

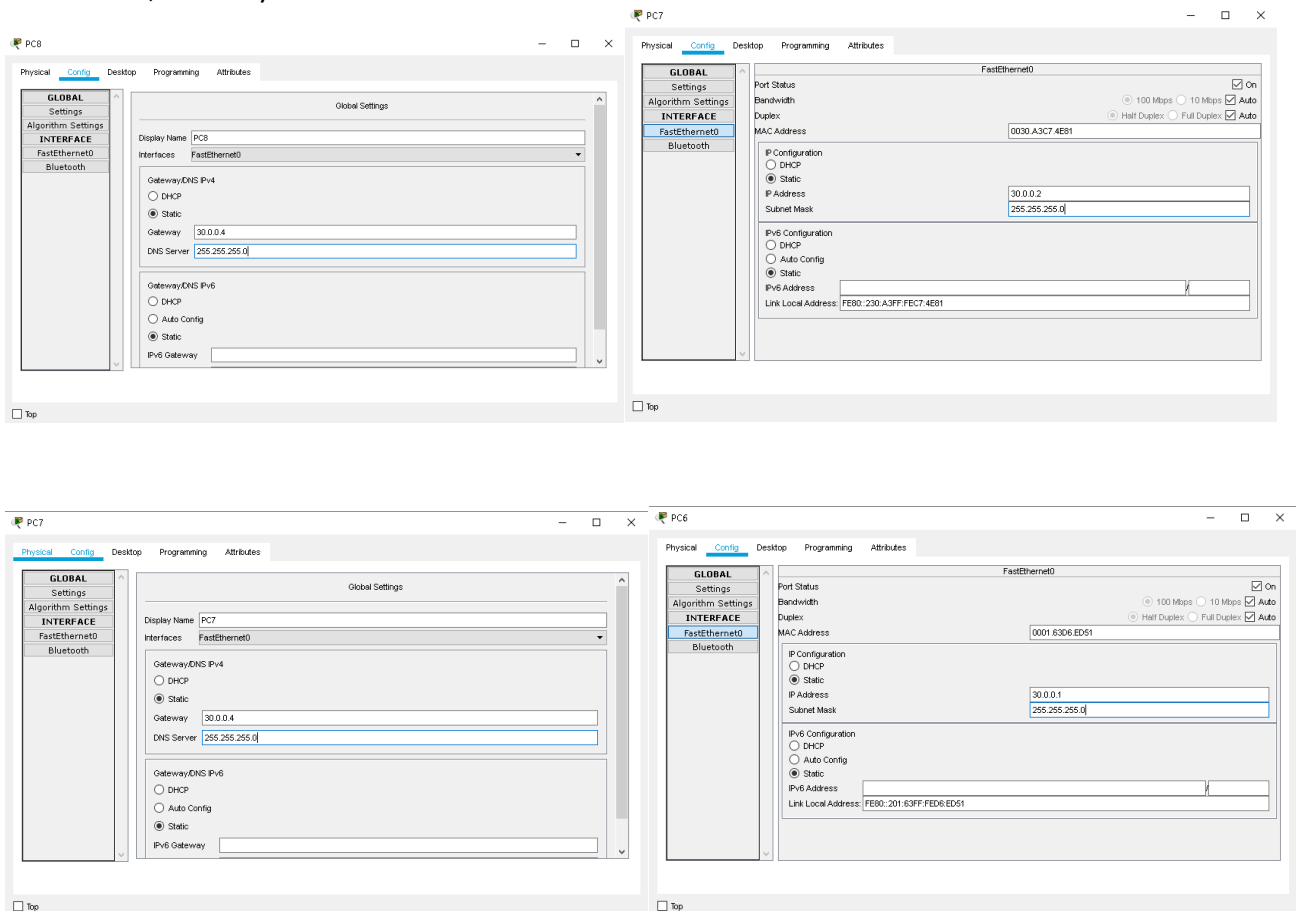
## PRACTICAL - 3

Aim - Create a network with three routers with BGP and each router associated network will have minimum three PC. Show connectivity.

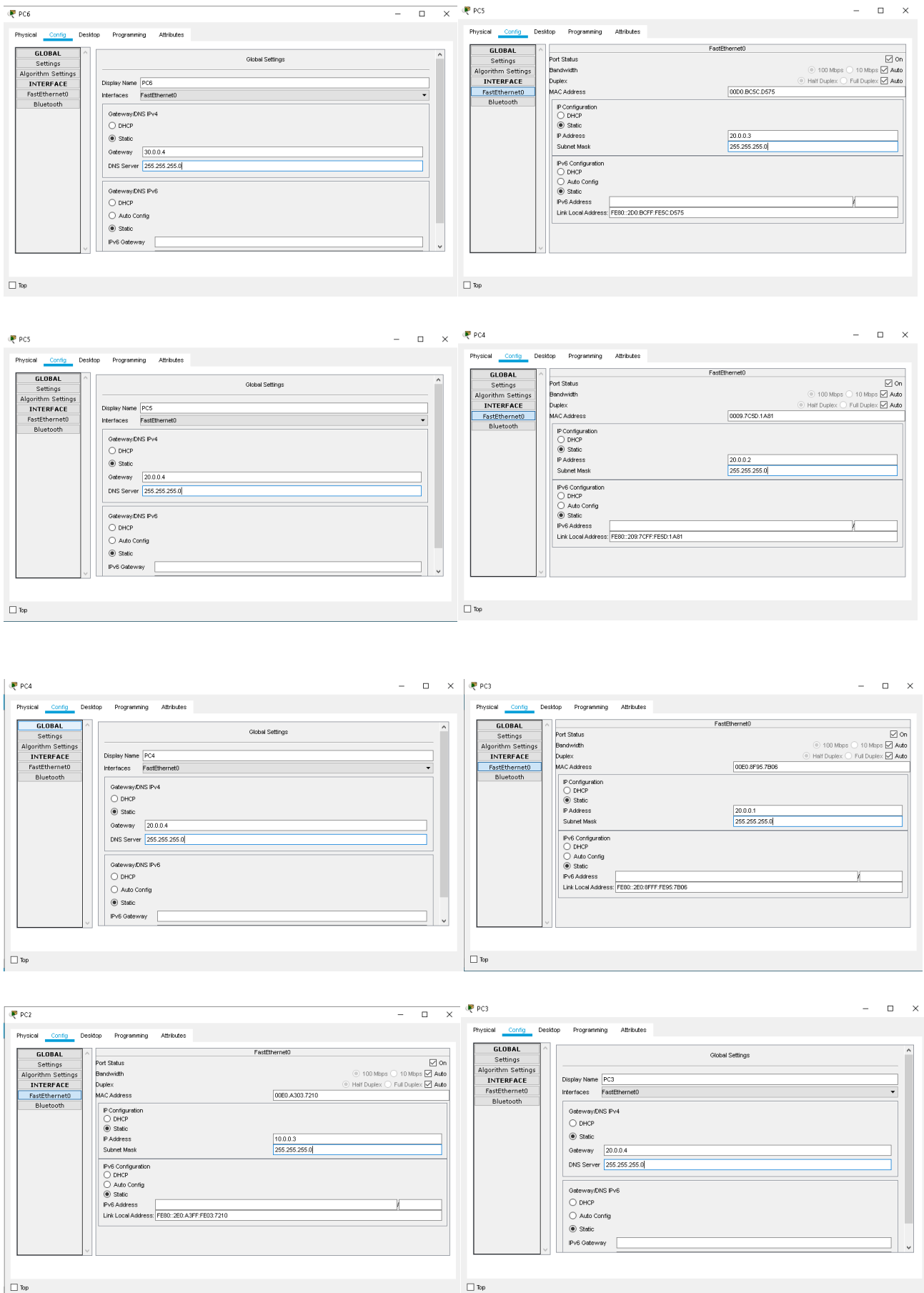
1. Align 9 end-devices as follows:



2. Set the DNS, Gateway and Fast Ethernet connections for all the PCs as follows:



Abhishek Iyengar  
07 - MSc. CS. Part – 1  
Advanced Networking Concepts



Abhishek Iyengar  
07 - MSc. CS. Part – 1  
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PC2

Physical Config Desktop Programming Attributes

GLOBAL Settings Algorithm Settings INTERFACE FastEthernet0 Bluetooth

Global Settings

Display Name: PC2

Interfaces: FastEthernet0

Gateway/DNS IPv4  
☐ DHCP  
☒ Static  
Gateway: 10.0.0.4  
DNS Server: 255.255.255.0

Gateway/DNS IPv6  
☐ DHCP  
☐ Auto Config  
☒ Static  
IPv6 Gateway:

Top

PC1

Physical Config Desktop Programming Attributes

GLOBAL Settings Algorithm Settings INTERFACE FastEthernet0 Bluetooth

FastEthernet0

Port Status: ☒ On

Bandwidth: ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex: ☒ Half Duplex ☐ Full Duplex ☒ Auto

MAC Address: 0000.475B.B616

IP Configuration  
☐ DHCP  
☒ Static  
IP Address: 10.0.0.2  
Subnet Mask: 255.255.255.0

IPv6 Configuration  
☐ DHCP  
☐ Auto Config  
☒ Static  
IPv6 Address:   
Link Local Address: FE80:260:47FF:FE5B:B616

Top

PC1

Physical Config Desktop Programming Attributes

GLOBAL Settings Algorithm Settings INTERFACE FastEthernet0 Bluetooth

Global Settings

Display Name: PC1

Interfaces: FastEthernet0

Gateway/DNS IPv4  
☐ DHCP  
☒ Static  
Gateway: 10.0.0.4  
DNS Server: 255.255.255.0

Gateway/DNS IPv6  
☐ DHCP  
☐ Auto Config  
☒ Static  
IPv6 Gateway:

Top

PC0

Physical Config Desktop Programming Attributes

GLOBAL Settings Algorithm Settings INTERFACE FastEthernet0 Bluetooth

FastEthernet0

Port Status: ☒ On

Bandwidth: ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex: ☒ Half Duplex ☐ Full Duplex ☒ Auto

MAC Address: 000C.85DE.25AC

IP Configuration  
☐ DHCP  
☒ Static  
IP Address: 10.0.0.1  
Subnet Mask: 255.255.255.0

IPv6 Configuration  
☐ DHCP  
☐ Auto Config  
☒ Static  
IPv6 Address:   
Link Local Address: FE80:20C:85FF:FEDE:25AC

Top

PC0

Physical Config Desktop Programming Attributes

GLOBAL Settings Algorithm Settings INTERFACE FastEthernet0 Bluetooth

Global Settings

Display Name: PC0

Interfaces: FastEthernet0

Gateway/DNS IPv4  
☐ DHCP  
☒ Static  
Gateway: 10.0.0.4  
DNS Server: 255.255.255.0

Gateway/DNS IPv6  
☐ DHCP  
☐ Auto Config  
☒ Static  
IPv6 Gateway:

Top

PC8

Physical Config Desktop Programming Attributes

GLOBAL Settings Algorithm Settings INTERFACE FastEthernet0 Bluetooth

FastEthernet0

Port Status: ☒ On

Bandwidth: ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex: ☒ Half Duplex ☐ Full Duplex ☒ Auto

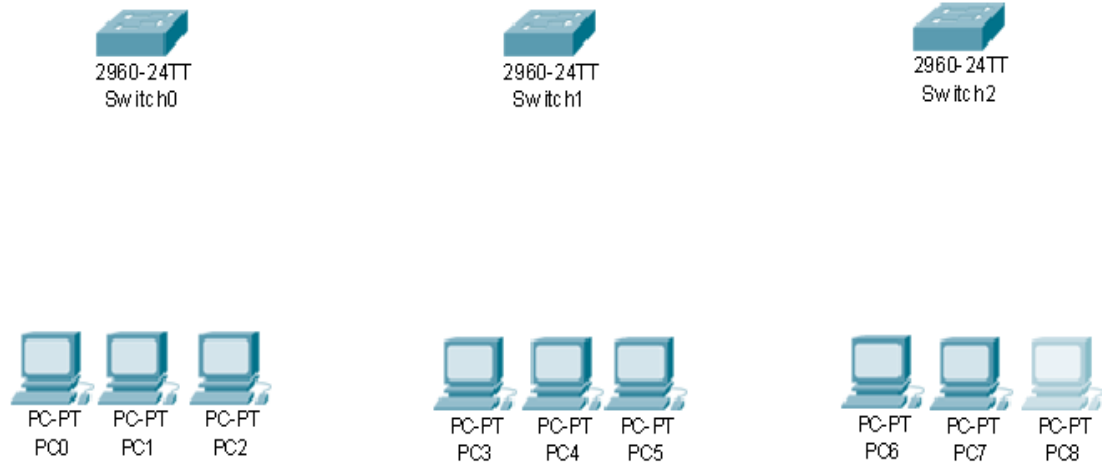
MAC Address: 0090.0C10.A370

IP Configuration  
☐ DHCP  
☒ Static  
IP Address: 30.0.0.3  
Subnet Mask: 255.255.255.0

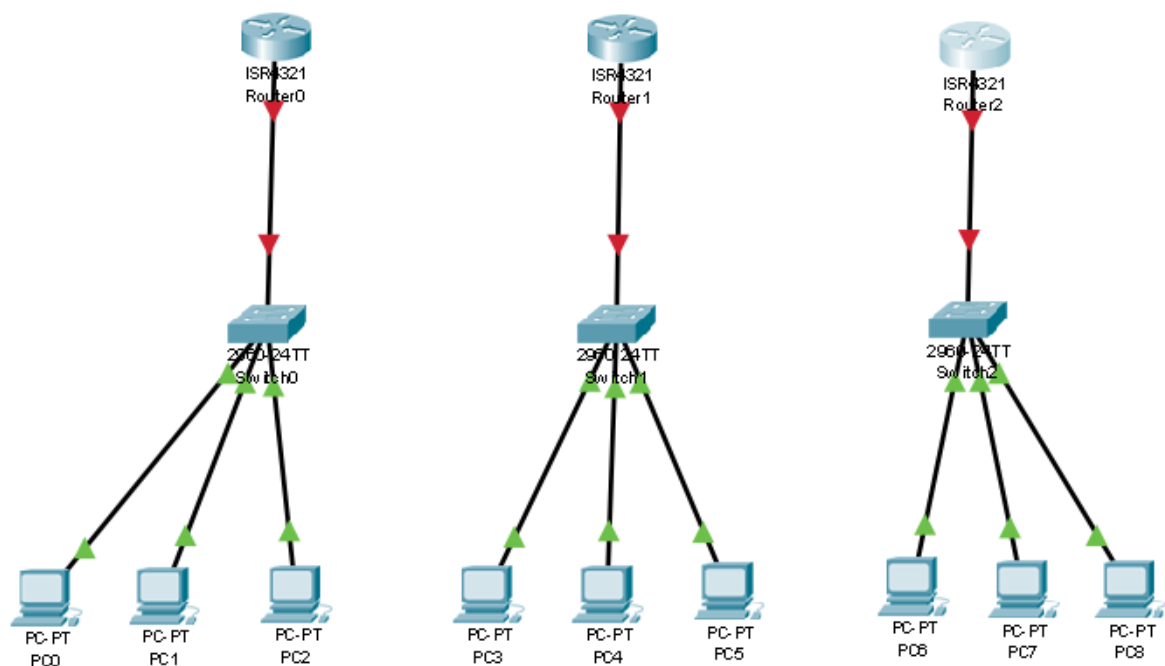
IPv6 Configuration  
☐ DHCP  
☐ Auto Config  
☒ Static  
IPv6 Address:   
Link Local Address: FE80:290:0FF:FE10:A370

