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CERTIFICATE

This is to certify that the Mr./Ms.....
of S.Y.B.Sc.(CS) Semester-IV has completed the practical work in the subject of Computer
Network during the Academic year 2023-24 under the guidance of **Dr. Sanjivani Nalkar** being
the partial requirement for the fulfillment of the curriculum of Degree of Bachelor of Science in
Computer Science, University of Mumbai.

Place:

Date:

Sign of Subject In Charge

Sign of External Examiner

Sign of Incharge / H.O.D

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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
ex. ping google.com
- 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
ex. tracert google.com
- 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.
ex. netstat -in
 - ii) **netstat -a command**
The netstat -a command shows the state of all sockets.
ex. netstat -a
 - iii) **netstat -s**
The netstat -s command shows statistics for each protocol (while the netstat -p command shows the statistics for the specified protocol).
ex. netstat -s
 - iv) **netstat -r**
Another option relevant to performance is the display of the discovered Path Maximum Transmission Unit (PMTU).
ex. netstat -r
- 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.
ex. `arp -a`
 - ii) `arp -g`: Same as the `arp -a` command.
ex. `arp -g`
 - 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.
ex. `arp -d`
 - 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.
ex. `arp -s`
- 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.
ex. `ipconfig`
- 6) `getmac`: `Getmac` is a Windows command used to display the Media Access Control (MAC) addresses for each network adapter in the computer.
ex. `getmac`
- 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.
ex. `hostname`
- 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.
ex. `nslookup google.com`
- 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.
ex. `pathping`

- 10) SystemInfo: This command is use ot display detailed configuration information about a computer and its operating system, including operating system configuration, security information, product ID, and hardware properties
ex. systeminfo

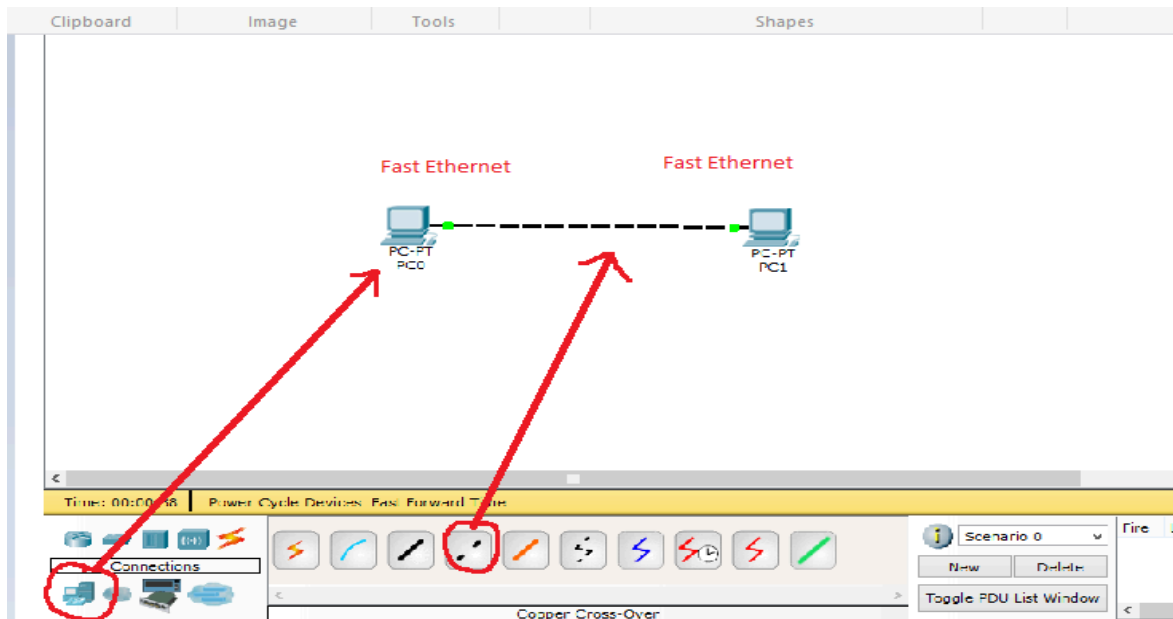
Practical No 2

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

1. Place two computer(PC) on screen
2. Connect PC's using copper crossover wire



3. 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

PC0

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.1.2

Subnet Mask 255.255.255.0

Default Gateway 192.168.1.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::202:16FF:FEA6:BA6D

Default Gateway

DNS Server

PC1

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.1.3

Subnet Mask 255.255.255.0

Default Gateway 192.168.1.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

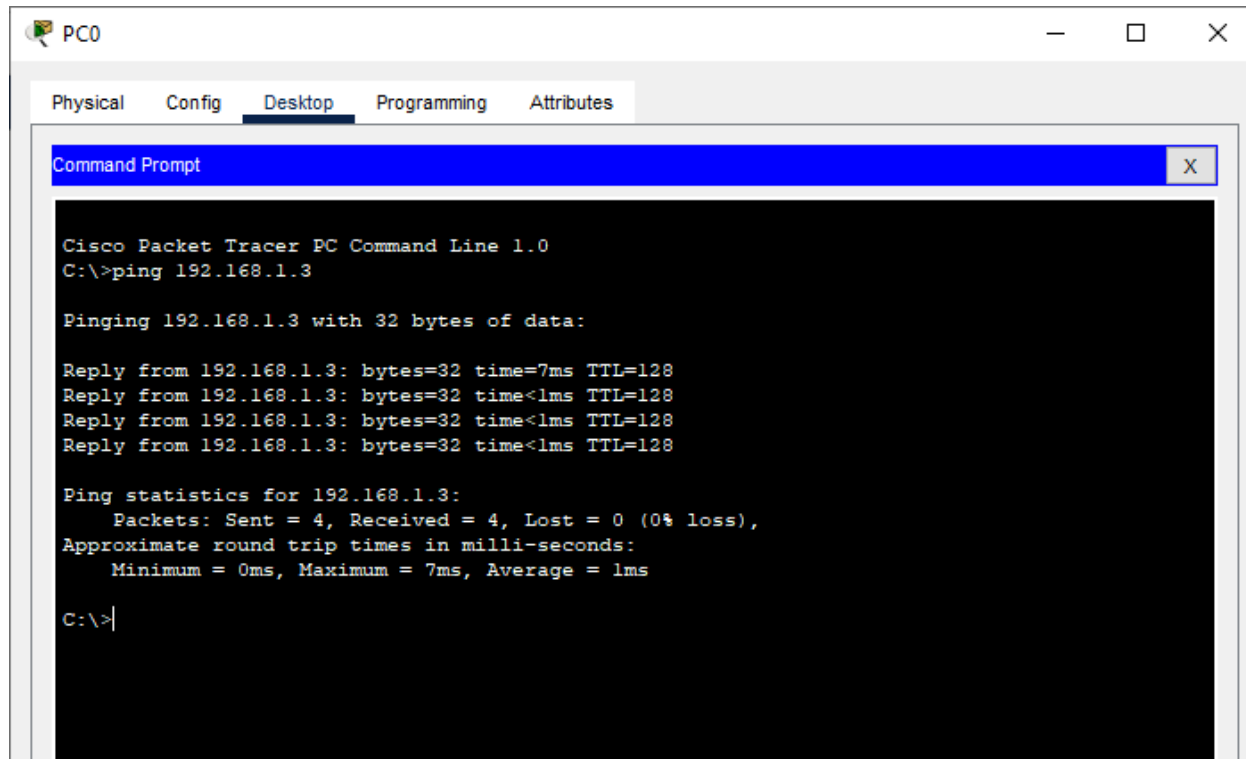
Link Local Address FE80::206:2AFF:FE01:EEDE

Default Gateway

DNS Server

802.1X

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



The screenshot shows a window titled 'PC0' with a tabbed interface. The 'Desktop' tab is active, displaying a 'Command Prompt' window. The Command Prompt shows the execution of a ping command from PC0 to PC1 (192.168.1.3). The output indicates successful connectivity with 0% packet loss and a round trip time of 7ms.

```
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.

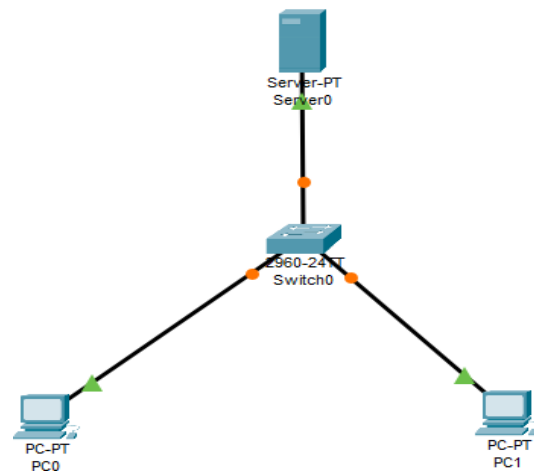
DHCP provides the following benefits.

- 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

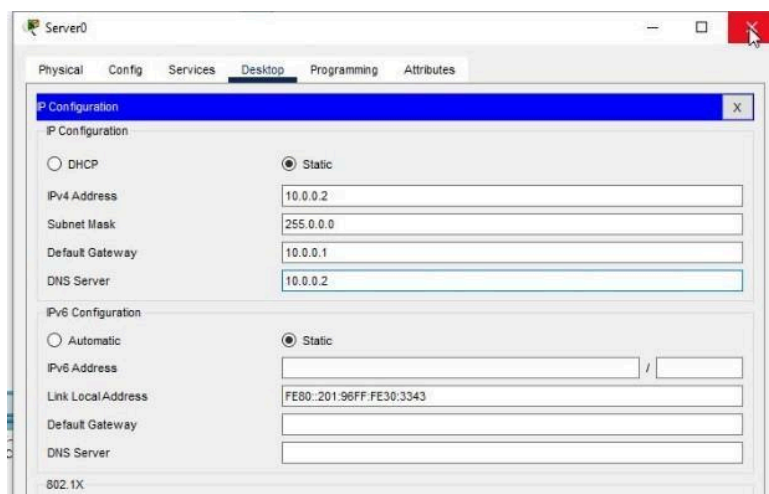
DHCP runs at the application layer of the Transmission Control Protocol/IP (TCP/IP) stack to dynamically assign IP addresses to DHCP clients and to allocate TCP/IP configuration information to DHCP clients. This includes subnet mask information, default gateway IP addresses and domain name system (DNS)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

We use the following topology for the present case

1. Select two PC's and one server and place it as shown below.
2. Place a switch in the middle of connection as shown below
3. We connect the components using copper straight wire, select fast ethernet



4. Configuring the Server:



5. Enabling and setting the DHCP Service on the Server:

The screenshot shows the 'Server0' configuration window with the 'Services' tab selected. The 'DHCP' service is enabled (radio button selected). The configuration fields are as follows:

- Interface: FastEthernet0
- Service: On
- Pool Name: serverPool
- Default Gateway: 10.0.0.1
- DNS Server: 10.0.0.2
- Start IP Address: 10.0.0.3
- Subnet Mask: 255.0.0.0
- Maximum Number of Users: 512
- TFTP Server: 0.0.0.0
- WLC Address: 0.0.0.0

Buttons: Add, Save, Remove

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
serverPool	10.0.0.1	10.0.0.2	10.0.0.3	255.0.0.0	512	0.0.0.0	0.0.0.0

6. Verifying the Dynamic Addressing on both the PCs:

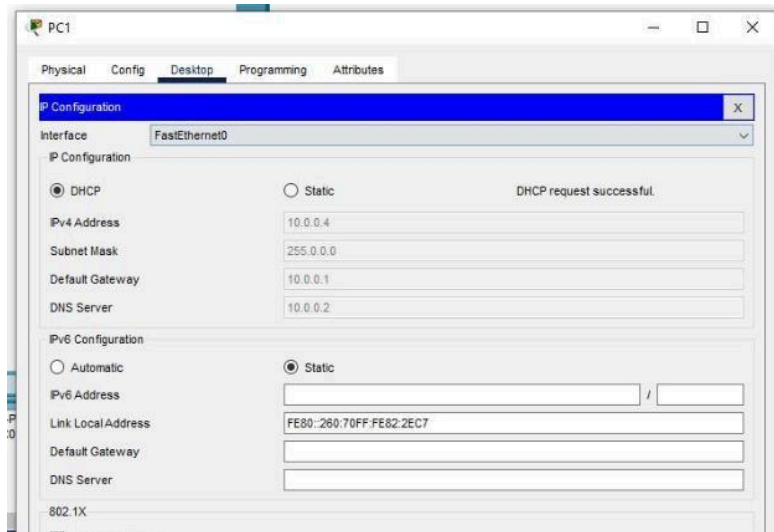
The screenshot shows the 'PC0' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing the following settings:

- Interface: FastEthernet0
- IP Configuration: DHCP (radio button selected)
- IPv4 Address: 10.0.0.3
- Subnet Mask: 255.0.0.0
- Default Gateway: 10.0.0.1
- DNS Server: 10.0.0.2

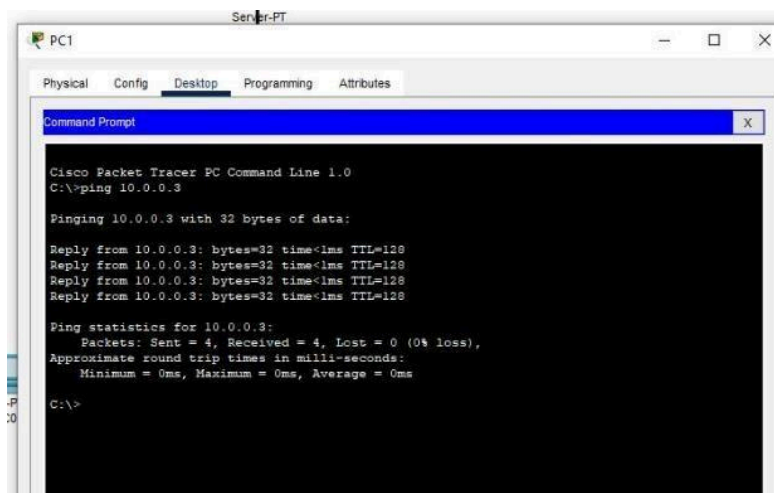
IPv6 Configuration:

- Automatic: (radio button selected)
- Static: (radio button selected)
- IPv6 Address: /
- Link Local Address: FE80::260:5CFF:FE65:CD24
- Default Gateway: /
- DNS Server: /

Bottom status: R02 1X



7. 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.

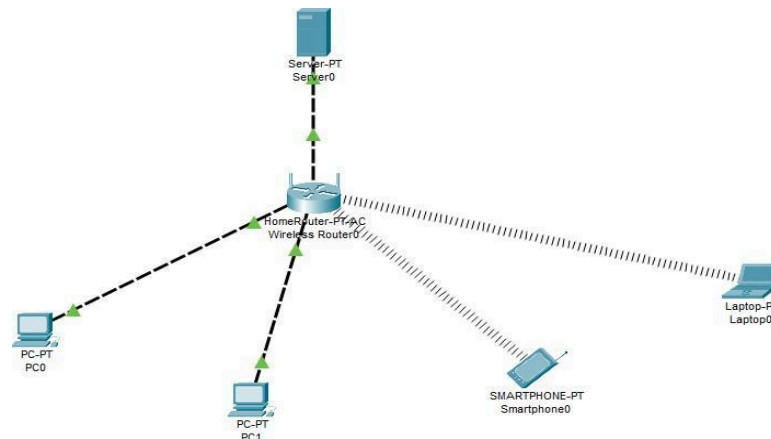
- 1) It is easier to set up compared to setting up a wired network.
- 2) It is more convenient to access.
- 3) It is less complicated to add new users in the network.
- 4) It gives users more flexibility to stay online even when moving from one area in the office to another.
- 5) Guest users can have 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



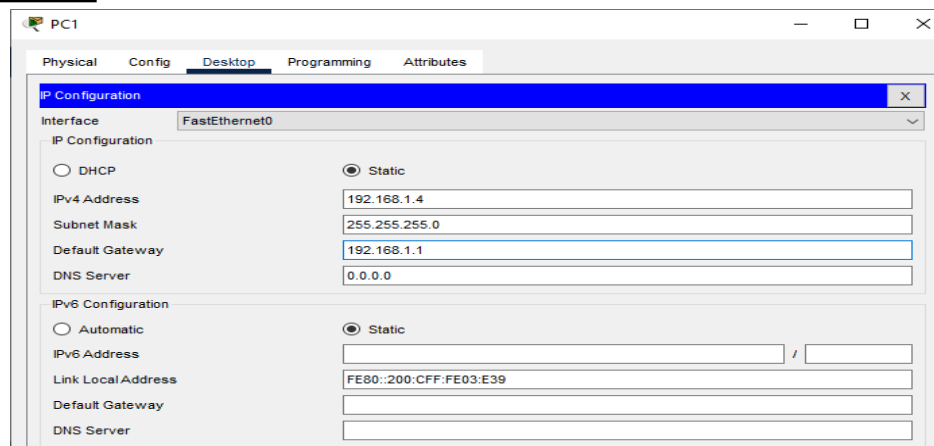
Configure the Server:

The screenshot shows the configuration window for Server0. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Static' option is chosen. The IPv4 Address is set to 192.168.1.2, the Subnet Mask is 255.255.255.0, the Default Gateway is 192.168.1.1, and the DNS Server is 0.0.0.0. The IPv6 Configuration section shows the 'Static' option selected, with the Link Local Address set to FE80::201:43FF:FECD:D046.

Configure PC0:

The screenshot shows the configuration window for PC0. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Static' option is chosen. The IPv4 Address is set to 192.168.1.3, the Subnet Mask is 255.255.255.0, the Default Gateway is 192.168.1.1, and the DNS Server is 0.0.0.0. The IPv6 Configuration section shows the 'Static' option selected, with the Link Local Address set to FE80::202:17FF:FEA8:7204.

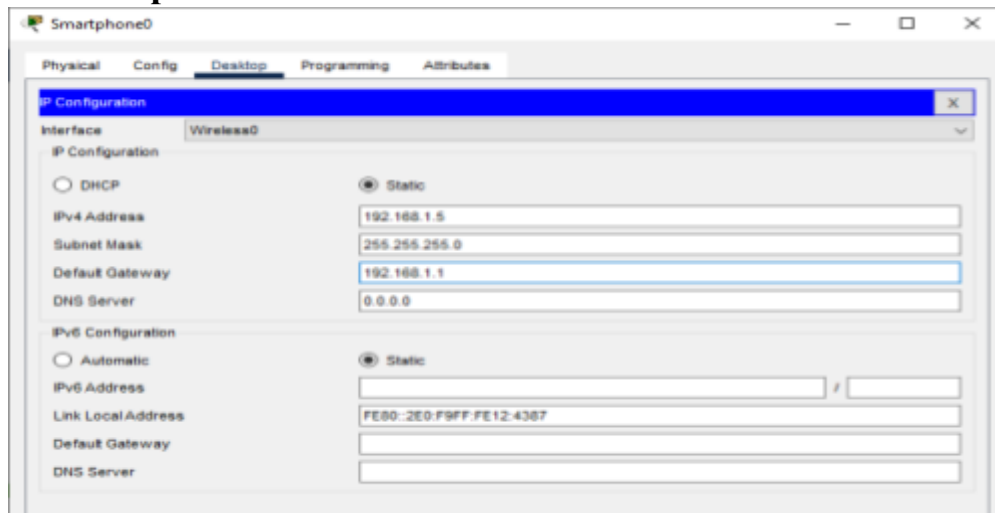
Configure PC1:



The screenshot shows the 'PC1' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing settings for the 'FastEthernet0' interface. The 'Static' radio button is selected under 'IP Configuration'. The 'IPv4 Address' is set to 192.168.1.4, 'Subnet Mask' to 255.255.255.0, 'Default Gateway' to 192.168.1.1, and 'DNS Server' to 0.0.0.0. The 'IPv6 Configuration' section is also expanded, showing 'Static' selected, with 'IPv6 Address' left blank, 'Link Local Address' set to FE80::200:CFF:FE03:E39, and 'Default Gateway' and 'DNS Server' left blank.

Field	Value
Interface	FastEthernet0
IP Configuration	Static
IPv4 Address	192.168.1.4
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
DNS Server	0.0.0.0
IPv6 Configuration	Static
IPv6 Address	
Link Local Address	FE80::200:CFF:FE03:E39
Default Gateway	
DNS Server	

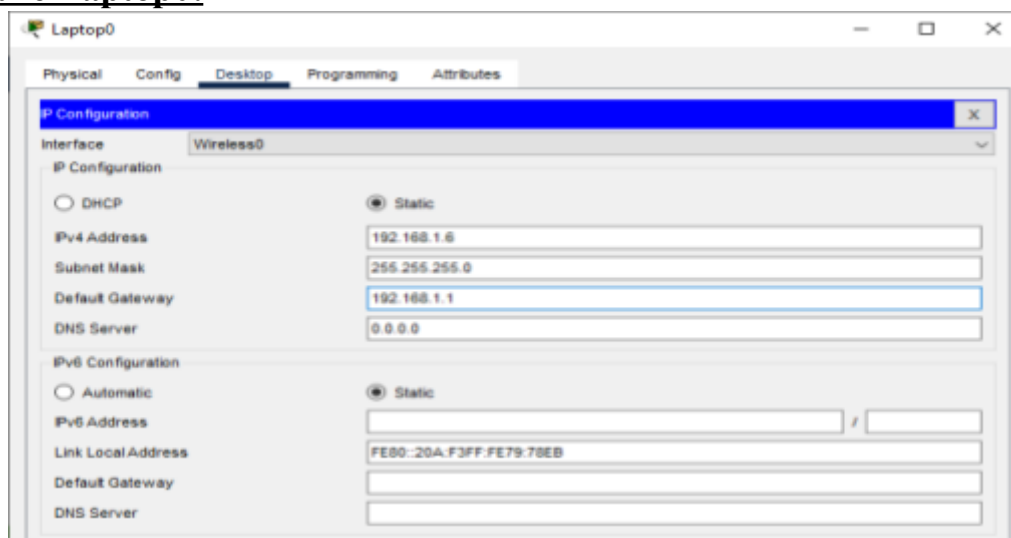
Configure Smartphone0:



The screenshot shows the 'Smartphone0' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing settings for the 'Wireless0' interface. The 'Static' radio button is selected under 'IP Configuration'. The 'IPv4 Address' is set to 192.168.1.5, 'Subnet Mask' to 255.255.255.0, 'Default Gateway' to 192.168.1.1, and 'DNS Server' to 0.0.0.0. The 'IPv6 Configuration' section is also expanded, showing 'Static' selected, with 'IPv6 Address' left blank, 'Link Local Address' set to FE80::2E0:F9FF:FE12:43B7, and 'Default Gateway' and 'DNS Server' left blank.

Field	Value
Interface	Wireless0
IP Configuration	Static
IPv4 Address	192.168.1.5
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
DNS Server	0.0.0.0
IPv6 Configuration	Static
IPv6 Address	
Link Local Address	FE80::2E0:F9FF:FE12:43B7
Default Gateway	
DNS Server	

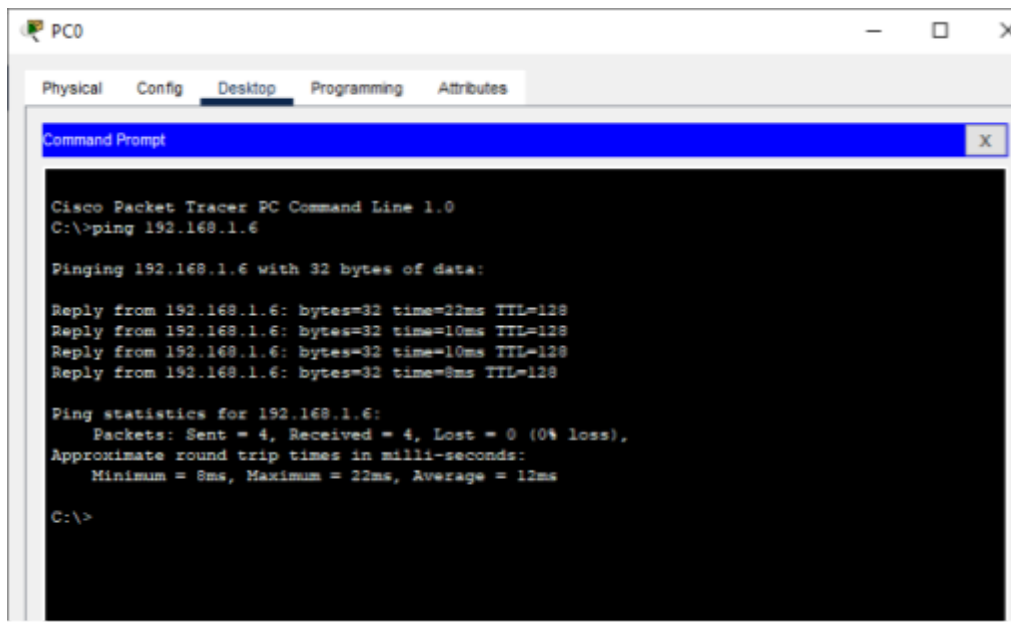
Configure Laptop0:



The screenshot shows the 'Laptop0' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing settings for the 'Wireless0' interface. The 'Static' radio button is selected under 'IP Configuration'. The 'IPv4 Address' is set to 192.168.1.6, 'Subnet Mask' to 255.255.255.0, 'Default Gateway' to 192.168.1.1, and 'DNS Server' to 0.0.0.0. The 'IPv6 Configuration' section is also expanded, showing 'Static' selected, with 'IPv6 Address' left blank, 'Link Local Address' set to FE80::20A:F3FF:FET9:78EB, and 'Default Gateway' and 'DNS Server' left blank.

Field	Value
Interface	Wireless0
IP Configuration	Static
IPv4 Address	192.168.1.6
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
DNS Server	0.0.0.0
IPv6 Configuration	Static
IPv6 Address	
Link Local Address	FE80::20A:F3FF:FET9:78EB
Default Gateway	
DNS Server	

Checking the connectivity (pinging laptop0 from PC0):



