

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).

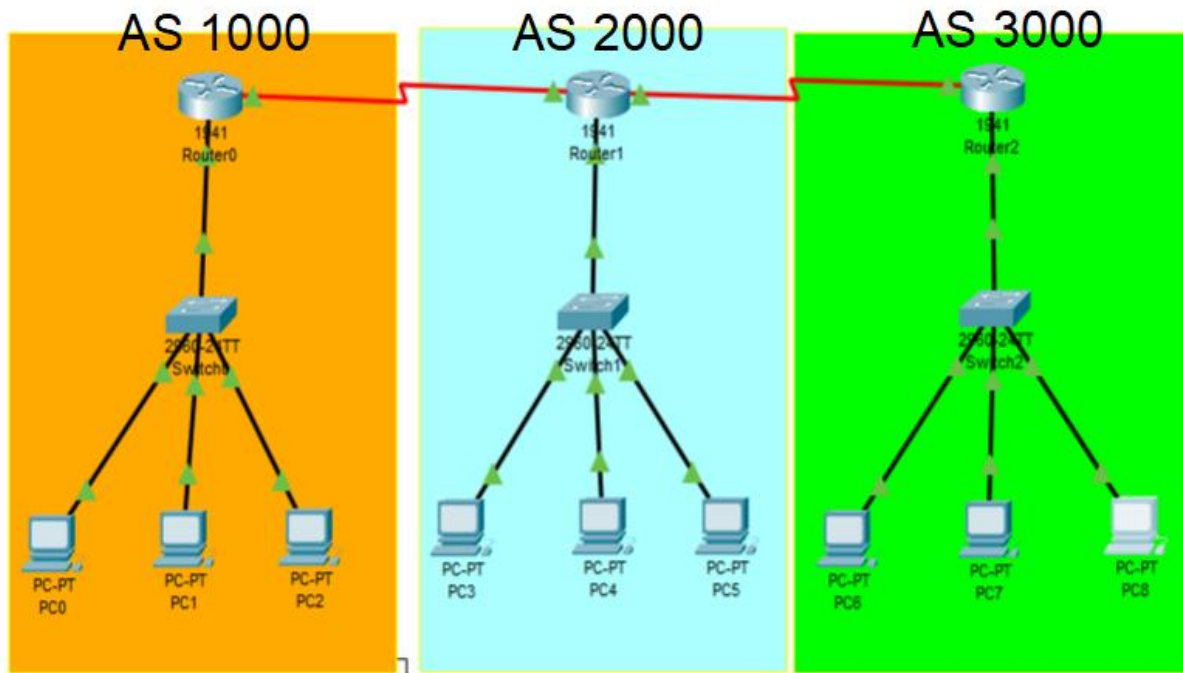
The protocol can connect together any internetwork of autonomous system using an arbitrary topology. The only requirement is that each AS have at least one router that is able to run BGP and that is router connect to at least one other AS's BGP router.

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

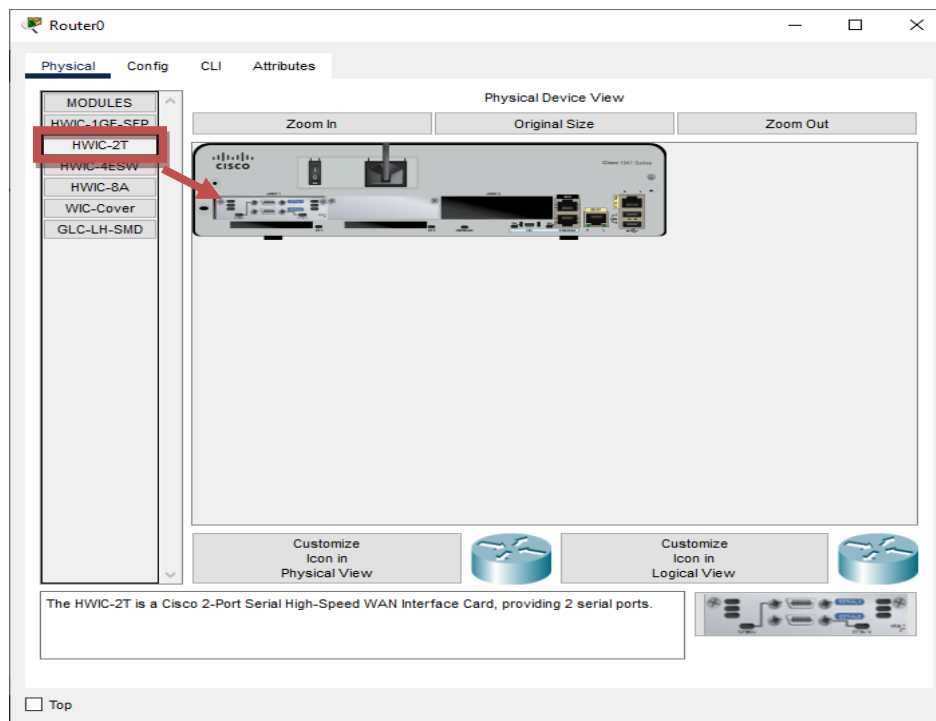
We use the following topology for the present case



