping command

- i) Pinging PC8 (ip address 10.30.0.4) from PC0



The screenshot shows a Windows Command Prompt window titled "PC0". The window has tabs: Physical, Config, Desktop, Programming, and Attributes. The "Desktop" tab is selected. The title bar says "Command Prompt". The main area contains the following text:

```
C:\>ping 10.30.0.4

Pinging 10.30.0.4 with 32 bytes of data:

Reply from 10.30.0.4: bytes=32 time=20ms TTL=125
Reply from 10.30.0.4: bytes=32 time=11ms TTL=125
Reply from 10.30.0.4: bytes=32 time=6ms TTL=125
Reply from 10.30.0.4: bytes=32 time=15ms TTL=125

Ping statistics for 10.30.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 6ms, Maximum = 20ms, Average = 13ms

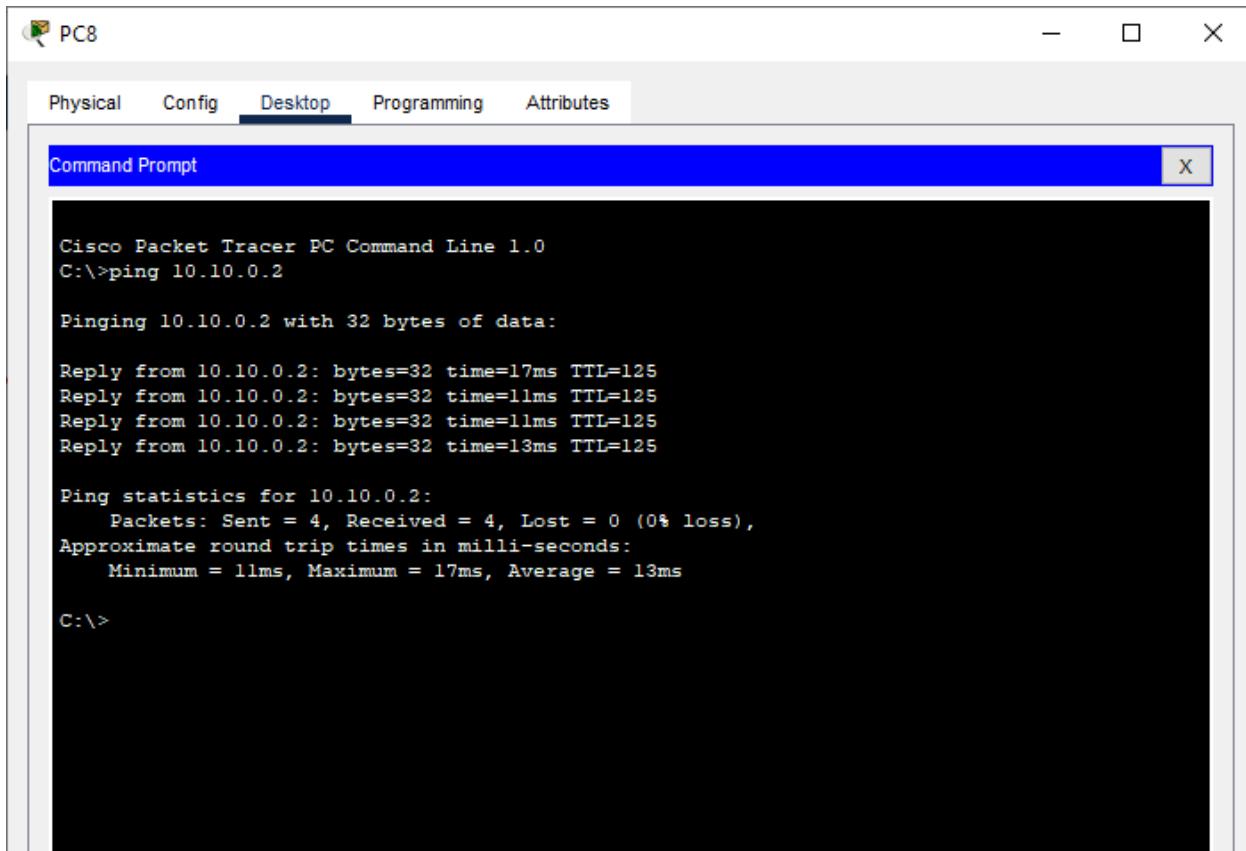
C:\>ping 10.30.0.4

Pinging 10.30.0.4 with 32 bytes of data:

Reply from 10.30.0.4: bytes=32 time=13ms TTL=125
Reply from 10.30.0.4: bytes=32 time=11ms TTL=125
Reply from 10.30.0.4: bytes=32 time=14ms TTL=125
Reply from 10.30.0.4: bytes=32 time=10ms TTL=125

Ping statistics for 10.30.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 14ms, Average = 12ms
```

- ii) Pinging PC0 (ip address 10.10.0.2) from PC8



The screenshot shows a window titled "PC8" with a tab bar at the top: Physical, Config, Desktop, Programming, Attributes. The "Desktop" tab is selected. Below the tabs is a "Command Prompt" window with a blue header bar containing the text "Command Prompt" and a close button "X". The main area of the window displays the output of a ping command:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.10.0.2

Pinging 10.10.0.2 with 32 bytes of data:

Reply from 10.10.0.2: bytes=32 time=17ms TTL=125
Reply from 10.10.0.2: bytes=32 time=11ms TTL=125
Reply from 10.10.0.2: bytes=32 time=11ms TTL=125
Reply from 10.10.0.2: bytes=32 time=13ms TTL=125

Ping statistics for 10.10.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 17ms, Average = 13ms