```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
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

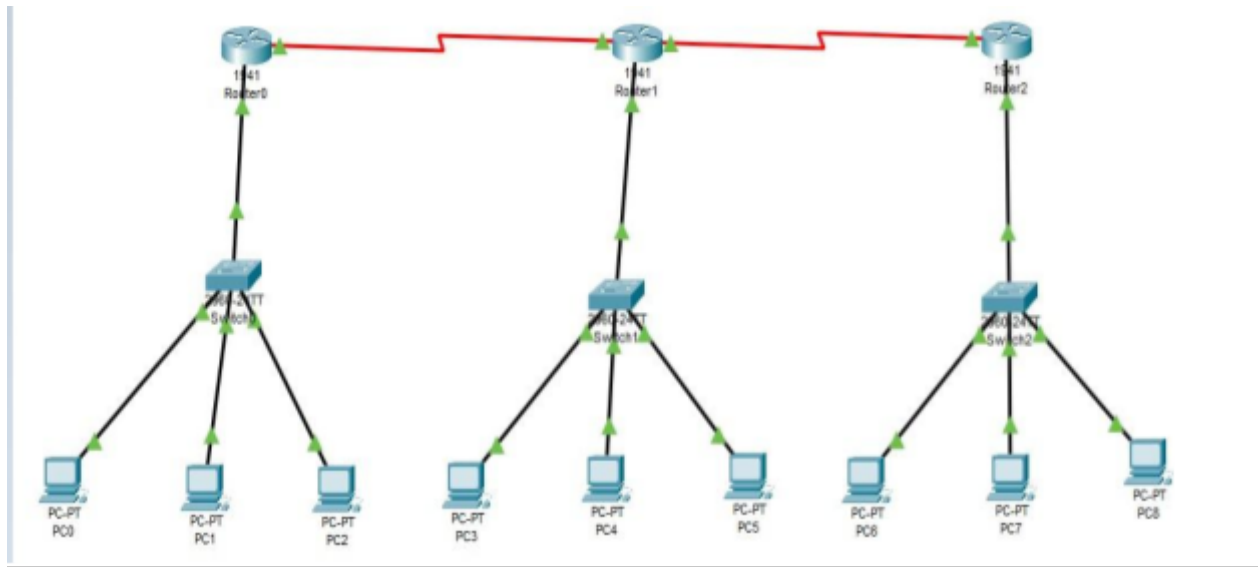
Pros:

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.

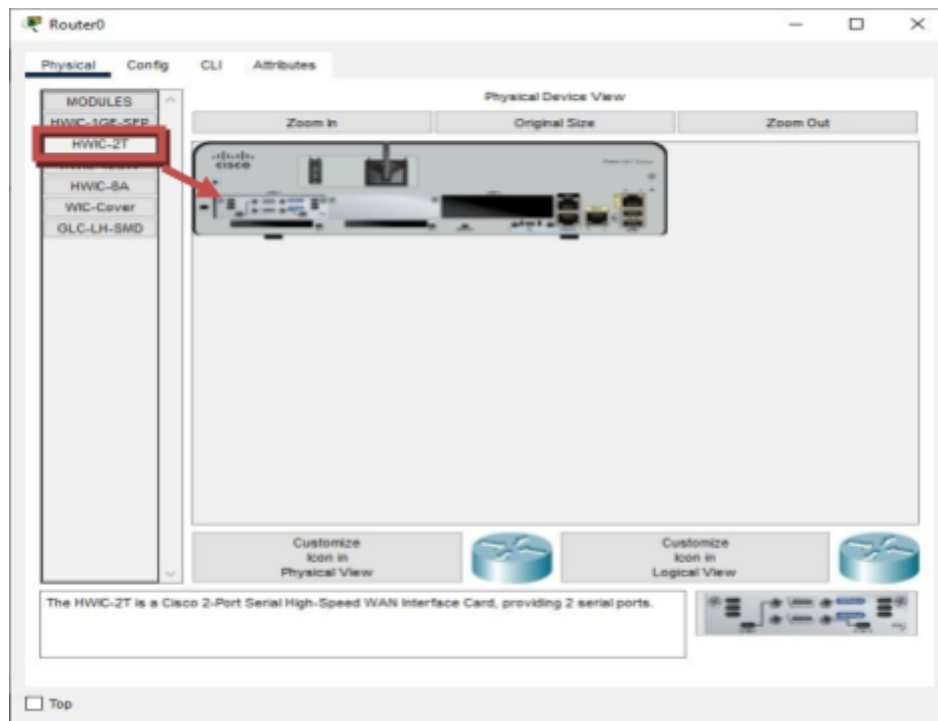
We use the following topology for the present case



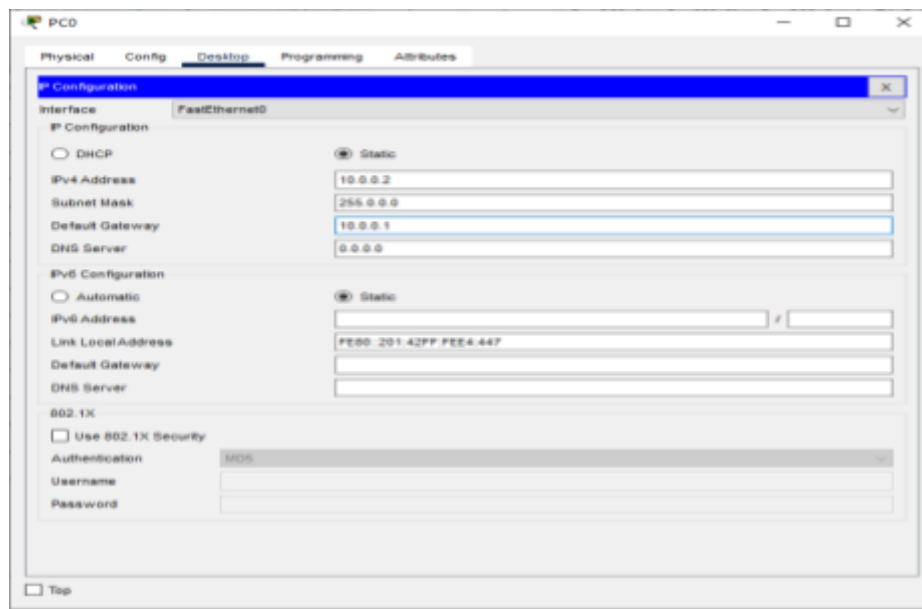
We configure the above network using the following IP addresses

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	FastEthernet0	10.0.0.2	10.0.0.0	10.0.0.1
PC1	FastEthernet0	10.0.0.3	10.0.0.0	10.0.0.1
PC2	FastEthernet0	10.0.0.4	10.0.0.0	10.0.0.1
PC3	FastEthernet0	20.0.0.2	20.0.0.0	20.0.0.1
PC4	FastEthernet0	20.0.0.3	20.0.0.0	20.0.0.1
PC5	FastEthernet0	20.0.0.4	20.0.0.0	20.0.0.1
PC6	FastEthernet0	30.0.0.2	30.0.0.0	30.0.0.1
PC7	FastEthernet0	30.0.0.3	30.0.0.0	30.0.0.1
PC8	FastEthernet0	30.0.0.4	30.0.0.0	30.0.0.1

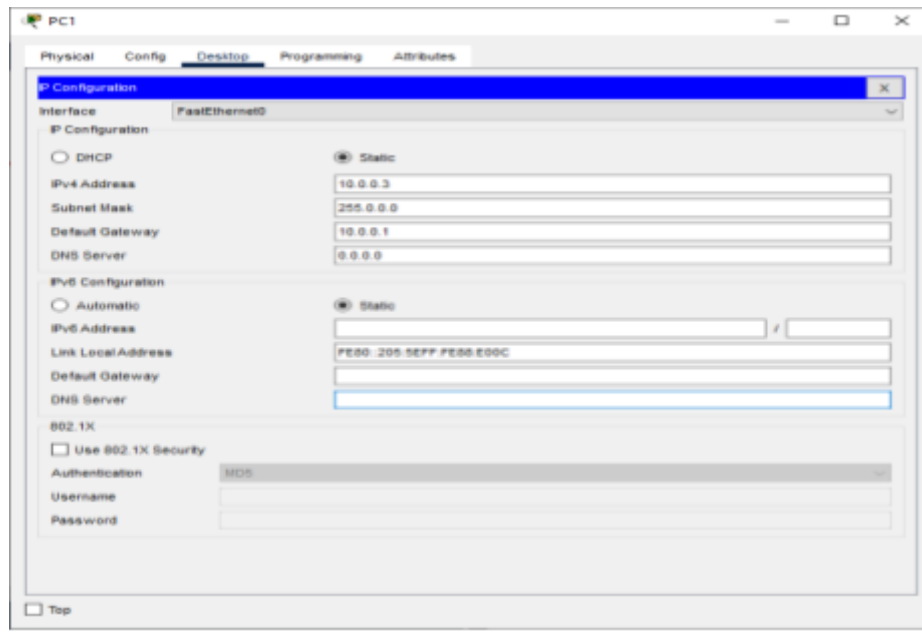
Adding Serial Interface in each Router



Configuring PC0:



Configuring PC1:



The screenshot shows the 'PC1' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing settings for the 'FastEthernet0' interface. The 'IP Configuration' section has two radio buttons: 'DHCP' (unselected) and 'Static' (selected). The 'Static' configuration includes the following fields:

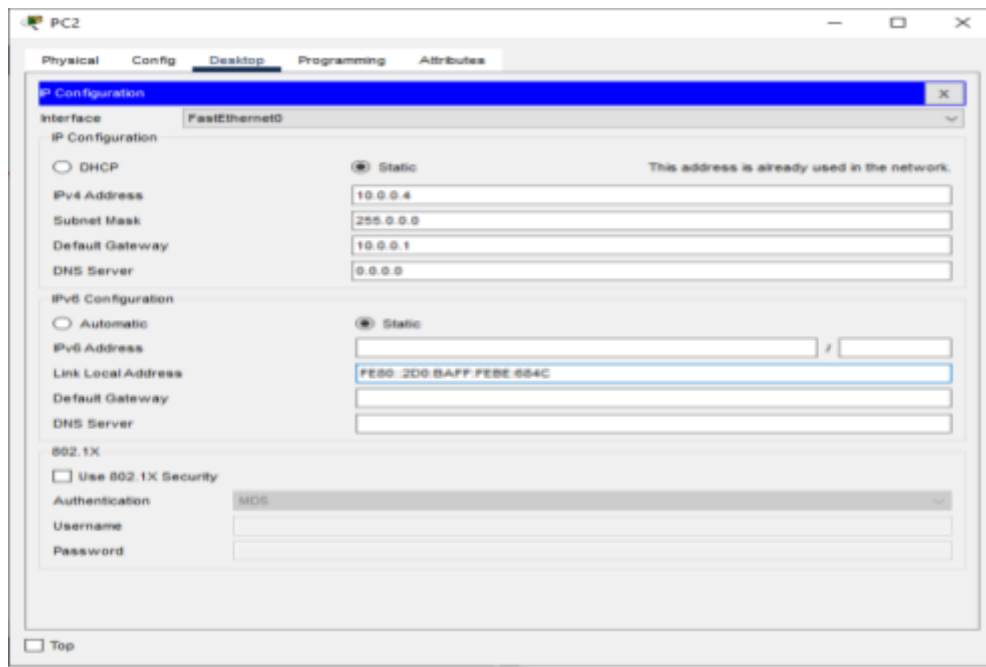
- IPv4 Address: 10.0.0.3
- Subnet Mask: 255.0.0.0
- Default Gateway: 10.0.0.1
- DNS Server: 0.0.0.0

The 'IPv6 Configuration' section also has two radio buttons: 'Automatic' (unselected) and 'Static' (selected). The 'Static' configuration includes the following fields:

- IPv6 Address: (empty)
- Link Local Address: FE80:205:5E7F:FE80:E00C
- Default Gateway: (empty)
- DNS Server: (empty)

Below the IPv6 configuration, there is a section for '802.1X' with a checkbox 'Use 802.1X Security' (unchecked). The 'Authentication' dropdown is set to 'MD5'. The 'Username' and 'Password' fields are empty.

Configuring PC2:



The screenshot shows the 'PC2' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing settings for the 'FastEthernet0' interface. The 'IP Configuration' section has two radio buttons: 'DHCP' (unselected) and 'Static' (selected). The 'Static' configuration includes the following fields:

- IPv4 Address: 10.0.0.4
- Subnet Mask: 255.0.0.0
- Default Gateway: 10.0.0.1
- DNS Server: 0.0.0.0

A warning message 'This address is already used in the network.' is displayed next to the IPv4 Address field.

The 'IPv6 Configuration' section also has two radio buttons: 'Automatic' (unselected) and 'Static' (selected). The 'Static' configuration includes the following fields:

- IPv6 Address: (empty)
- Link Local Address: FE80:2D0:BAFF:FE8E:664C
- Default Gateway: (empty)
- DNS Server: (empty)

Below the IPv6 configuration, there is a section for '802.1X' with a checkbox 'Use 802.1X Security' (unchecked). The 'Authentication' dropdown is set to 'MD5'. The 'Username' and 'Password' fields are empty.