Top

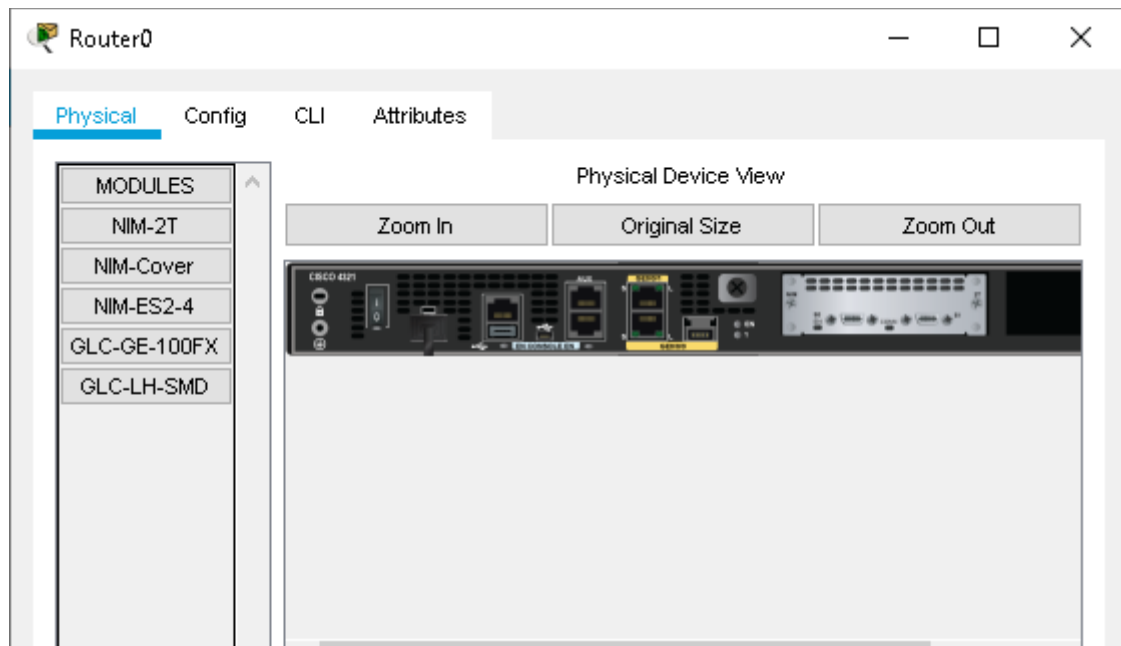
3. Add 3 Switches as follows:



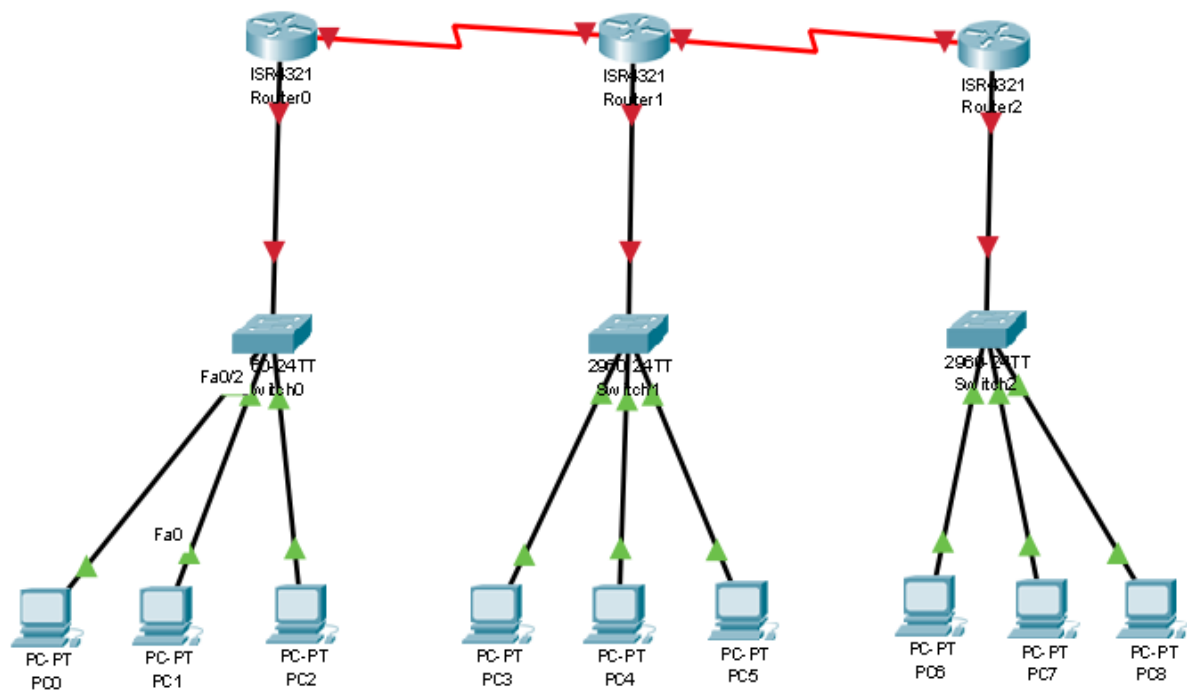
4. Add 3 Routers and connect all the components using Fast Ethernet connection as follows:



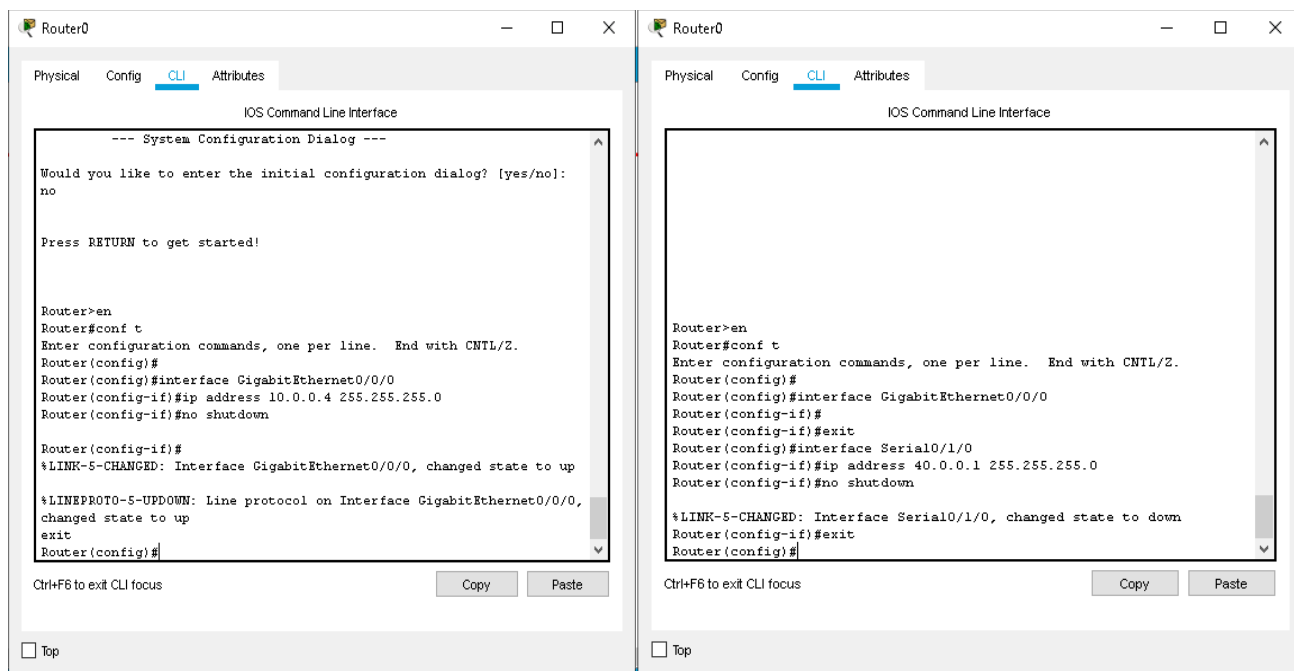
5. Power off each of the Routers and add the NIM-2T Module to all the Routers as follows:



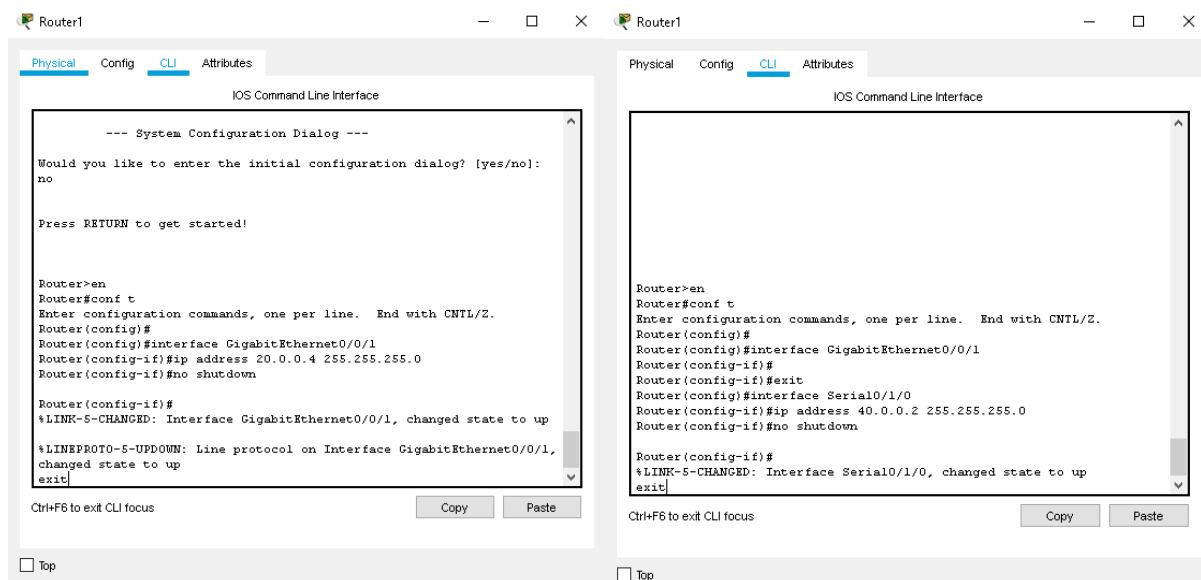
6. Connect the Routers using Serial DTE wires as shown:

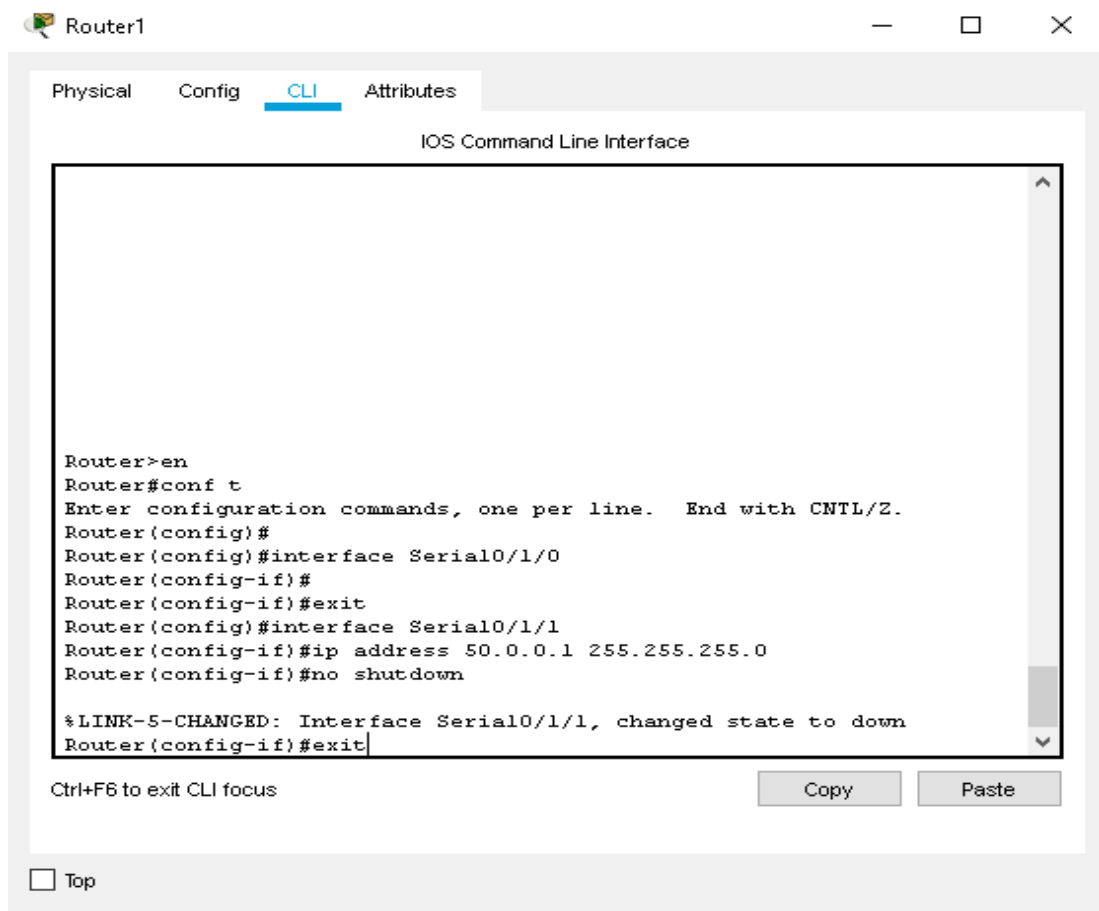


7. Configure Router0 using the Command Line Interface as follows:

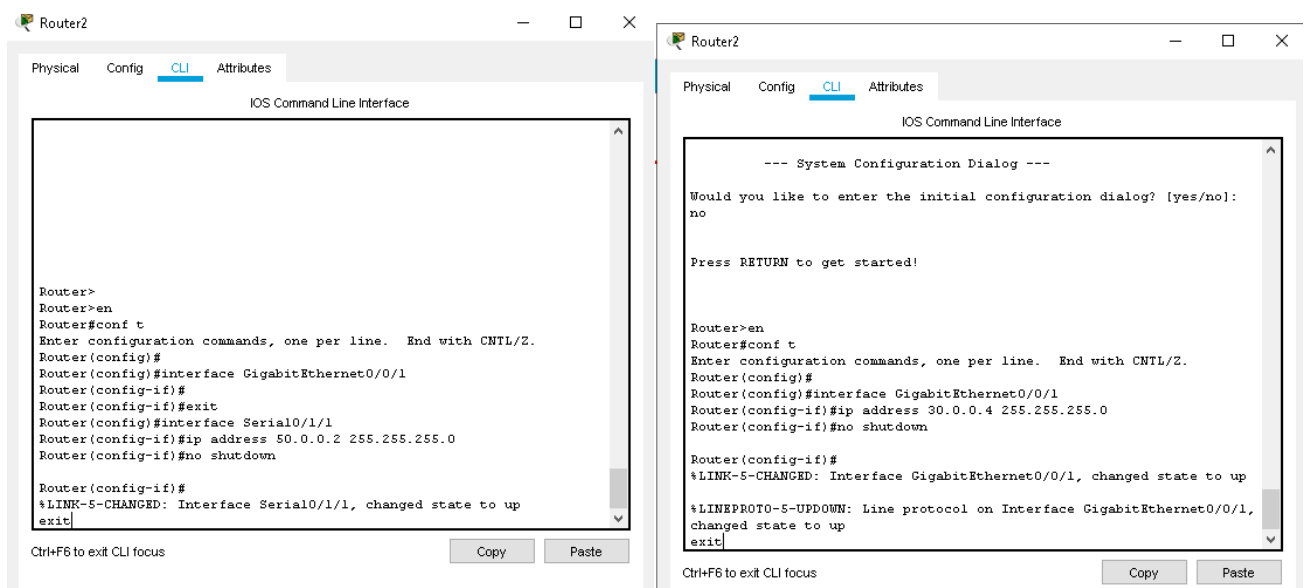


8. Configure Router0 using the Command Line Interface as follows:

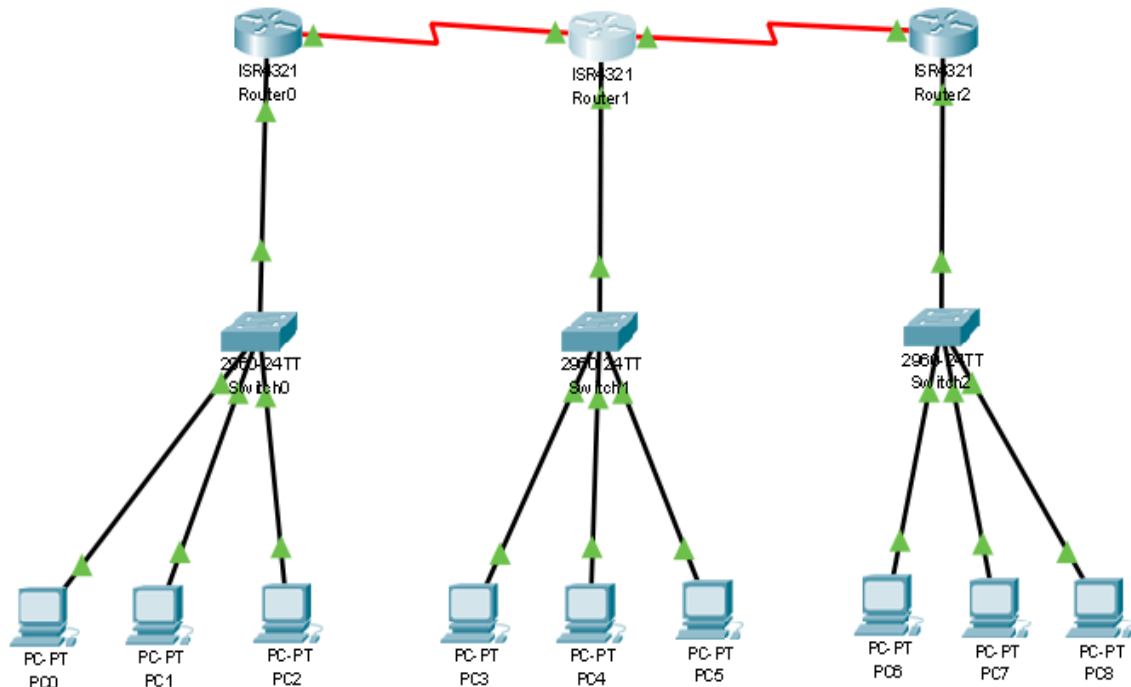




9. Configure Router0 using the Command Line Interface as follows:



10. The Final connection will look as shown:



11. Note how intra-connection packet sending succeeds and inter-connection fails:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC0	PC1	ICMP	Dark Blue	0.000	N	0	(edit)
	Successful	PC3	PC4	ICMP	Blue	0.000	N	1	(edit)
	Successful	PC6	PC7	ICMP	Orange	0.000	N	2	(edit)

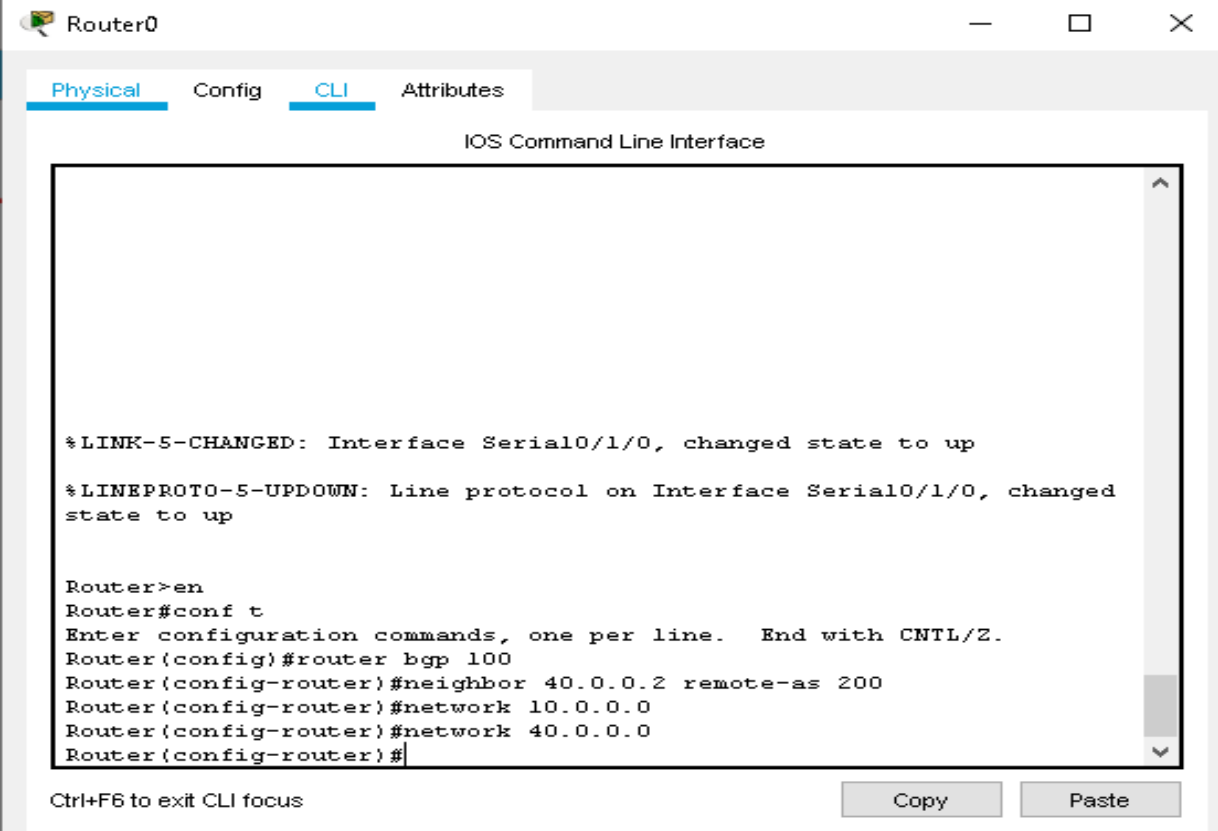
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	Router0	Router1	ICMP	Cyan	0.000	N	0	(edit)
	Successful	Router1	Router2	ICMP	Magenta	0.000	N	1	(edit)