C:\>
```

Result:

Hence the RIPv2 has been studied and verified through the given network

Practical No 7

Aim: Using Packet Tracer, create a network with three routers with OSPF and each router associated network will have minimum three PC and show Connectivity

Theory:

Open shortest path first (OSPF) is a link-state routing protocol that is used to find the best path between the source and the destination router using its own shortest path first (SPF) algorithm. A link-state routing protocol is a protocol that uses the concept of triggered updates, i.e., if there is a change observed in the learned routing table then the updates are triggered only, not like the distance-vector routing protocol where the routing table is exchanged at a period of time.

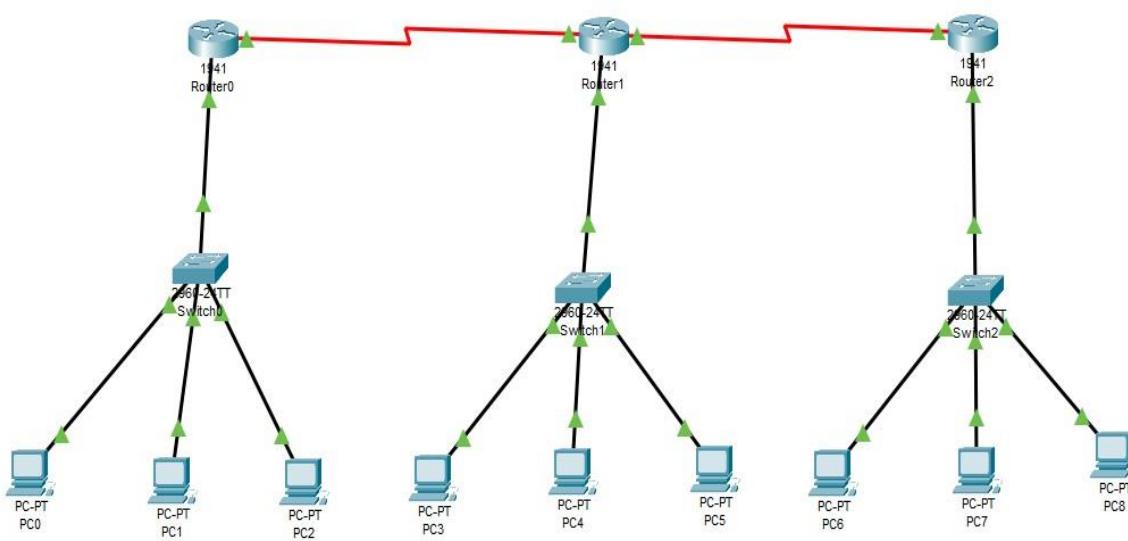
Open shortest path first (OSPF) is developed by Internet Engineering Task Force (IETF) as one of the Interior Gateway Protocol (IGP), i.e., the protocol which aims at moving the packet within a large autonomous system or routing domain.

OSPF advantages –

1. Both IPv4 and IPv6 routed protocols
2. Load balancing with equal-cost routes for the same destination
3. Unlimited hop counts
4. Trigger updates for fast convergence
5. A loop-free topology using SPF algorithm
6. Run-on most routers
7. Classless protocol

There are some disadvantages of OSPF like, it requires an extra CPU process to run the SPF algorithm, requiring more RAM to store adjacency topology, and being more complex to set up and hard to troubleshoot.

We use the following topology for the present case

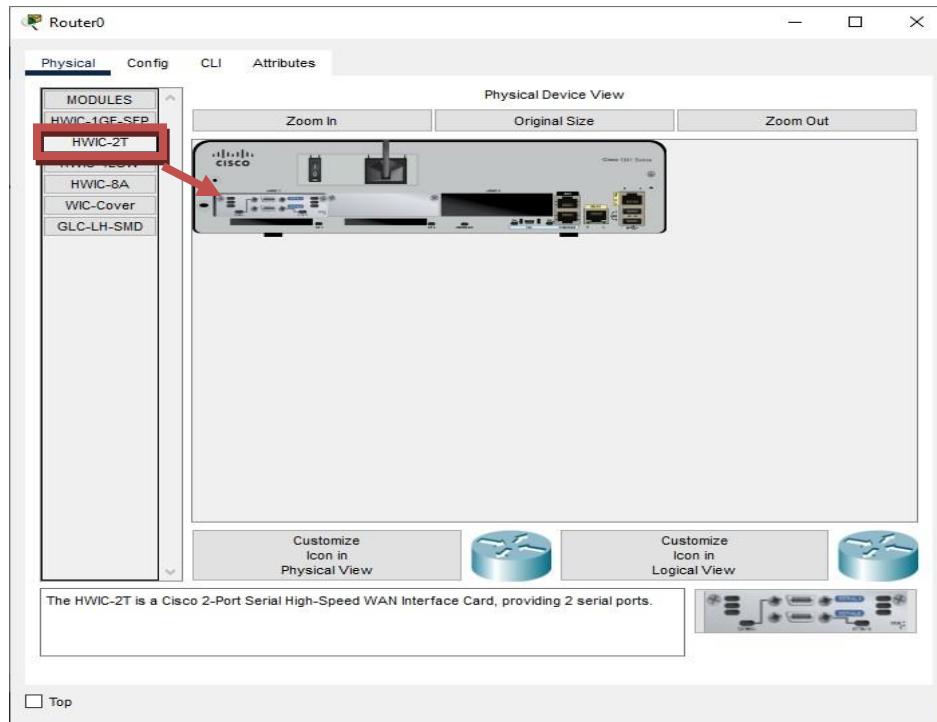


We configure the above network using the following IP addresses

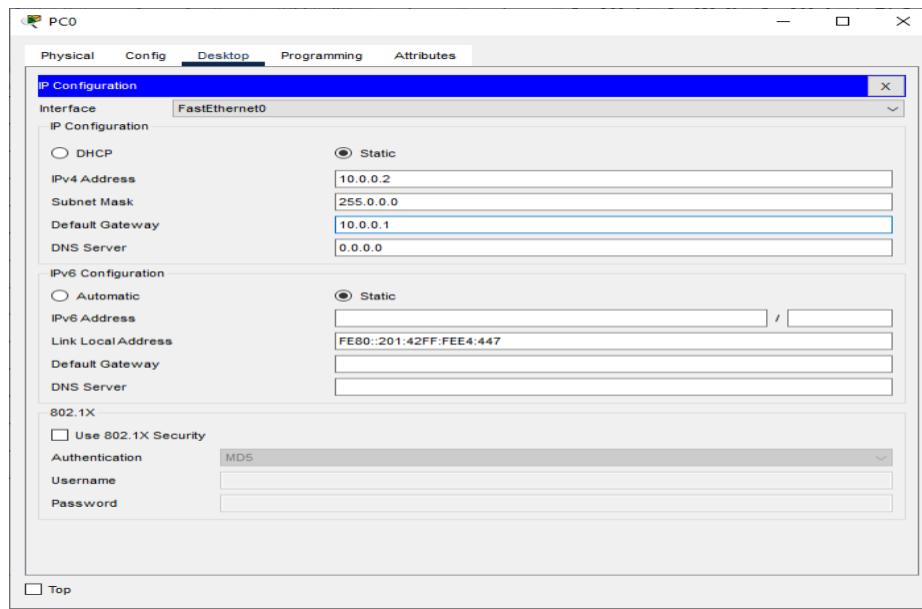