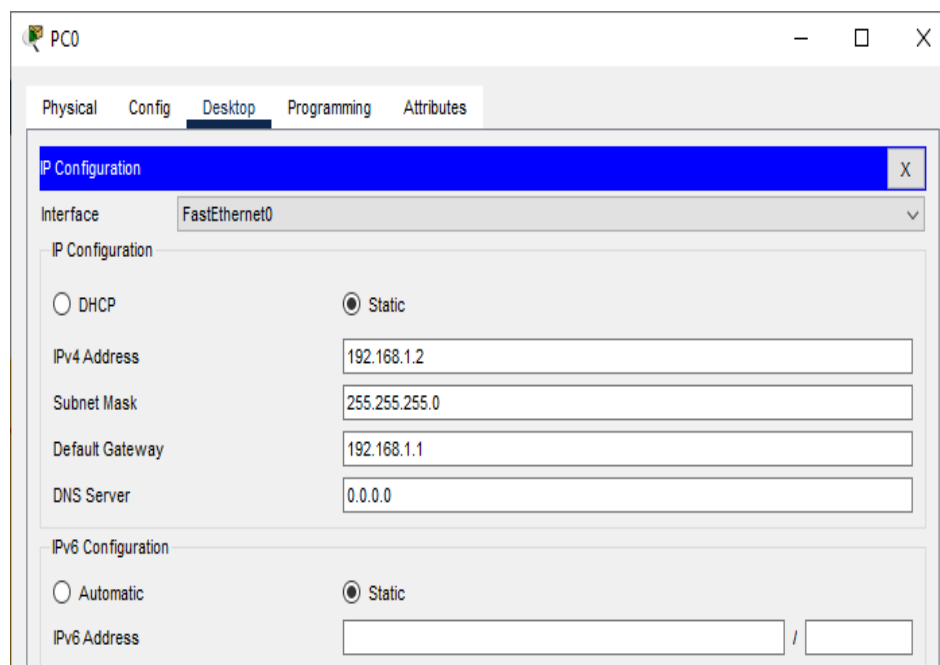
We configure the above network using the following IP addresses

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	
	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	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	192.168.3.0	192.168.3.1
PC7	FastEthernet0	192.168.3.3		
PC8	FastEthernet0	192.168.3.4		

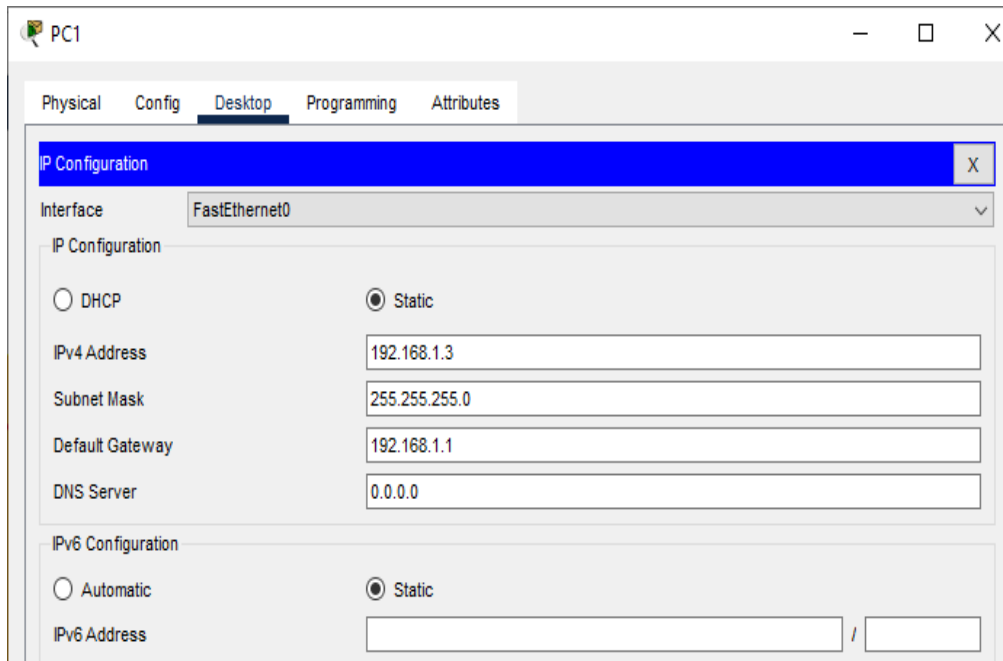
Adding Serial Interface in each Router



Configuring PC0:



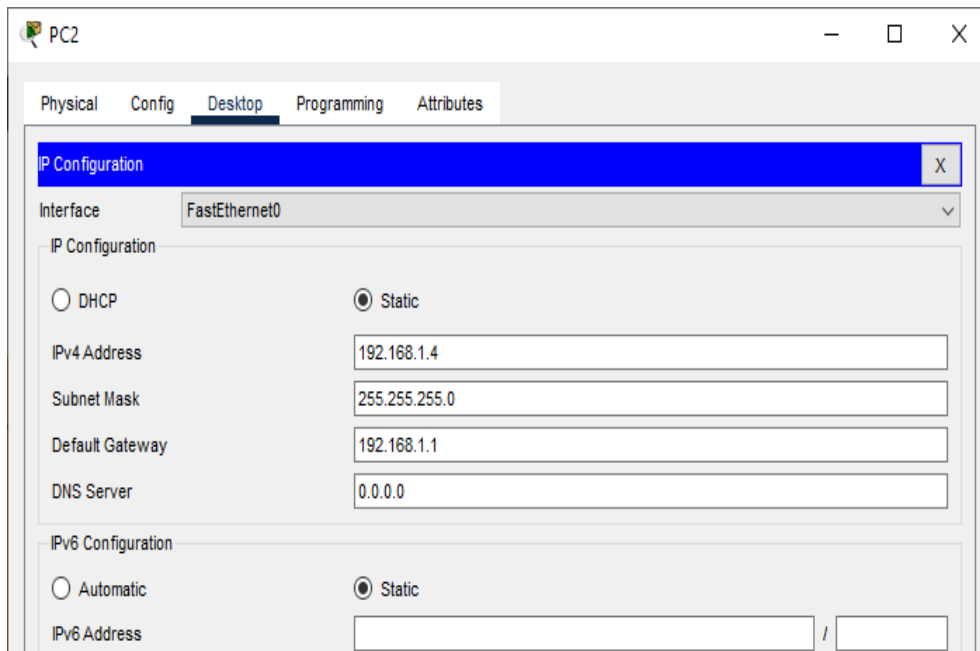
Configuring PC1:



The screenshot shows the 'PC1' configuration window with the 'Desktop' tab selected. The '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: 192.168.1.3, Subnet Mask: 255.255.255.0, Default Gateway: 192.168.1.1, and DNS Server: 0.0.0.0. The 'IPv6 Configuration' section is collapsed, showing 'Automatic' and 'Static' radio buttons, with the 'Static' button selected and an empty IPv6 Address field.

Field	Value
Interface	FastEthernet0
IP Configuration	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	Static
IPv6 Address	

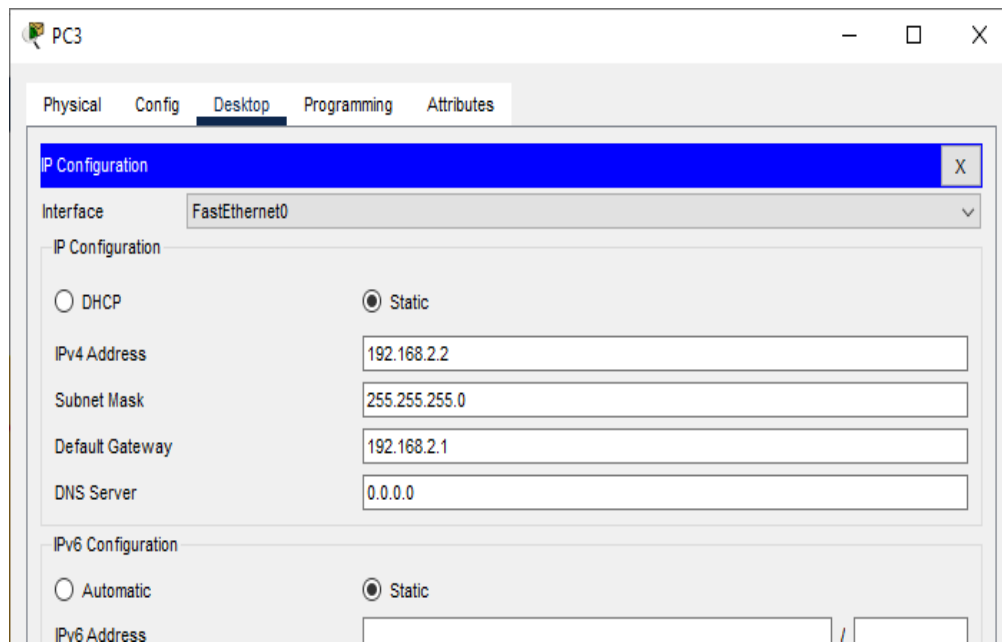
Configuring PC2:



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. The 'IPv6 Configuration' section is collapsed, showing 'Automatic' and 'Static' radio buttons, with the 'Static' button selected and an empty IPv6 Address field.

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	

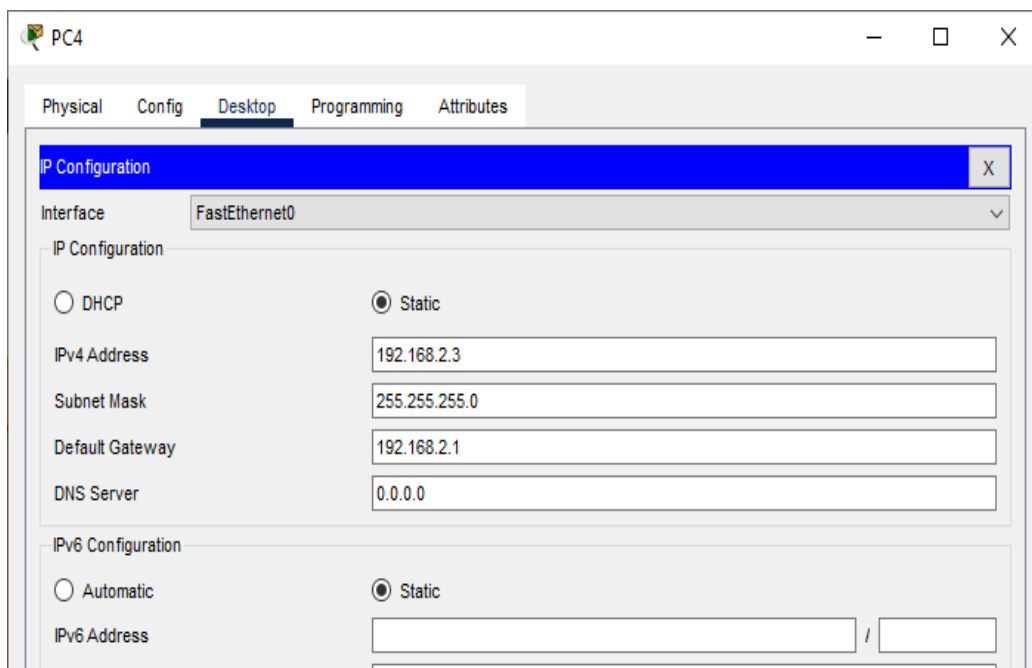
Configuring PC3:



The screenshot shows the configuration window for PC3. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Interface' is set to 'FastEthernet0'. The 'Static' radio button is selected for IPv4 Configuration. 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 shows 'Static' selected, but the IPv6 Address field is empty.