Configuring PC3:

The screenshot shows the configuration window for PC3. The 'Desktop' tab is selected. The 'IP Configuration' section is expanded, showing the 'FastEthernet0' interface. The 'Static' radio button is selected for both IPv4 and IPv6 configurations. The IPv4 configuration fields are filled with: IPv4 Address: 20.0.0.2, Subnet Mask: 255.0.0.0, Default Gateway: 20.0.0.1, and DNS Server: 0.0.0.0. The IPv6 configuration fields are: IPv6 Address: (empty), Link Local Address: FE80::202:17FF:FE81:A06, Default Gateway: (empty), and DNS Server: (empty). The '802.1X' section is collapsed. A 'Top' button is at the bottom left.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP <input checked="" type="radio"/> Static	
IPv4 Address	20.0.0.2
Subnet Mask	255.0.0.0
Default Gateway	20.0.0.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic <input checked="" type="radio"/> Static	
IPv6 Address	
Link Local Address	FE80::202:17FF:FE81:A06
Default Gateway	
DNS Server	
802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MDS
Username	
Password	

☐ Top

Configuring PC4:

The screenshot shows the configuration window for PC4. The 'Desktop' tab is selected. The 'IP Configuration' section is expanded, showing the 'FastEthernet0' interface. The 'Static' radio button is selected for both IPv4 and IPv6 configurations. The IPv4 configuration fields are filled with: IPv4 Address: 20.0.0.3, Subnet Mask: 255.0.0.0, Default Gateway: 20.0.0.1, and DNS Server: 0.0.0.0. The IPv6 configuration fields are: IPv6 Address: (empty), Link Local Address: FE80::20A:41FF:FE13:AB7E, Default Gateway: (empty), and DNS Server: (empty). The '802.1X' section is collapsed. A 'Top' button is at the bottom left.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP <input checked="" type="radio"/> Static	
IPv4 Address	20.0.0.3
Subnet Mask	255.0.0.0
Default Gateway	20.0.0.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic <input checked="" type="radio"/> Static	
IPv6 Address	
Link Local Address	FE80::20A:41FF:FE13:AB7E
Default Gateway	
DNS Server	
802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MDS
Username	
Password	

☐ Top

PC5

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 20.0.0.4

Subnet Mask 255.0.0.0

Default Gateway 20.0.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80-2E0-F9FF-FE0D-3AA

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

☐ Top

Configuring PC6:

PC6

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 30.0.0.2

Subnet Mask 255.0.0.0

Default Gateway 30.0.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80-2E0-F9FF-FE9A-D3AA

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

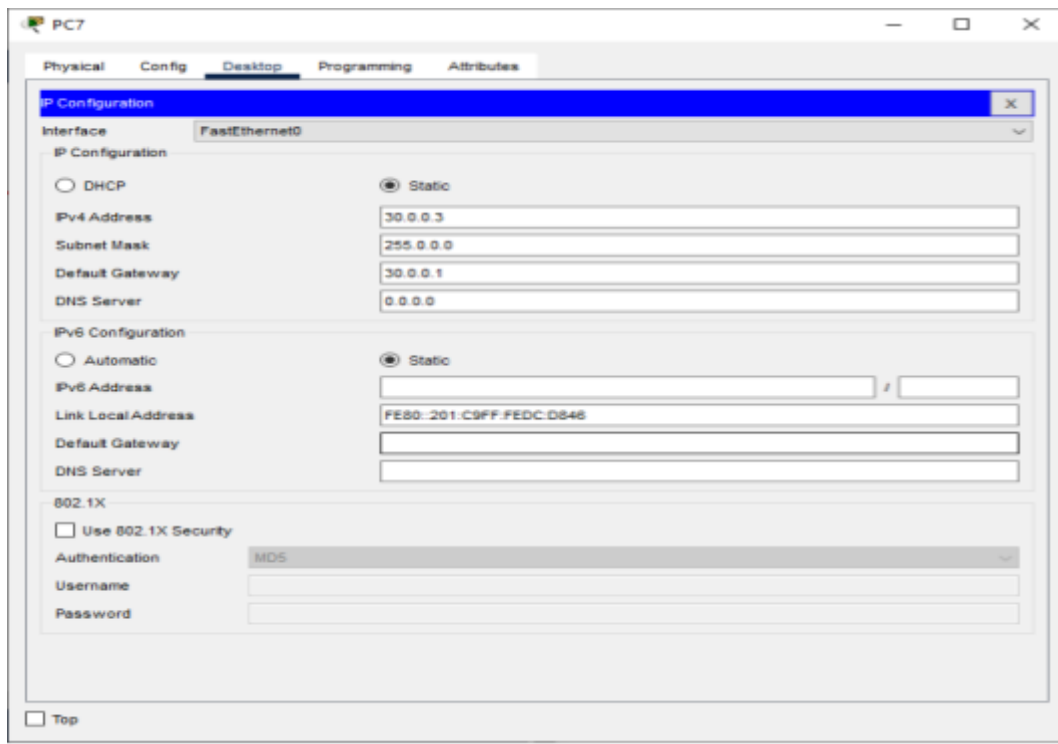
Authentication MD5

Username

Password

☐ Top

Configuring PC7:



The screenshot shows the configuration window for PC7. The 'Desktop' tab is selected. The 'IP Configuration' section is expanded, showing the 'FastEthernet0' interface. The 'Static' radio button is selected under 'IP Configuration'. The IPv4 Address is set to 30.0.0.3, Subnet Mask to 255.0.0.0, Default Gateway to 30.0.0.1, and DNS Server to 0.0.0.0. The IPv6 Configuration section shows 'Static' selected, with IPv6 Address, Link Local Address (FE80::201:C9FF:FE0C:D846), Default Gateway, and DNS Server fields. The 802.1X section shows 'Use 802.1X Security' unchecked, Authentication set to MDS, and Username and Password fields.

PC7

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 30.0.0.3

Subnet Mask: 255.0.0.0

Default Gateway: 30.0.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::201:C9FF:FE0C:D846

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

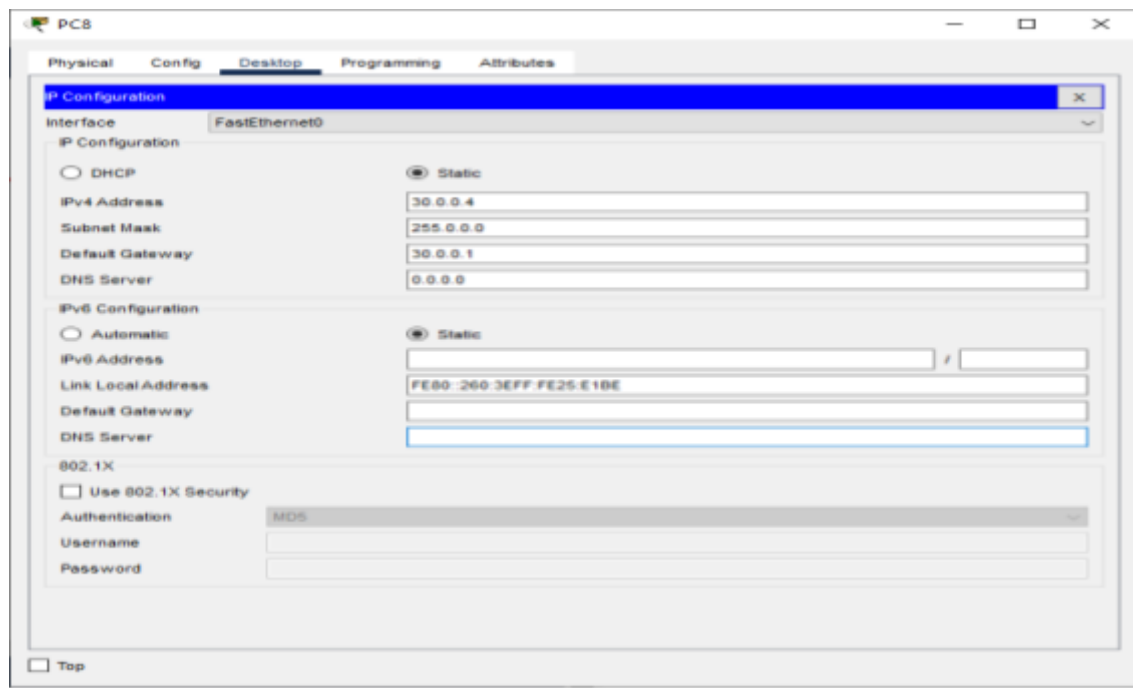
Authentication: MDS

Username:

Password:

☐ Top

Configuring PC8:



The screenshot shows the configuration window for PC8. The 'Desktop' tab is selected. The 'IP Configuration' section is expanded, showing the 'FastEthernet0' interface. The 'Static' radio button is selected under 'IP Configuration'. The IPv4 Address is set to 30.0.0.4, Subnet Mask to 255.0.0.0, Default Gateway to 30.0.0.1, and DNS Server to 0.0.0.0. The IPv6 Configuration section shows 'Static' selected, with IPv6 Address, Link Local Address (FE80::260:3EFF:FE25:E18E), Default Gateway, and DNS Server fields. The 802.1X section shows 'Use 802.1X Security' unchecked, Authentication set to MDS, and Username and Password fields.

PC8

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 30.0.0.4

Subnet Mask: 255.0.0.0

Default Gateway: 30.0.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::260:3EFF:FE25:E18E

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MDS

Username:

Password:

☐ Top

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 192.168.1.2
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 192.168.1.4
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 192.168.0.4
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

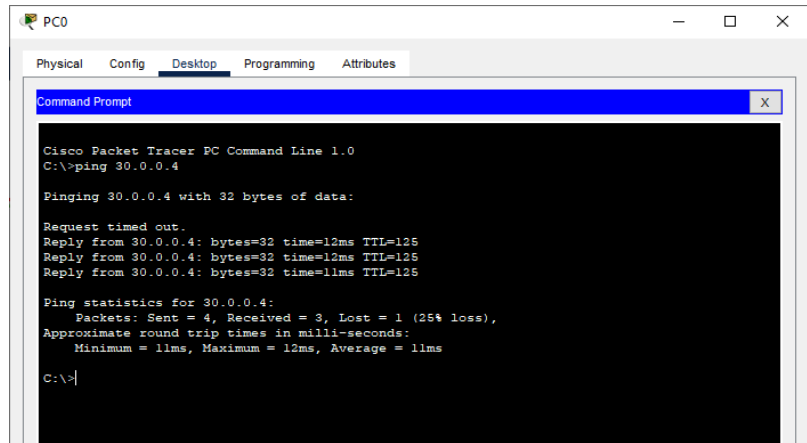
```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 192.168.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#network 192.168.1.0
Router(config-router)#exit
Router(config)#
Router#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

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



```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 30.0.0.4

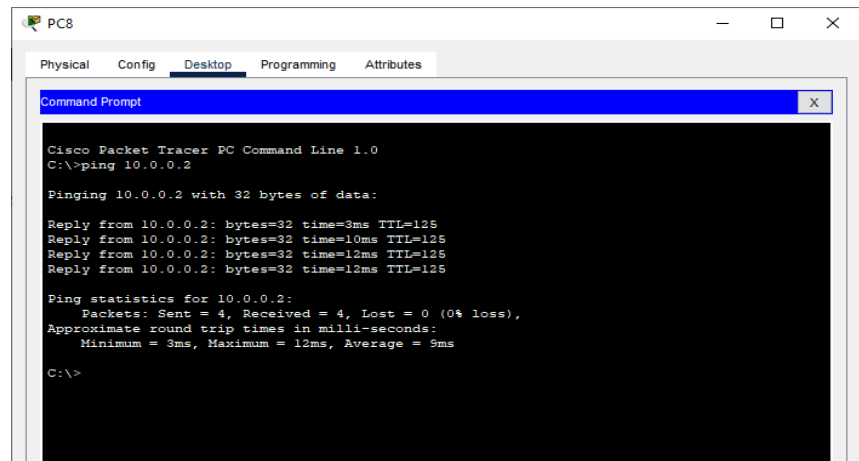
Pinging 30.0.0.4 with 32 bytes of data:

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



```
PC8
Physical Config Desktop Programming Attributes
Command Prompt
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 discontinuous 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.

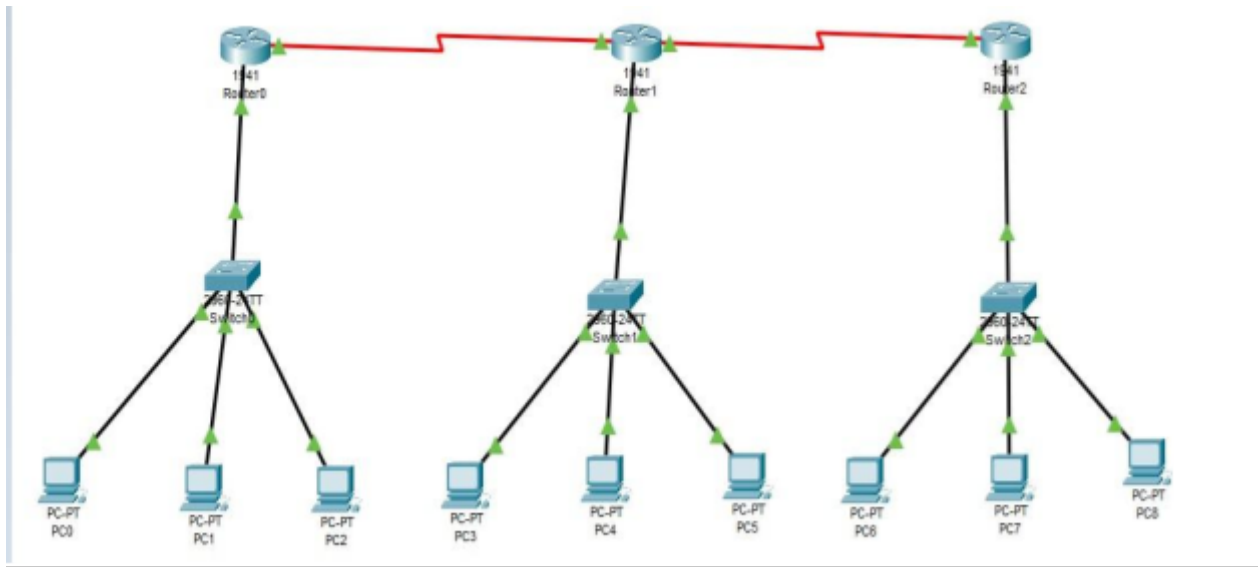
Advantages of RIPv2

- 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).

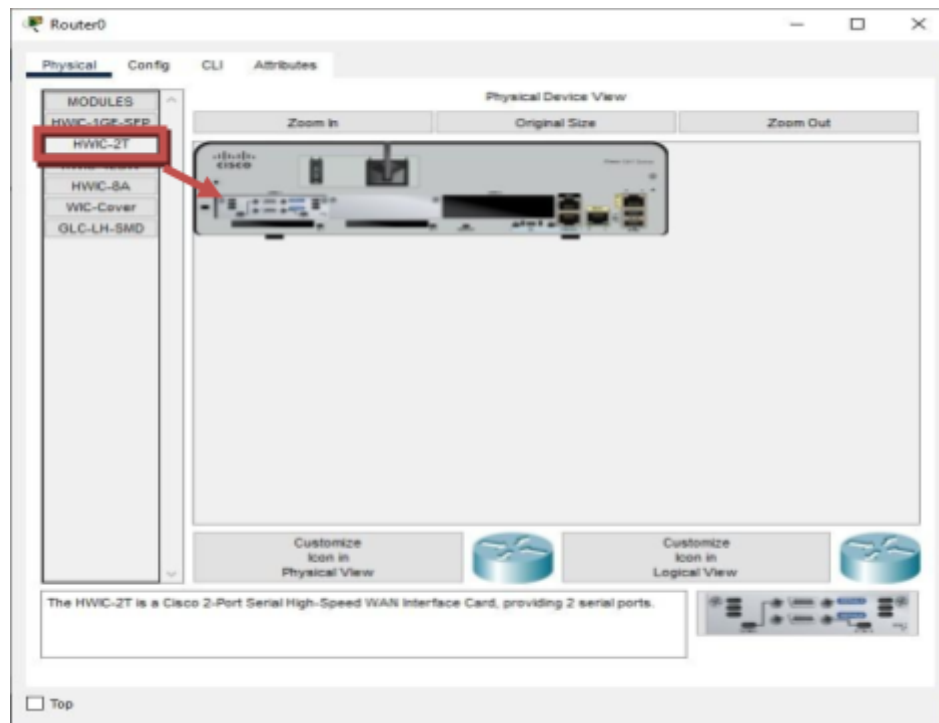
We use the following topology for the present case



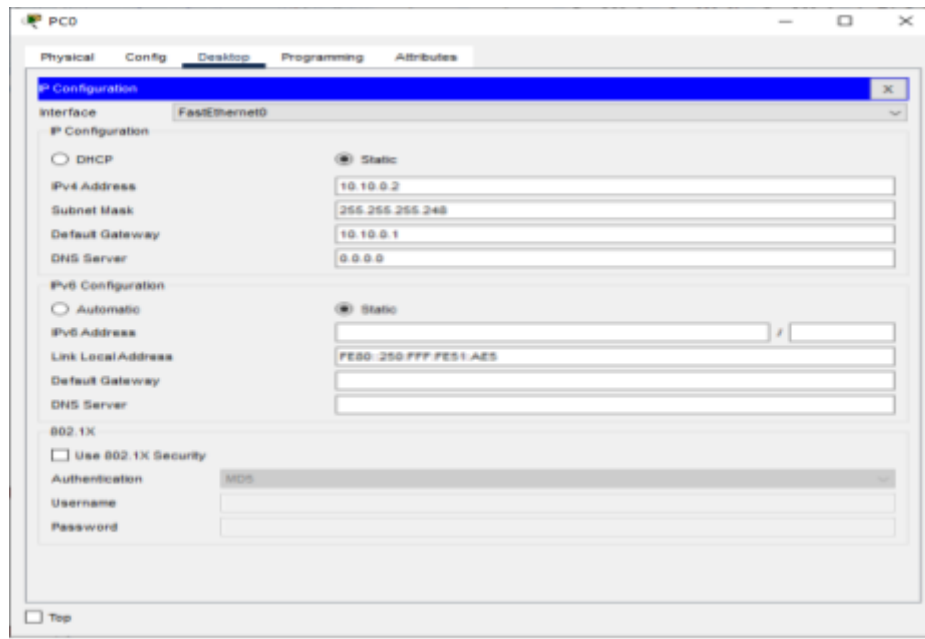
We configure the above network using the following IP addresses

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	FastEthernet0	10.10.0.2	255.255.255.248	10.10.0.0	10.10.0.1
PC1	FastEthernet0	10.10.0.3	255.255.255.248	10.10.0.0	10.10.0.1
PC2	FastEthernet0	10.10.0.4	255.255.255.248	10.10.0.0	10.10.0.1
PC3	FastEthernet0	10.20.0.2	255.255.255.248	10.20.0.0	10.20.0.1
PC4	FastEthernet0	10.20.0.3	255.255.255.248	10.20.0.0	10.20.0.1
PC5	FastEthernet0	10.20.0.4	255.255.255.248	10.20.0.0	10.20.0.1
PC6	FastEthernet0	10.30.0.2	255.255.255.248	10.30.0.0	10.30.0.1
PC7	FastEthernet0	10.30.0.3	255.255.255.248	10.30.0.0	10.30.0.1
PC8	FastEthernet0	10.30.0.4	255.255.255.248	10.30.0.0	10.30.0.1

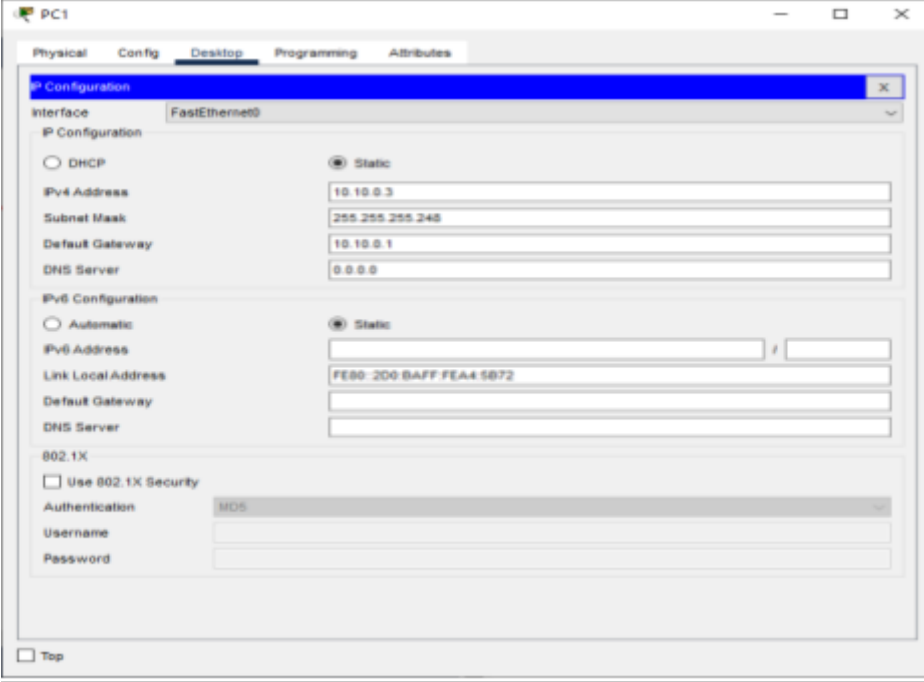
Adding Serial Interface in each Router



Configuring PC0:



Configuring PC1:

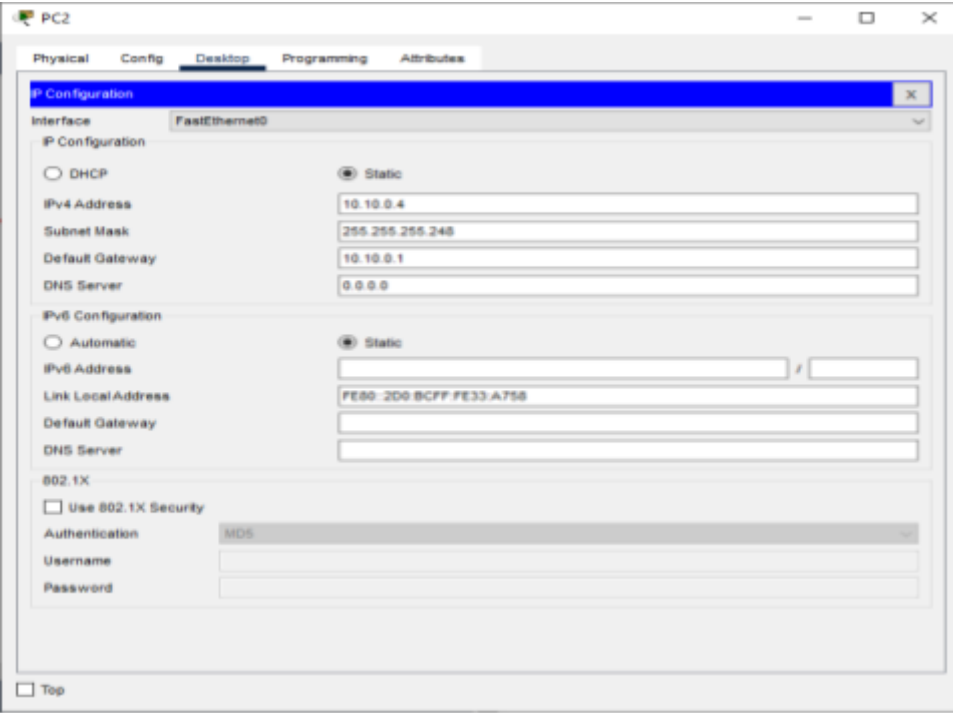


The screenshot shows the 'PC1' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing settings for the 'FastEthernet0' interface. The 'IP Configuration' section has two radio buttons: 'DHCP' (unselected) and 'Static' (selected). Below these are fields for 'IPv4 Address' (10.10.0.3), 'Subnet Mask' (255.255.255.248), 'Default Gateway' (10.10.0.1), and 'DNS Server' (0.0.0.0). The 'IPv6 Configuration' section also has two radio buttons: 'Automatic' (unselected) and 'Static' (selected). Below these are fields for 'IPv6 Address' (empty), 'Link Local Address' (FE80::200:BAFF:FEA4:5B72), 'Default Gateway' (empty), and 'DNS Server' (empty). The '802.1X' section has a checkbox for 'Use 802.1X Security' (unchecked), a dropdown for 'Authentication' (set to 'MD5'), and fields for 'Username' and 'Password' (both empty). A 'Top' button is at the bottom left.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP <input checked="" type="radio"/> Static	
IPv4 Address	10.10.0.3
Subnet Mask	255.255.255.248
Default Gateway	10.10.0.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic <input checked="" type="radio"/> Static	
IPv6 Address	
Link Local Address	FE80::200:BAFF:FEA4:5B72
Default Gateway	
DNS Server	
802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Configuring PC2:



The screenshot shows the 'PC2' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing settings for the 'FastEthernet0' interface. The 'IP Configuration' section has two radio buttons: 'DHCP' (unselected) and 'Static' (selected). Below these are fields for 'IPv4 Address' (10.10.0.4), 'Subnet Mask' (255.255.255.248), 'Default Gateway' (10.10.0.1), and 'DNS Server' (0.0.0.0). The 'IPv6 Configuration' section also has two radio buttons: 'Automatic' (unselected) and 'Static' (selected). Below these are fields for 'IPv6 Address' (empty), 'Link Local Address' (FE80::200:BCFF:FE33:A758), 'Default Gateway' (empty), and 'DNS Server' (empty). The '802.1X' section has a checkbox for 'Use 802.1X Security' (unchecked), a dropdown for 'Authentication' (set to 'MD5'), and fields for 'Username' and 'Password' (both empty). A 'Top' button is at the bottom left.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP <input checked="" type="radio"/> Static	
IPv4 Address	10.10.0.4
Subnet Mask	255.255.255.248
Default Gateway	10.10.0.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic <input checked="" type="radio"/> Static	
IPv6 Address	
Link Local Address	FE80::200:BCFF:FE33:A758
Default Gateway	
DNS Server	
802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Configuring PC3:

The screenshot shows the configuration window for PC3. The 'Desktop' tab is selected. The 'IP Configuration' section is expanded, showing settings for the 'FastEthernet0' interface. The 'Static' radio button is selected for both IPv4 and IPv6 configurations. The IPv4 address is 10.20.0.2, subnet mask is 255.255.255.248, default gateway is 10.20.0.1, and DNS server is 0.0.0.0. The IPv6 address is empty, link local address is FE80::2E0:8FFF:FE7E:6379, and default gateway and DNS server are empty. The '802.1X' section is collapsed, showing 'Use 802.1X Security' is unchecked, authentication is MD5, and username and password fields are empty.

PC3

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 10.20.0.2

Subnet Mask: 255.255.255.248

Default Gateway: 10.20.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::2E0:8FFF:FE7E:6379

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

Configuring PC4:

The screenshot shows the configuration window for PC4. The 'Desktop' tab is selected. The 'IP Configuration' section is expanded, showing settings for the 'FastEthernet0' interface. The 'Static' radio button is selected for both IPv4 and IPv6 configurations. The IPv4 address is 10.20.0.3, subnet mask is 255.255.255.248, default gateway is 10.20.0.1, and DNS server is 0.0.0.0. The IPv6 address is empty, link local address is FE80::2D0:FFFF:FE8B:2C17, and default gateway and DNS server are empty. The '802.1X' section is collapsed, showing 'Use 802.1X Security' is unchecked, authentication is MD5, and username and password fields are empty.

PC4

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 10.20.0.3

Subnet Mask: 255.255.255.248

Default Gateway: 10.20.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::2D0:FFFF:FE8B:2C17

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

PC5

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 10.20.0.4

Subnet Mask: 255.0.0.0

Default Gateway: 10.20.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::230:F2FF:FE77:CBE7

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MDS

Username:

Password:

☐ Top

Configuring PC6:

PC6

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 10.30.0.2

Subnet Mask: 255.255.255.248

Default Gateway: 10.30.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::200:CFF:FE40:DCD0

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MDS

Username:

Password:

☐ Top

Configuring PC7:

The screenshot shows the configuration window for PC7. The 'Desktop' tab is selected. The 'IP Configuration' section is expanded, showing the 'FastEthernet0' interface. The 'IP Configuration' radio button is selected, and the 'Static' option is chosen. The IPv4 Address is set to 10.30.0.3, Subnet Mask to 255.0.0.0, Default Gateway to 10.30.0.1, and DNS Server to 0.0.0.0. The 'IPv6 Configuration' section is also expanded, showing the 'Static' option selected. The IPv6 Address is empty, Link Local Address is FE80::202:4AFF:FE4A:9D3E, Default Gateway is empty, and DNS Server is empty. The '802.1X' section is expanded, showing the 'Use 802.1X Security' checkbox unchecked, Authentication set to MD5, Username empty, and Password empty. A 'Top' button is at the bottom left.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	10.30.0.3
Subnet Mask	255.0.0.0
Default Gateway	10.30.0.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	
Link Local Address	FE80::202:4AFF:FE4A:9D3E
Default Gateway	
DNS Server	
802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Configuring PC8:

The screenshot shows the configuration window for PC8. The 'Desktop' tab is selected. The 'IP Configuration' section is expanded, showing the 'FastEthernet0' interface. The 'IP Configuration' radio button is selected, and the 'Static' option is chosen. The IPv4 Address is set to 10.30.0.4, Subnet Mask to 255.0.0.0, Default Gateway to 10.30.0.1, and DNS Server to 0.0.0.0. The 'IPv6 Configuration' section is also expanded, showing the 'Static' option selected. The IPv6 Address is empty, Link Local Address is FE80::240:8FF:FE65:D944, Default Gateway is empty, and DNS Server is empty. The '802.1X' section is expanded, showing the 'Use 802.1X Security' checkbox unchecked, Authentication set to MD5, Username empty, and Password empty. A 'Top' button is at the bottom left.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	10.30.0.4
Subnet Mask	255.0.0.0
Default Gateway	10.30.0.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	
Link Local Address	FE80::240:8FF:FE65:D944
Default Gateway	
DNS Server	
802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Configuring IP addresses on Router 0

i) Interface G0/0

The screenshot shows the configuration window for Router0, specifically for the GigabitEthernet0/0 interface. The left sidebar lists various configuration categories: GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under the INTERFACE category, GigabitEthernet0/0 is selected. The main panel displays the configuration for this interface. The Port Status is set to On. The Bandwidth is set to 100 Mbps. The Duplex is set to Full Duplex. The MAC Address is 0090.0C15.A101. The IP Configuration section shows the IPv4 Address as 10.10.0.1 and the Subnet Mask as 255.255.255.248. The Tx Ring Limit is set to 10.

Category	Value
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input type="radio"/> 1000 Mbps <input checked="" type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps
Duplex	<input type="radio"/> Half Duplex <input checked="" type="radio"/> Full Duplex
MAC Address	0090.0C15.A101
IPv4 Address	10.10.0.1
Subnet Mask	255.255.255.248
Tx Ring Limit	10

ii) Interface S0/1/0

The screenshot shows the configuration window for Router0, specifically for the Serial0/1/0 interface. The left sidebar lists various configuration categories: GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under the INTERFACE category, Serial0/1/0 is selected. The main panel displays the configuration for this interface. The Port Status is set to On. The Duplex is set to Full Duplex. The Clock Rate is set to 1200. The IP Configuration section shows the IPv4 Address as 192.168.0.1 and the Subnet Mask as 255.255.255.252. The Tx Ring Limit is set to 10.

Category	Value
Port Status	<input checked="" type="checkbox"/> On
Duplex	<input checked="" type="radio"/> Full Duplex
Clock Rate	1200
IPv4 Address	192.168.0.1
Subnet Mask	255.255.255.252
Tx Ring Limit	10

Configuring IP addresses on Router 1

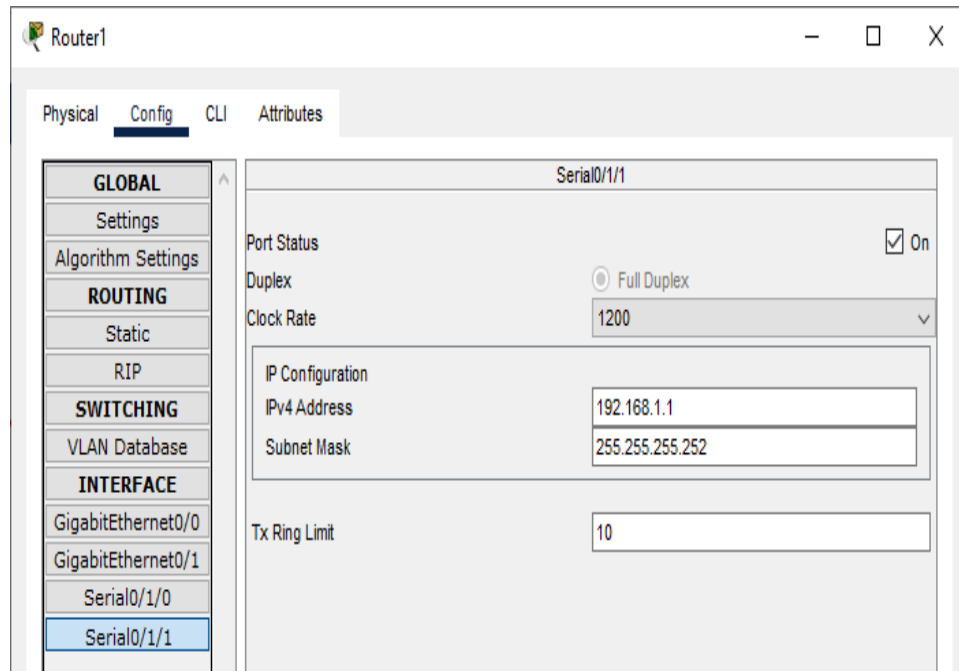
i) Interface G0/0

The screenshot shows the configuration window for Router1, specifically the 'Config' tab for the GigabitEthernet0/0 interface. The left sidebar shows a tree view with categories: GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under the INTERFACE category, GigabitEthernet0/0 is selected. The main configuration area for GigabitEthernet0/0 includes: Port Status (checked On), Bandwidth (radio buttons for 1000 Mbps, 100 Mbps, 10 Mbps, and a checked Auto checkbox), Duplex (radio buttons for Half Duplex, Full Duplex, and a checked Auto checkbox), MAC Address (0001.9670.9B01), IP Configuration (IPv4 Address: 10.20.0.1, Subnet Mask: 255.255.255.248), and Tx Ring Limit (10).

ii) Interface S0/1/0

The screenshot shows the configuration window for Router1, specifically the 'Config' tab for the Serial0/1/0 interface. The left sidebar shows a tree view with categories: GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under the INTERFACE category, Serial0/1/0 is selected. The main configuration area for Serial0/1/0 includes: Port Status (checked On), Duplex (radio buttons for Full Duplex and Half Duplex, with Full Duplex selected), Clock Rate (2000000), IP Configuration (IPv4 Address: 192.168.0.2, Subnet Mask: 255.255.255.252), and Tx Ring Limit (10).

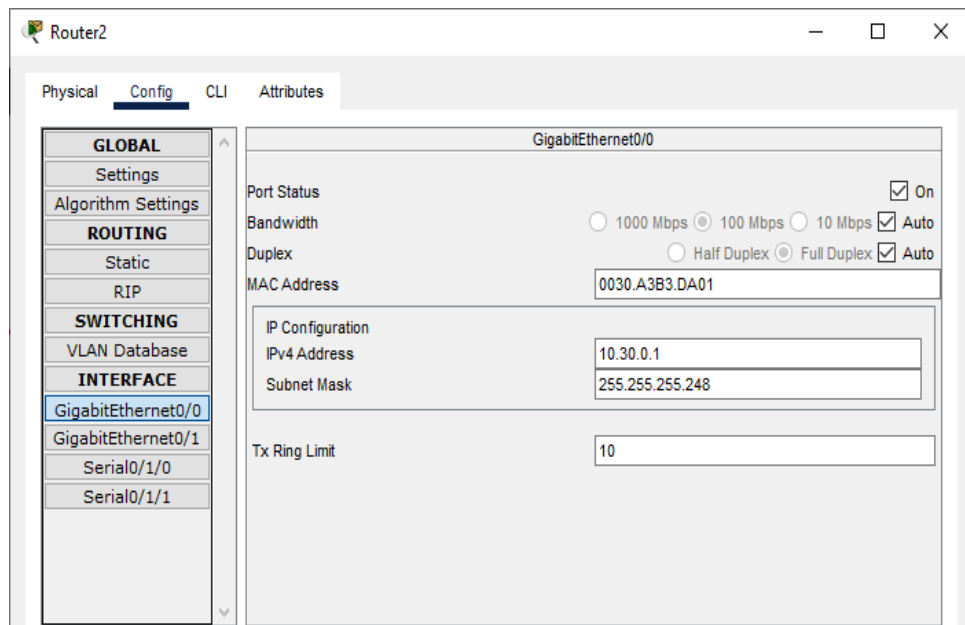
iii) Interface S0/1/1



The screenshot shows the configuration window for Router1, specifically for the Serial0/1/1 interface. The left sidebar contains a tree view with categories: GLOBAL (Settings, Algorithm Settings), ROUTING (Static, RIP), SWITCHING (VLAN Database), and INTERFACE (GigabitEthernet0/0, GigabitEthernet0/1, Serial0/1/0, Serial0/1/1). The Serial0/1/1 interface is selected. The main configuration area for Serial0/1/1 includes: Port Status (checked On), Duplex (radio button selected for Full Duplex), Clock Rate (dropdown menu set to 1200), IP Configuration (IPv4 Address: 192.168.1.1, Subnet Mask: 255.255.255.252), and Tx Ring Limit (text box set to 10).

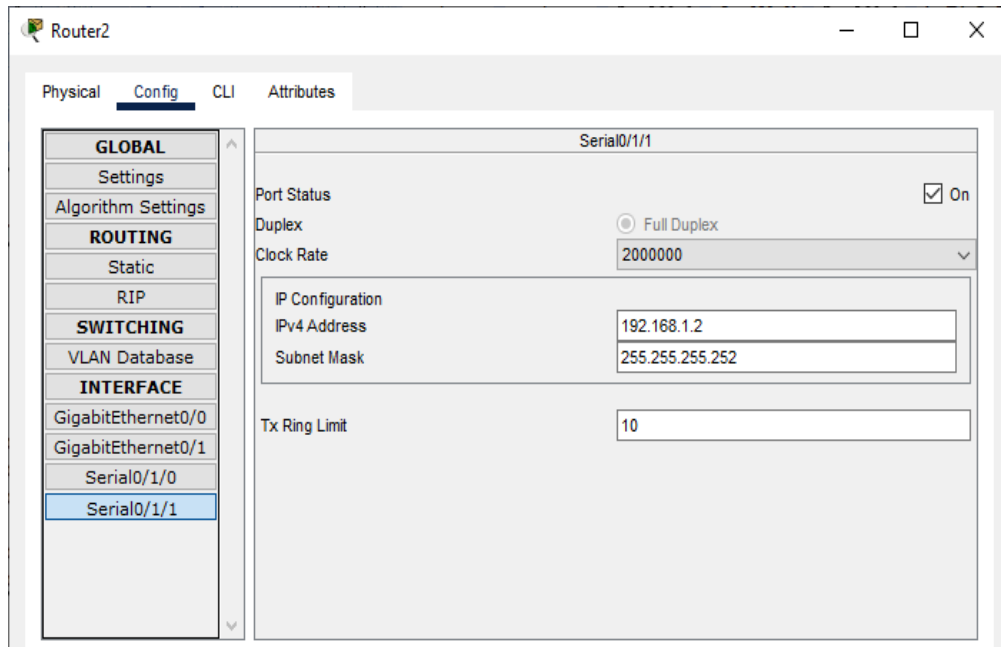
Configuring IP addresses on Router 2

i) Interface G0/0



The screenshot shows the configuration window for Router2, specifically for the GigabitEthernet0/0 interface. The left sidebar contains a tree view with categories: GLOBAL (Settings, Algorithm Settings), ROUTING (Static, RIP), SWITCHING (VLAN Database), and INTERFACE (GigabitEthernet0/0, GigabitEthernet0/1, Serial0/1/0, Serial0/1/1). The GigabitEthernet0/0 interface is selected. The main configuration area for GigabitEthernet0/0 includes: Port Status (checked On), Bandwidth (radio buttons for 1000 Mbps, 100 Mbps, 10 Mbps, and checked Auto), Duplex (radio buttons for Half Duplex, Full Duplex, and checked Auto), MAC Address (text box set to 0030.A3B3.DA01), IP Configuration (IPv4 Address: 10.30.0.1, Subnet Mask: 255.255.255.248), and Tx Ring Limit (text box set to 10).

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)

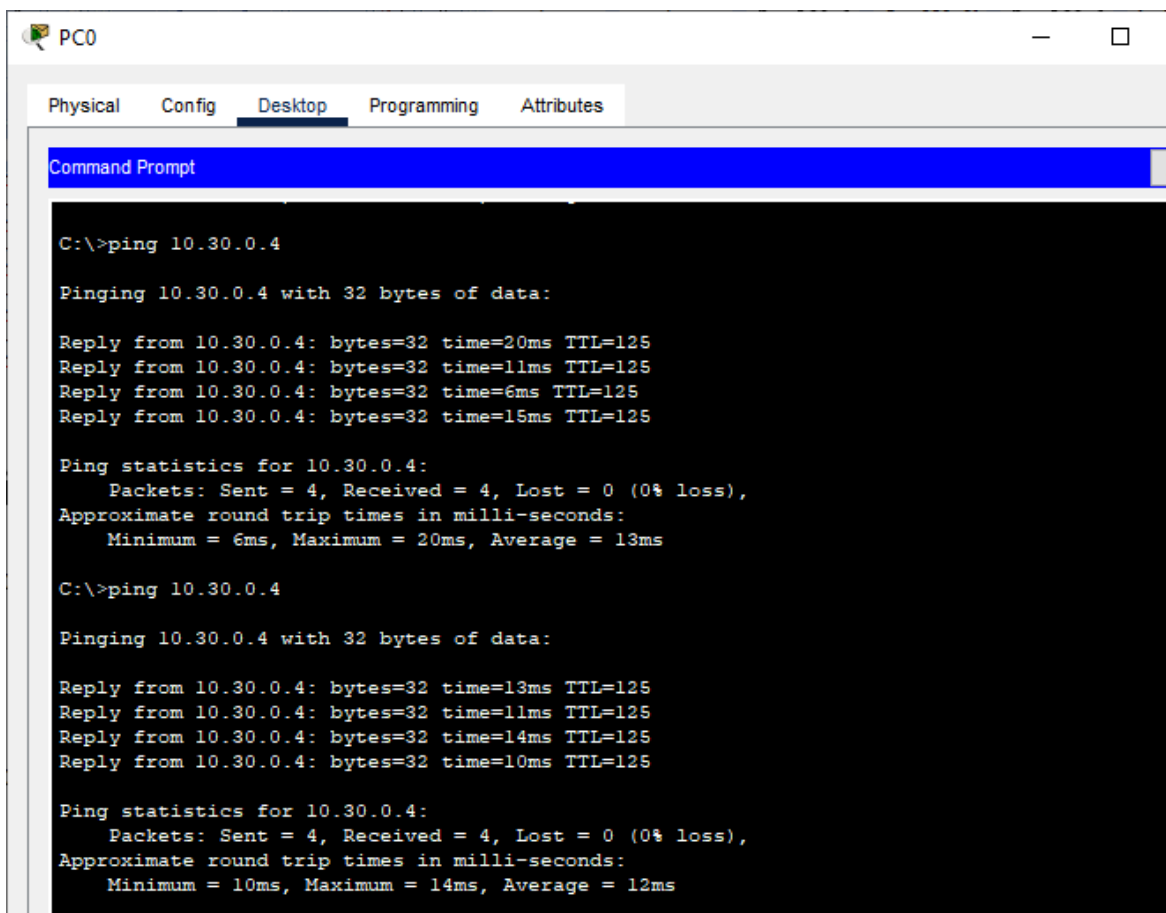
```
Router>enable
Router#configure terminal
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 10.20.0.0
Router(config-router)#network 192.168.0.0
Router(config-router)#network 192.168.1.0
Router(config-router)#exit
Router(config)#
```

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 window titled 'PC0' with tabs for Physical, Config, Desktop, Programming, and Attributes. The 'Desktop' tab is active, displaying a 'Command Prompt' window. The command prompt shows two successful ping tests to the IP address 10.30.0.4. Each test consists of four replies and a summary of ping statistics.