Host	Interface	IP address	Default Gateway	Subnet Mask	Wildcard Mask
Router 0	G0/0	10.0.0.1		255.0.0.0	0.255.255.255
	S0/1/0	40.0.0.1			
Router 1	G0/0	20.0.0.1			
	S0/1/0	40.0.0.2			
Router 2	S0/1/1	50.0.0.1			
	G0/0	30.0.0.1			
Router 2	S0/1/1	50.0.0.2			
PC0	FastEthernet 0	10.0.0.2	10.0.0.1	255.0.0.0	0.255.255.255
PC1	FastEthernet 0	10.0.0.3			
PC2	FastEthernet 0	10.0.0.4			
PC3	FastEthernet 0	20.0.0.2			
PC4	FastEthernet 0	20.0.0.3	20.0.0.1		
PC5	FastEthernet 0	20.0.0.4			
PC6	FastEthernet 0	30.0.0.2			

	0		30.0.0.1		
PC7	FastEthernet 0	30.0.0.3			
PC8	FastEthernet 0	30.0.0.4			

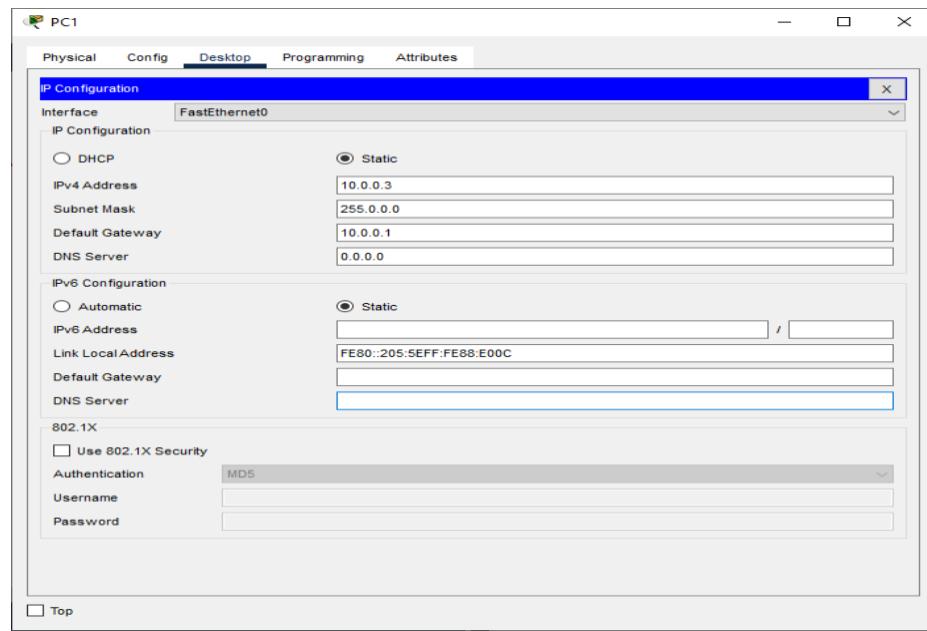
Adding Serial Interface in each Router



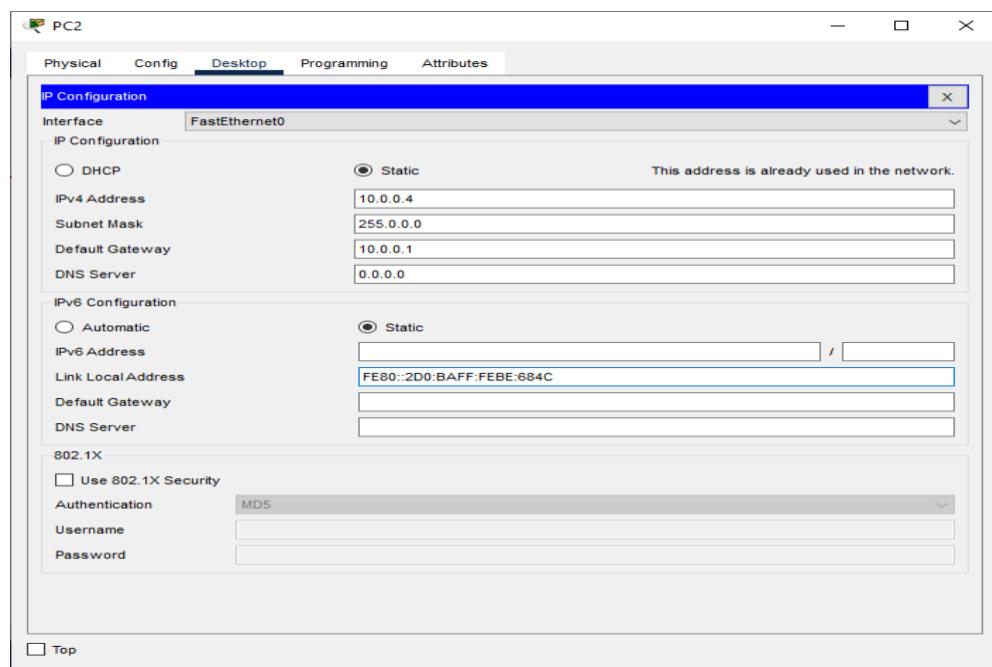
Configuring PC0:

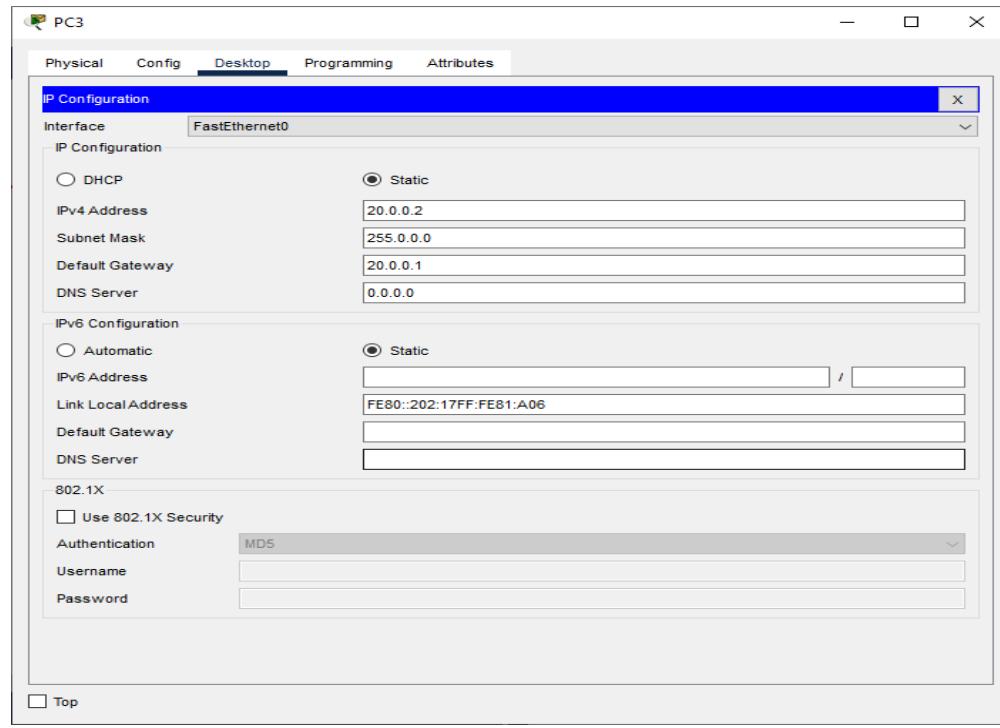


Configuring PC1:

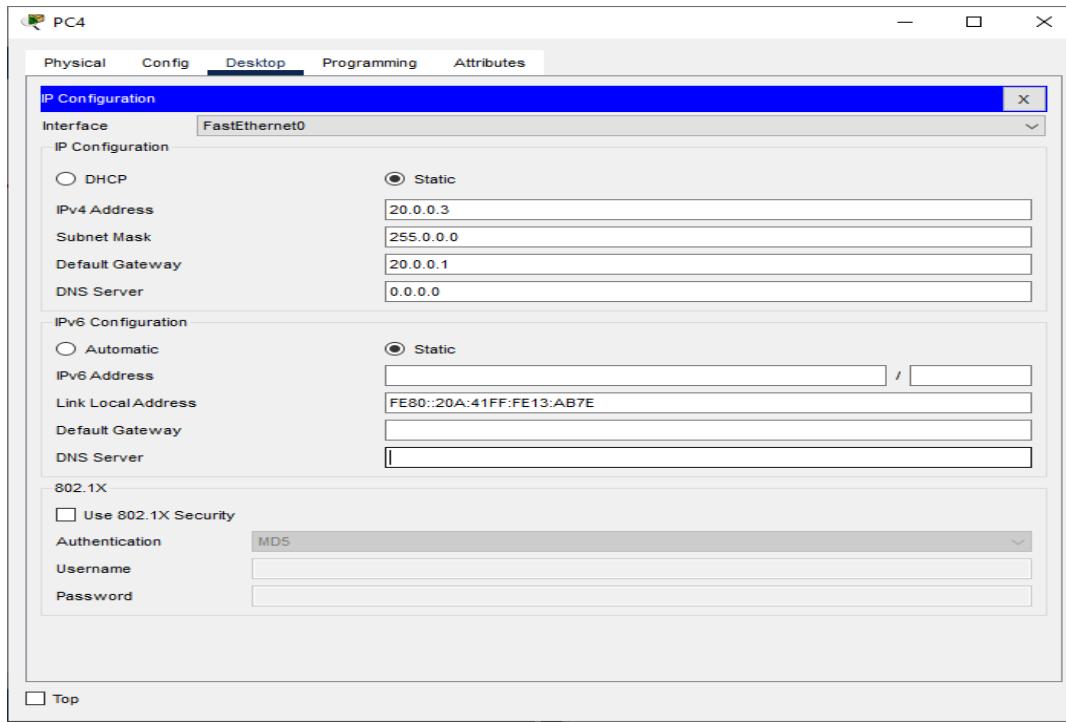


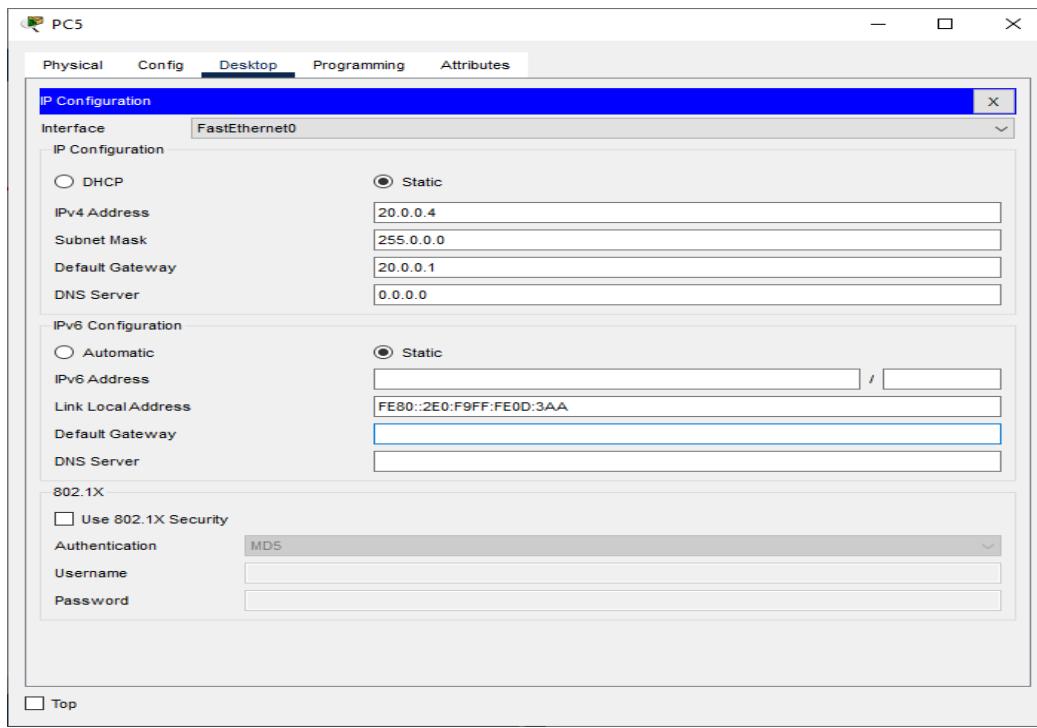
Configuring PC2:



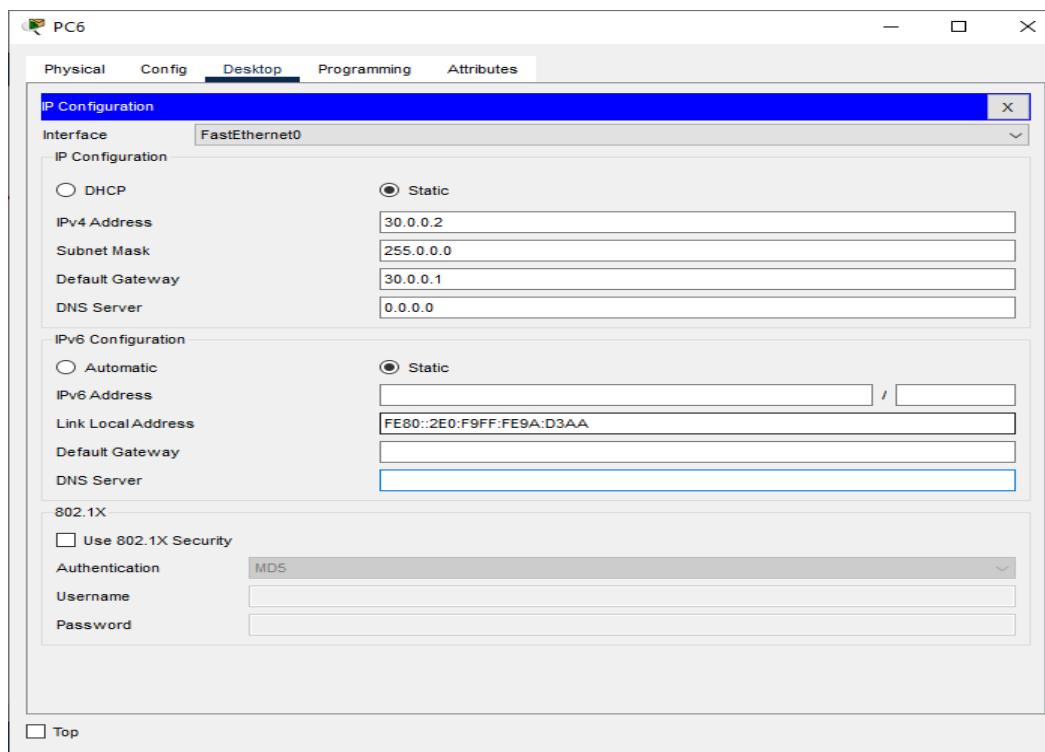


Configuring PC4:

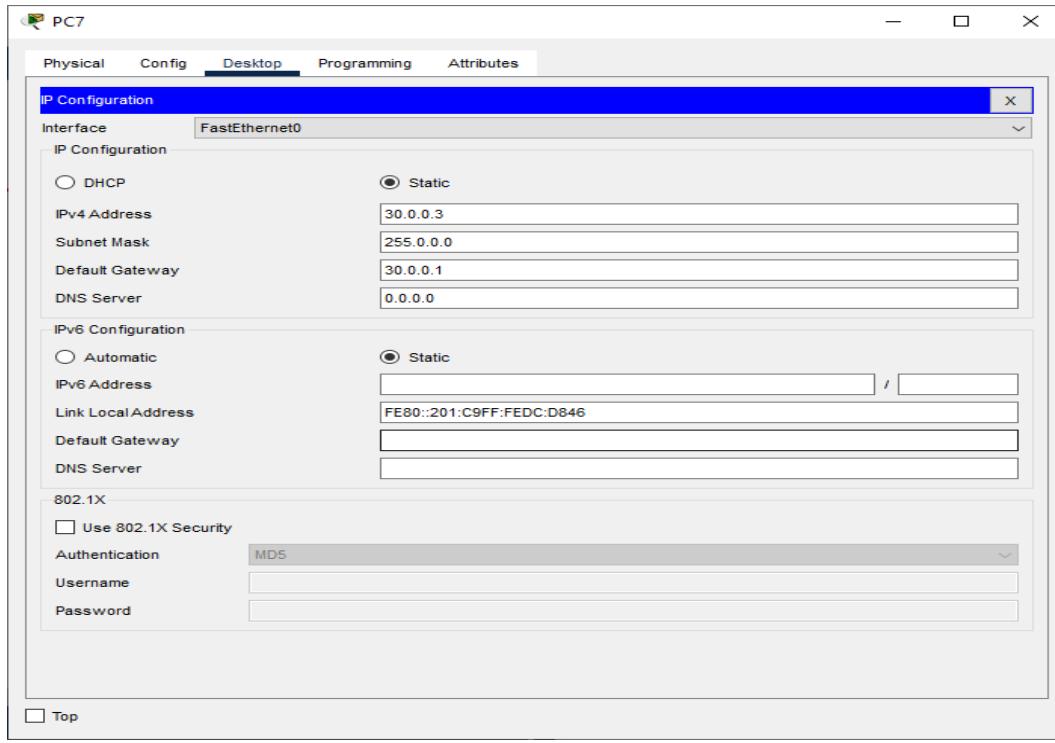




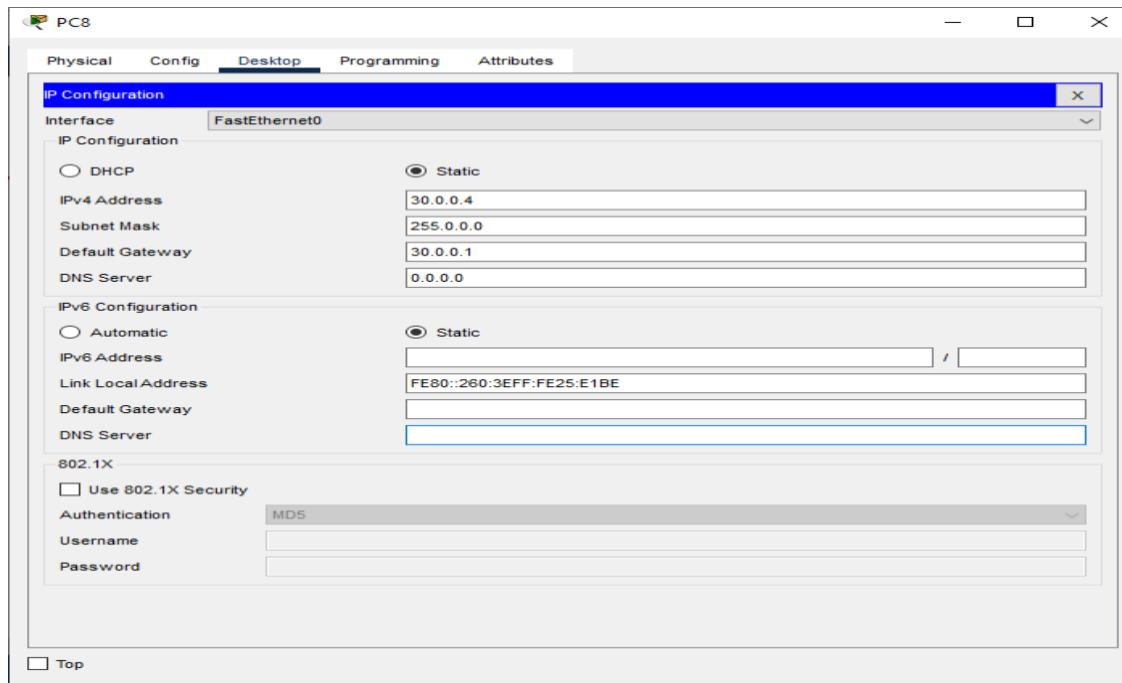
Configuring PC6:



Configuring PC7:

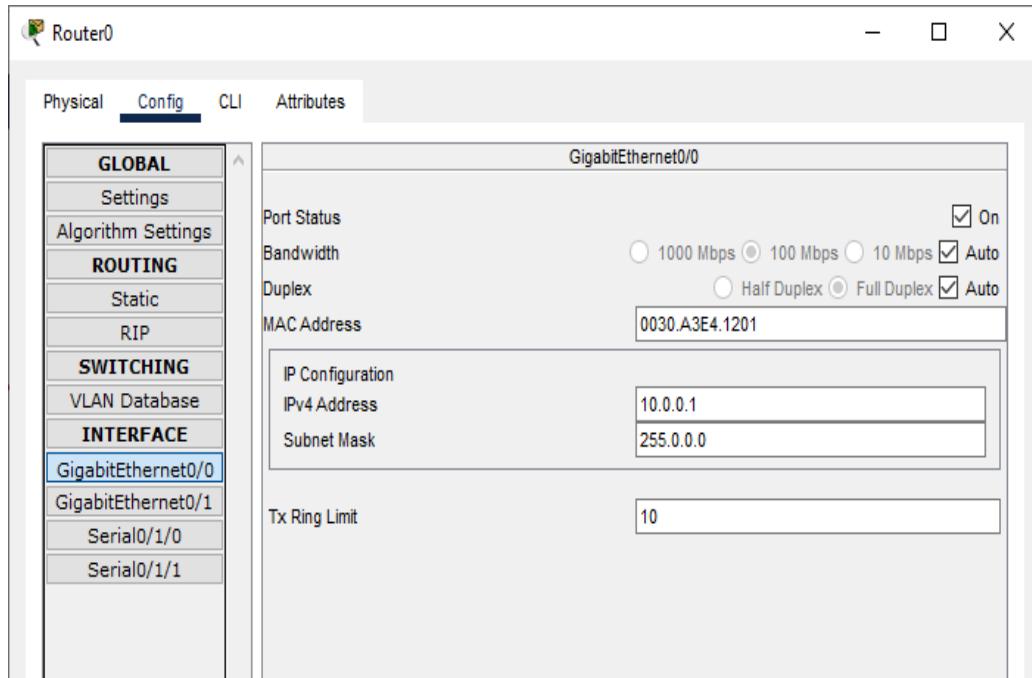


Configuring PC8:

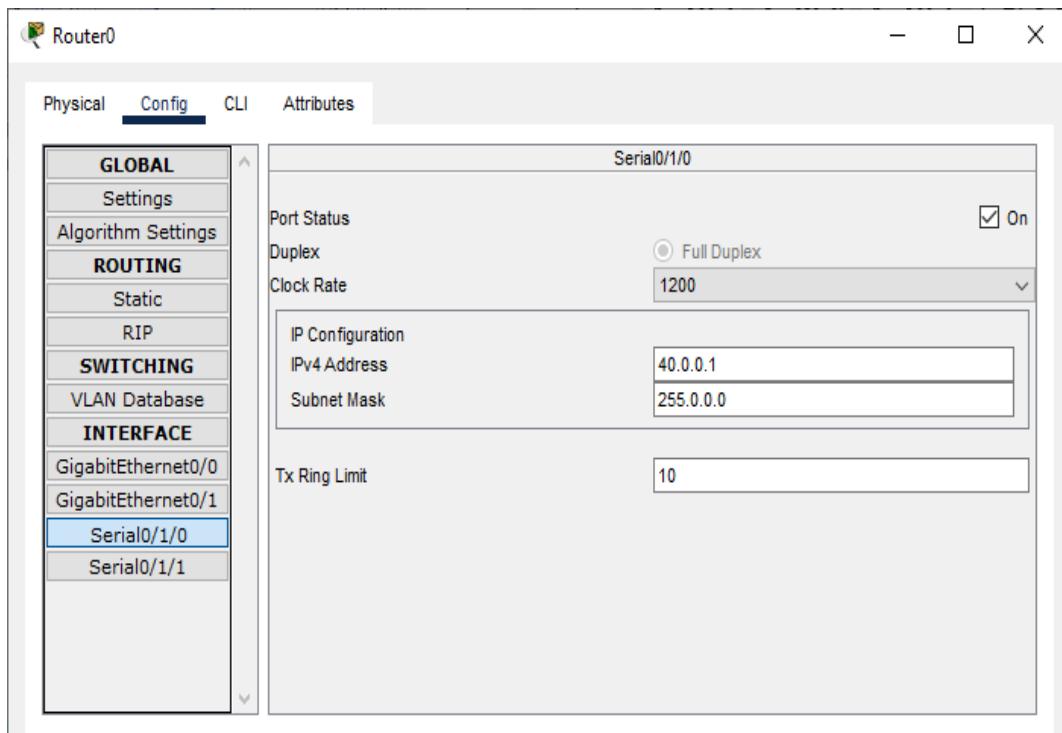


Configuring IP addresses on Router 0

i) Interface G0/0

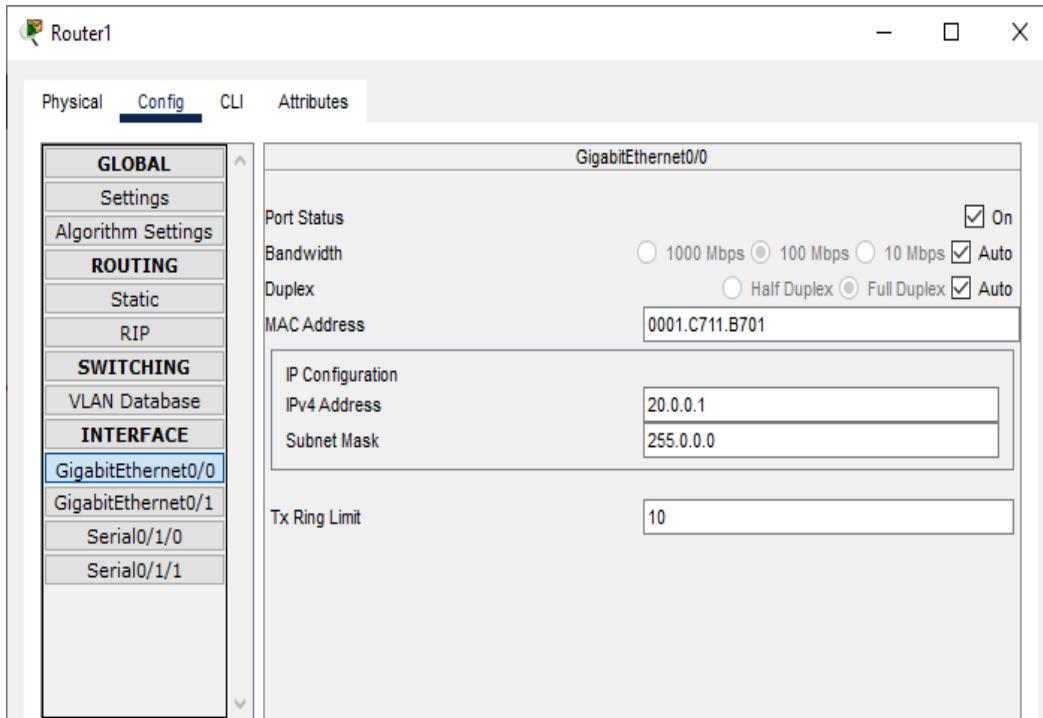


ii) Interface S0/1/0

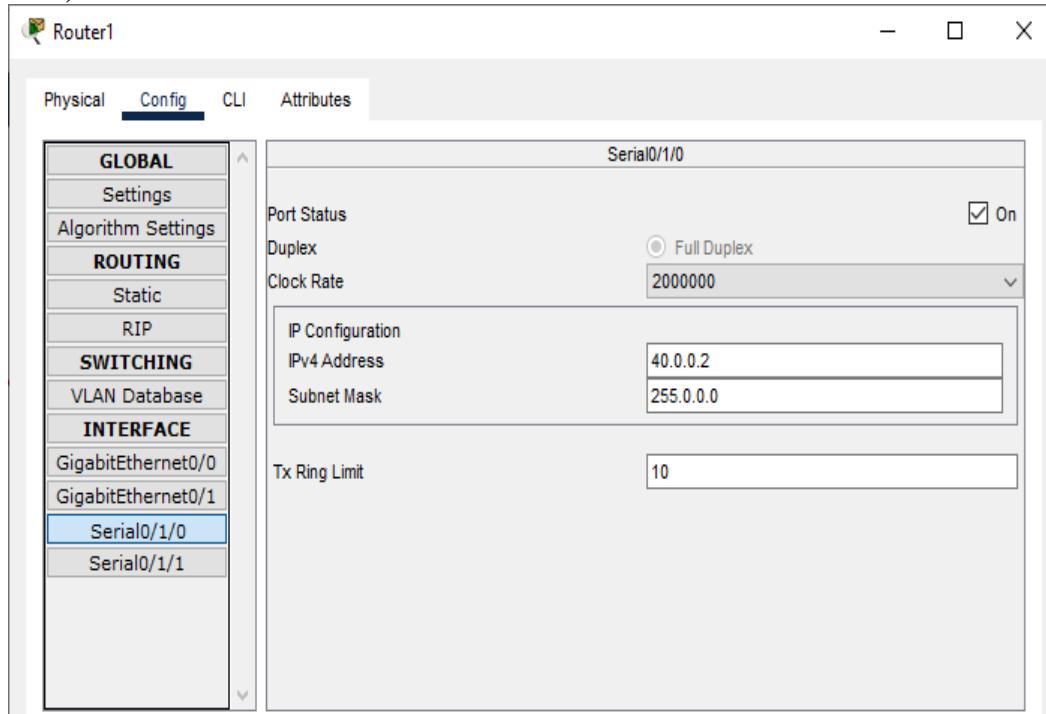


Configuring IP addresses on Router 1

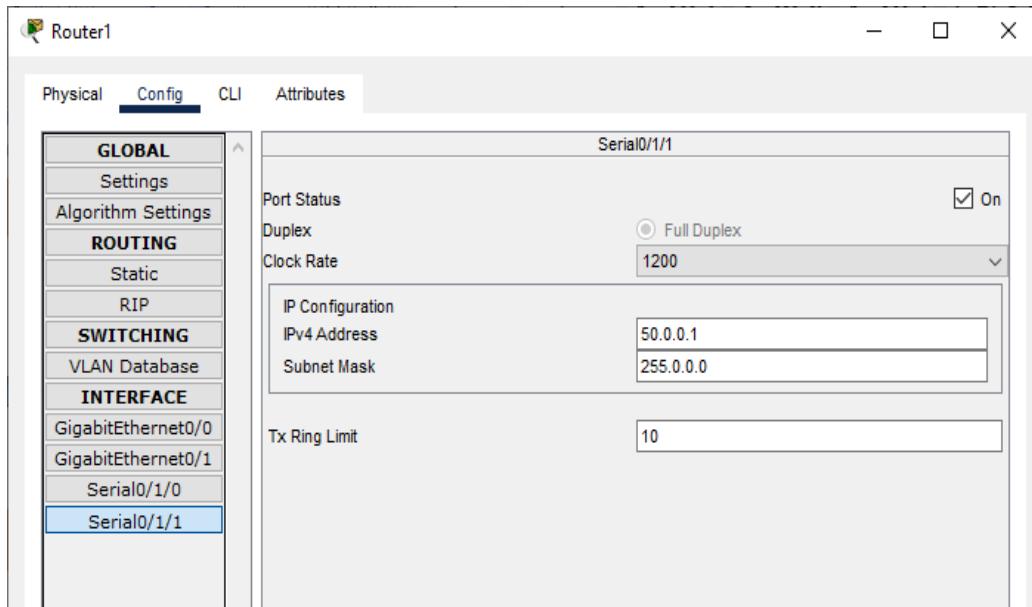
i) Interface G0/0



ii) Interface S0/1/0

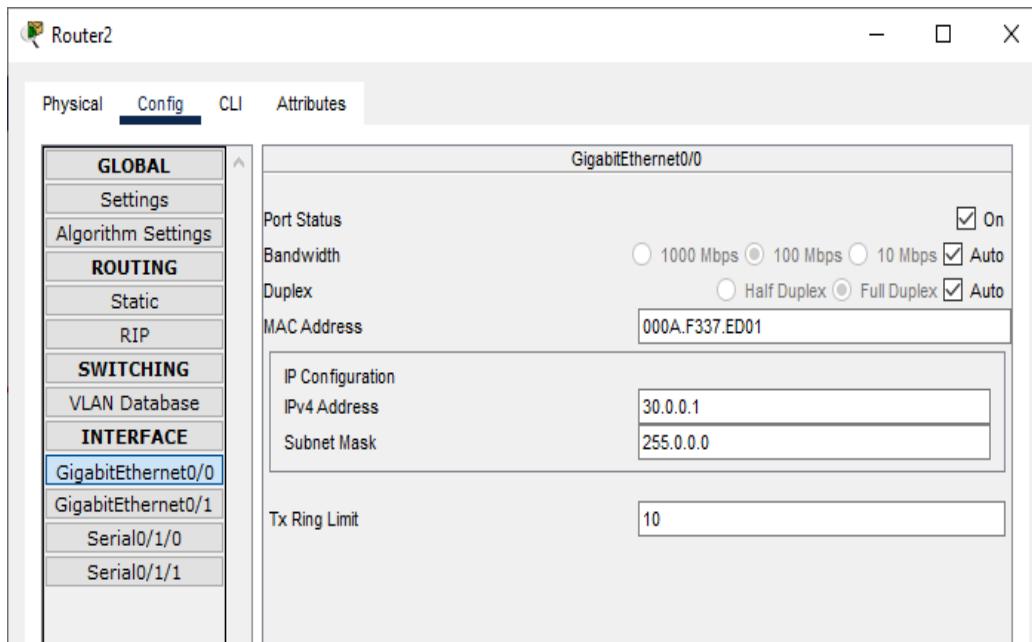


iii) Interface S0/1/1

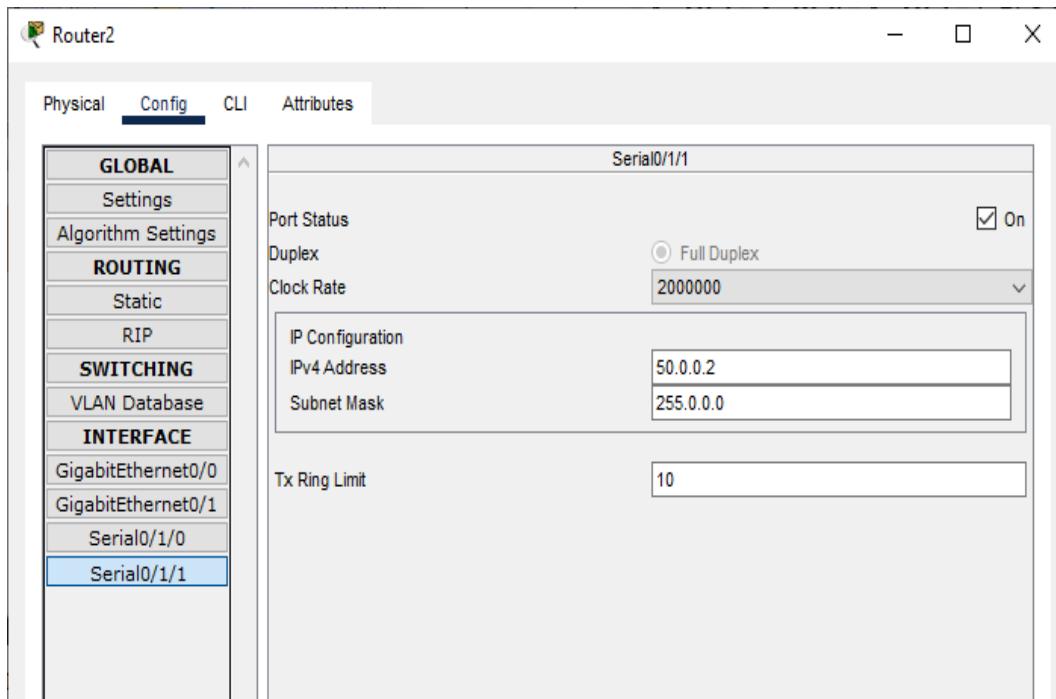


Configuring IP addresses on Router 2

i) Interface G0/0



ii) Interface S0/1/1

**Configuring Router 0 for OSPF (using the CLI mode)**