Field	Value
Interface	FastEthernet0
IPv4 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	

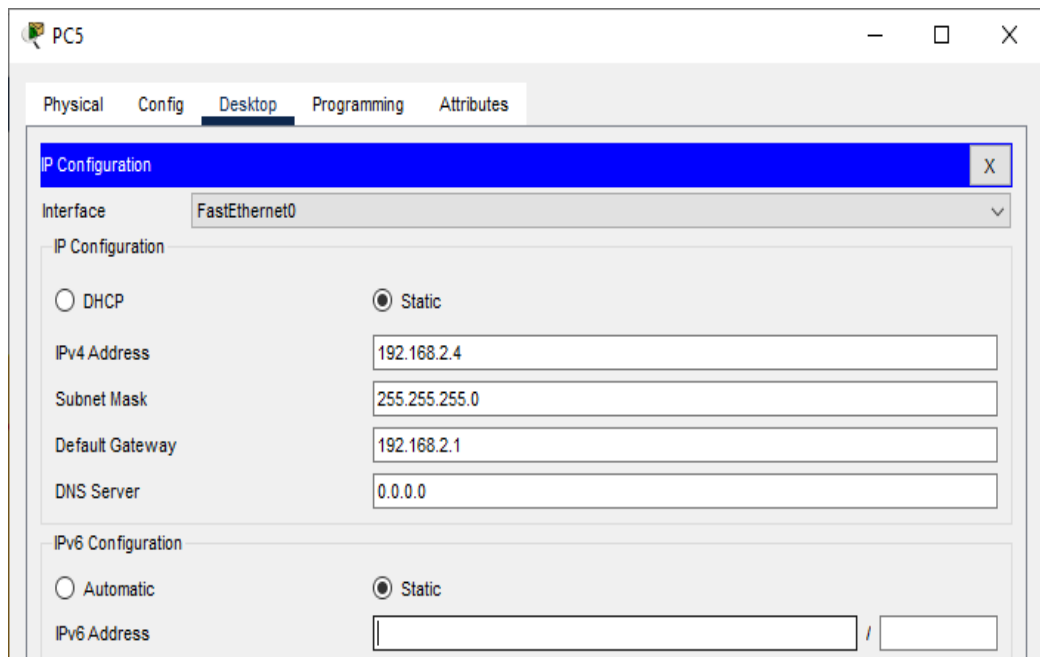
Configuring PC4:



The screenshot shows the configuration window for PC4. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Interface' is set to 'FastEthernet0'. The 'Static' radio button is selected for IPv4 Configuration. 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 shows 'Static' selected, but the IPv6 Address field is empty.

Field	Value
Interface	FastEthernet0
IPv4 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	

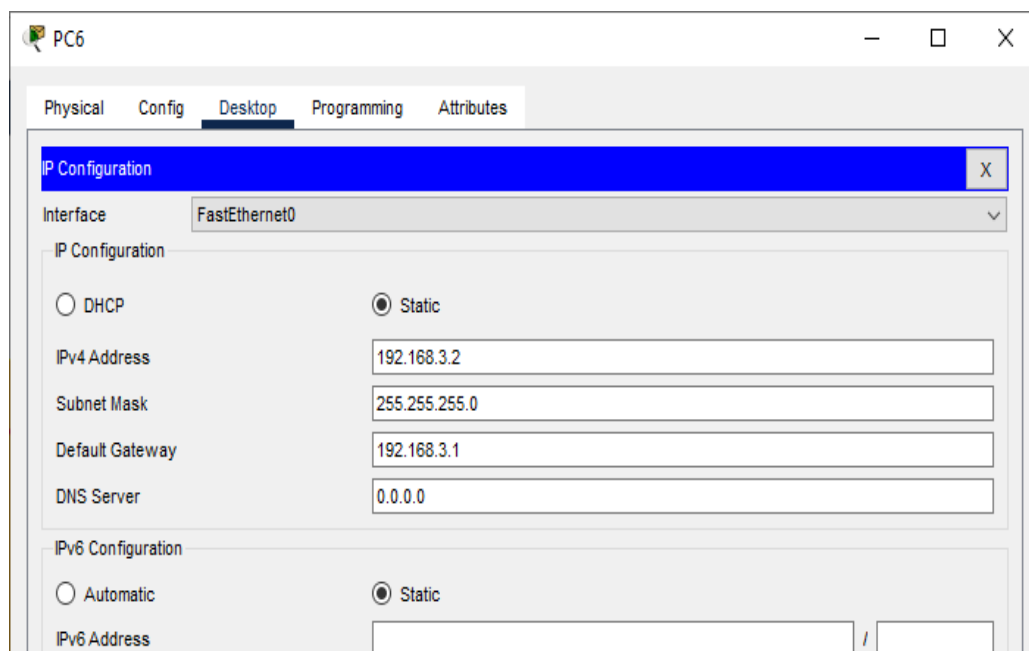
Configuring PC5:



The screenshot shows the configuration window for PC5. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Static' radio button is chosen. The IPv4 Address is set to 192.168.2.4, Subnet Mask to 255.255.255.0, Default Gateway to 192.168.2.1, and DNS Server to 0.0.0.0. The IPv6 Configuration section shows the 'Static' radio button selected, but the IPv6 Address field is empty.