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Failed	PC0	PC3	ICMP	Blue	0.000	N	0	(edit)
	Failed	PC3	PC6	ICMP	Blue	0.000	N	1	(edit)
	Failed	PC8	PC2	ICMP	Magenta	0.000	N	2	(edit)

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Failed	Router0	Router2	ICMP	Green	0.000	N	0	(edit)



12. Configure BGP Routing in Router0 as follows:



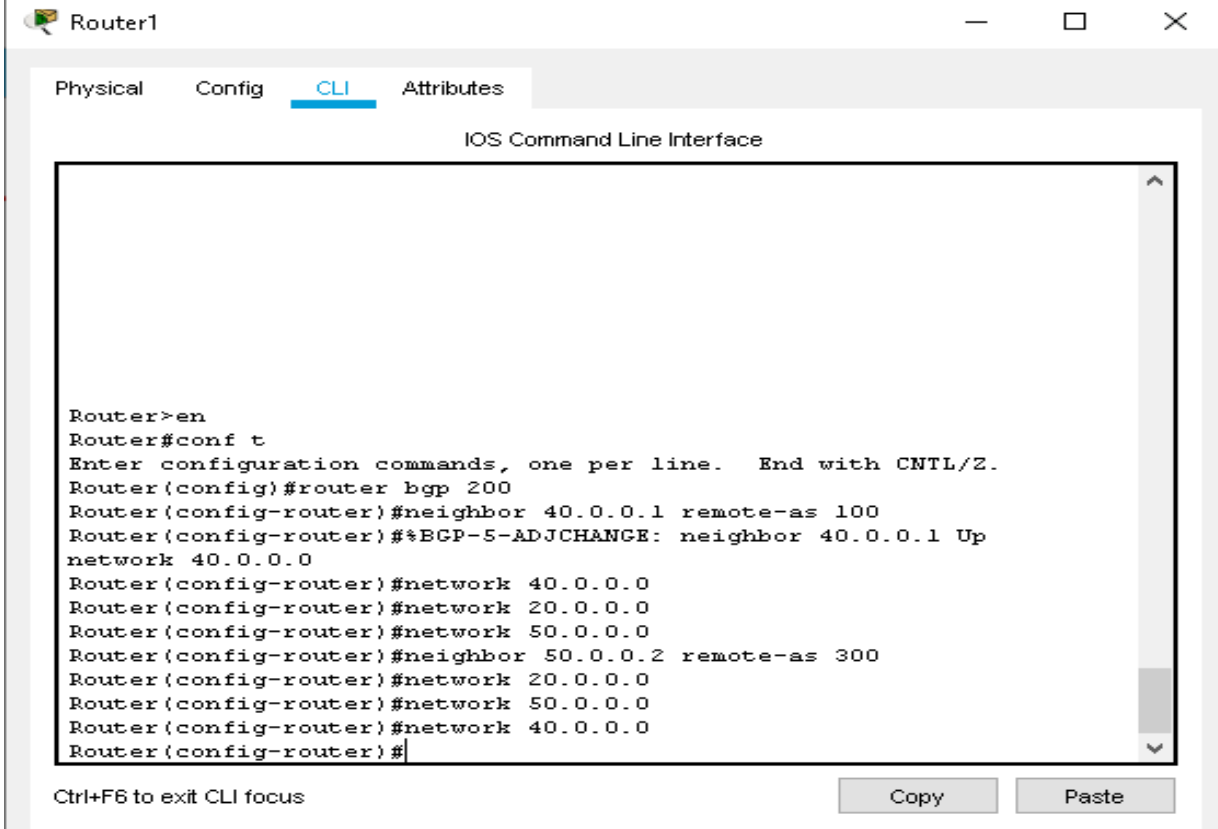
The screenshot shows a window titled "Router0" with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the "IOS Command Line Interface". The terminal output shows the following commands and messages:

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

Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router bgp 100
Router(config-router)#neighbor 40.0.0.2 remote-as 200
Router(config-router)#network 10.0.0.0
Router(config-router)#network 40.0.0.0
Router(config-router)#
```

At the bottom of the window, there is a text label "Ctrl+F6 to exit CLI focus" and two buttons: "Copy" and "Paste".

13. Configure BGP Routing in Router1 as follows:

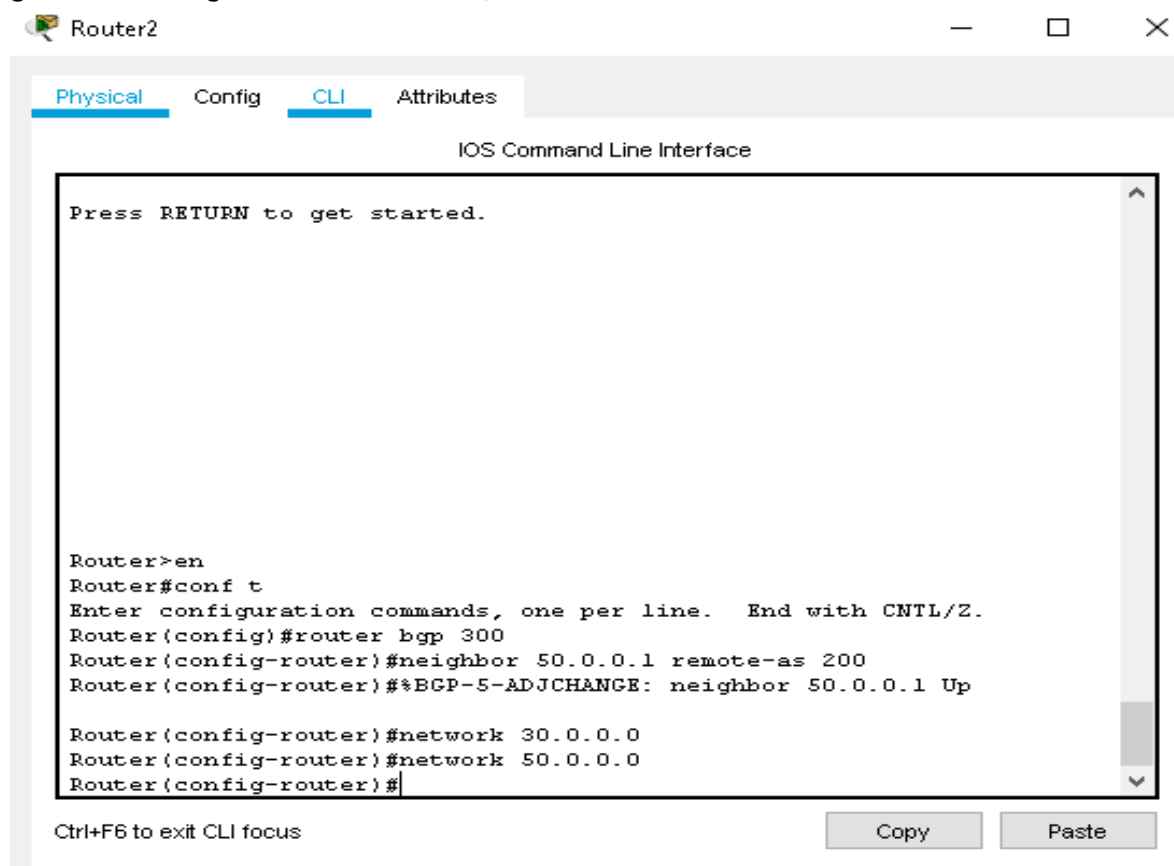


The screenshot shows a window titled "Router1" with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the "IOS Command Line Interface". The terminal output shows the following commands and messages:

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router bgp 200
Router(config-router)#neighbor 40.0.0.1 remote-as 100
Router(config-router)%%BGP-5-ADJCHANGE: neighbor 40.0.0.1 Up
Router(config-router)#network 40.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#neighbor 50.0.0.2 remote-as 300
Router(config-router)#network 20.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#network 40.0.0.0
Router(config-router)#
```

At the bottom of the window, there is a text label "Ctrl+F6 to exit CLI focus" and two buttons: "Copy" and "Paste".