```

Router(config)#
Router(config)#router ospf 1
Router(config-router)#network 10.0.0.0 0.0.0.255 area 1
Router(config-router)#network 40.0.0.0 0.0.0.255 area 1
Router(config-router)#exit
Router(config)#
  
```

Configuring Router 1 for OSPF (using the CLI mode)

```

Router(config)#
Router(config)#router ospf 1
Router(config-router)#
Router(config-router)#network 20.0.0.0 0.0.0.255 area 1
Router(config-router)#network 40.0.0.0 0.0.0.255 area 1
Router(config-router)#network 50.0.0.0 0.0.0.255 area 1
Router(config-router)#exit
Router(config)#
  
```

Configuring Router 2 for OSPF (using the CLI mode)

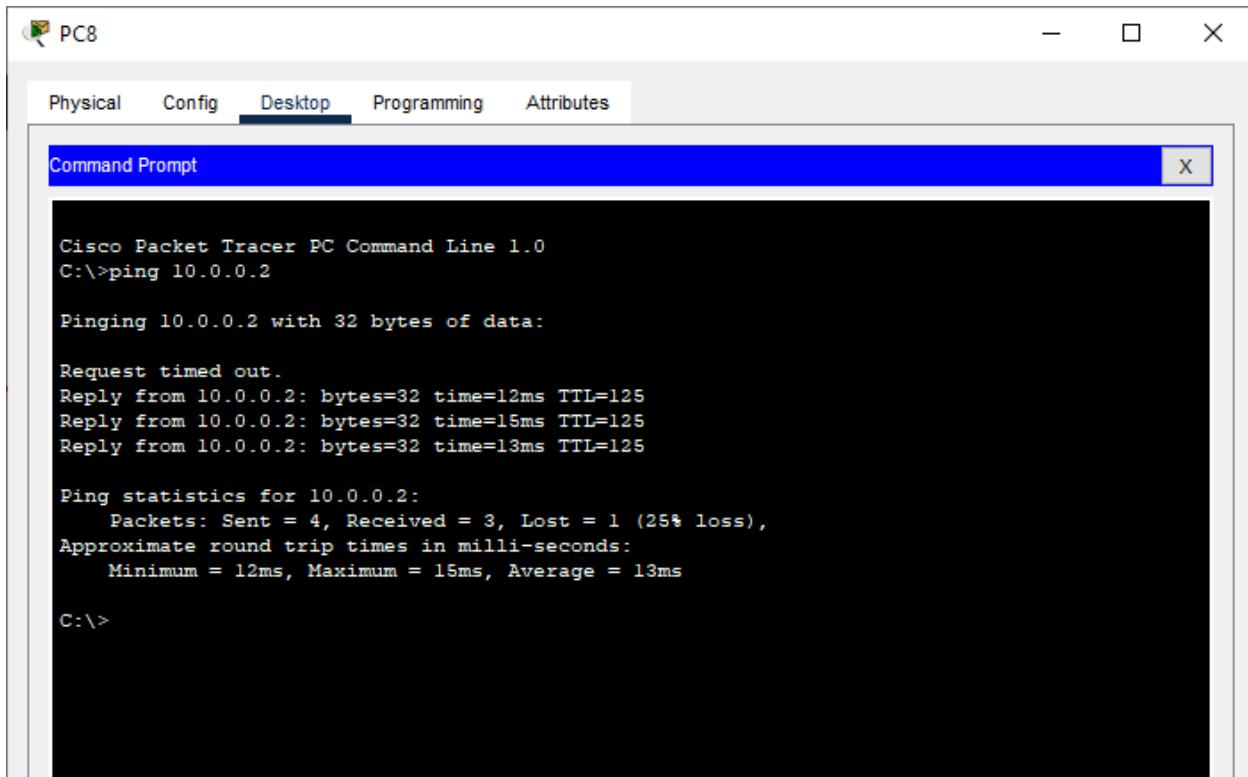
```
Router(config)#  
Router(config)#router ospf 1  
Router(config-router)#  
Router(config-router)#network 30.0.0.0 0.0.0.255 area 1  
Router(config-router)#network 50.0.0.0 0.0.0.255 area 1  
Router(config-router)# exit  
Router(config)#
```

Checking the connectivity by using the ping command

- i) Pinging PC8 (ip address 10.30.0.4) from PC1

```
Cisco Packet Tracer PC Command Line 1.0  
C:\>pinf 30.0.0.3  
Invalid Command.  
  