```
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

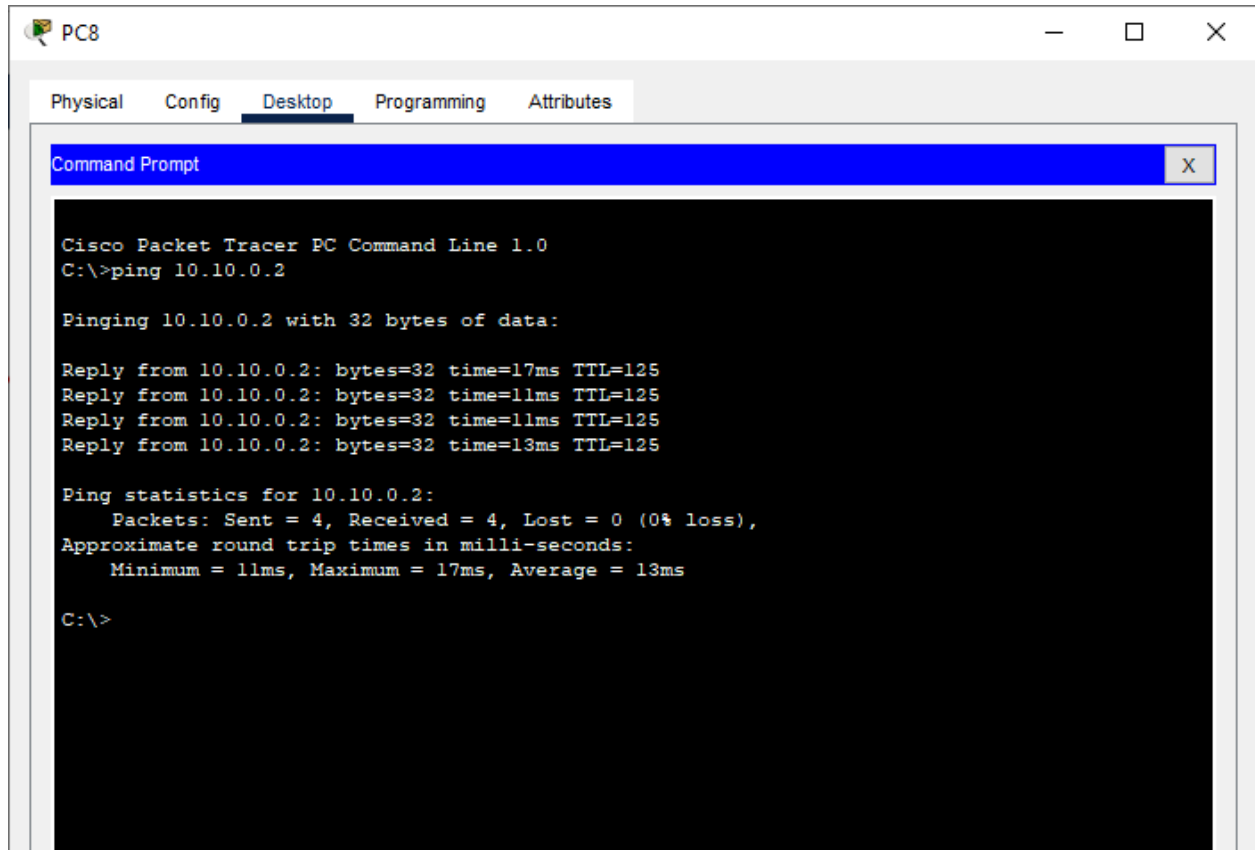
C:\>ping 10.30.0.4

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



```
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.

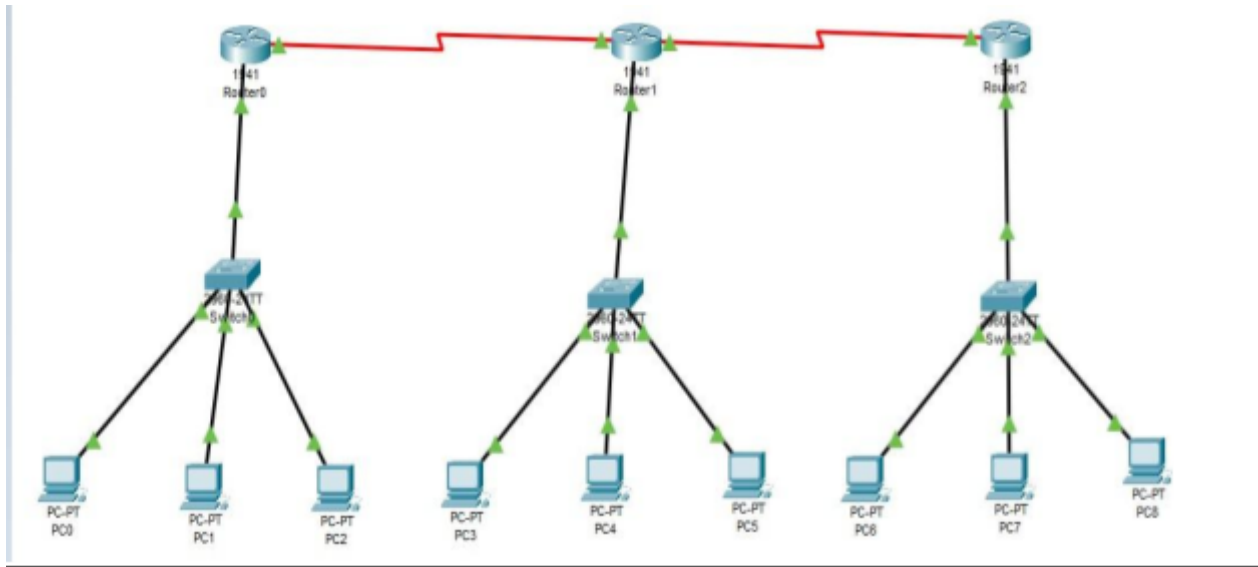
Open shortest path first (OSPF) is developed by Internet Engineering Task Force (IETF) as one of the Interior Gateway Protocol (IGP), i.e., the protocol which aims at moving the packet within a large autonomous system or routing domain.

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

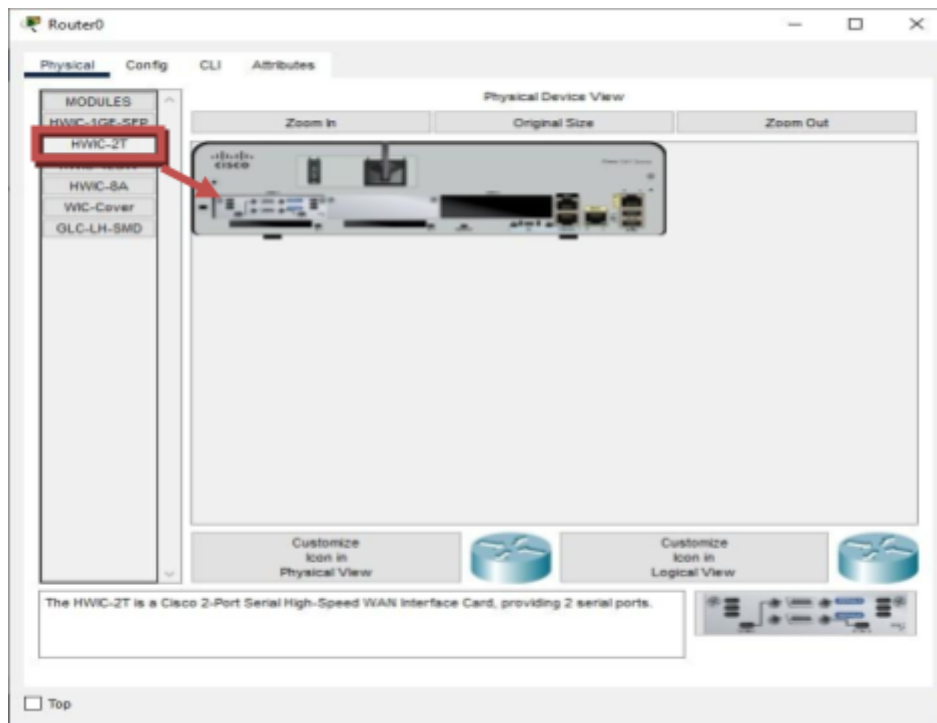


We configure the above network using the following IP addresses

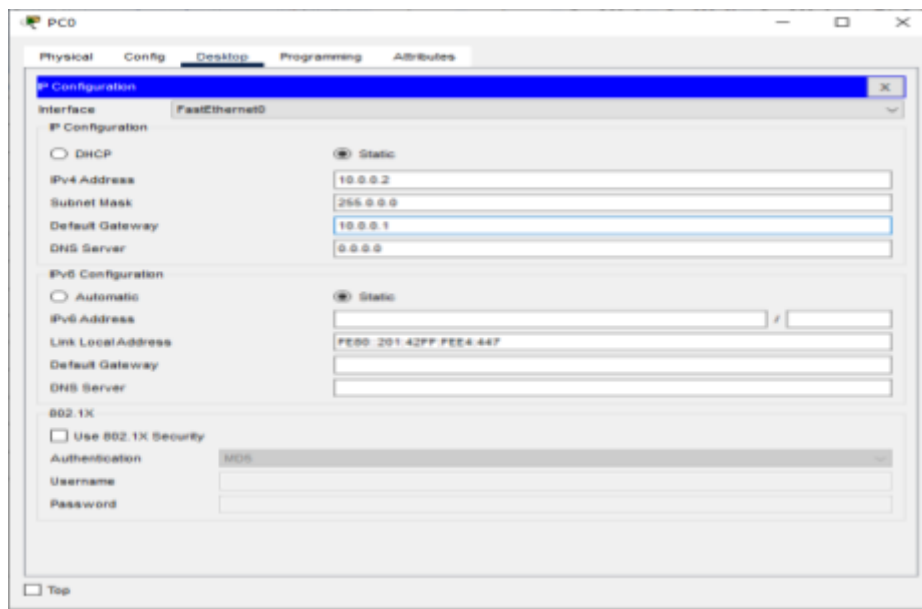
Host	Interface	IP address	Default Gateway	Subnet Mask	Wildcard Mask
Router 0	G0/0	10.0.0.1		255.0.0.0	0.255.255.255
	S0/1/0	40.0.0.1			
Router 1	G0/0	20.0.0.1			
	S0/1/0	40.0.0.2			
	S0/1/1	50.0.0.1			
Router 2	G0/0	30.0.0.1			
	S0/1/1	50.0.0.2			
PC0	FastEthernet0	10.0.0.2	10.0.0.1		
PC1	FastEthernet0	10.0.0.3			
PC2	FastEthernet0	10.0.0.4			
PC3	FastEthernet0	20.0.0.2	20.0.0.1		
PC4	FastEthernet0	20.0.0.3			
PC5	FastEthernet0	20.0.0.4			
PC6	FastEthernet0	30.0.0.2			

PC7	FastEthernet0	30.0.0.3	30.0.0.1		
PC8	FastEthernet0	30.0.0.4			

Adding Serial Interface in each Router



Configuring PC0:



Configuring PC1:

The screenshot shows the 'PC1' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing settings for the 'FastEthernet0' interface. The 'Static' radio button is selected for both IPv4 and IPv6 configurations. The IPv4 address is set to 10.0.0.3, the subnet mask to 255.0.0.0, the default gateway to 10.0.0.1, and the DNS server to 0.0.0.0. The IPv6 address is set to FE80:205:5E9F:FE68:E00C, the link local address to FE80:205:5E9F:FE68:E00C, and the default gateway to 0.0.0.0. The 802.1X section is also visible, with 'Use 802.1X Security' unchecked, 'Authentication' set to MD5, and 'Username' and 'Password' fields empty.

PC1

Physical Config Desktop Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 10.0.0.3

Subnet Mask: 255.0.0.0

Default Gateway: 10.0.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: FE80:205:5E9F:FE68:E00C

Link Local Address: FE80:205:5E9F:FE68:E00C

Default Gateway: 0.0.0.0

DNS Server: 0.0.0.0

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

Configuring PC2:

The screenshot shows the 'PC2' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing settings for the 'FastEthernet0' interface. The 'Static' radio button is selected for both IPv4 and IPv6 configurations. The IPv4 address is set to 10.0.0.4, the subnet mask to 255.0.0.0, the default gateway to 10.0.0.1, and the DNS server to 0.0.0.0. The IPv6 address is set to FE80:2D0:8A9F:FE6E:654C, the link local address to FE80:2D0:8A9F:FE6E:654C, and the default gateway to 0.0.0.0. The 802.1X section is also visible, with 'Use 802.1X Security' unchecked, 'Authentication' set to MD5, and 'Username' and 'Password' fields empty. A warning message 'This address is already used in the network.' is displayed next to the IPv4 address field.

PC2

Physical Config Desktop Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static This address is already used in the network.

IPv4 Address: 10.0.0.4

Subnet Mask: 255.0.0.0

Default Gateway: 10.0.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: FE80:2D0:8A9F:FE6E:654C

Link Local Address: FE80:2D0:8A9F:FE6E:654C

Default Gateway: 0.0.0.0

DNS Server: 0.0.0.0

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

PC3

Physical Config Desktop Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 20.0.0.2

Subnet Mask: 255.0.0.0

Default Gateway: 20.0.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::202:17FF:FE81:A06

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

Configuring PC4:

PC4

Physical Config Desktop Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 20.0.0.3

Subnet Mask: 255.0.0.0

Default Gateway: 20.0.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::20A:41FF:FE13:AB7E

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

PC5

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 20.0.0.4

Subnet Mask: 255.0.0.0

Default Gateway: 20.0.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::2E0:F9FF:FE0D:3AA

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

Configuring PC6:

PC6

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 30.0.0.2

Subnet Mask: 255.0.0.0

Default Gateway: 30.0.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::2E0:F9FF:FE9A:D3AA

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

Configuring PC7:

The screenshot shows the configuration window for PC7. The 'Desktop' tab is selected. The 'IP Configuration' section is expanded, showing the 'FastEthernet0' interface. The 'Static' radio button is selected under 'IP Configuration'. The IPv4 Address is set to 30.0.0.3, Subnet Mask to 255.0.0.0, Default Gateway to 30.0.0.1, and DNS Server to 0.0.0.0. The IPv6 Configuration section shows 'Static' selected, with IPv6 Address set to FE80::201:C9FF:FEDC:D846, Link Local Address set to FE80::201:C9FF:FEDC:D846, and Default Gateway and DNS Server fields are empty. The 802.1X section shows 'Use 802.1X Security' unchecked, Authentication set to MD5, and Username and Password fields are empty. A 'Top' button is at the bottom left.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	30.0.0.3
Subnet Mask	255.0.0.0
Default Gateway	30.0.0.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	FE80::201:C9FF:FEDC:D846
Link Local Address	FE80::201:C9FF:FEDC:D846
Default Gateway	
DNS Server	
802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Configuring PC8:

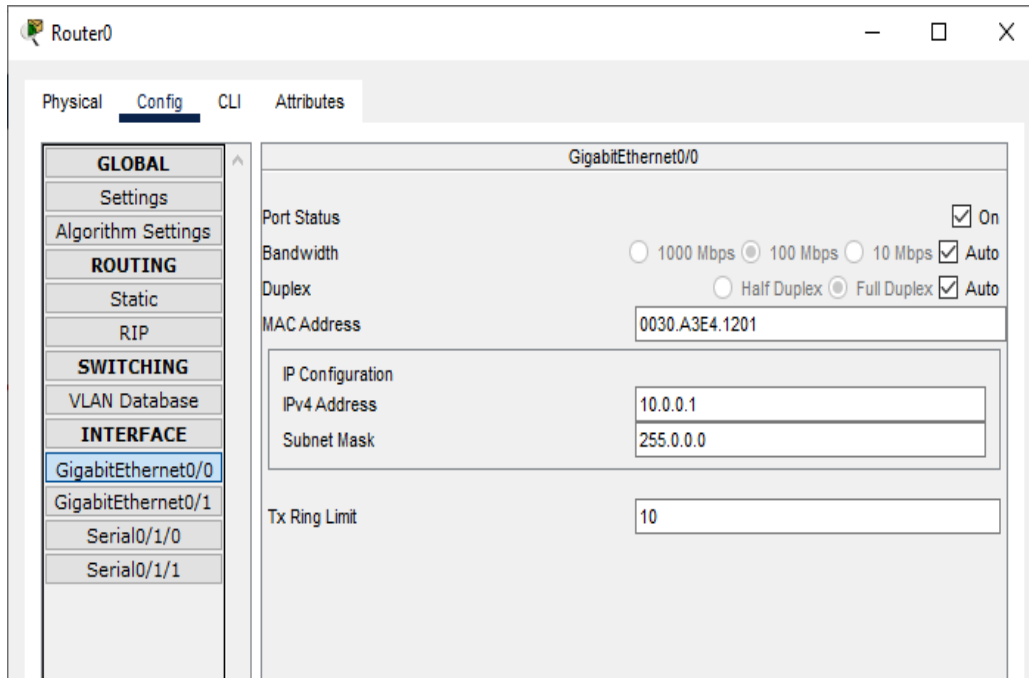
The screenshot shows the configuration window for PC8. The 'Desktop' tab is selected. The 'IP Configuration' section is expanded, showing the 'FastEthernet0' interface. The 'Static' radio button is selected under 'IP Configuration'. The IPv4 Address is set to 30.0.0.4, Subnet Mask to 255.0.0.0, Default Gateway to 30.0.0.1, and DNS Server to 0.0.0.0. The IPv6 Configuration section shows 'Static' selected, with IPv6 Address set to FE80::260:3EFF:FE25:E1BE, Link Local Address set to FE80::260:3EFF:FE25:E1BE, and Default Gateway and DNS Server fields are empty. The 802.1X section shows 'Use 802.1X Security' unchecked, Authentication set to MD5, and Username and Password fields are empty. A 'Top' button is at the bottom left.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	30.0.0.4
Subnet Mask	255.0.0.0
Default Gateway	30.0.0.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	FE80::260:3EFF:FE25:E1BE
Link Local Address	FE80::260:3EFF:FE25:E1BE
Default Gateway	
DNS Server	
802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Configuring IP addresses on Router 0

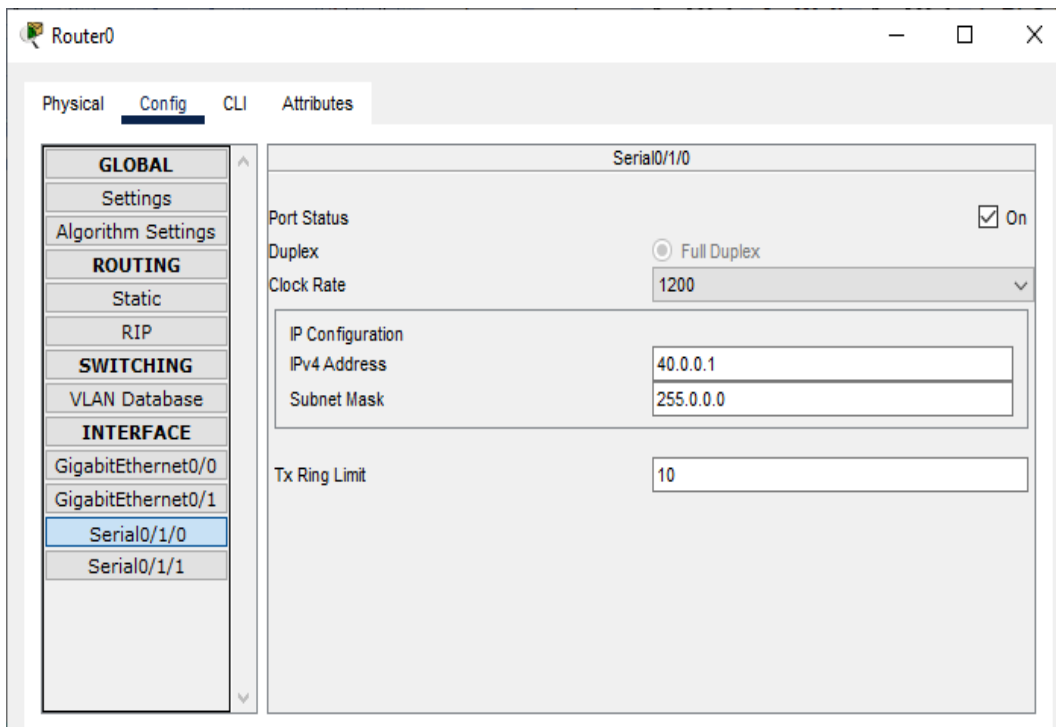
i) Interface G0/0



The screenshot shows the configuration window for Router0, specifically the 'Config' tab for the GigabitEthernet0/0 interface. The left sidebar lists various configuration categories: GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under the INTERFACE category, GigabitEthernet0/0 is selected. The main configuration area for GigabitEthernet0/0 includes the following settings:

- Port Status: ☒ On
- Bandwidth: ☐ 1000 Mbps ☒ 100 Mbps ☐ 10 Mbps ☒ Auto
- Duplex: ☐ Half Duplex ☒ Full Duplex ☒ Auto
- MAC Address: 0030.A3E4.1201
- IP Configuration:
 - IPv4 Address: 10.0.0.1
 - Subnet Mask: 255.0.0.0
- Tx Ring Limit: 10

ii) Interface S0/1/0



The screenshot shows the configuration window for Router0, specifically the 'Config' tab for the Serial0/1/0 interface. The left sidebar lists various configuration categories: GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under the INTERFACE category, Serial0/1/0 is selected. The main configuration area for Serial0/1/0 includes the following settings:

- Port Status: ☒ On
- Duplex: ☒ Full Duplex
- Clock Rate: 1200
- IP Configuration:
 - IPv4 Address: 40.0.0.1
 - Subnet Mask: 255.0.0.0
- Tx Ring Limit: 10

Configuring IP addresses on Router 1

i) Interface G0/0

The screenshot shows the configuration window for Router1, specifically for the GigabitEthernet0/0 interface. The left sidebar contains a tree view with categories: GLOBAL, ROUTING, SWITCHING, and INTERFACE. Under the INTERFACE category, GigabitEthernet0/0 is selected. The main configuration area for GigabitEthernet0/0 includes the following fields:

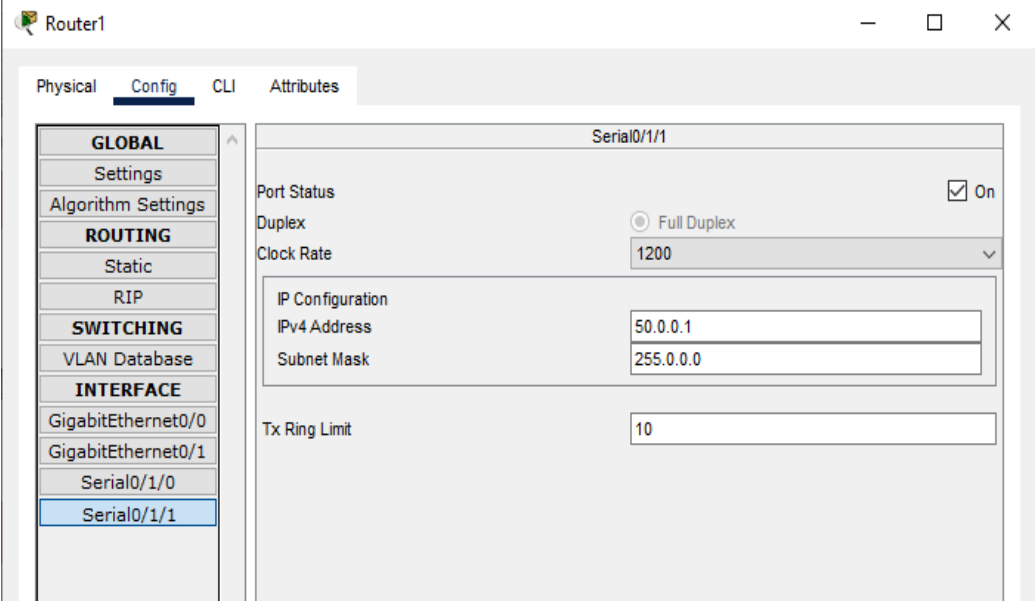
- Port Status: ☒ On
- Bandwidth: ☐ 1000 Mbps ☒ 100 Mbps ☐ 10 Mbps ☒ Auto
- Duplex: ☐ Half Duplex ☒ Full Duplex ☒ Auto
- MAC Address: 0001.C711.B701
- IP Configuration:
 - IPv4 Address: 20.0.0.1
 - Subnet Mask: 255.0.0.0
- Tx Ring Limit: 10

ii) Interface S0/1/0

The screenshot shows the configuration window for Router1, specifically for the Serial0/1/0 interface. The left sidebar contains a tree view with categories: GLOBAL, ROUTING, SWITCHING, and INTERFACE. Under the INTERFACE category, Serial0/1/0 is selected. The main configuration area for Serial0/1/0 includes the following fields:

- Port Status: ☒ On
- Duplex: ☒ Full Duplex
- Clock Rate: 2000000
- IP Configuration:
 - IPv4 Address: 40.0.0.2
 - Subnet Mask: 255.0.0.0
- Tx Ring Limit: 10

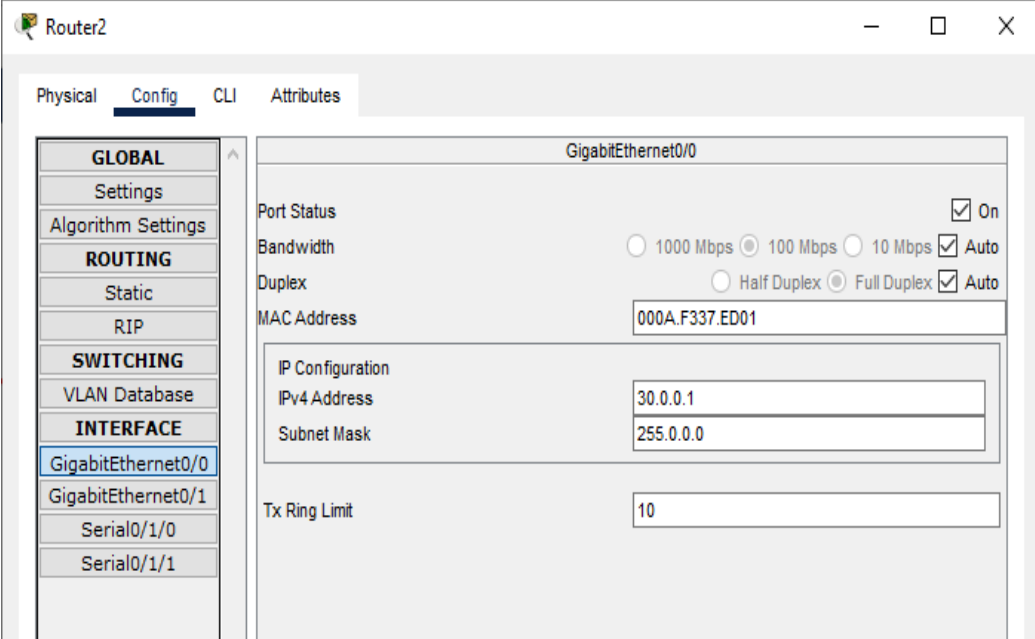
iii) Interface S0/1/1



The screenshot shows the configuration window for Router1, specifically for the Serial0/1/1 interface. The left sidebar contains a tree view with categories: GLOBAL, Settings, Algorithm Settings, ROUTING (with sub-items Static and RIP), SWITCHING (with sub-item VLAN Database), and INTERFACE (with sub-items GigabitEthernet0/0, GigabitEthernet0/1, Serial0/1/0, and Serial0/1/1). The Serial0/1/1 interface is selected. The main configuration area has tabs for Physical, Config, CLI, and Attributes, with Config being active. The Serial0/1/1 configuration includes: Port Status (checked On), Duplex (radio button selected for Full Duplex), Clock Rate (dropdown menu set to 1200), IP Configuration (IPv4 Address: 50.0.0.1, Subnet Mask: 255.0.0.0), and Tx Ring Limit (text box set to 10).

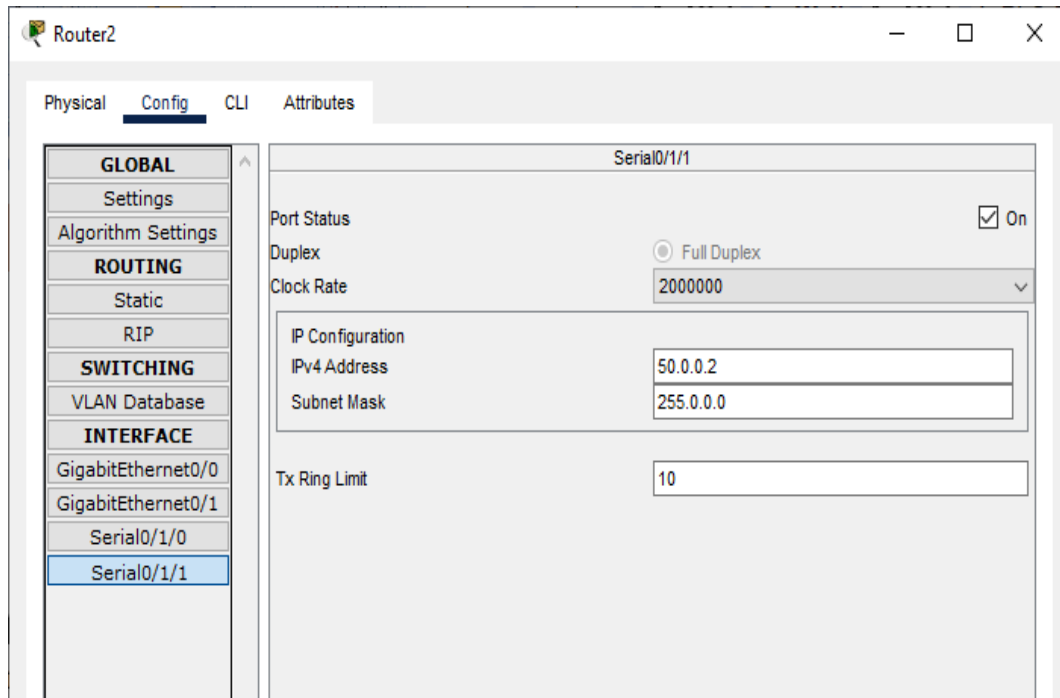
Configuring IP addresses on Router 2

i) Interface G0/0



The screenshot shows the configuration window for Router2, specifically for the GigabitEthernet0/0 interface. The left sidebar contains a tree view with categories: GLOBAL, Settings, Algorithm Settings, ROUTING (with sub-items Static and RIP), SWITCHING (with sub-item VLAN Database), and INTERFACE (with sub-items GigabitEthernet0/0, GigabitEthernet0/1, Serial0/1/0, and Serial0/1/1). The GigabitEthernet0/0 interface is selected. The main configuration area has tabs for Physical, Config, CLI, and Attributes, with Config being active. The GigabitEthernet0/0 configuration includes: Port Status (checked On), Bandwidth (radio buttons for 1000 Mbps, 100 Mbps, 10 Mbps, and Auto; Auto is checked), Duplex (radio buttons for Half Duplex, Full Duplex, and Auto; Auto is checked), MAC Address (text box set to 000A.F337.ED01), IP Configuration (IPv4 Address: 30.0.0.1, Subnet Mask: 255.0.0.0), and Tx Ring Limit (text box set to 10).

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)

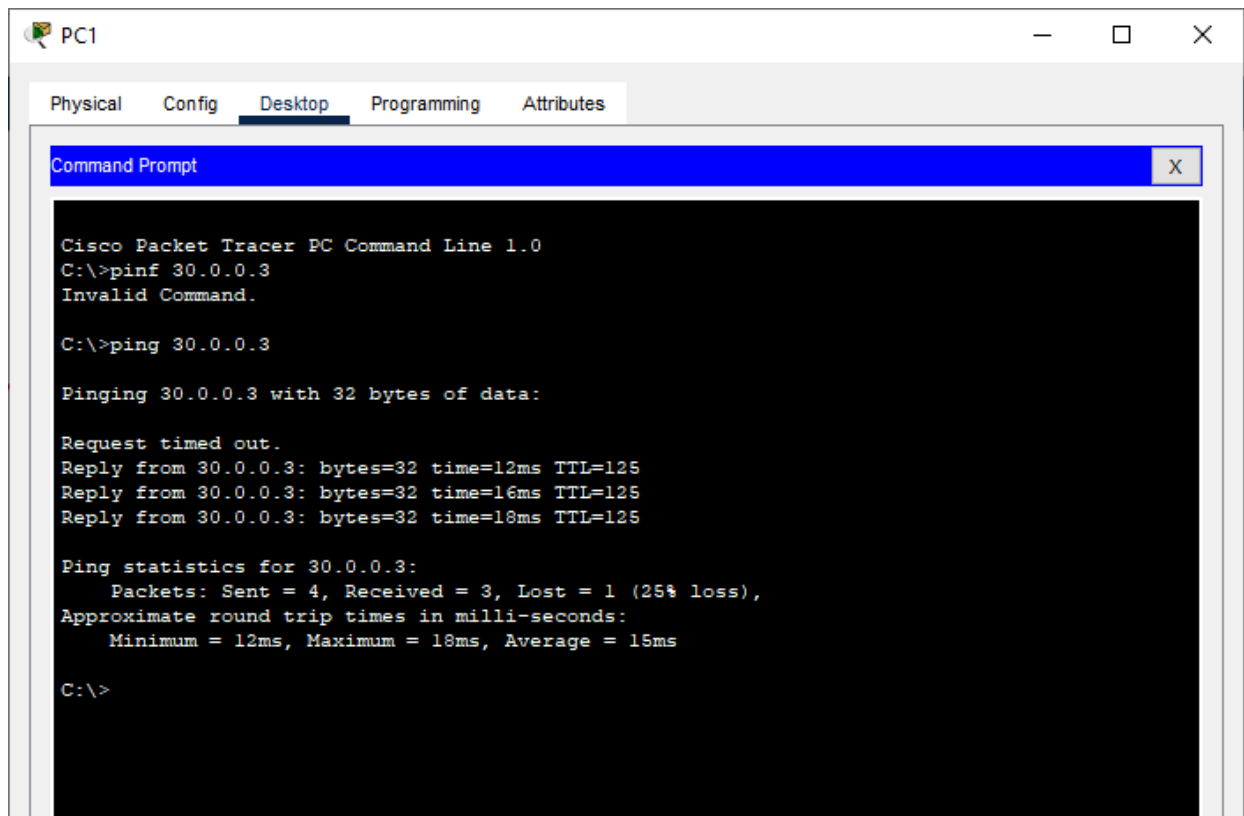
```
Router(config)#  
Router(config)#router ospf 1  
Router(config-router)#  
Router(config-router)#network 40.0.0.0 0.0.0.255 area 1  
Router(config-router)#network 40.0.0.0 0.0.0.255 area 1  
Router(config-router)#network 50.0.0.0 0.0.0.255 area 1  
Router(config-router)#exit  
Router(config)#
```

Configuring Router 2 for OSPF (using the CLI mode)

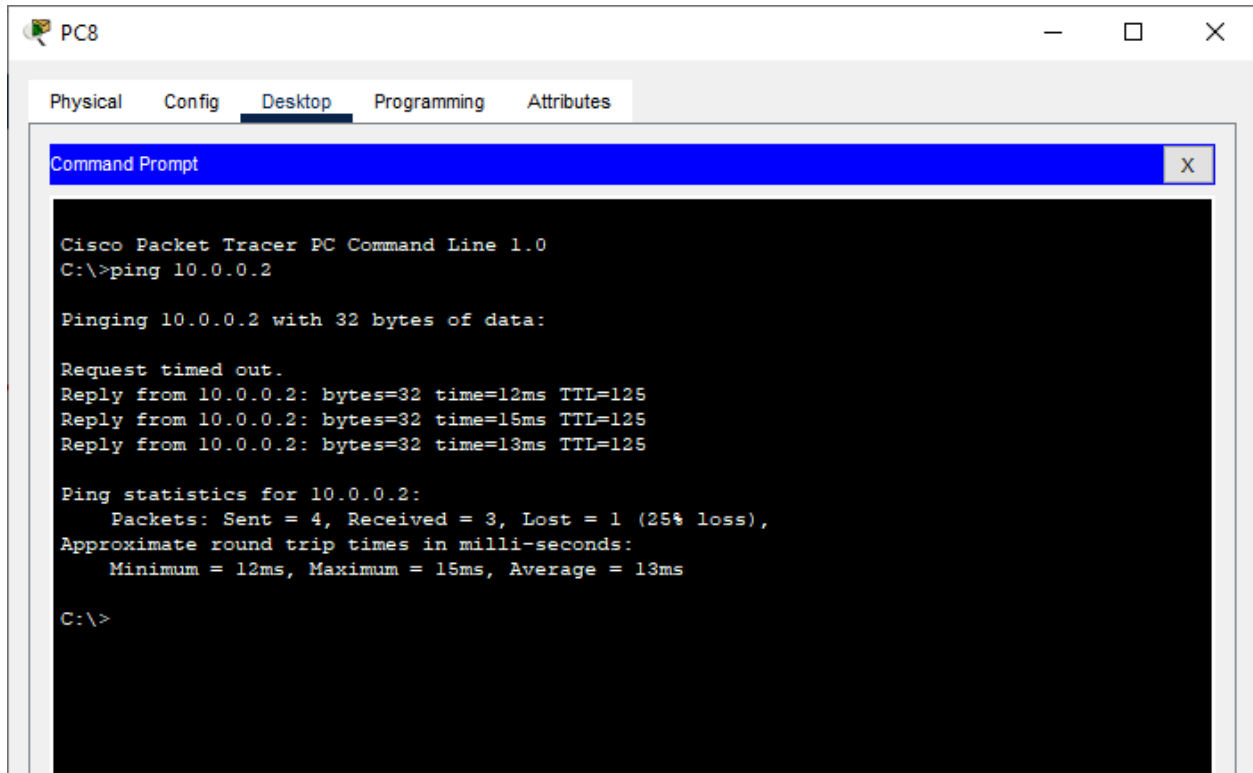
```
Router(config)#  
Router(config)#router ospf 1  
Router(config-router)#  
Router(config-router)#network 30.0.0.0 0.0.0.255 area 1  
Router(config-router)#network 50.0.0.0 0.0.0.255 area 1  
Router(config-router)# exit  
Router(config)#
```

Checking the connectivity by using the ping command

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



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).

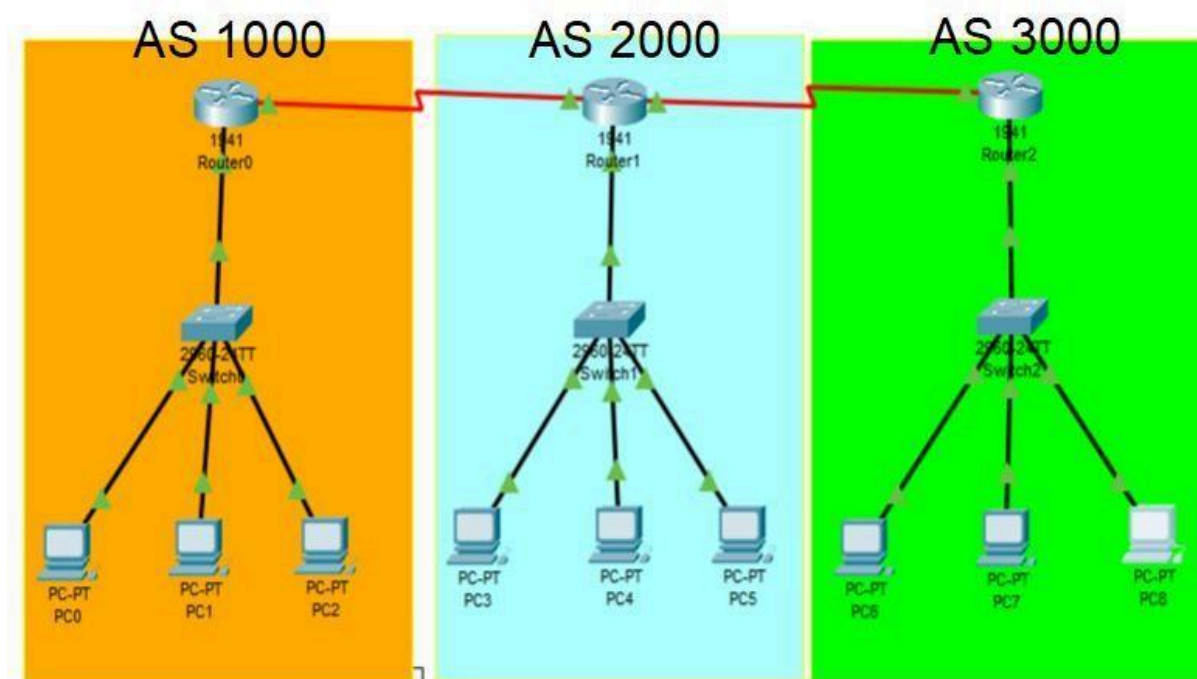
The protocol can connect together any internetwork of autonomous system using an arbitrary topology. The only requirement is that each AS have at least one router that is able to run BGP and that is router connect to at least one other AS's BGP router.

BGP's main function is to exchange network reach-ability 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 include 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 conserve network Bandwidth.
- h) BGP supports CIDR.
- i) BGP also supports Security

We use the following topology for the present case

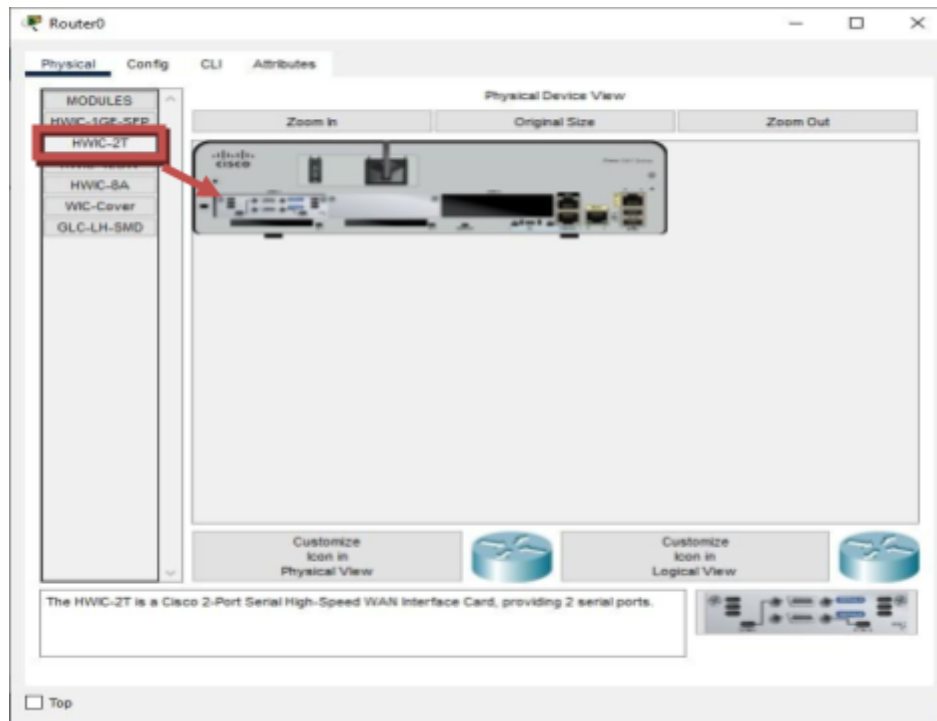


We configure the above network using the following IP addresses

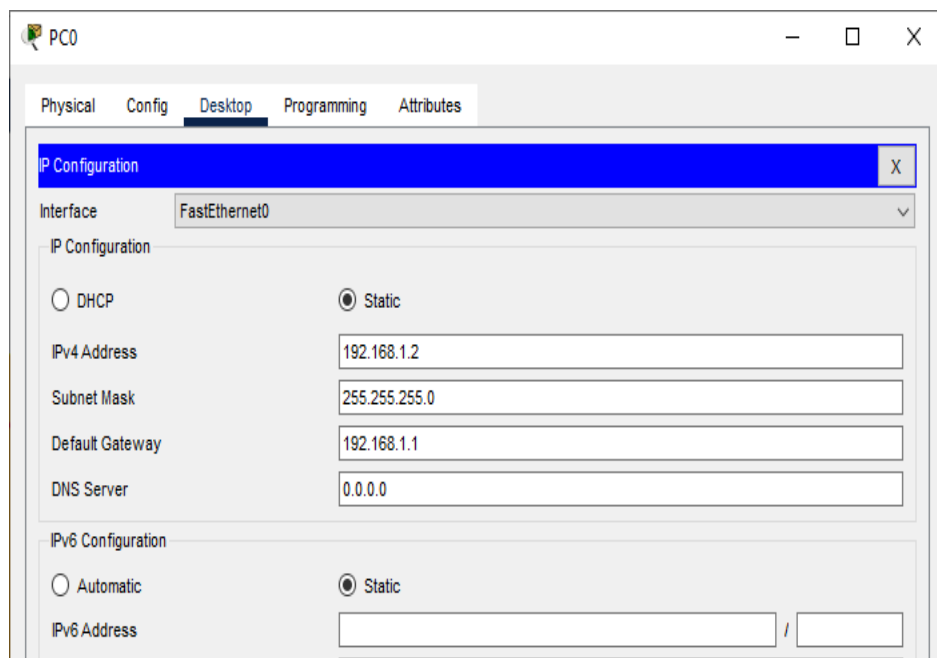
Host	Interface	IP address	Network Address	Default Gateway
Router 0 AS 1000	G0/0	192.168.1.1	192.168.1.0	
	S0/1/0	10.0.0.1	10.0.0.0	
Router 1 AS 2000	G0/0	192.168.2.1	192.168.2.0	
	S0/1/0	10.0.0.2	10.0.0.0	
Router 2 AS 3000	S0/1/1	20.0.0.1	20.0.0.0	
	G0/0	192.168.3.1	192.168.3.0	
	S0/1/1	20.0.0.2	20.0.0.0	
PC0	FastEthernet0	192.168.1.2	192.168.1.0	192.168.1.1
PC1	FastEthernet0	192.168.1.3		
PC2	FastEthernet0	192.168.1.4		
PC3	FastEthernet0	192.168.2.2	192.168.2.0	192.168.2.1
PC4	FastEthernet0	192.168.2.3		
PC5	FastEthernet0	192.168.2.4		
PC6	FastEthernet0	192.168.3.2		

PC7	FastEthernet0	192.168.3.3	192.168.3.0	192.168.3.1
PC8	FastEthernet0	192.168.3.4		

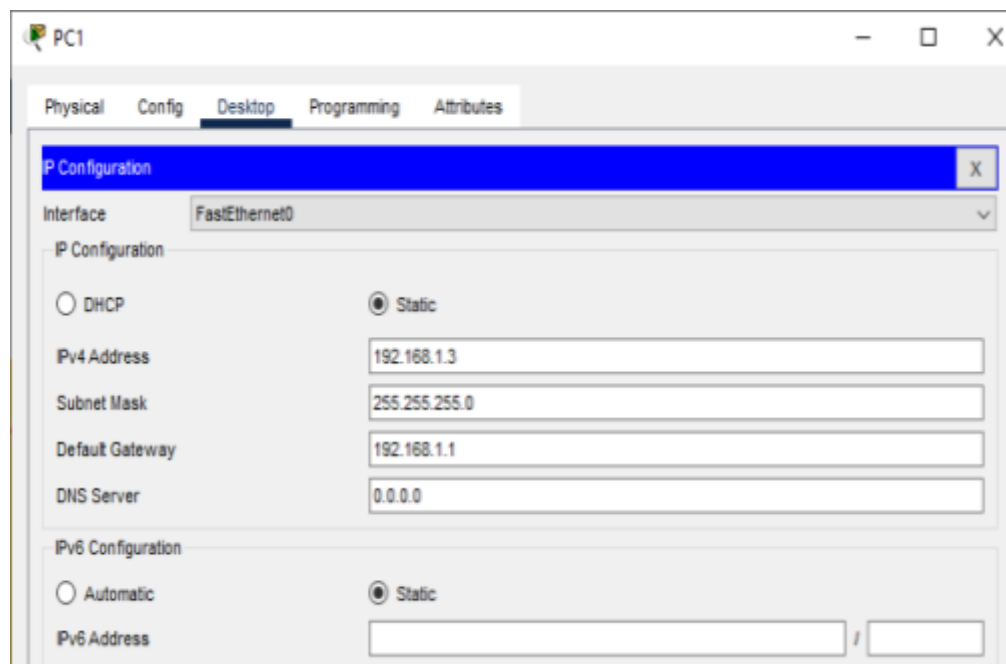
Adding Serial Interface in each Router



Configuring PC0:



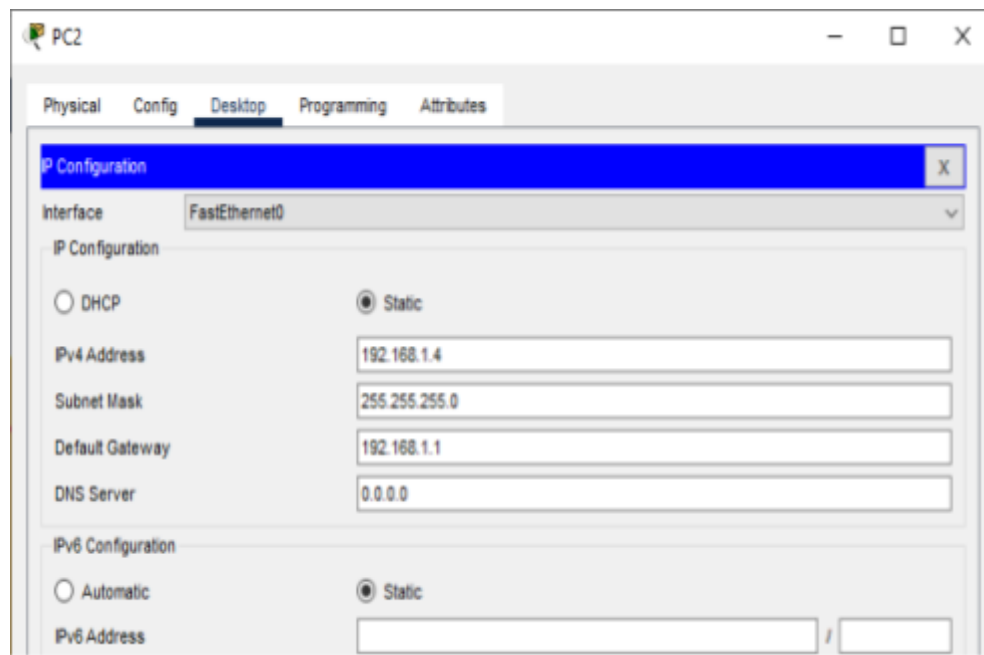
Configuring PC1:



The screenshot shows the 'PC1' configuration window with the 'Desktop' tab selected. The 'P Configuration' section is highlighted in blue. The 'Interface' dropdown is set to 'FastEthernet0'. Under 'IP Configuration', the 'Static' radio button is selected. The fields are filled with: IPv4 Address: 192.168.1.3, Subnet Mask: 255.255.255.0, Default Gateway: 192.168.1.1, and DNS Server: 0.0.0.0. Under 'IPv6 Configuration', the 'Static' radio button is also selected, and the 'IPv6 Address' field is empty.

Field	Value
Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	
<input checked="" type="radio"/> Static	
IPv4 Address	192.168.1.3
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	
<input checked="" type="radio"/> Static	
IPv6 Address	

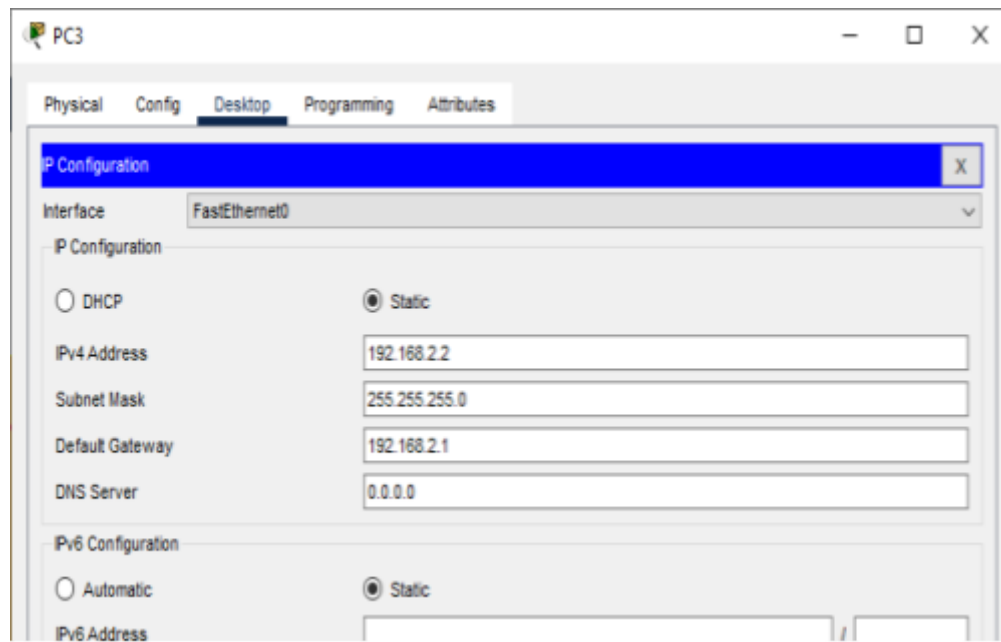
Configuring PC2:



The screenshot shows the 'PC2' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is highlighted in blue. The 'Interface' dropdown is set to 'FastEthernet0'. Under 'IP Configuration', the 'Static' radio button is selected. The fields are filled with: IPv4 Address: 192.168.1.4, Subnet Mask: 255.255.255.0, Default Gateway: 192.168.1.1, and DNS Server: 0.0.0.0. Under 'IPv6 Configuration', the 'Static' radio button is also selected, and the 'IPv6 Address' field is empty.

Field	Value
Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	
<input checked="" type="radio"/> Static	
IPv4 Address	192.168.1.4
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	
<input checked="" type="radio"/> Static	
IPv6 Address	

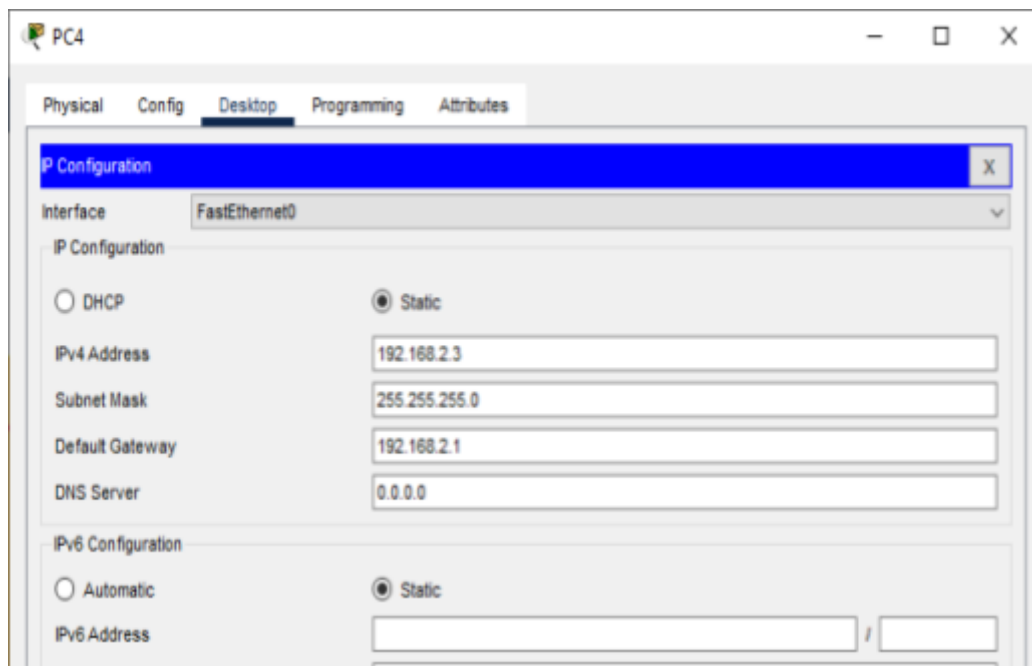
Configuring PC3:



The screenshot shows the 'PC3' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is highlighted in blue. The 'Interface' dropdown is set to 'FastEthernet0'. Under 'IP Configuration', the 'Static' radio button is selected. The fields are filled with: IPv4 Address: 192.168.2.2, Subnet Mask: 255.255.255.0, Default Gateway: 192.168.2.1, and DNS Server: 0.0.0.0. The 'IPv6 Configuration' section is also visible, with 'Static' selected and an empty IPv6 Address field.

Field	Value
Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	
<input checked="" type="radio"/> Static	
IPv4 Address	192.168.2.2
Subnet Mask	255.255.255.0
Default Gateway	192.168.2.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	
<input checked="" type="radio"/> Static	
IPv6 Address	

Configuring PC4:



The screenshot shows the 'PC4' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is highlighted in blue. The 'Interface' dropdown is set to 'FastEthernet0'. Under 'IP Configuration', the 'Static' radio button is selected. The fields are filled with: IPv4 Address: 192.168.2.3, Subnet Mask: 255.255.255.0, Default Gateway: 192.168.2.1, and DNS Server: 0.0.0.0. The 'IPv6 Configuration' section is also visible, with 'Static' selected and an empty IPv6 Address field.

Field	Value
Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	
<input checked="" type="radio"/> Static	
IPv4 Address	192.168.2.3
Subnet Mask	255.255.255.0
Default Gateway	192.168.2.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	
<input checked="" type="radio"/> Static	
IPv6 Address	

Configuring PC5:

PC5

Physical

Config

Desktop

Programming

Attributes

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

192.168.2.4

Subnet Mask

255.255.255.0

Default Gateway

192.168.2.1

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

Configuring PC6:

PC6

Physical

Config

Desktop

Programming

Attributes

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

192.168.3.2

Subnet Mask

255.255.255.0

Default Gateway

192.168.3.1

DNS Server

0.0.0.0

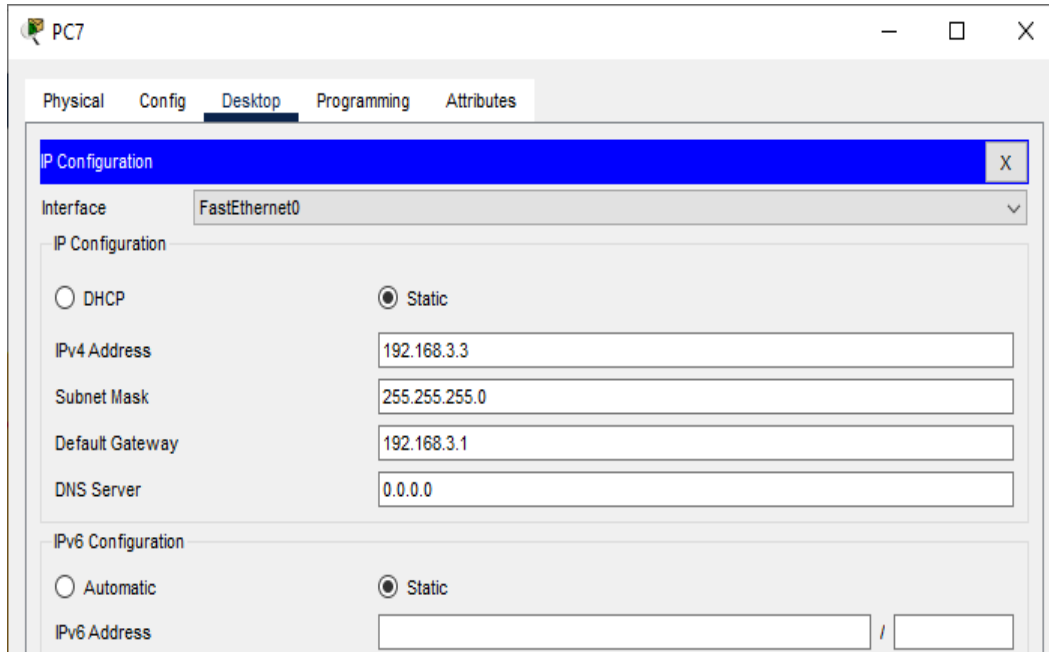
IPv6 Configuration

Automatic

Static

IPv6 Address

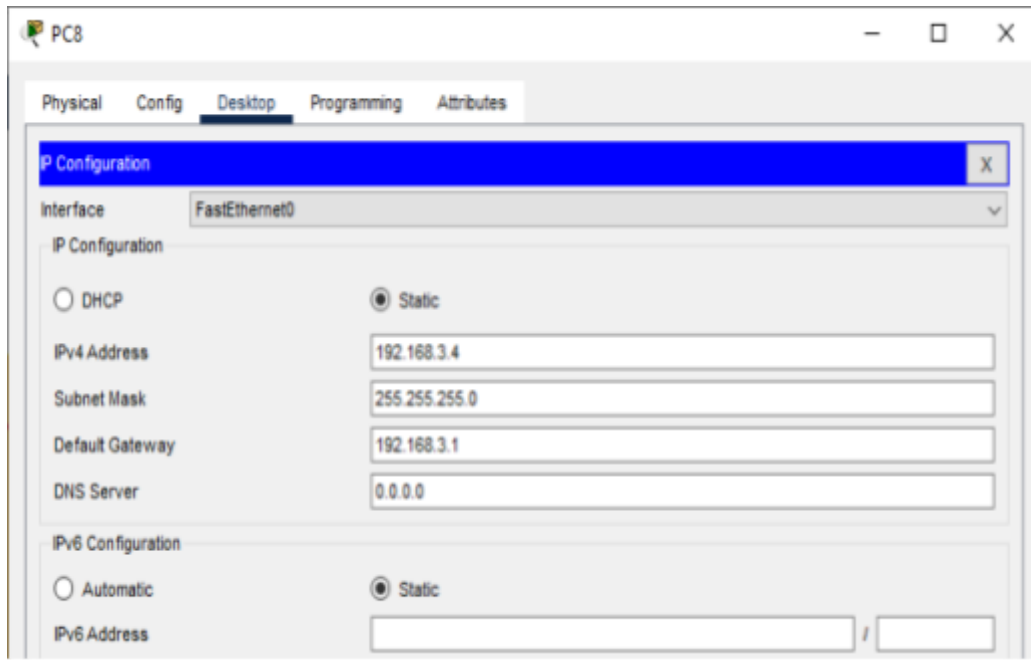
Configuring PC7:



The screenshot shows the 'PC7' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is highlighted in blue. The 'Interface' dropdown is set to 'FastEthernet0'. Under 'IP Configuration', the 'Static' radio button is selected. The fields are filled with: IPv4 Address: 192.168.3.3, Subnet Mask: 255.255.255.0, Default Gateway: 192.168.3.1, and DNS Server: 0.0.0.0. The 'IPv6 Configuration' section is also visible, with 'Static' selected and an empty IPv6 Address field.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.3.3
Subnet Mask	255.255.255.0
Default Gateway	192.168.3.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	

Configuring PC8:



The screenshot shows the 'PC8' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is highlighted in blue. The 'Interface' dropdown is set to 'FastEthernet0'. Under 'IP Configuration', the 'Static' radio button is selected. The fields are filled with: IPv4 Address: 192.168.3.4, Subnet Mask: 255.255.255.0, Default Gateway: 192.168.3.1, and DNS Server: 0.0.0.0. The 'IPv6 Configuration' section is also visible, with 'Static' selected and an empty IPv6 Address field.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.3.4
Subnet Mask	255.255.255.0
Default Gateway	192.168.3.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	

Configuring IP addresses on Router 0

i) Interface G0/0

The screenshot shows the configuration window for Router0, specifically the 'Config' tab. The left sidebar shows a tree view with 'INTERFACE' expanded and 'GigabitEthernet0/0' selected. The main area displays the configuration for 'GigabitEthernet0/0'. The 'Port Status' is 'On'. 'Bandwidth' is set to '1000 Mbps'. 'Duplex' is set to 'Full Duplex'. 'MAC Address' is '00D0.D398.4601'. The 'IP Configuration' section shows 'IPv4 Address' as '192.168.1.1' and 'Subnet Mask' as '255.255.255.0'. The 'Tx Ring Limit' is set to '10'.

GigabitEthernet0/0	
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input checked="" type="radio"/> 1000 Mbps <input type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto
Duplex	<input checked="" type="radio"/> Half Duplex <input type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	00D0.D398.4601
IP Configuration	
IPv4 Address	192.168.1.1
Subnet Mask	255.255.255.0
Tx Ring Limit	10

ii) Interface S0/1/0

The screenshot shows the configuration window for Router0, specifically the 'Config' tab. The left sidebar shows a tree view with 'INTERFACE' expanded and 'Serial0/1/0' selected. The main area displays the configuration for 'Serial0/1/0'. The 'Port Status' is 'On'. 'Duplex' is set to 'Full Duplex'. 'Clock Rate' is set to '1200'. The 'IP Configuration' section shows 'IPv4 Address' as '10.0.0.1' and 'Subnet Mask' as '255.0.0.0'. The 'Tx Ring Limit' is set to '10'.

Serial0/1/0	
Port Status	<input checked="" type="checkbox"/> On
Duplex	<input checked="" type="radio"/> Full Duplex
Clock Rate	1200
IP Configuration	
IPv4 Address	10.0.0.1
Subnet Mask	255.0.0.0
Tx Ring Limit	10

Configuring IP addresses on Router 1

i) Interface G0/0

The screenshot shows the configuration window for Router1, specifically for the GigabitEthernet0/0 interface. The left sidebar contains a tree view with categories: GLOBAL, Settings, Algorithm Settings, ROUTING (Static, RIP), SWITCHING (VLAN Database), and INTERFACE (GigabitEthernet0/0, GigabitEthernet0/1, Serial0/1/0, Serial0/1/1). The main area is titled 'GigabitEthernet0/0' and contains the following settings:

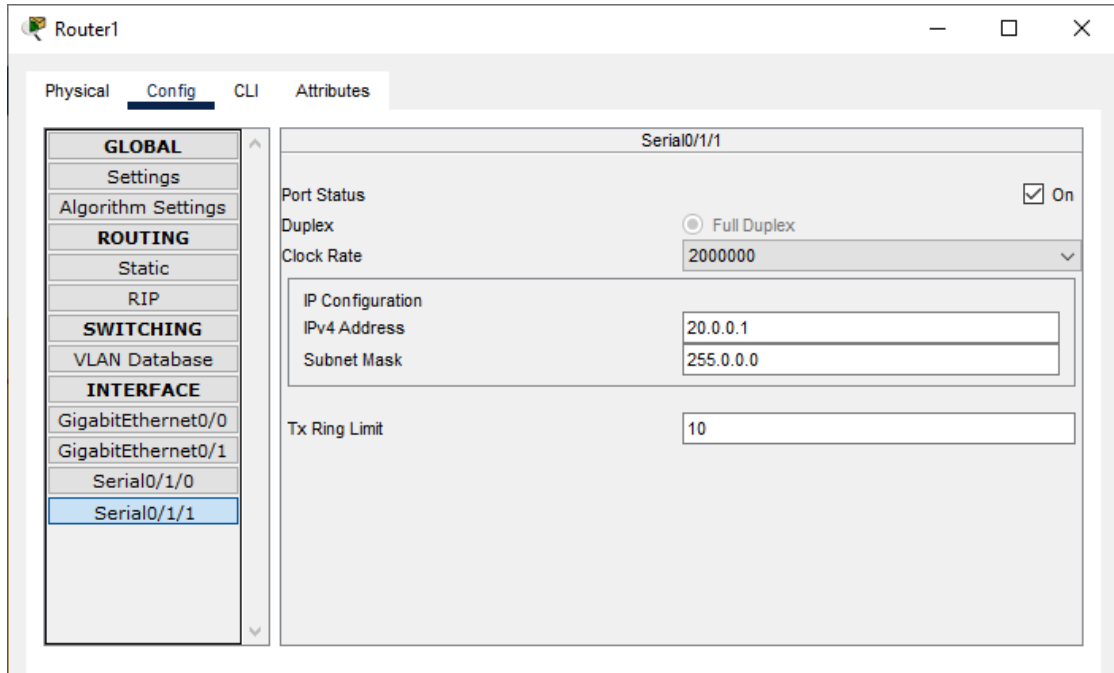
- Port Status: ☒ On
- Bandwidth: ☒ 1000 Mbps ☐ 100 Mbps ☐ 10 Mbps ☒ Auto
- Duplex: ☒ Half Duplex ☐ Full Duplex ☒ Auto
- MAC Address: 0090.2B5B.9E01
- IP Configuration:
 - IPv4 Address: 192.168.2.1
 - Subnet Mask: 255.255.255.0
- Tx Ring Limit: 10

ii) Interface S0/1/0

The screenshot shows the configuration window for Router1, specifically for the Serial0/1/0 interface. The left sidebar is the same as in the previous screenshot. The main area is titled 'Serial0/1/0' and contains the following settings:

- Port Status: ☒ On
- Duplex: ☒ Full Duplex
- Clock Rate: 2000000
- IP Configuration:
 - IPv4 Address: 10.0.0.2
 - Subnet Mask: 255.0.0.0
- Tx Ring Limit: 10

iii) Interface S0/1/1

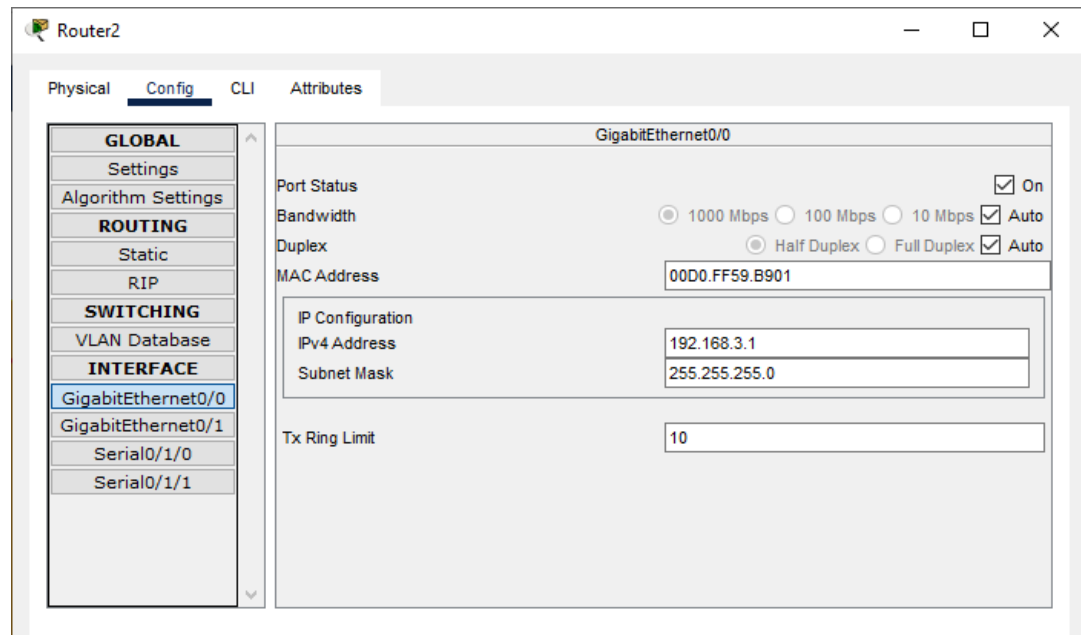


The screenshot shows the configuration window for Router1, specifically for the Serial0/1/1 interface. The left sidebar contains a tree view with categories: GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under the INTERFACE category, the following interfaces are listed: GigabitEthernet0/0, GigabitEthernet0/1, Serial0/1/0, and Serial0/1/1 (which is selected and highlighted in blue). The main configuration area for Serial0/1/1 includes the following settings:

- Port Status: ☒ On
- Duplex: ☐ Full Duplex
- Clock Rate: 2000000
- IP Configuration:
 - IPv4 Address: 20.0.0.1
 - Subnet Mask: 255.0.0.0
- Tx Ring Limit: 10

Configuring IP addresses on Router 2

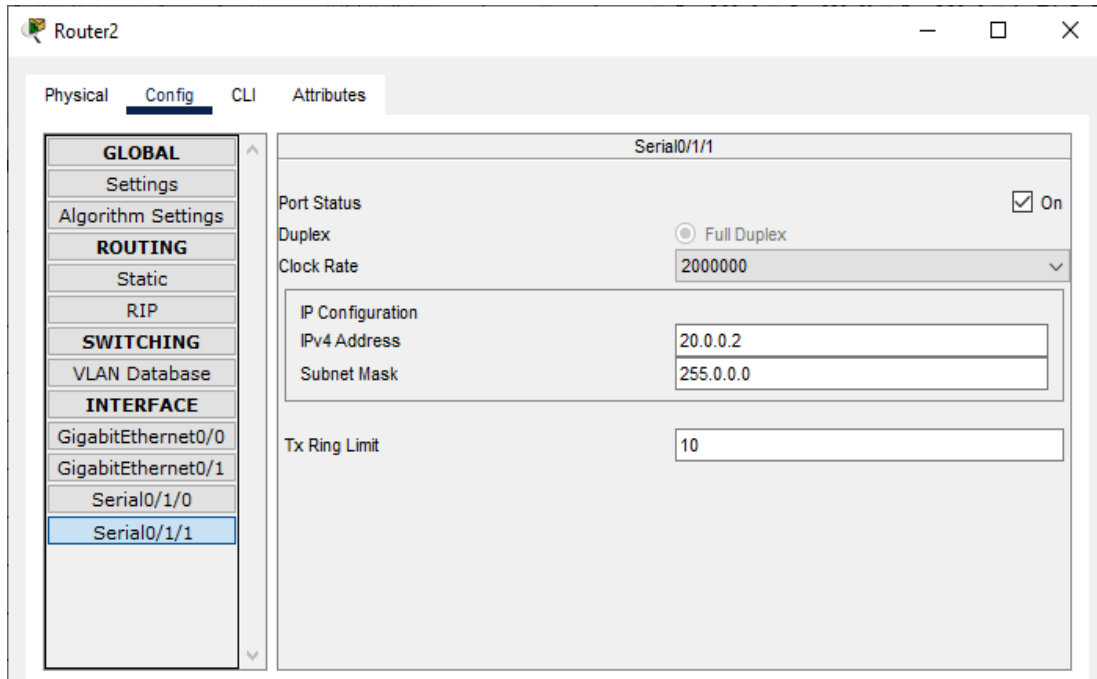
i) Interface G0/0



The screenshot shows the configuration window for Router2, specifically for the GigabitEthernet0/0 interface. The left sidebar contains a tree view with categories: GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under the INTERFACE category, the following interfaces are listed: GigabitEthernet0/0 (which is selected and highlighted in blue), GigabitEthernet0/1, Serial0/1/0, and Serial0/1/1. The main configuration area for GigabitEthernet0/0 includes the following settings:

- Port Status: ☒ On
- Bandwidth: ☒ 1000 Mbps ☐ 100 Mbps ☐ 10 Mbps ☒ Auto
- Duplex: ☐ Half Duplex ☐ Full Duplex ☒ Auto
- MAC Address: 00D0.FF59.B901
- IP Configuration:
 - IPv4 Address: 192.168.3.1
 - Subnet Mask: 255.255.255.0
- Tx Ring Limit: 10

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)

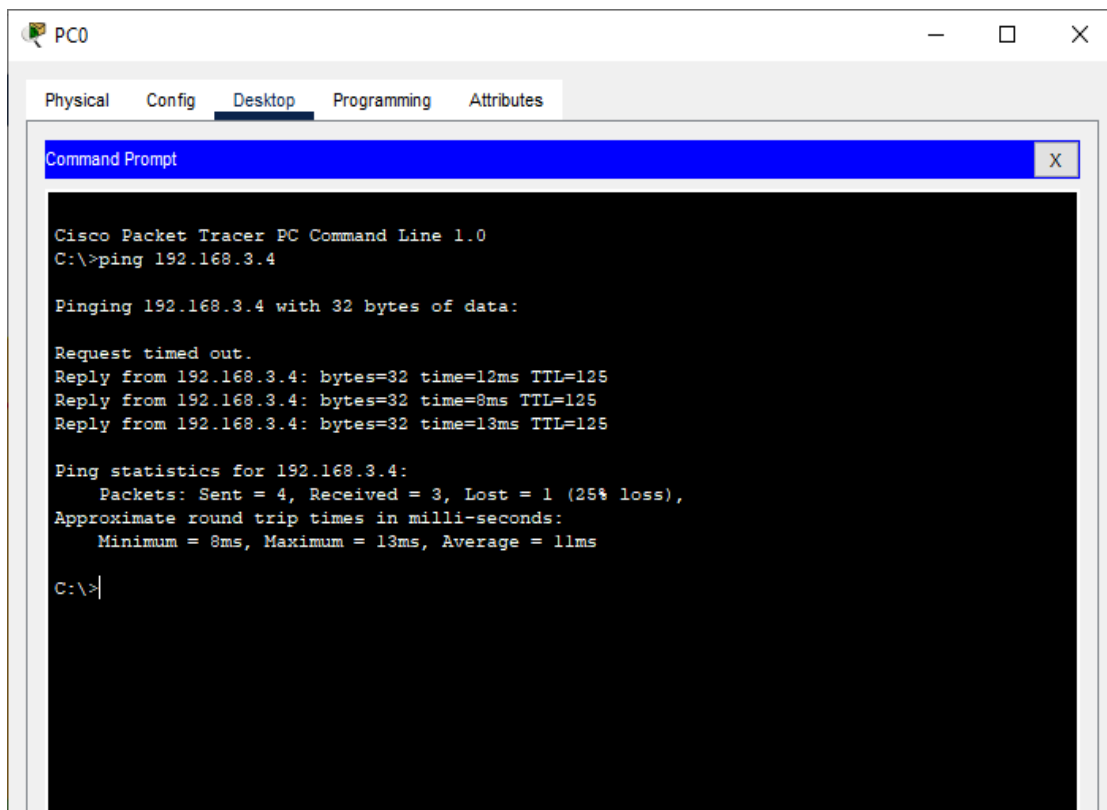
```
Router>enable
Router#configure terminal
Router(config)#
Router(config)#router bgp 2000
Router(config-router)#network 10.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#network 192.168.2.0
Router(config-router)#neighbor 10.0.0.1 remote-as 1000
Router(config-router)#neighbor 20.0.0.2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