Field	Value
Interface	FastEthernet0
IP Configuration	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	Static
IPv6 Address	

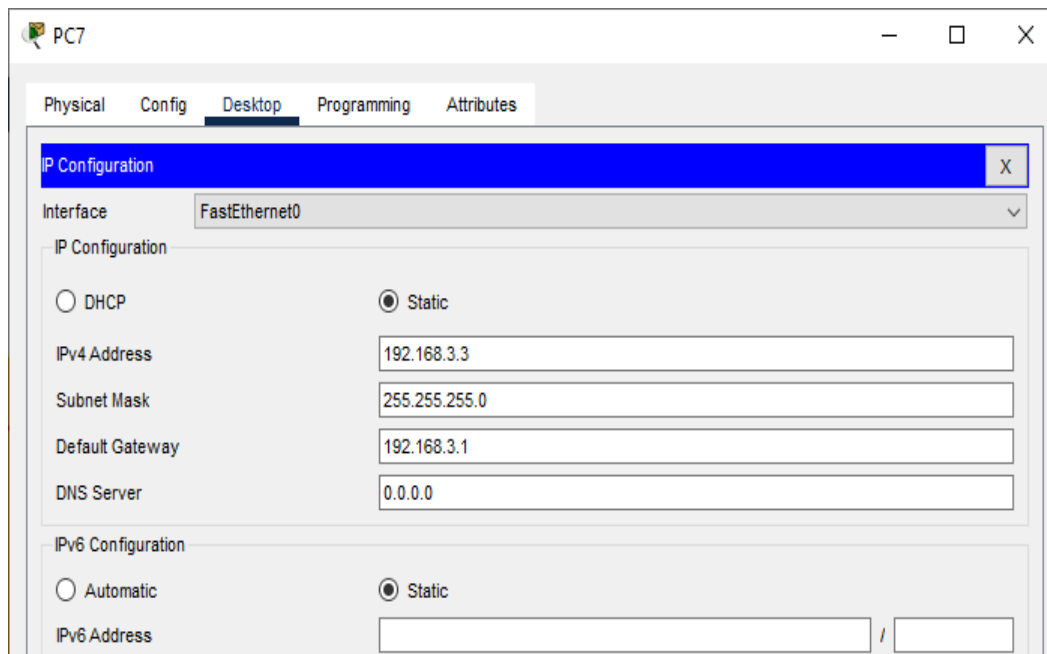
Configuring PC6:



The screenshot shows the configuration window for PC6. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Static' radio button is chosen. The IPv4 Address is set to 192.168.3.2, Subnet Mask to 255.255.255.0, Default Gateway to 192.168.3.1, and DNS Server to 0.0.0.0. The IPv6 Configuration section shows the 'Static' radio button selected, but the IPv6 Address field is empty.

Field	Value
Interface	FastEthernet0
IP Configuration	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	Static
IPv6 Address	

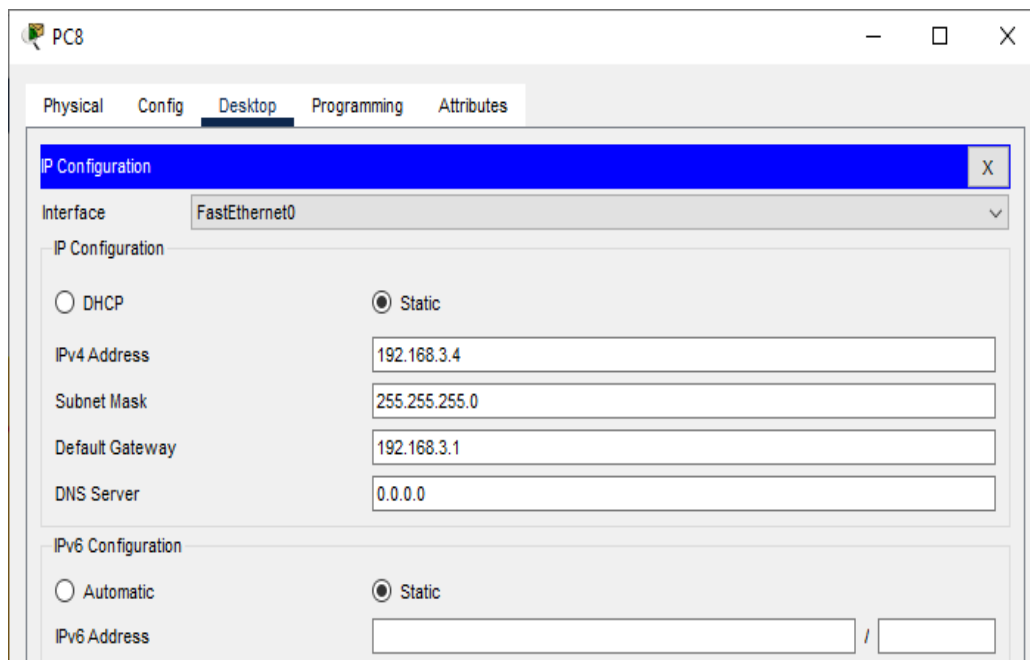
Configuring PC7:



The screenshot shows the configuration window for PC7. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Static' radio button is chosen. The IPv4 Address is set to 192.168.3.3, Subnet Mask to 255.255.255.0, Default Gateway to 192.168.3.1, and DNS Server to 0.0.0.0. The IPv6 Configuration section shows the 'Static' radio button selected, but the IPv6 Address field is empty.