C:\>ping 30.0.0.3  
  
Pinging 30.0.0.3 with 32 bytes of data:  
  
Request timed out.  
Reply from 30.0.0.3: bytes=32 time=12ms TTL=125  
Reply from 30.0.0.3: bytes=32 time=16ms TTL=125  
Reply from 30.0.0.3: bytes=32 time=18ms TTL=125  
  
Ping statistics for 30.0.0.3:  
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),  
    Approximate round trip times in milli-seconds:  
        Minimum = 12ms, Maximum = 18ms, Average = 15ms  
  
C:\>
```

- ii) Pinging PC0 (ip address 10.10.0.2) from PC8



```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 10.0.0.2: bytes=32 time=12ms TTL=125
Reply from 10.0.0.2: bytes=32 time=15ms TTL=125
Reply from 10.0.0.2: bytes=32 time=13ms TTL=125

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 12ms, Maximum = 15ms, Average = 13ms

C:\>
```

Result:

Hence the OSPF has been studied and verified through the given network

Practical No 8

Aim: Using Packet Tracer, create a network with three routers with BGP and each router associated network will have minimum three PC and show Connectivity

Theory:

Border Gateway Protocol (BGP) is used to Exchange routing information for the internet and is the protocol used between ISP which are different Autonomous Systems (AS).

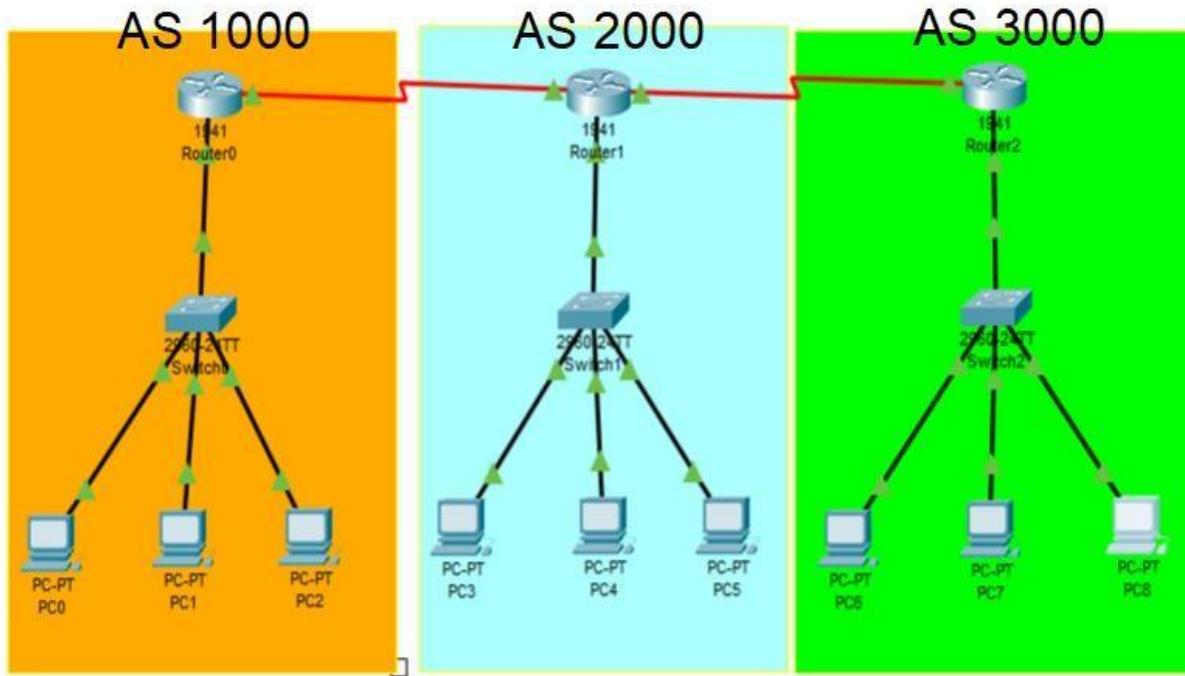
The protocol can connect together any internetwork of autonomous system using an arbitrary topology. The only requirement is that each AS have at least one router that is able to run BGP and that router connects to at least one other AS's BGP router.

BGP's main function is to exchange network reachability information with other BGP systems.

Characteristics of Border Gateway Protocol (BGP):

- a) The main role of BGP is to provide communication between two autonomous systems.
- b) BGP supports Next-Hop Paradigm.
- c) Coordination among multiple BGP speakers within the AS (Autonomous System).
- d) BGP advertisement also includes path information, along with the reachable destination and next destination pair.
- e) BGP can implement policies that can be configured by the administrator.
- f) BGP runs over TCP.
- g) BGP conserves network bandwidth.
- h) BGP supports CIDR.
- i) BGP also supports Security

We use the following topology for the present case

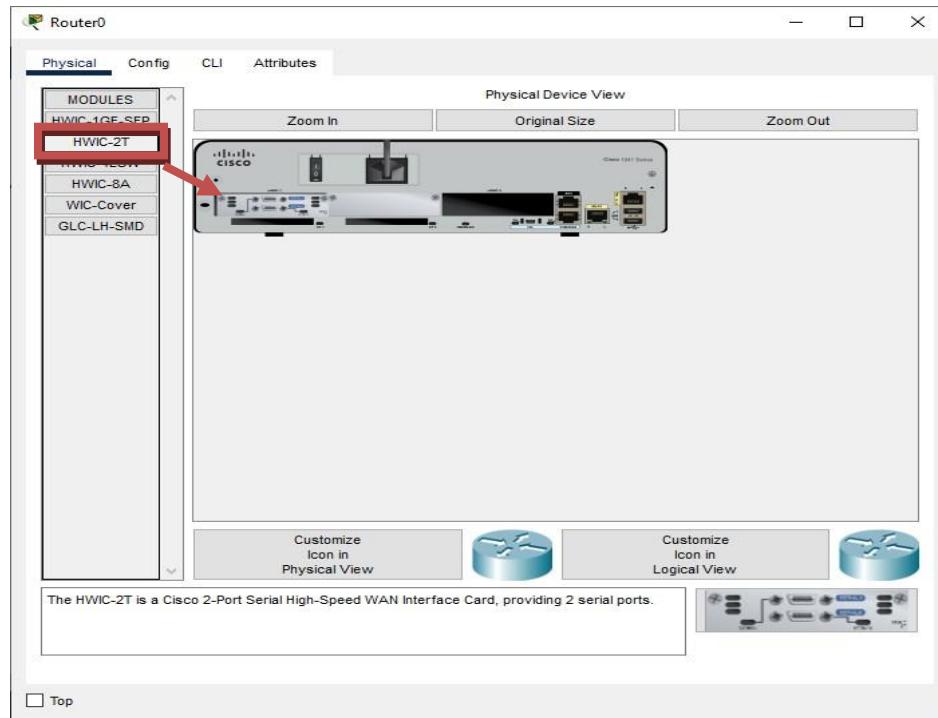


We configure the above network using the following IP addresses

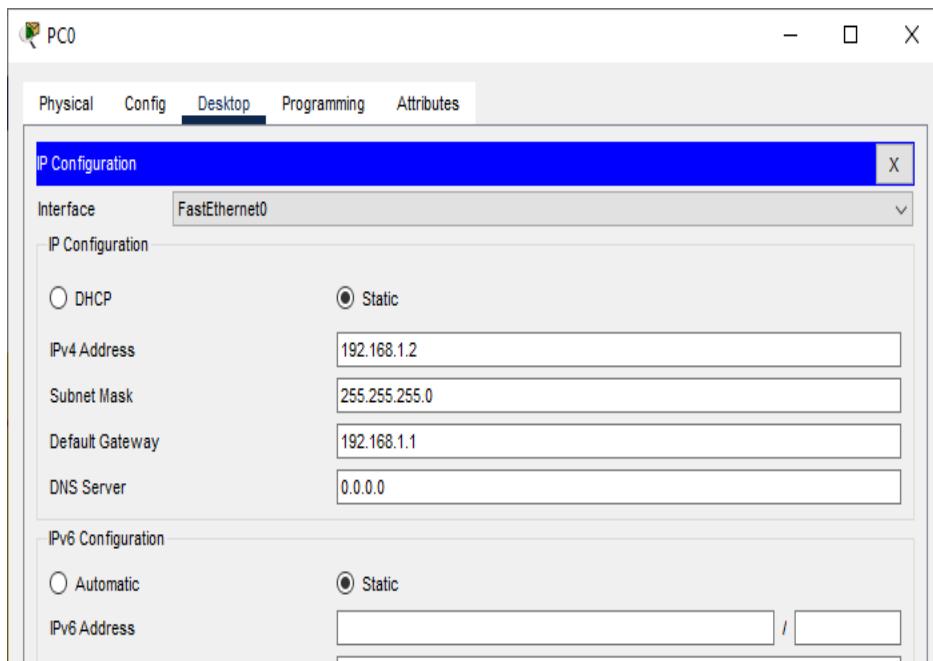
Host	Interface	IP address	Network Address	Default Gateway
Router 0 AS 1000	G0/0	192.168.1.1	192.168.1.0	
	S0/1/0	10.0.0.1	10.0.0.0	
Router 1 AS 2000	G0/0	192.168.2.1	192.168.2.0	
	S0/1/0	10.0.0.2	10.0.0.0	
	S0/1/1	20.0.0.1	20.0.0.0	
Router 2 AS 3000	G0/0	192.168.3.1	192.168.3.0	
	S0/1/1	20.0.0.2	20.0.0.0	
PC0	FastEthernet 0	192.168.1.2	192.168.1.0	192.168.1.1
PC1	FastEthernet 0	192.168.1.3		
PC2	FastEthernet 0	192.168.1.4		
PC3	FastEthernet 0	192.168.2.2	192.168.2.0	192.168.2.1
PC4	FastEthernet 0	192.168.2.3		

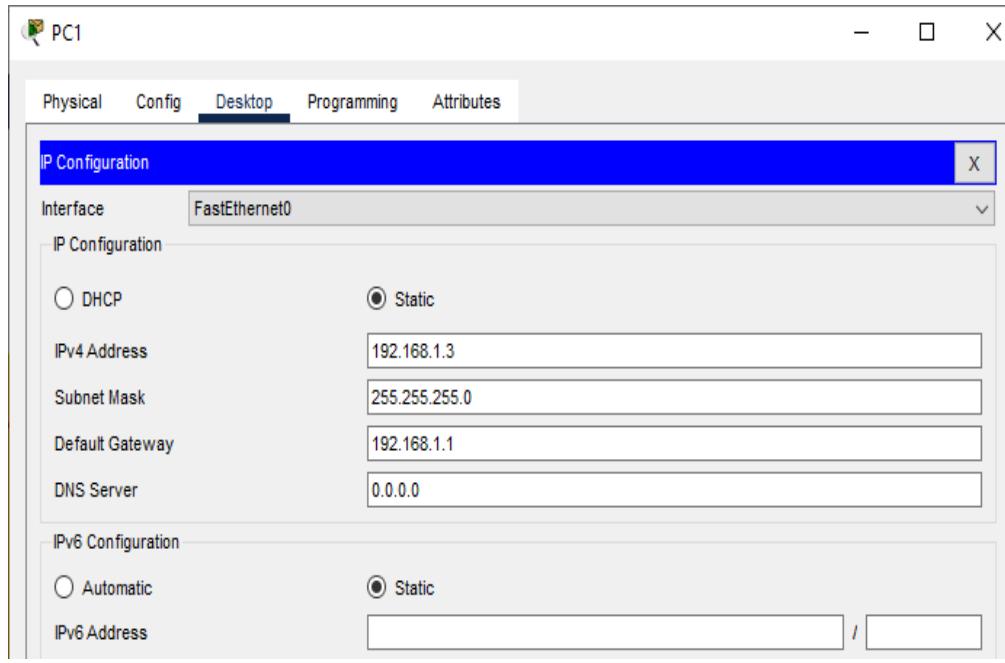
PC5	FastEthernet 0	192.168.2.4		
PC6	FastEthernet 0	192.168.3.2	192.168.3.0	192.168.3.1
PC7	FastEthernet 0	192.168.3.3		
PC8	FastEthernet 0	192.168.3.4		

Adding Serial Interface in each Router

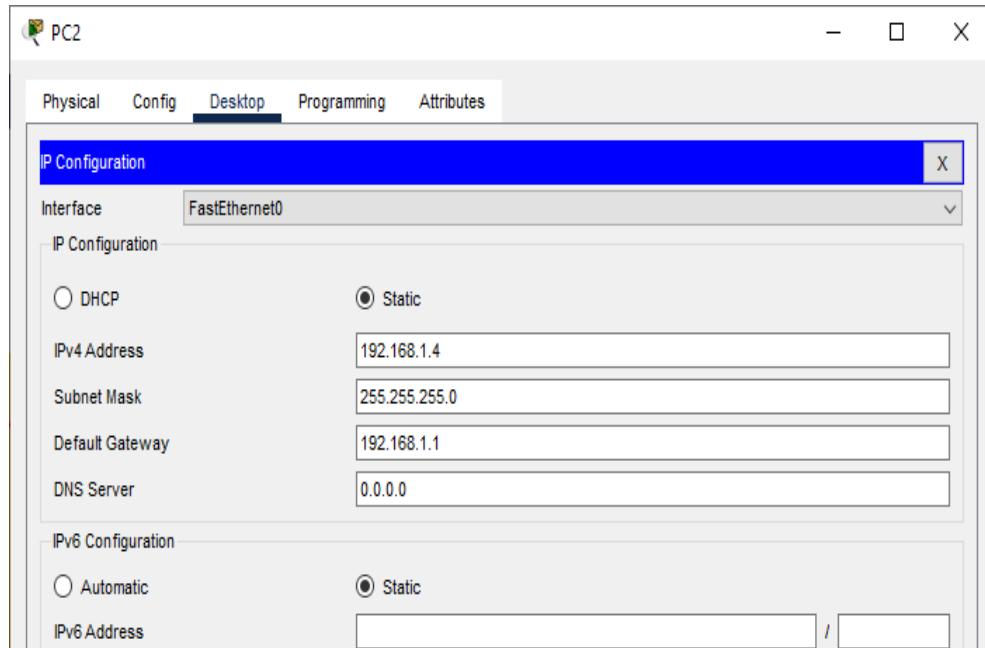


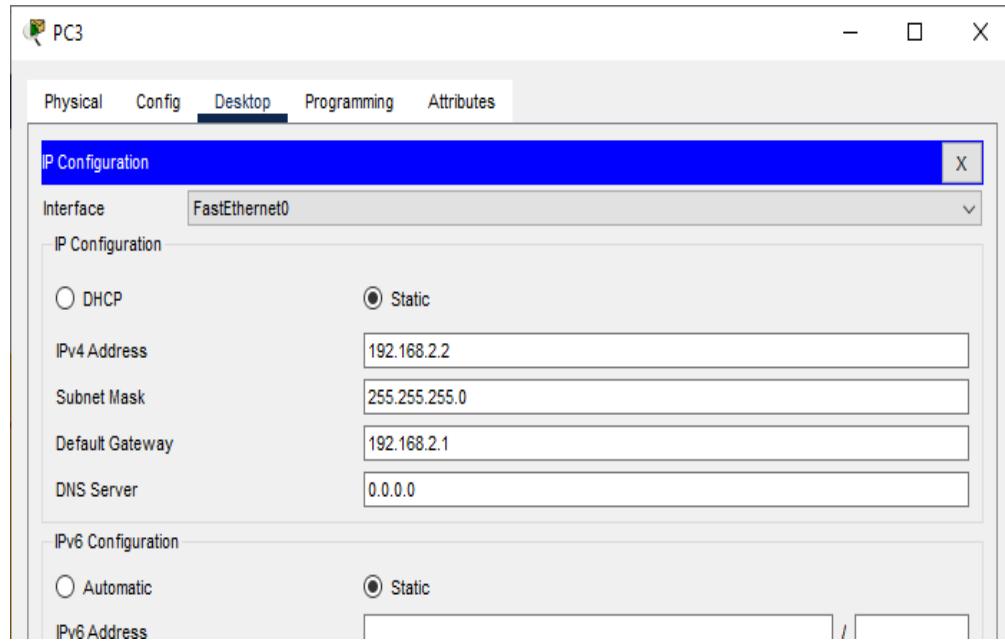
Configuring PC0:



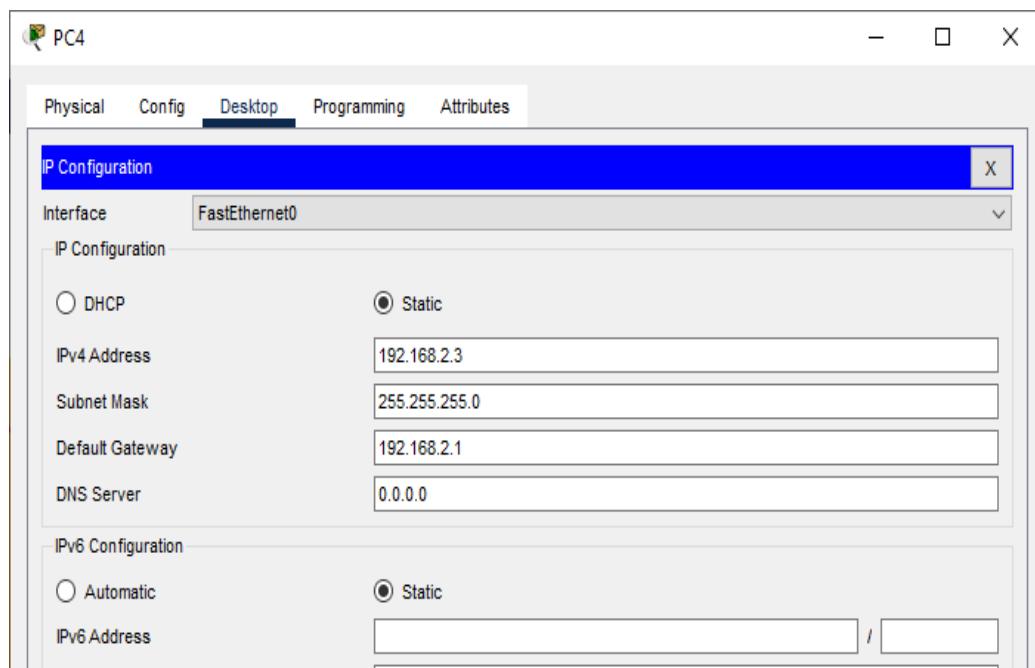


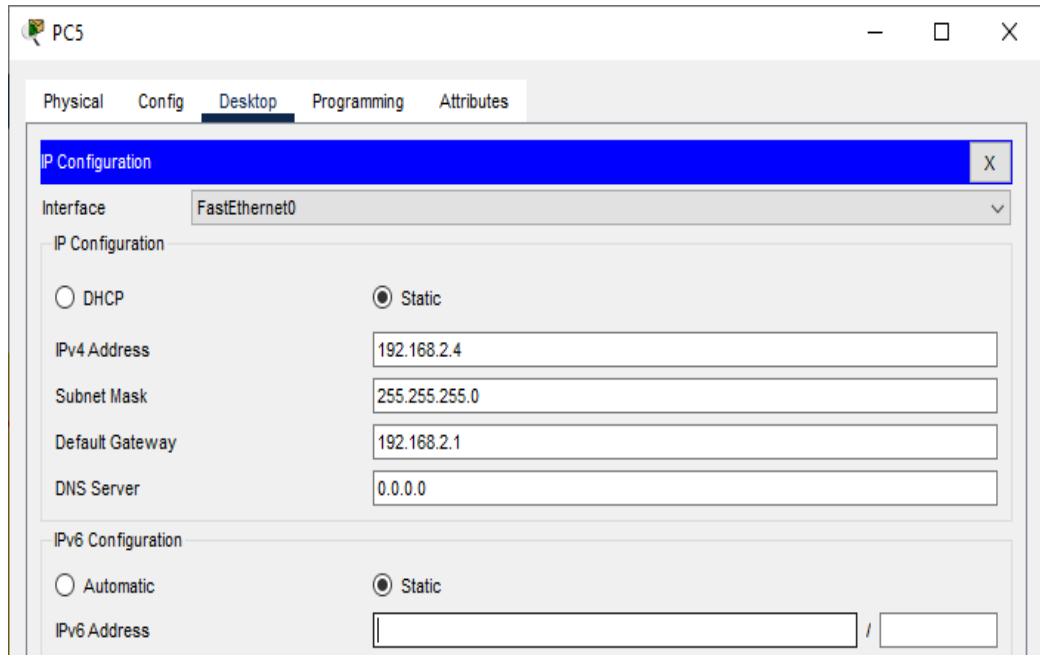
Configuring PC2:



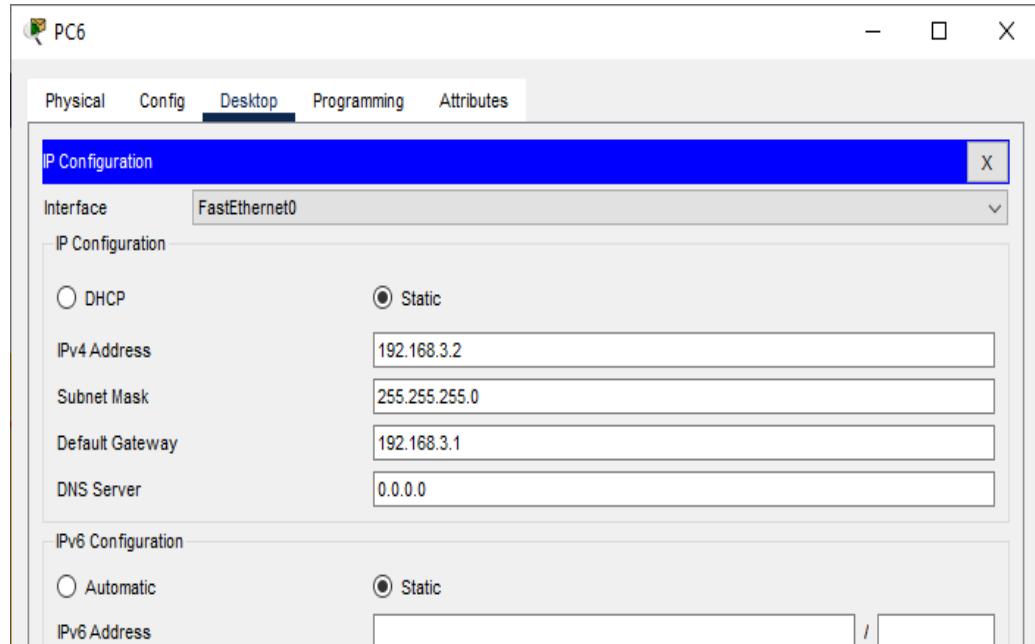


Configuring PC4:

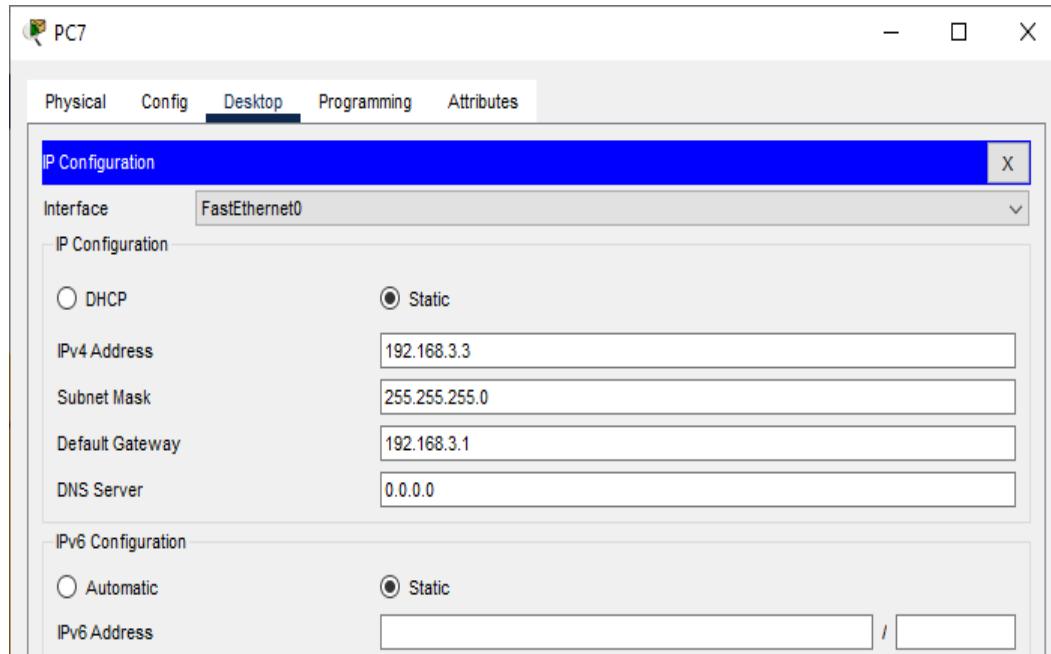




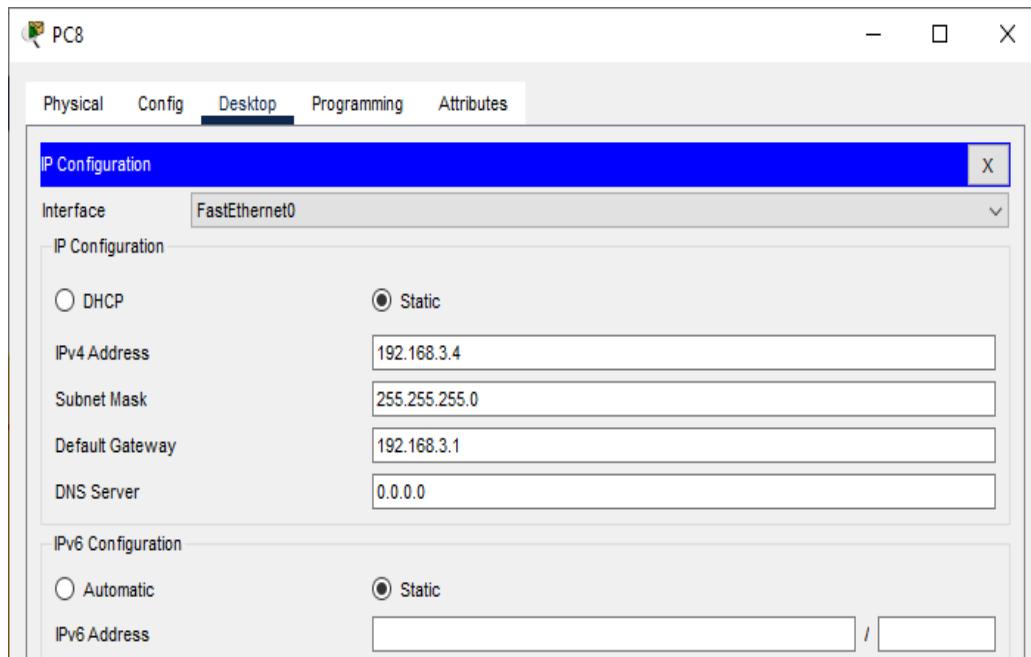
Configuring PC6:



Configuring PC7:

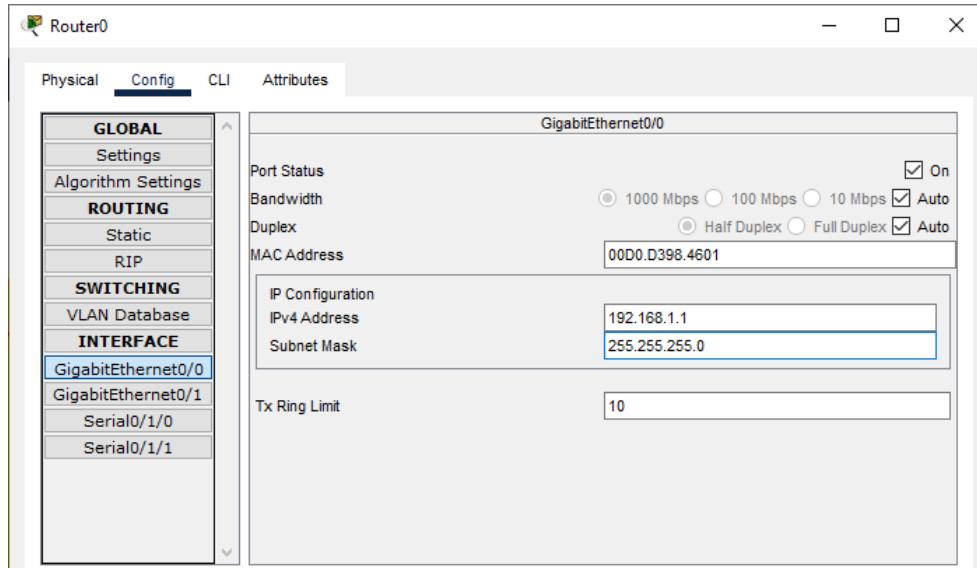


Configuring PC8:

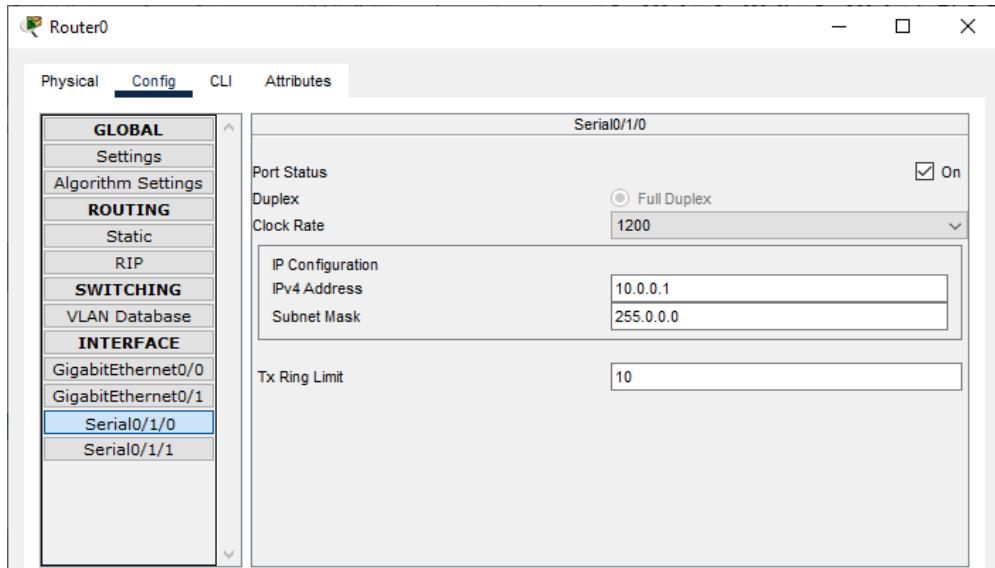


Configuring IP addresses on Router 0

i) Interface G0/0

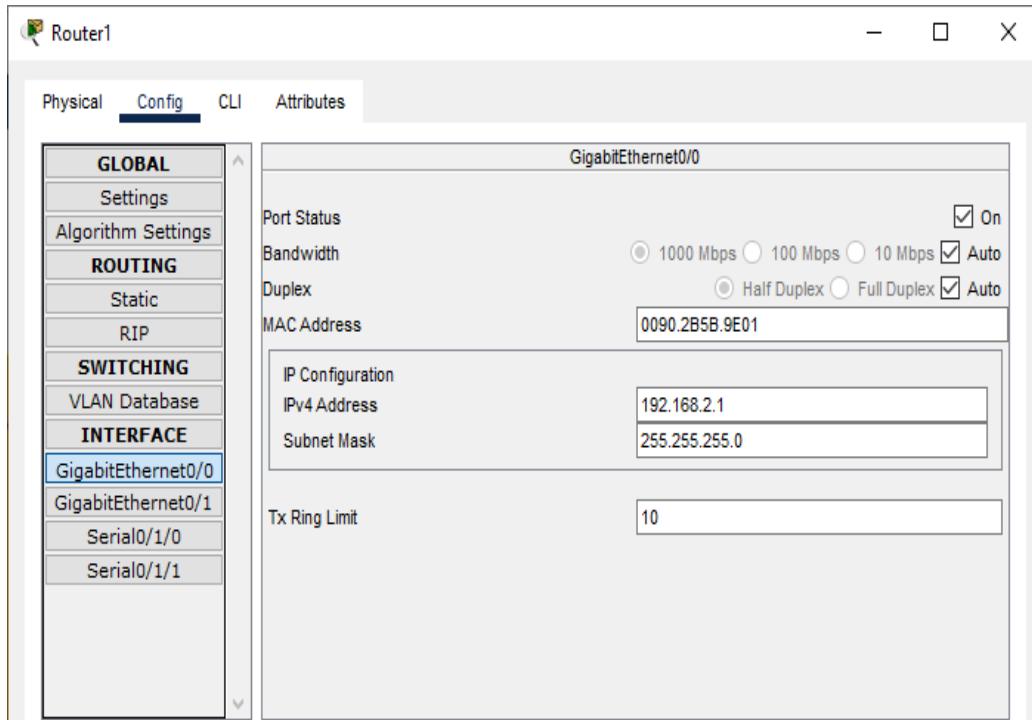


ii) Interface S0/1/0

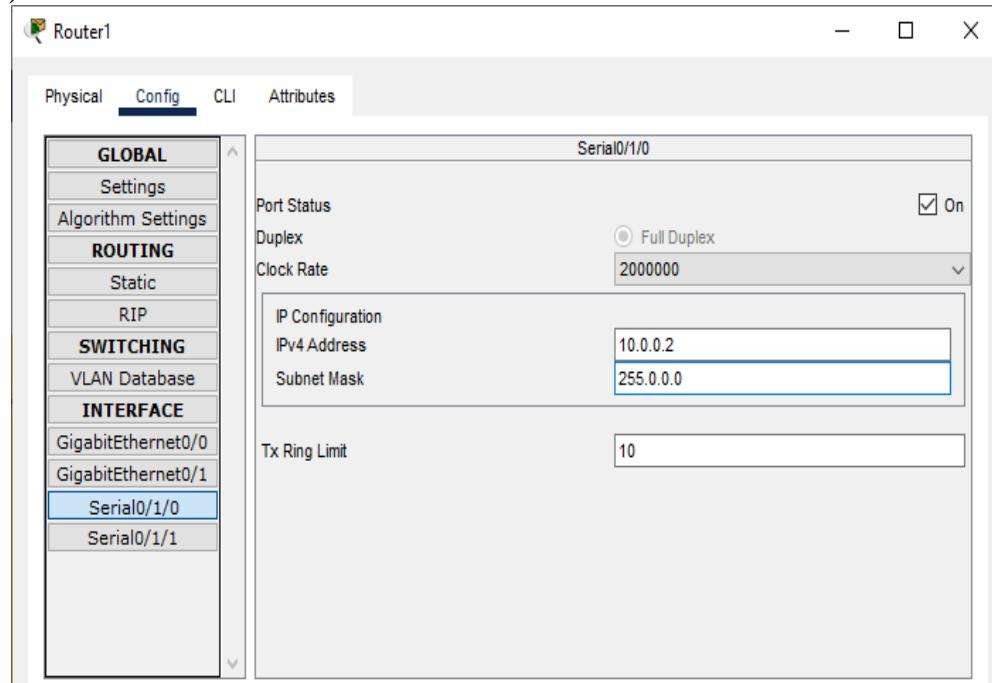


Configuring IP addresses on Router 1

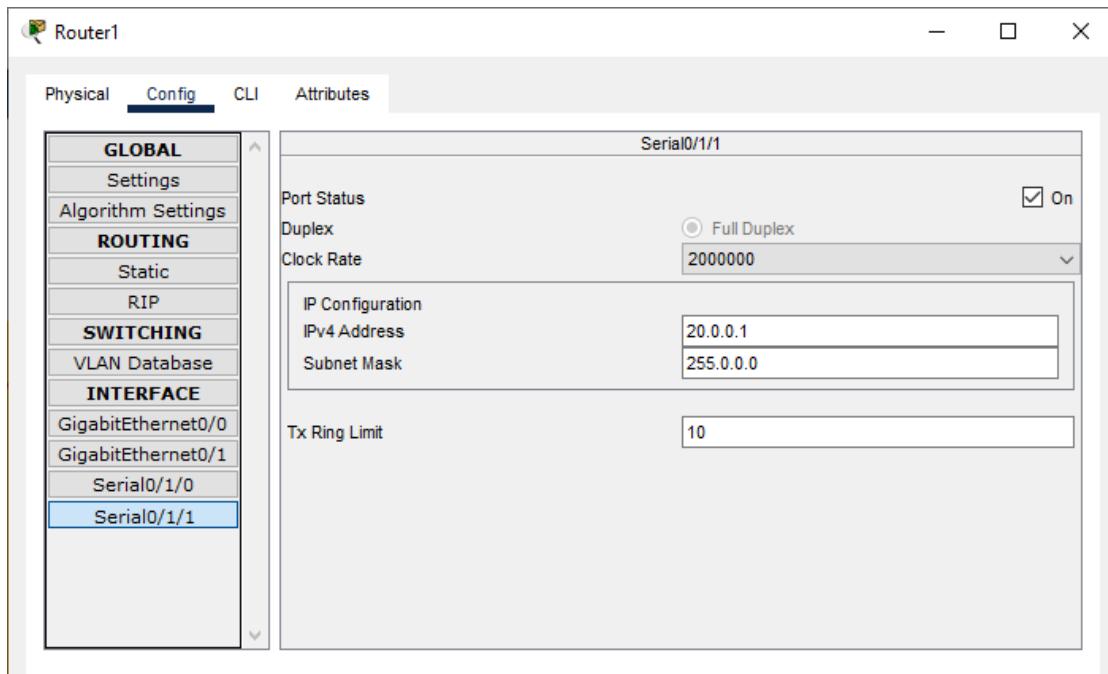
i) Interface G0/0



ii) Interface S0/1/0

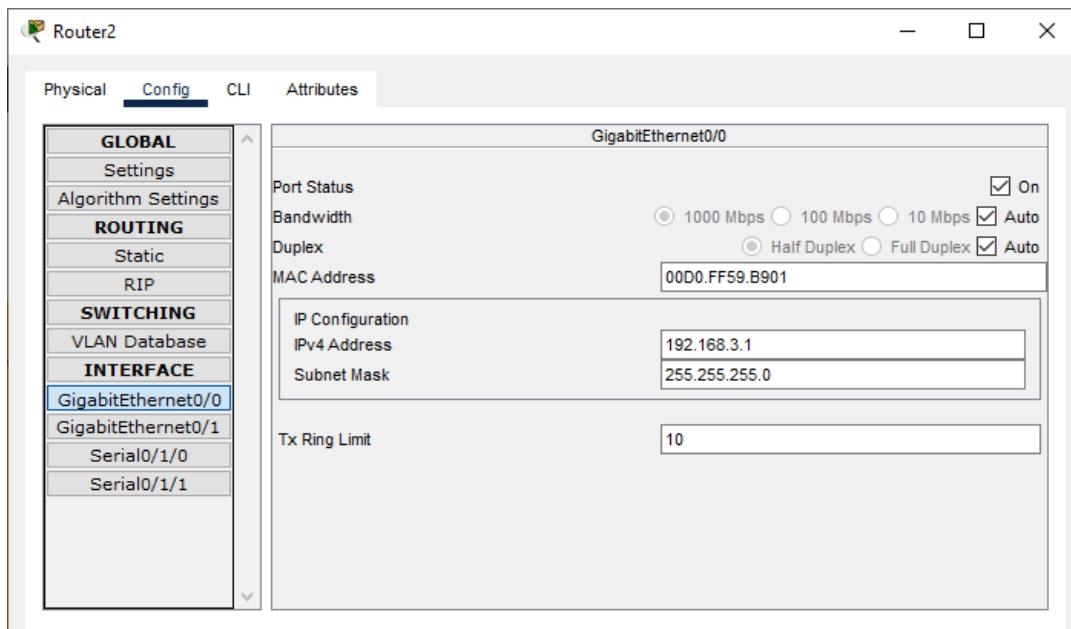


iii) Interface S0/1/1

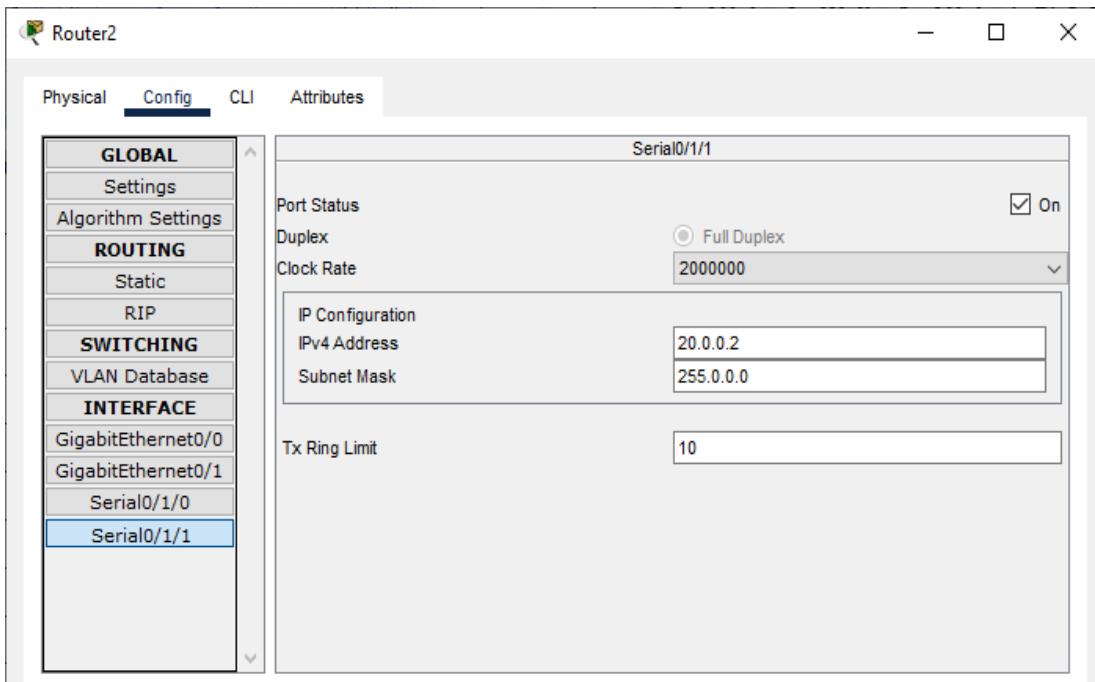


Configuring IP addresses on Router 2

i) Interface G0/0



ii) Interface S0/1/1



Configuring Router 0 for BGP (using the CLI mode)