14. Configure BGP Routing in Router 2 as follows;



15. After successful BGP configuration, send packets over the inter-connected network :

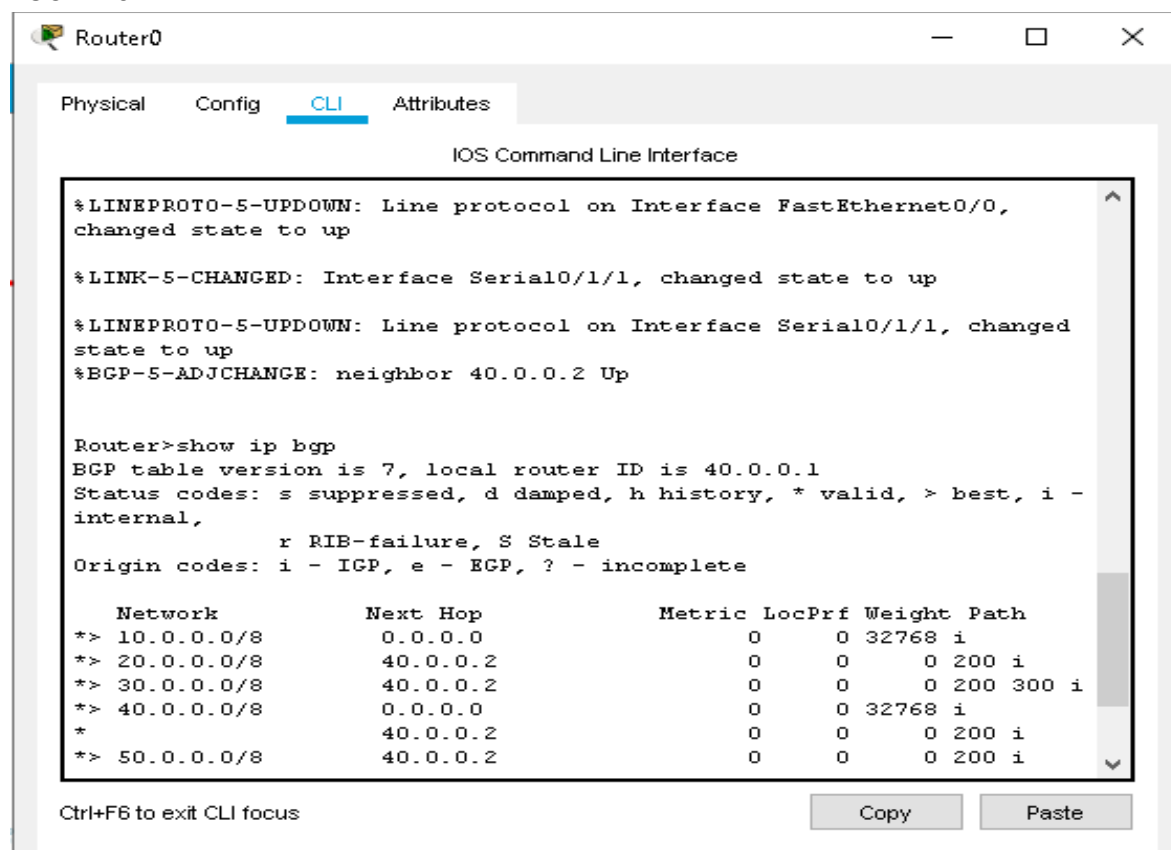
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC0	PC3	ICMP		0.000	N	0	(edit)
	Failed	PC0	PC6	ICMP		0.000	N	1	(edit)
	Successful	PC0	PC6	ICMP		0.000	N	2	(edit)

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	Router0	Router2	ICMP		0.000	N	0	(edit)
	Successful	Router1	Router0	ICMP		0.000	N	1	(edit)
	Successful	Router2	Router0	ICMP		0.000	N	2	(edit)

16. Finally, in every Router's CLI, type 'show ip route' to get the connection details:

#### ROUTER 0



The screenshot shows the CLI of Router0. The tabs at the top are Physical, Config, CLI (selected), and Attributes. The main window displays the following text:

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

%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up

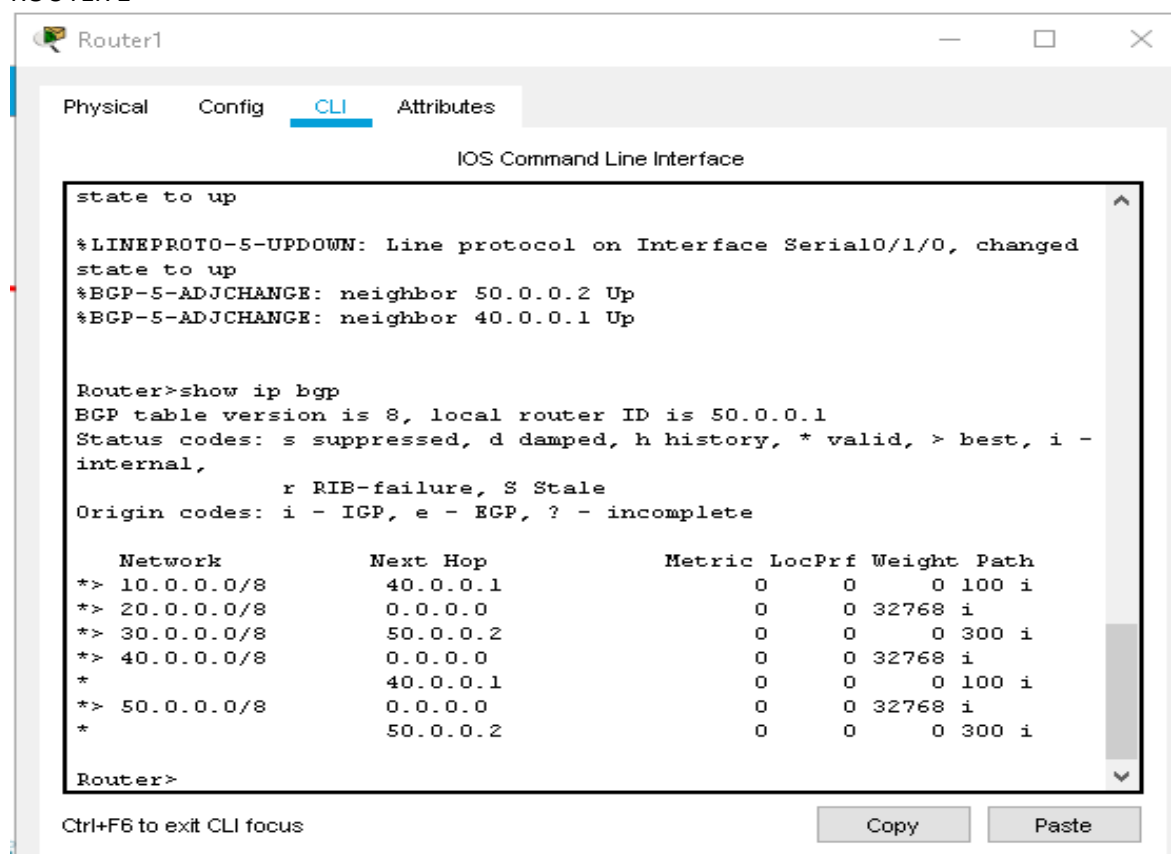
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed
state to up
%BGP-5-ADJCHANGE: neighbor 40.0.0.2 Up