Field	Value
Interface	FastEthernet0
IP Configuration	
DHCP	<input type="radio"/>
Static	<input checked="" type="radio"/>
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	
Automatic	<input type="radio"/>
Static	<input checked="" type="radio"/>
IPv6 Address	

Configuring PC8:



The screenshot shows the configuration window for PC8. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Static' radio button is chosen. The IPv4 Address is set to 192.168.3.4, Subnet Mask to 255.255.255.0, Default Gateway to 192.168.3.1, and DNS Server to 0.0.0.0. The IPv6 Configuration section shows the 'Static' radio button selected, but the IPv6 Address field is empty.

Field	Value
Interface	FastEthernet0
IP Configuration	
DHCP	<input type="radio"/>
Static	<input checked="" type="radio"/>
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	
Automatic	<input type="radio"/>
Static	<input checked="" type="radio"/>
IPv6 Address	

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: 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 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: 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 shows the configuration tree with 'INTERFACE' expanded and 'GigabitEthernet0/0' selected. The main panel displays the following settings:

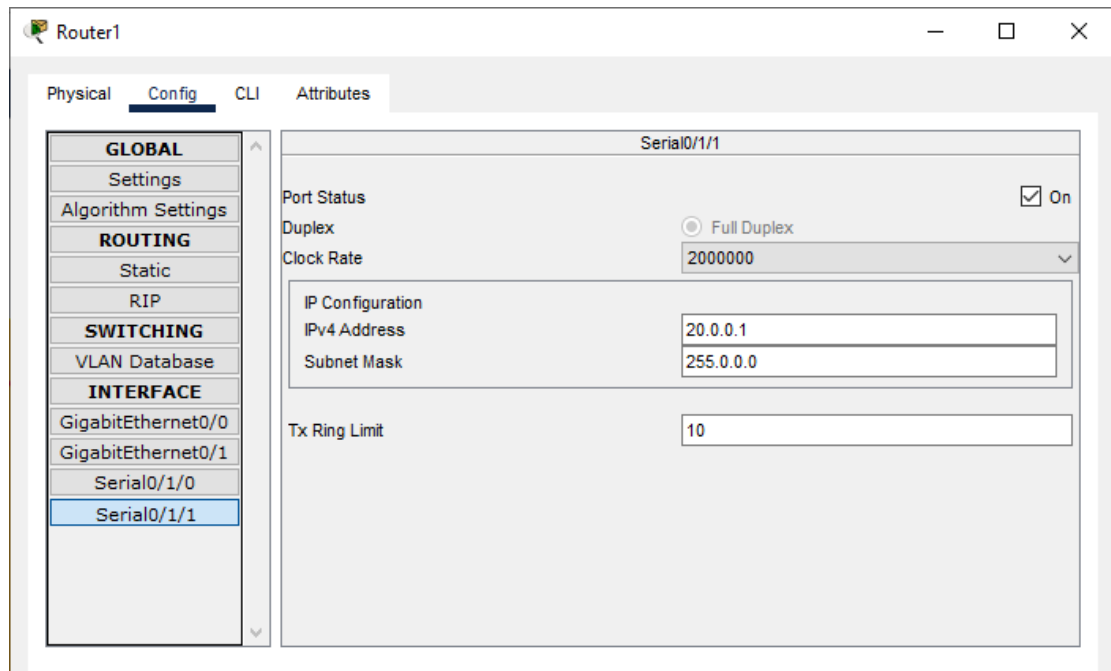
GigabitEthernet0/0	
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input checked="" type="radio"/> 1000 Mbps <input type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto
Duplex	<input checked="" type="radio"/> Half Duplex <input type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	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 shows the configuration tree with 'INTERFACE' expanded and 'Serial0/1/0' selected. The main panel displays the following settings:

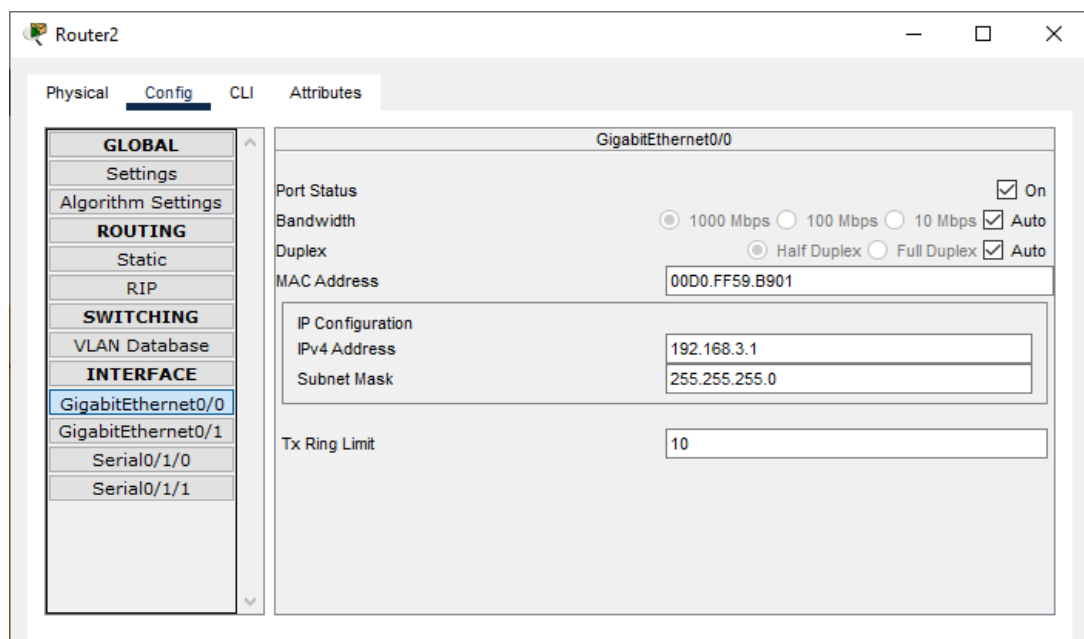
Serial0/1/0	
Port Status	<input checked="" type="checkbox"/> On
Duplex	<input checked="" type="radio"/> Full Duplex
Clock Rate	2000000
IP Configuration	
IPv4 Address	10.0.0.2
Subnet Mask	255.0.0.0
Tx Ring Limit	10

iii) Interface S0/1/1

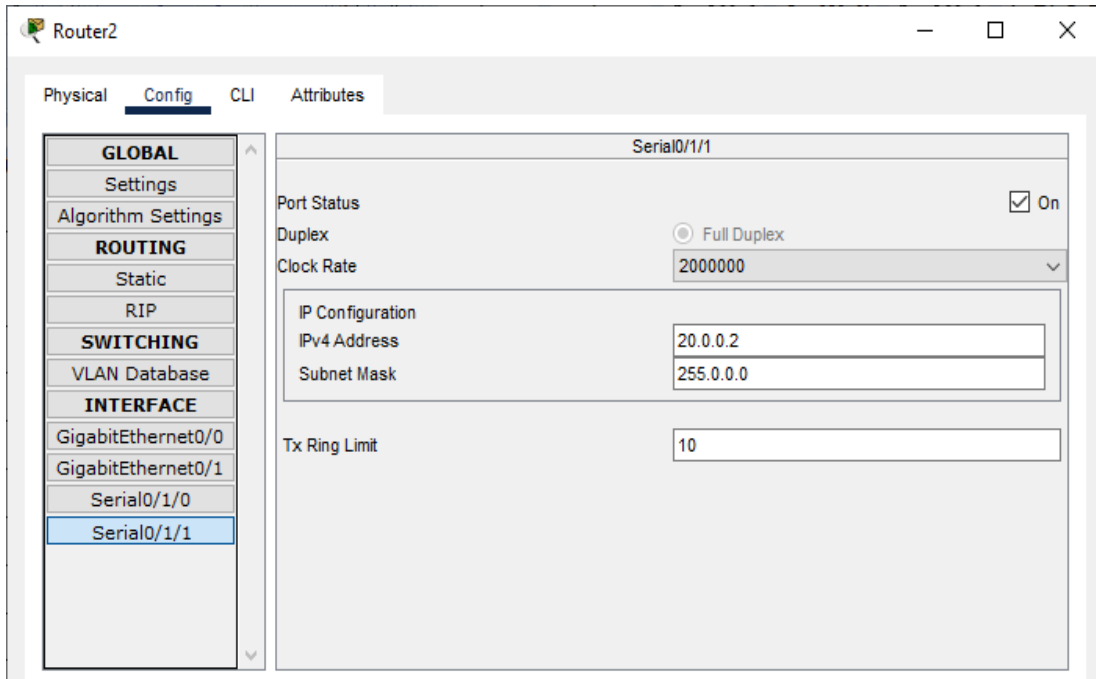


Configuring IP addresses on Router 2

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)