```

Router>enable
Router#configure terminal
Router(config)#
Router(config)#router bgp 1000
Router(config-router)#
Router(config-router)#network 10.0.0.0
Router(config-router)#network 192.168.1.0
Router(config-router)#neighbor 10.0.0.2 remote-as 2000

```

Configuring Router 1 for BGP (using the CLI mode)

```

Router>enable
Router#configure terminal
Router(config)#
Router(config)#router bgp 2000
Router(config-router)#network 10.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#network 192.168.2.0
Router(config-router)#neighbor 10.0.0.1 remote-as 1000
Router(config-router)#neighbor 20.0.0.2 remote-as 3000

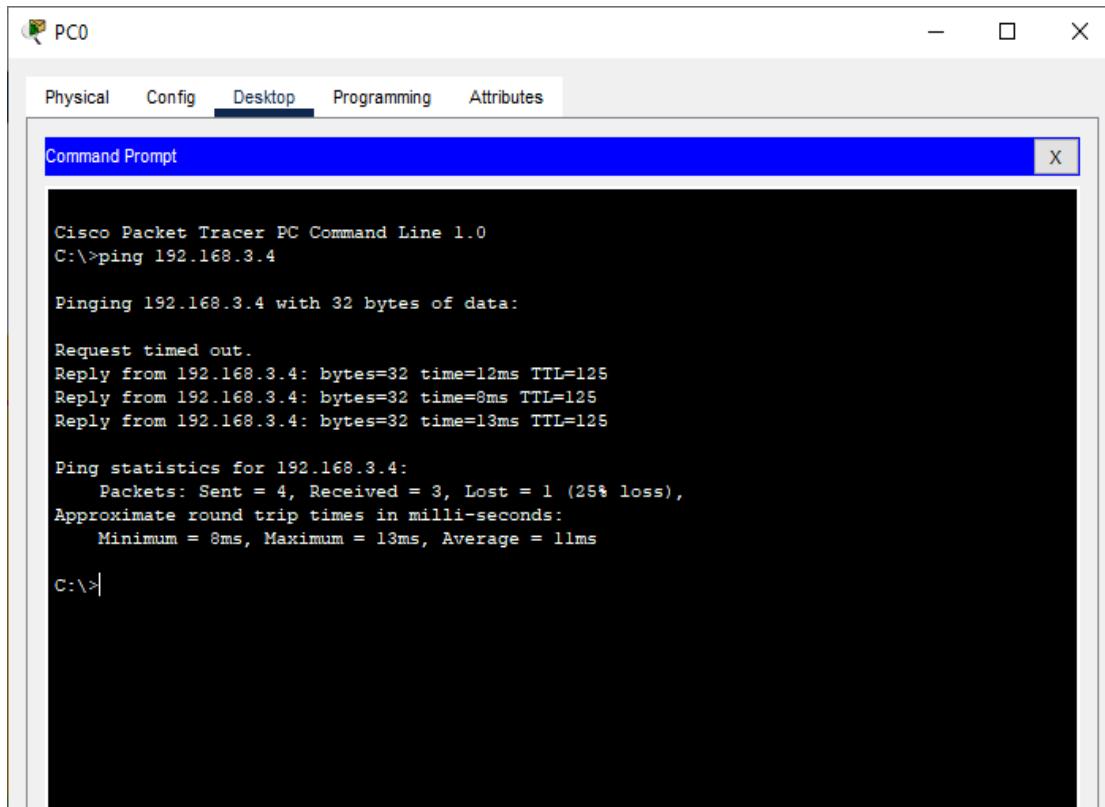
```

Configuring Router 2 for BGP (using the CLI mode)

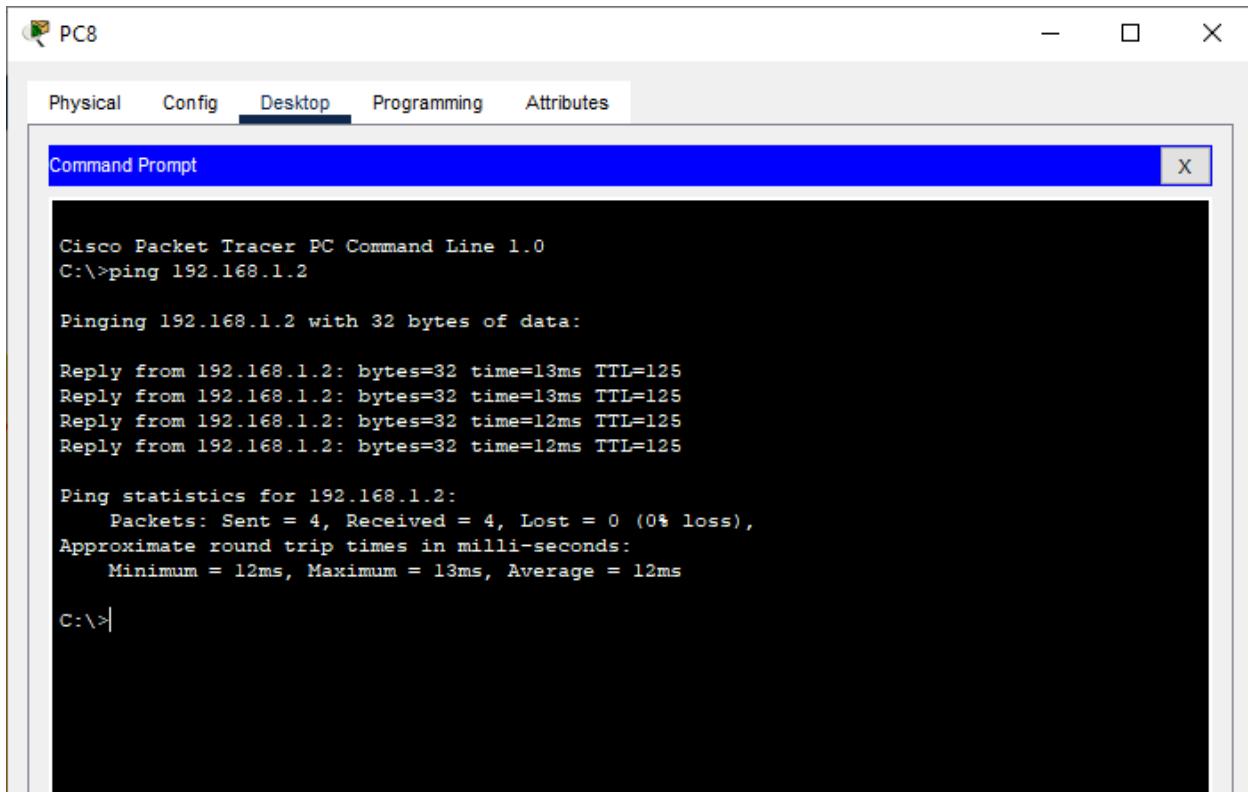
```
Router>enable  
Router#configure terminal  
Router(config)#  
Router(config)#router bgp 3000  
Router(config-router)#  
Router(config-router)#network 20.0.0.0  
Router(config-router)#network 192.168.3.0  
Router(config-router)#neighbor 20.0.0.1 remote-as 2000
```

Checking the connectivity by using the ping command

- i) Pinging PC8 (ip address 192.168.3.4) from PC1



ii) Pinging PC0 (ip address 192.168.1.2) from PC8



```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time=13ms TTL=125
Reply from 192.168.1.2: bytes=32 time=13ms TTL=125
Reply from 192.168.1.2: bytes=32 time=12ms TTL=125
Reply from 192.168.1.2: bytes=32 time=12ms TTL=125

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 12ms, Maximum = 13ms, Average = 12ms