Configuring Router 2 for BGP (using the CLI mode)

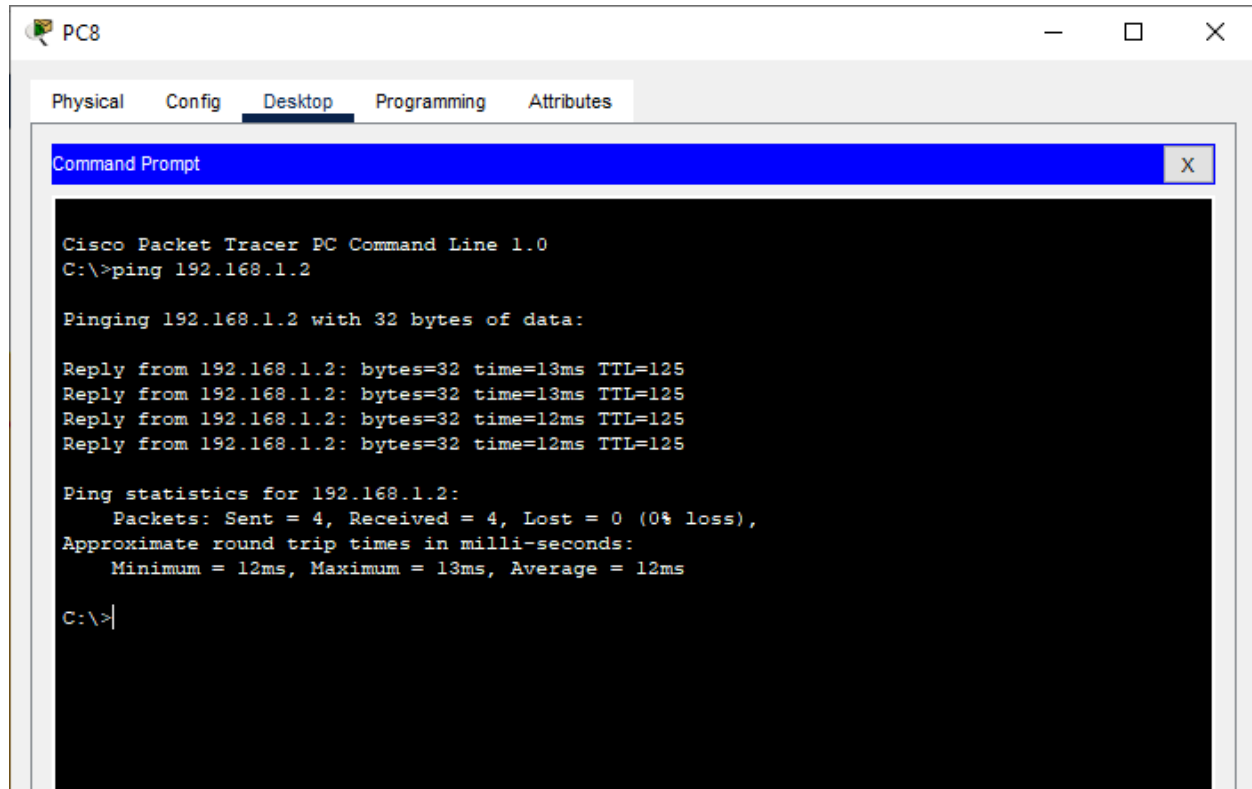
```
Router>enable
Router#configure terminal
Router(config)#
Router(config)#router bgp 3000
Router(config-router)#
Router(config-router)#network 20.0.0.0
Router(config-router)#network 192.168.3.0
Router(config-router)#neighbor 20.0.0.1 remote-as 2000
```

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