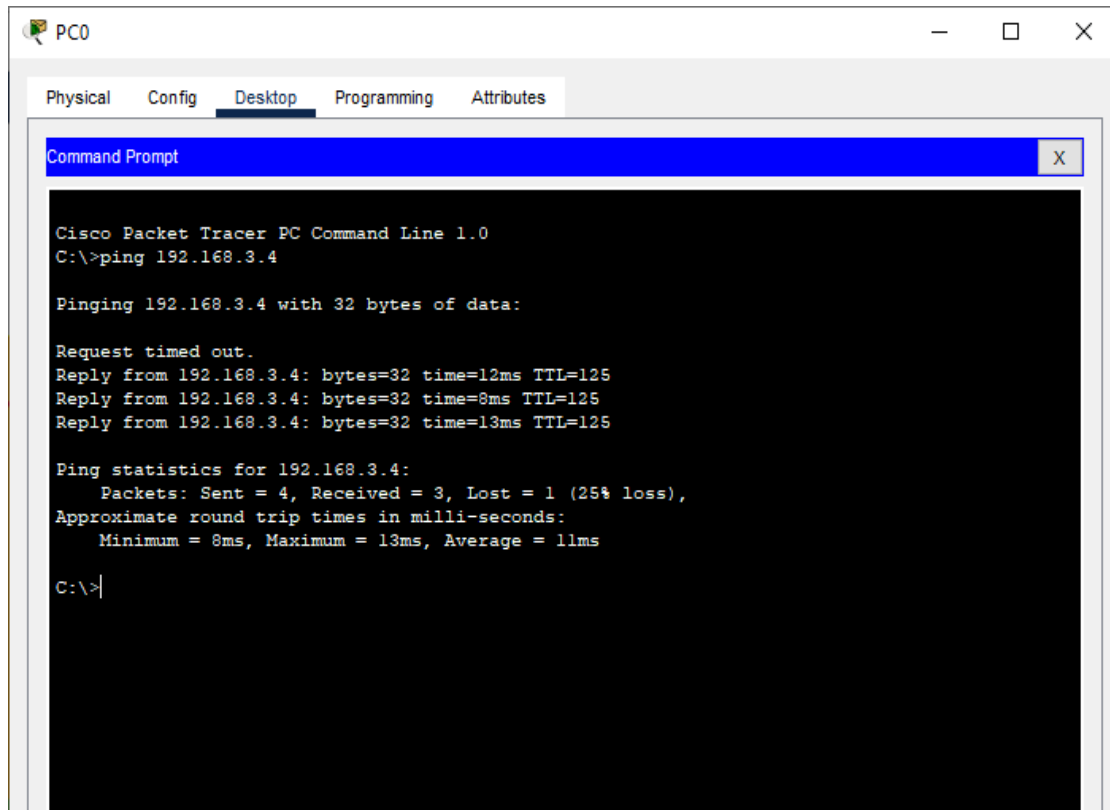
```
Router>enable
Router#configure terminal
Router(config)#
Router(config)#router bgp 2000
Router(config-router)#network 10.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#network 192.168.2.0
Router(config-router)#neighbor 10.0.0.1 remote-as 1000
Router(config-router)#neighbor 20.0.0.2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

Configuring Router 2 for BGP (using the CLI mode)

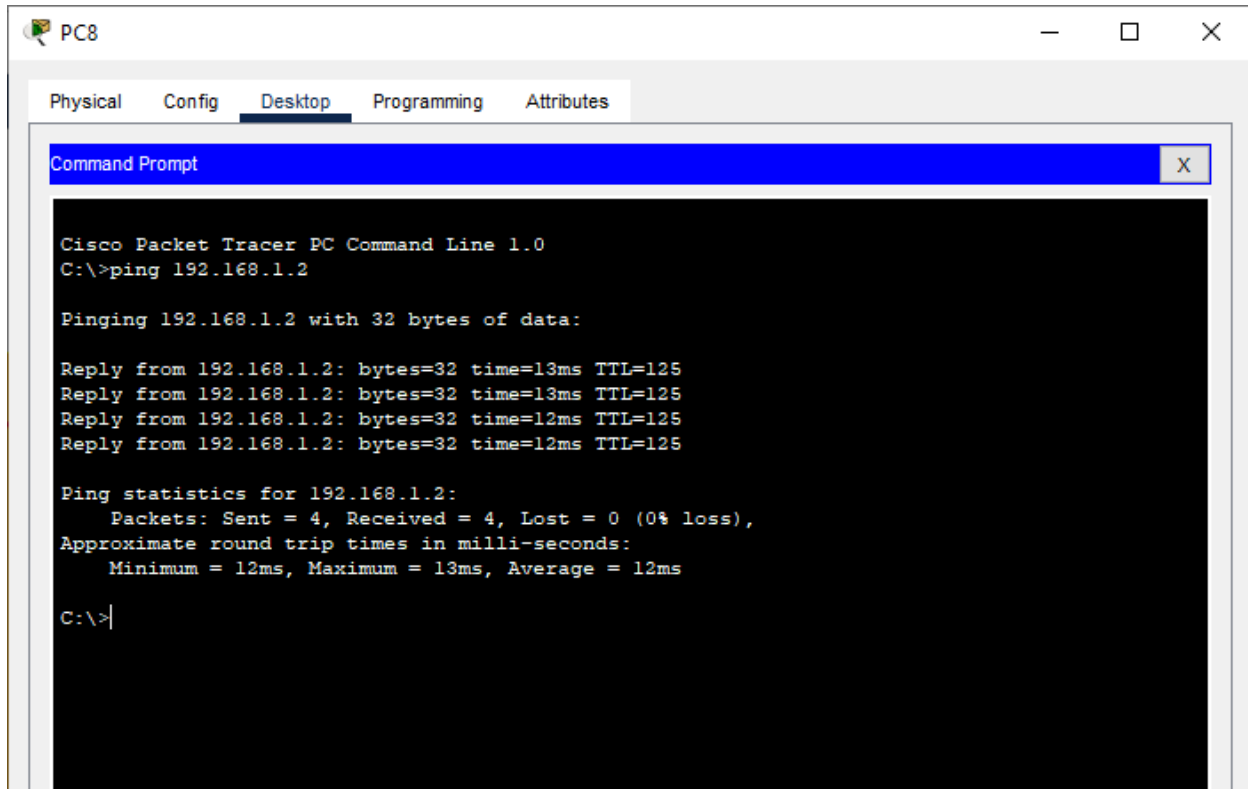
```
Router>enable
Router#configure terminal
Router(config)#
Router(config)#router bgp 3000
Router(config-router)#
Router(config-router)#network 20.0.0.0
Router(config-router)#network 192.168.3.0
Router(config-router)#neighbor 20.0.0.1 remote-as 2000
```

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

Link for the video demonstration of the practical:

<https://youtu.be/fBEFfW-TWec>