C:\>
```

Result:

Hence the BGP has been studied and verified through the given network

Practical No 9

Aim: Using Packet Tracer, create a wireless network of multiple PCs using appropriate access point

Theory:

A Wireless Access Point (WAP) is a networking device that allows connecting the devices with the wired network. A Wireless Access Point (WAP) is used to create the WLAN (Wireless Local Area Network), it is commonly used in large offices and buildings which have expanded businesses.

A wireless AP connects the wired networks to the wireless client. It eases access to the network for mobile users which increases productivity and reduces the infrastructure cost.

Advantages of Wireless Access Point (WAP):

- 1) More User Access
- 2) Broader Transmission Range
- 3) Flexible Networking

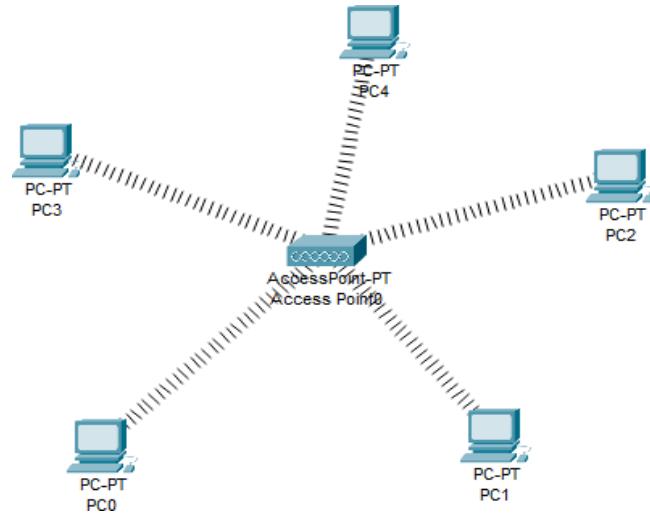
Disadvantages of Wireless Access Point (WAP):

- 1) High cost
- 2) Poor stability
- 3) Less Secure

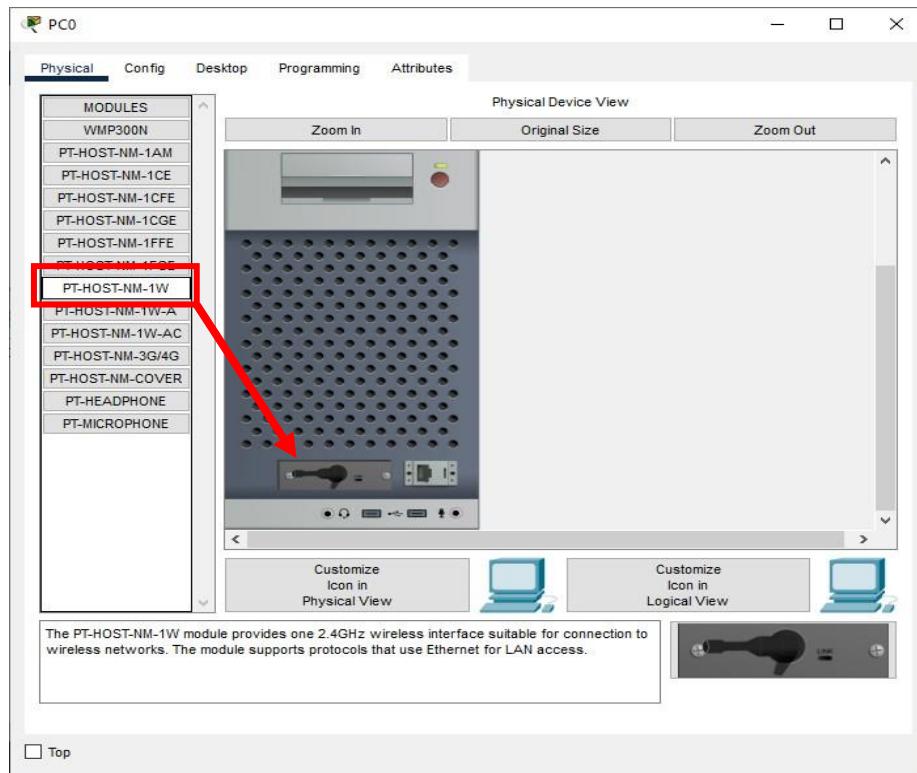
Application of Wireless Access Point:

- 1) It is a device that creates a WLAN (Wireless Local Area Network) in large enterprises.
- 2) It is used to extend the coverage area of the network so that it can't disconnect which allows more users to connect to the network easily.
- 3) An access point connects a switch, Ethernet cable, wired router, and Wi-fi to designate the particular area.
- 4) It is used to provide connectivity to the users in large offices or enterprises which allows users to roam easily anywhere in the office and be connected to a network.
- 5) LANs can also be provided in public places such as coffee shops, restaurants, airports, etc.

We use the following topology for the present case (5PCs and an Access Point)

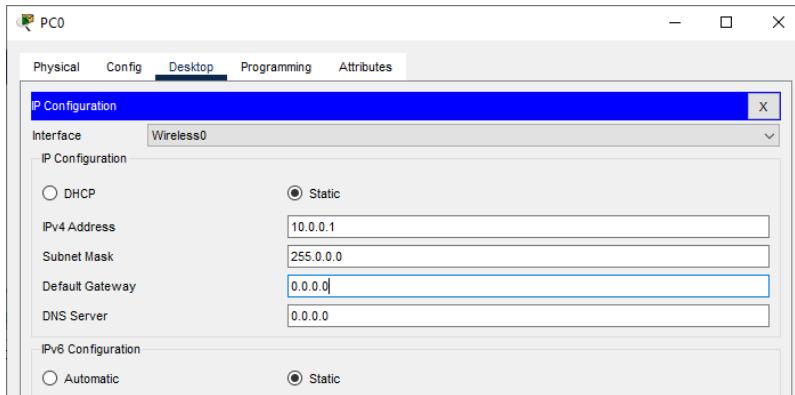


Add a Wireless interface to each PC as follows

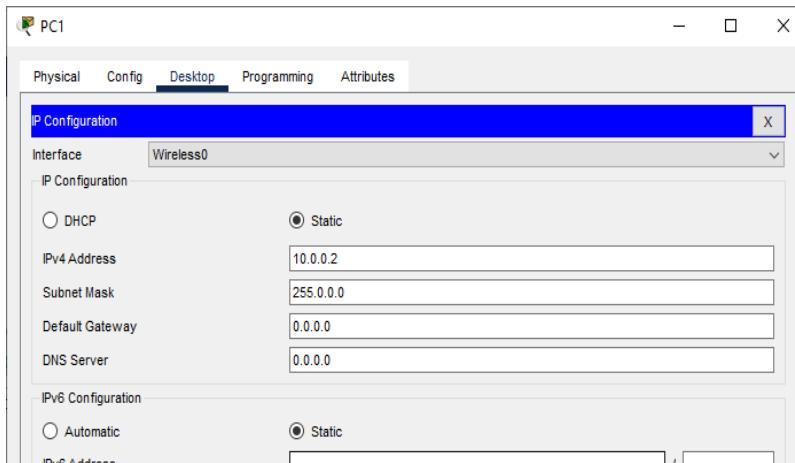


Assigning IP Address to each PC (select Static)

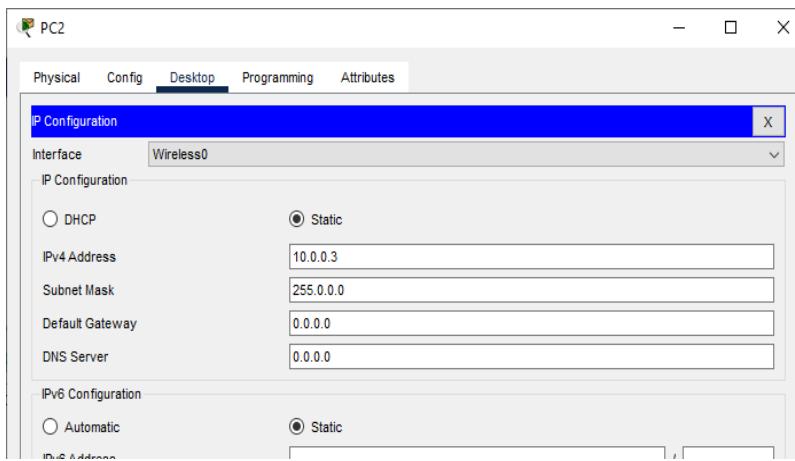
1) PC0 :



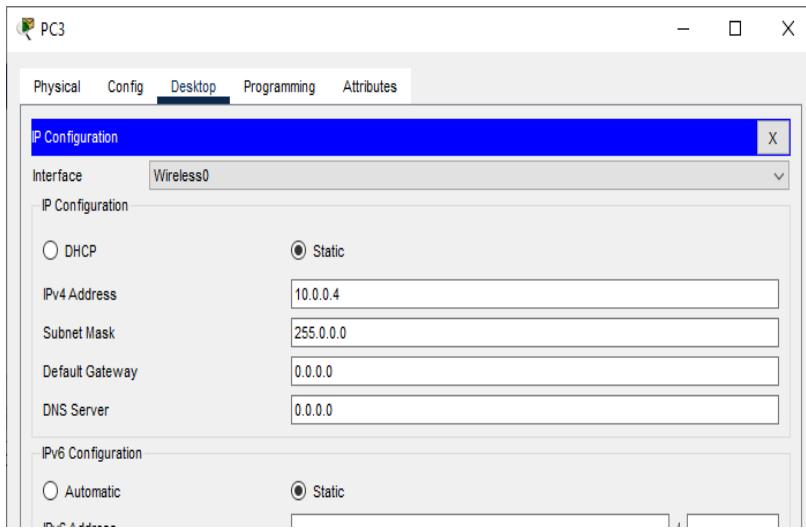
2) PC1 :



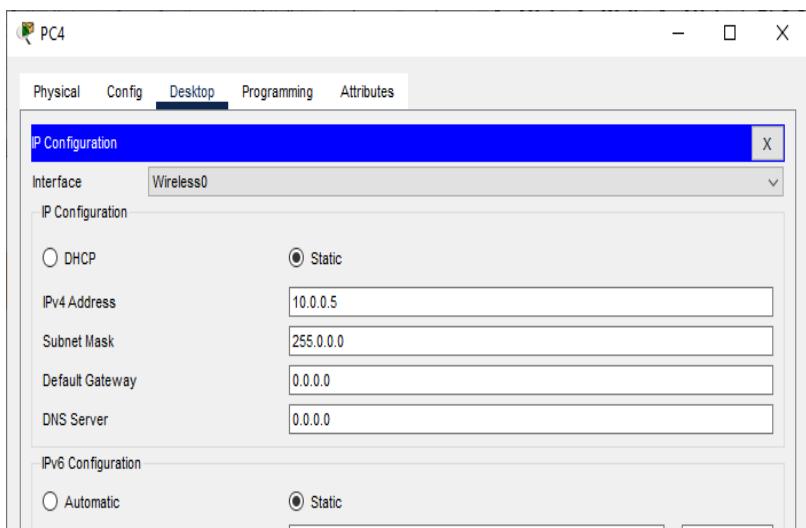
3) PC2 :



4) PC3 :



5) PC4 :

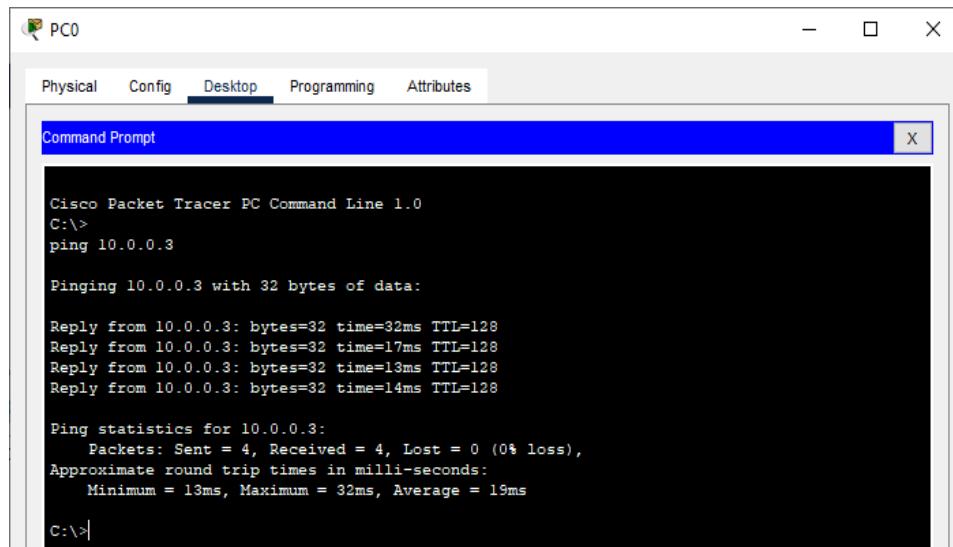


The IP addresses assigned are

Host	IP address
PC0	10.0.0.1
PC1	10.0.0.2
PC2	10.0.0.3
PC3	10.0.0.4
PC4	10.0.0.5

We verify the connectivity by sending ping message from any PC to any other PC

Pinging PC2 (10.0.0.3) from PC0 (10.0.0.1)



PC0

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:>
ping 10.0.0.3

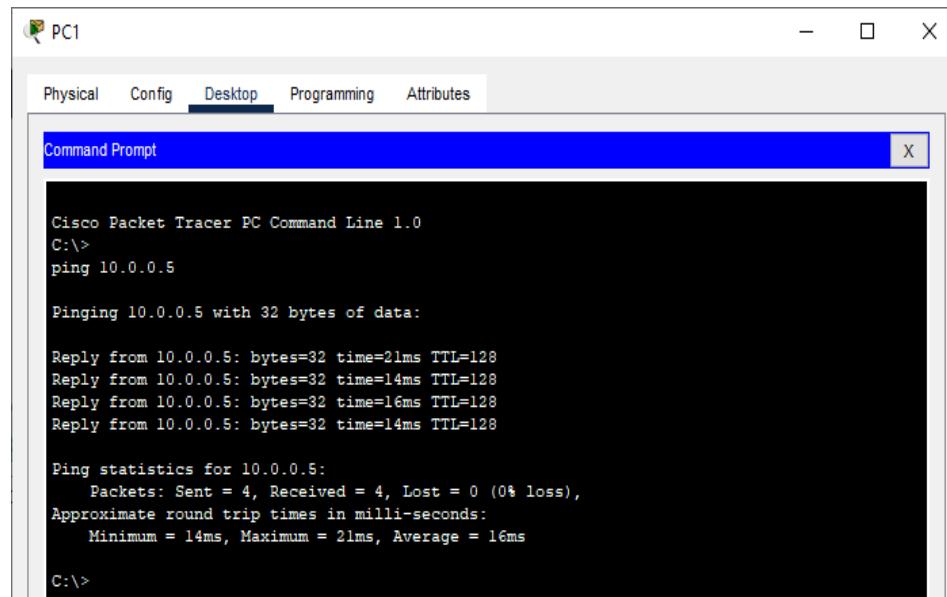
Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time=32ms TTL=128
Reply from 10.0.0.3: bytes=32 time=17ms TTL=128
Reply from 10.0.0.3: bytes=32 time=13ms TTL=128
Reply from 10.0.0.3: bytes=32 time=14ms TTL=128

Ping statistics for 10.0.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 13ms, Maximum = 32ms, Average = 19ms

C:>|
```

Pinging PC4 (10.0.0.5) from PC1 (10.0.0.2)



PC1

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:>
ping 10.0.0.5

Pinging 10.0.0.5 with 32 bytes of data:

Reply from 10.0.0.5: bytes=32 time=21ms TTL=128
Reply from 10.0.0.5: bytes=32 time=14ms TTL=128
Reply from 10.0.0.5: bytes=32 time=16ms TTL=128
Reply from 10.0.0.5: bytes=32 time=14ms TTL=128

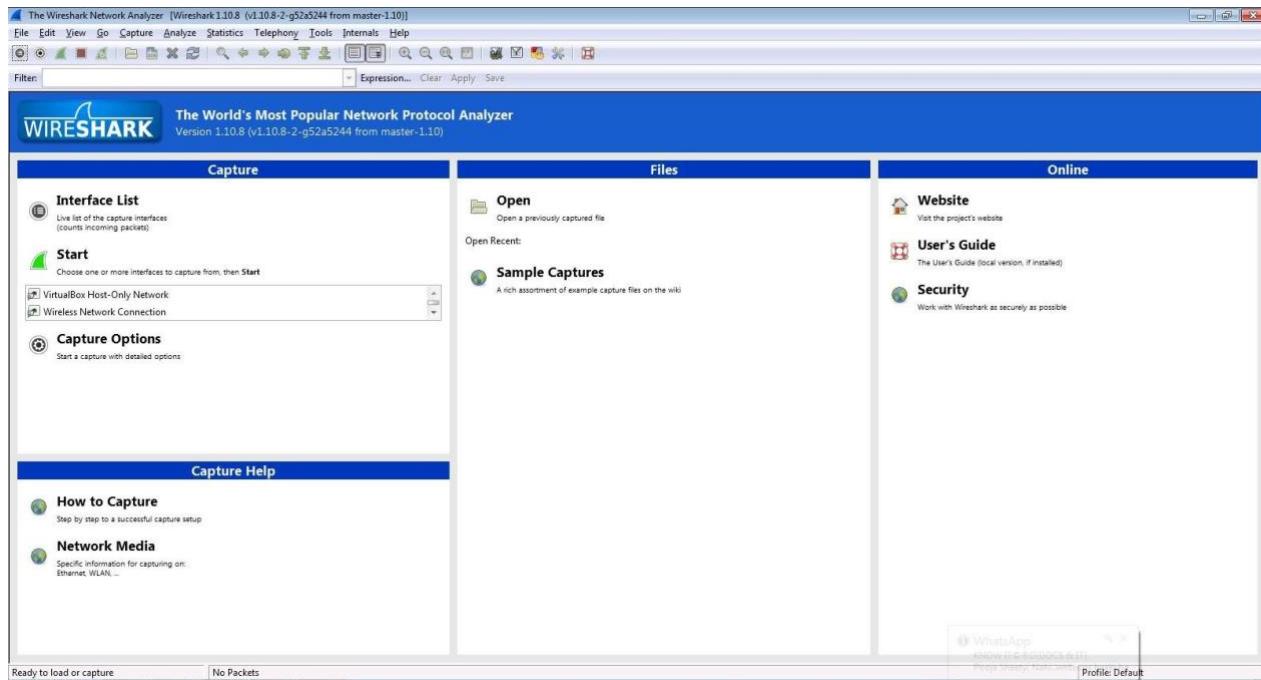
Ping statistics for 10.0.0.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 14ms, Maximum = 21ms, Average = 16ms