Router>show ip bgp
BGP table version is 7, local router ID is 40.0.0.1
Status codes: s suppressed, d damped, h history, * valid, > best, i -
internal,
                r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop          Metric LocPrf Weight Path
*> 10.0.0.0/8        0.0.0.0              0      0 32768 i
*> 20.0.0.0/8        40.0.0.2              0      0      0 200 i
*> 30.0.0.0/8        40.0.0.2              0      0      0 200 300 i
*> 40.0.0.0/8        0.0.0.0              0      0 32768 i
*                   40.0.0.2              0      0      0 200 i
*> 50.0.0.0/8        40.0.0.2              0      0      0 200 i
```

At the bottom, there is a prompt 'Ctrl+F6 to exit CLI focus' and two buttons: 'Copy' and 'Paste'.

#### ROUTER 1



The screenshot shows the CLI of Router1. The tabs at the top are Physical, Config, CLI (selected), and Attributes. The main window displays the following text:

```
state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed
state to up
%BGP-5-ADJCHANGE: neighbor 50.0.0.2 Up
%BGP-5-ADJCHANGE: neighbor 40.0.0.1 Up

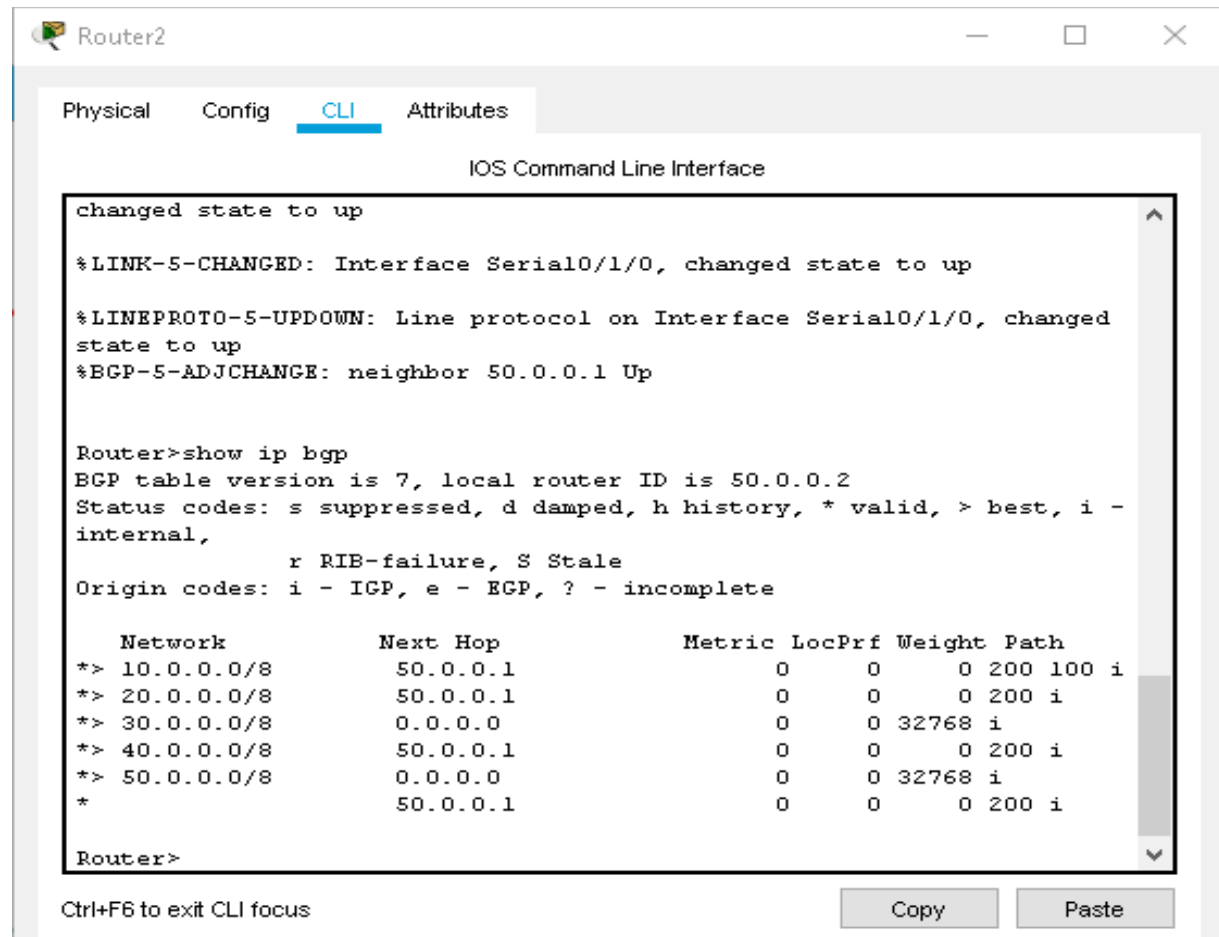
Router>show ip bgp
BGP table version is 8, local router ID is 50.0.0.1
Status codes: s suppressed, d damped, h history, * valid, > best, i -
internal,
                r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop          Metric LocPrf Weight Path
*> 10.0.0.0/8        40.0.0.1              0      0      0 100 i
*> 20.0.0.0/8        0.0.0.0              0      0 32768 i
*> 30.0.0.0/8        50.0.0.2              0      0      0 300 i
*> 40.0.0.0/8        0.0.0.0              0      0 32768 i
*                   40.0.0.1              0      0      0 100 i
*> 50.0.0.0/8        0.0.0.0              0      0 32768 i
*                   50.0.0.2              0      0      0 300 i

Router>
```

At the bottom, there is a prompt 'Ctrl+F6 to exit CLI focus' and two buttons: 'Copy' and 'Paste'.

## ROUTER 2



The screenshot shows the CLI of a router named 'Router2'. The 'CLI' tab is selected. The interface displays several system messages indicating that the interface Serial0/1/0 has changed state to up, and BGP neighbor 50.0.0.1 is up. The user has entered the command 'show ip bgp', which displays the BGP table version 7, local router ID 50.0.0.2, and a routing table with the following entries:

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 10.0.0.0/8	50.0.0.1	0	0	0 200 100	i
*> 20.0.0.0/8	50.0.0.1	0	0	0 200	i
*> 30.0.0.0/8	0.0.0.0	0	0	32768	i
*> 40.0.0.0/8	50.0.0.1	0	0	0 200	i
*> 50.0.0.0/8	0.0.0.0	0	0	32768	i
*	50.0.0.1	0	0	0 200	i

At the bottom of the CLI window, there is a status bar with the text 'Ctrl+F6 to exit CLI focus' and two buttons: 'Copy' and 'Paste'.