C:>
```

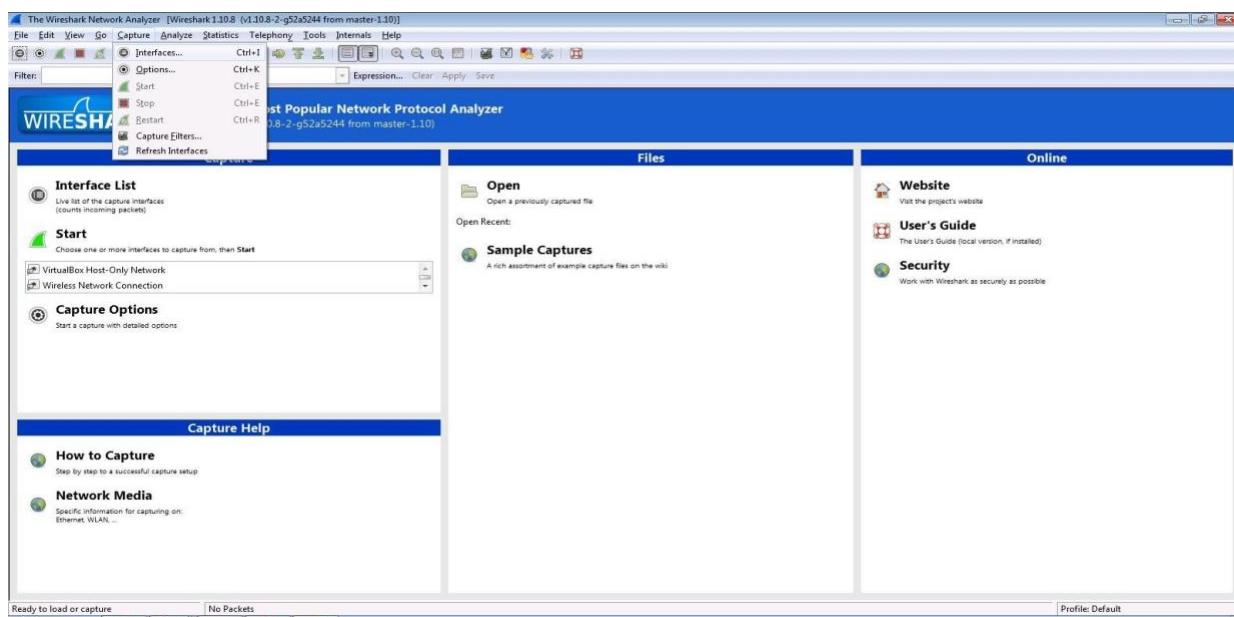
PRACTICAL NO 10

Using Wireshark, network analyzer, set the filter for ICMP, TCP, HTTP, UDP, FTP and perform respective protocol transactions to show/prove that the network analyzer is working

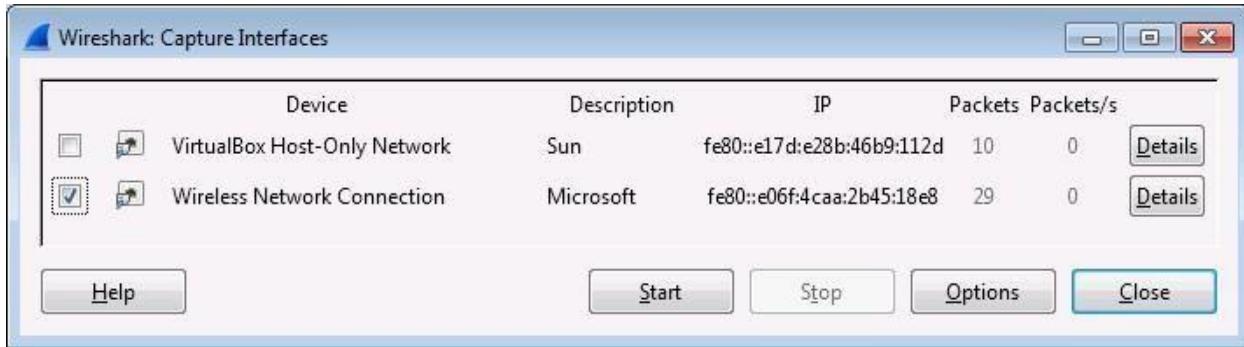
Step 1: Install and open Wireshark .



Step 2: Go to Capture tab and select Interface option.



Step 3: In Capture interface, Select Local Area Connection and click on start.



Step 4: The source, Destination and protocols of the packets in the LAN network are displayed.

No.	Time	Source	Destination	Protocol	Length	Info
9637	549.408818.192.168.0.101	192.168.0.101	253.92.53.255.255	TCP	60	[TCP Keep-Alive] <--> [ACK] Seq=6401 Ack=6294 Win=26 SRE=27
9678	549.647244.192.168.0.101	27.202.165.113	TCP	55	[TCP Keep-Alive] 56741 > http [ACK] Seq=3629 Ack=125 win=11 Reassembly error, protocol TCP: New fragment overlaps old data	
9639	549.777053.23.202.165.113	192.168.0.101	TCP	66	[TCP Keep-Alive ACK] http > 56741 [ACK] Seq=125 Ack=3630 win=2328 Len=0 SLE=3629 SRE=3630	
9640	550.396166.192.168.0.101	173.194.32.217	TCP	55	[TCP Keep-Alive] 56618 > http [ACK] Seq=2285 Ack=517 win=16644 Len=1	
9641	550.396166.192.168.0.101	95.101.129.104	TCP	55	[TCP Keep-Alive] 56743 > http [ACK] Seq=765 Ack=179 win=17244 Len=1	
9642	550.645582.192.168.0.101	82.163.143.169	DNS	70	Standard query 0x99f6 A google.com	
9644	550.752129.192.168.0.101	190.93.253.58	TCP	54	56664 > http [FIN, ACK] Seq=9154 Ack=11865 win=16636 Len=0	
9645	550.752129.192.168.0.101	14.129.139.8	TCP	54	56741 > 56664 [ACK] Seq=9155 Ack=11865 win=16636 Len=0	
9646	550.767359.173.139.2217	192.168.0.101	TCP	66	[TCP Keep-Alive] 56741 > 56664 [ACK] Seq=9156 Ack=11865 win=16636 Len=0	
9647	550.820575.190.93.253.58	192.168.0.101	TCP	54	http > 56664 [ACK] Seq=11865 Ack=9159 win=51200 Len=0	
9648	550.842120.82.163.143.169	192.168.0.101	DNS	246	Standard query 0x99f6 A 173.194.46.78 A 173.194.46.68 A 173.194.46.64 A 173.194.46.65 A 173.194.46.67 A 173.194.46.69	
9649	550.900800.144.76.39.8	192.168.0.101	TCP	54	http > 56795 [ACK] Seq=555 Ack=346 win=3036 Len=0	
9650	551.239413.192.168.0.101	192.168.0.101	NBNS	92	Name query NB AE3EET-PC-1<c>	
9651	551.447136.192.168.0.101	255.255.255.255	UDP	132	Name query NB 50636 destination port: 10505	
9652	551.471204.192.168.0.101	95.101.129.56	TCP	55	[TCP Keep-Alive] 56604 > http [ACK] Seq=1002 Ack=506 win=16916 Len=1	
9653	551.998933.192.168.0.101	192.168.0.255	NBNS	92	Name query NB AE3EET-PC-1<c>	
9654	552.17783.192.168.0.101	192.168.0.255	NBNS	92	Name query NB AE3EET-PC-1<c>	
9655	553.846017.192.168.0.101	192.168.0.101	TCP	66	[TCP Keep-Alive] 56741 > 56604 [ACK] Seq=1003 Ack=506 SLE=1002 SRE=1003	
9656	553.479249.192.168.0.101	173.194.46.71	TCP	55	[TCP Keep-Alive] 56741 > https [ACK] Seq=13948 Ack=4868 win=4280 Len=1	
9657	553.561183.192.168.0.101	255.255.255.255	UDP	132	Source port: 50638 destination port: 10505	
9658	553.741206.173.194.46.71	192.168.0.101	TCP	66	[TCP Keep-Alive] https > 56747 [ACK] Seq=4868 Ack=13947 win=705 Len=0 SLE=13946 SRE=13947	
9659	555.591968.192.168.0.101	255.255.255.255	UDP	132	Source port: 50640 destination port: 10505	
9660	556.287397.216.58.210.67	192.168.0.101	TCP	54	http > 56525 [FIN, ACK] Seq=501 Ack=1239 win=45440 Len=0	
9661	556.287473.192.168.0.101	216.58.210.67	TCP	54	56525 > http [ACK] Seq=1239 Ack=501 Win=16660 Len=0	
9662	557.637229.192.168.0.101	255.255.255.255	UDP	132	Source port: 50642 destination port: 10505	
9663	558.409039.192.168.0.101	192.168.0.101	TCP	55	[TCP Keep-Alive] 56741 > http [ACK] Seq=1350 Ack=25709 Win=16800 Len=1	
9664	558.409813.206.19.49.154	192.168.0.101	TCP	54	[TCP Keep-Alive ACK] http > 56741 [ACK] Seq=13509 Ack=25709 Ack=1221 Win=5320 Len=0	
9665	558.656088.173.236.30.250	192.168.0.101	TCP	54	http > 56795 [FIN, ACK] Seq=5872 Ack=2357 Win=2024 Len=0	
9666	558.656184.192.168.0.101	173.236.30.250	TCP	54	56795 > http [ACK] Seq=2357 Ack=5828 Win=17032 Len=0	
9667	559.20.409.192.168.0.101	173.194.46.77	TCP	55	[TCP Keep-Alive] 56541 > http [ACK] Seq=500 Ack=1941 Win=16508 Len=1	
9668	559.490385.173.194.46.77	192.168.0.101	TCP	66	[TCP Keep-Alive ACK] 56541 [ACK] Seq=1941 Ack=501 Win=44032 Len=0 SLE=500 SRE=501	
9669	559.652731.192.168.0.101	255.255.255.255	UDP	132	Source port: 50644 destination port: 10505	

Frame 1: 54 bytes on wire (432 bits), 54 bytes captured (432 bits) on interface 0
 Src: Ethernet II, Dl: Link-Layer, If: 8:0:0:bcd (0:0:a0:01:8a:c0) Dst: D-Link_Networ... (0:b:c5:83:87:9c)
 Internet Protocol Version 4, Src: 192.168.0.101 (192.168.0.101), Dst: 173.194.46.78 (173.194.46.78)
 Transmission Control Protocol, Src Port: 56160 (56160), Dst Port: https (443), Seq: 1, Ack: 1, Len: 0

File: C:\Users\Ajeet\AppData\Local\Temp... Packets: 9669 - Displayed: 9669 (100.0%) - Dropped: 0 (0.0%) Profile: Default

Step 5: Open a website in a new window and enter the user id and password. Register if needed.

Sign Up for gogoNET

Already a member? Click here to sign in.

Create a new account...

Business Email Address

Password

Retype Password

What is the "I" in IoT? What is this word?
Internet


 Privacy & Terms 

Sign Up

Create a new account...

 Facebook  twitter

 LinkedIn

About gogoNET


   
...and 120849 more

Community, training and services for IT professionals deploying IPv6 and the Internet of Things. Join to get free v6 connectivity.

Step 6: Enter the credentials and then sign in.

Sign In to gogoNET

New? Click here to join

Business Email Address

Password

Sign In

Forgot your password?

...Or sign in with one of these:

 Facebook  twitter

 YAHOO!  LinkedIn

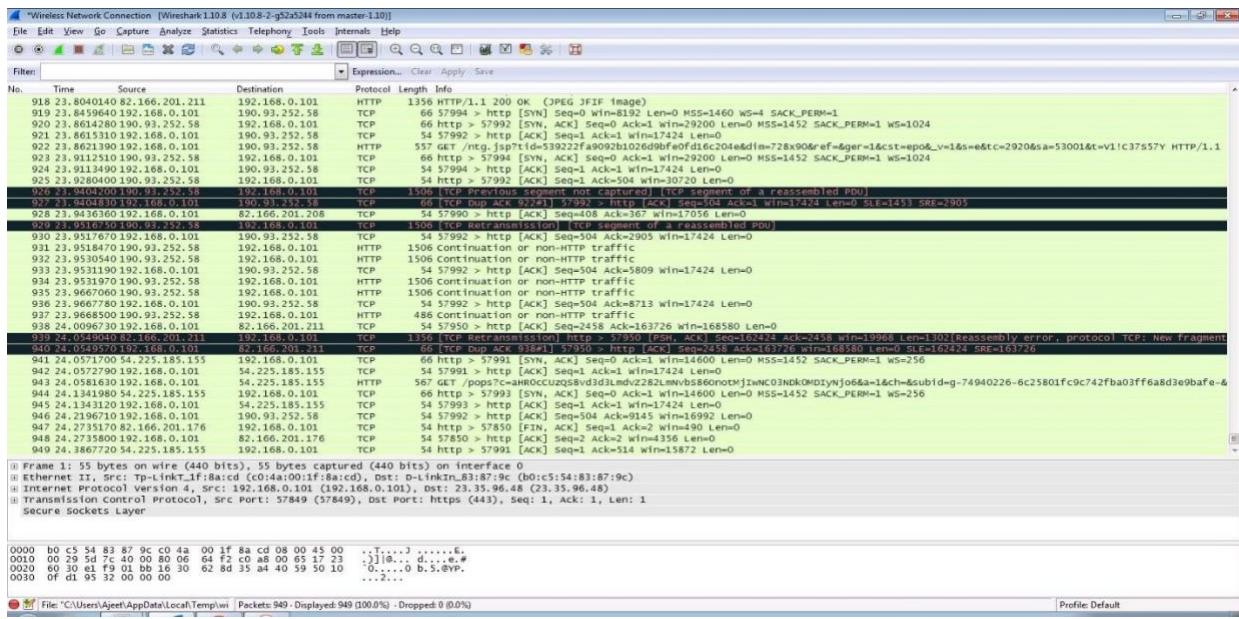
 Windows Live ID

About gogoNET

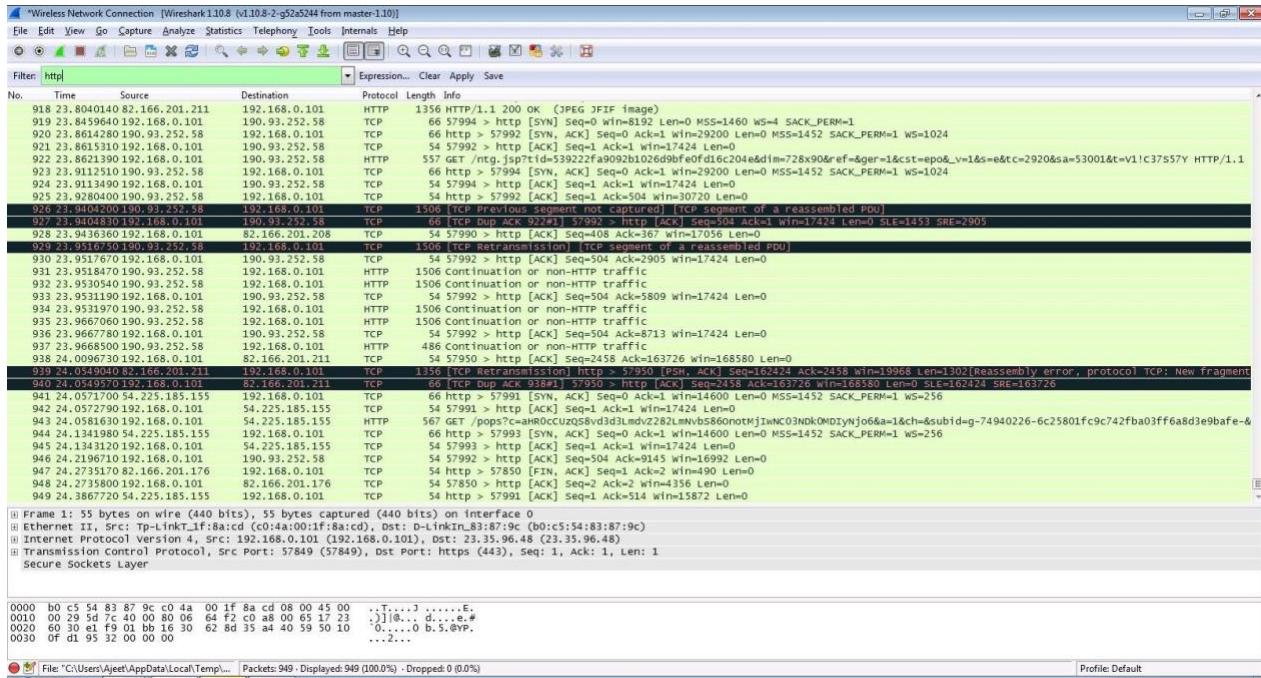

   
...and 120851 more

Community, training and services for IT professionals deploying IPv6 and the Internet of Things. Join to get free v6 connectivity.

Step 7: The wireshark tool will keep recording the packets

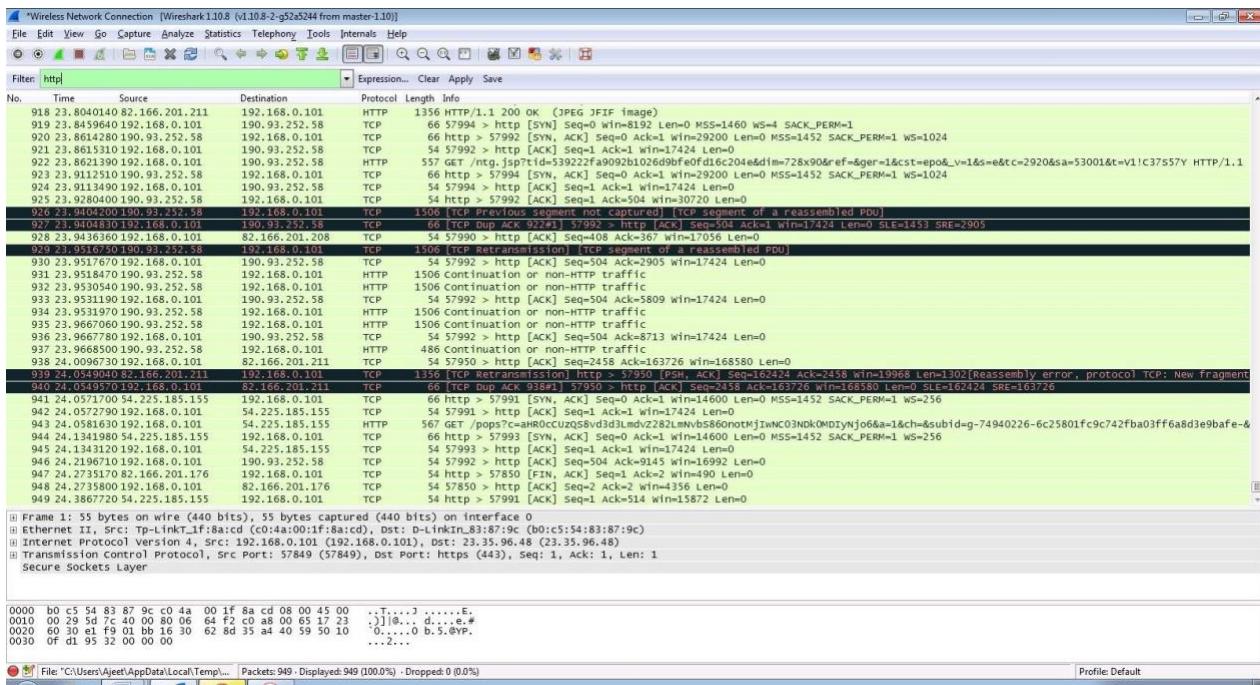


Step 8: Select filter as http to make the search easier and click on apply.

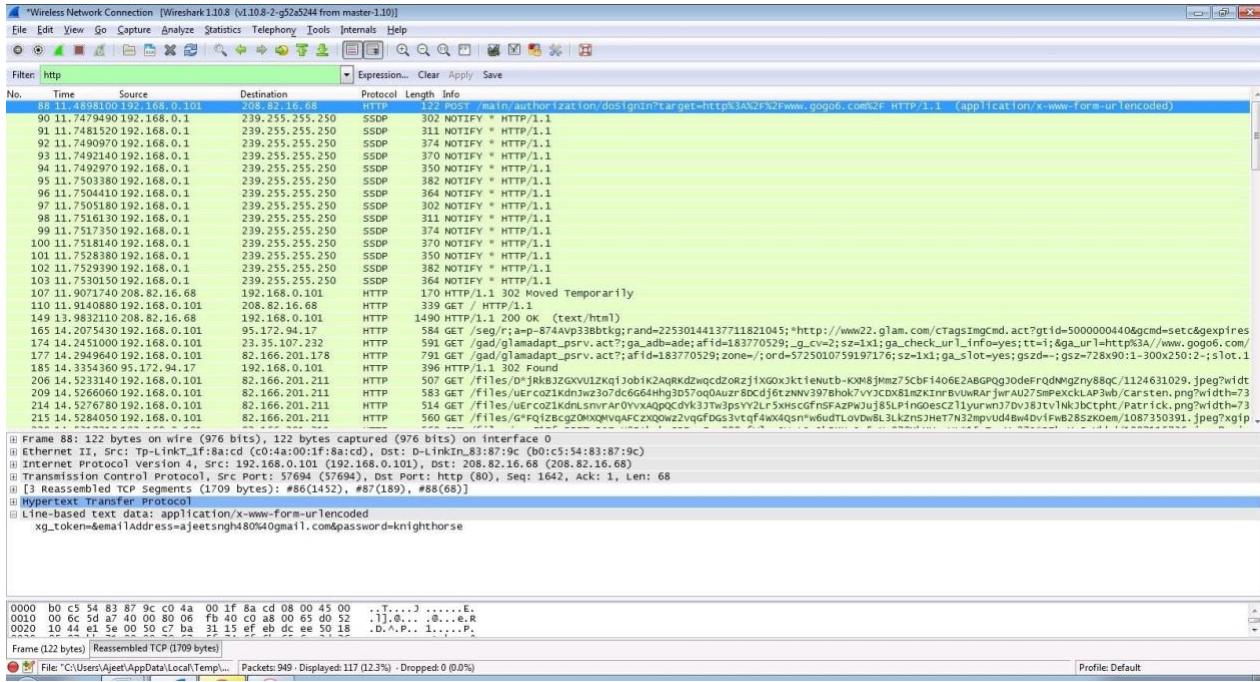


Step 9: Now stop the tool to stop recording.

Computer Networks



Step 10: Find the post methods for username and password.



Step 11: U will see the email- id and password that you used to log in.

```
Frame 88: 122 bytes on wire (976 bits), 122 bytes captured (976 bits) on interface 0
Ethernet II, Src: Tp-LinkT_1f:8a:cd (c0:4a:00:1f:8a:cd), Dst: D-LinkIn_83:87:9c (b0:c5:54:83:87:9c)
Internet Protocol Version 4, Src: 192.168.0.101 (192.168.0.101), Dst: 208.82.16.68 (208.82.16.68)
Transmission Control Protocol, Src Port: 57694 (57694), Dst Port: http (80), Seq: 1642, Ack: 1, Len: 68
[3 Reassembled TCP Segments (1709 bytes): #86(1452), #87(189), #88(68)]
Hypertext Transfer Protocol
Line-based text data; application/x-www-form-urlencoded
xg_token=&emailAddress=ajeetsngh480%40gmail.com&password=knighthorse
```
