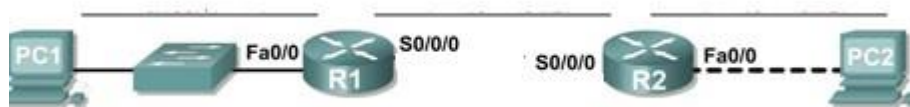


Lab 6: Subnet and Router Configuration

Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	192.168.1.65	255.255.255.192	N/A
	S0/0/0	192.168.1.129	255.255.255.192	N/A
R2	Fa0/0	192.168.1.193	255.255.255.192	N/A
	S0/0/0	192.168.1.190	255.255.255.192	N/A
PC1	NIC	192.168.1.126	255.255.255.192	192.168.1.65
PC2	NIC	192.168.1.254	255.255.255.192	192.168.1.193

Learning Objectives

Upon completion of this lab, you will be able to:

- Subnet an address space given requirements.
- Assign appropriate addresses to interfaces and document.
- Configure and activate Serial and FastEthernet interfaces.
- Test and verify configurations.
- Reflect upon and document the network implementation.

Scenario

In this lab activity, you will design and apply an IP addressing scheme for the topology shown in the Topology Diagram. You will be given one address block that you must subnet to provide a logical addressing scheme for the network. The routers will then be ready for interface address configuration according to your IP addressing scheme. When the configuration is complete, verify that the network is working properly.

Task 1: Subnet the Address Space.

Step 1: Examine the network requirements.

You have been given the 192.168.1.0/24 address space to use in your network design. The network consists of the following segments:

- The network connected to router R1 will require enough IP addresses to support 15 hosts.
- The network connected to router R2 will require enough IP addresses to support 30 hosts.
- The link between router R1 and router R2 will require IP addresses at each end of the link.

Step 2: Consider the following questions when creating your network design.

How many subnets are needed for this network?

Ans: Three subnets mentioned as follows :

First subnet is the network connected to router R1, second subnet is the link between routers R1 and R2 and the third subnet is the network connected to router R2 .

What is the subnet mask for this network in dotted decimal format?

Ans: We need 3 subnets for this network which can be represented by 2 bits

So, the subnet mask becomes: **11111111.11111111.11111111.1100000000**

i.e. **255.255.255.192**

What is the subnet mask for the network in slash format?

Ans: The subnet mask for the network in slash format is the number of ones in the subnet mask written in dot separated format

Hence, subnet mask for the network in slash format is **/26**

How many usable hosts are there per subnet?

Ans: In IPv4, there are two IPs that cannot be assigned to any devices. These are the **Network ID** and the **Broadcast IP address**. Therefore, you need to subtract two addresses from the total IP formula.

$2^6 - 2 = 62$ usable hosts per subnet.

Step 3: Assign sub-network addresses to the Topology Diagram.

1. Assign subnet 1 to the network attached to R1.

Subnet 1: 11000000.10101000.00000001.01000000 = 192.168.1.64

Network ID: 11000000.10101000.00000001.01000000 = 192.168.1.64/26

1st usable IP: 11000000.10101000.00000001.01000001 = 192.168.1.65/26

Last usable IP: 11000000.10101000.00000001.01111110 = 192.168.1.126/26

Broadcast IP: 11000000.10101000.00000001.01111111 = 192.168.1.127/26

2. Assign subnet 2 to the link between R1 and R2.

Subnet 2: 11000000.10101000.00000001.10000000 = 192.168.1.128

Network ID: 11000000.10101000.00000001.10000000 = 192.168.1.128/26

1st usable IP: 11000000.10101000.00000001.10000001 = 192.168.1.129/26

Last usable IP: 11000000.10101000.00000001.10111110 = 192.168.1.190/26

Broadcast IP: 11000000.10101000.00000001.10111111 = 192.168.1.191/26

3. Assign subnet 3 to the network attached to R2.

Subnet 3: 11000000.10101000.00000001.11000000 = 192.168.1.192

Network ID: 11000000.10101000.00000001.11000000 = 192.168.1.192/26

1st usable IP: 11000000.10101000.00000001.11000001 = 192.168.1.193/26

Last usable IP: 11000000.10101000.00000001.11111110 = 192.168.1.254/26

Broadcast IP: 11000000.10101000.00000001.11111111 = 192.168.1.255/26

Task 2: Determine Interface Addresses.

Step 1: Assign appropriate addresses to the device interfaces.

1. Assign the first valid host address in subnet 1 to the LAN interface on R1. Ans: 192.168.1.65
2. Assign the last valid host address in subnet 1 to PC1. Ans: 192.168.1.126
3. Assign the first valid host address in subnet 2 to the WAN interface on R1. Ans: 192.168.1.129
4. Assign the last valid host address in subnet 2 to the WAN interface on R2. Ans: 192.168.1.190

5. Assign the first valid host address in subnet 3 to the LAN interface of R2. Ans: 192.168.1.193
6. Assign the last valid host address in subnet 3 to PC2. Ans: 192.168.1.254

Step 2: Document the addresses to be used in the table provide under the Topology

Task 3: Configure the Serial and FastEthernet Addresses.

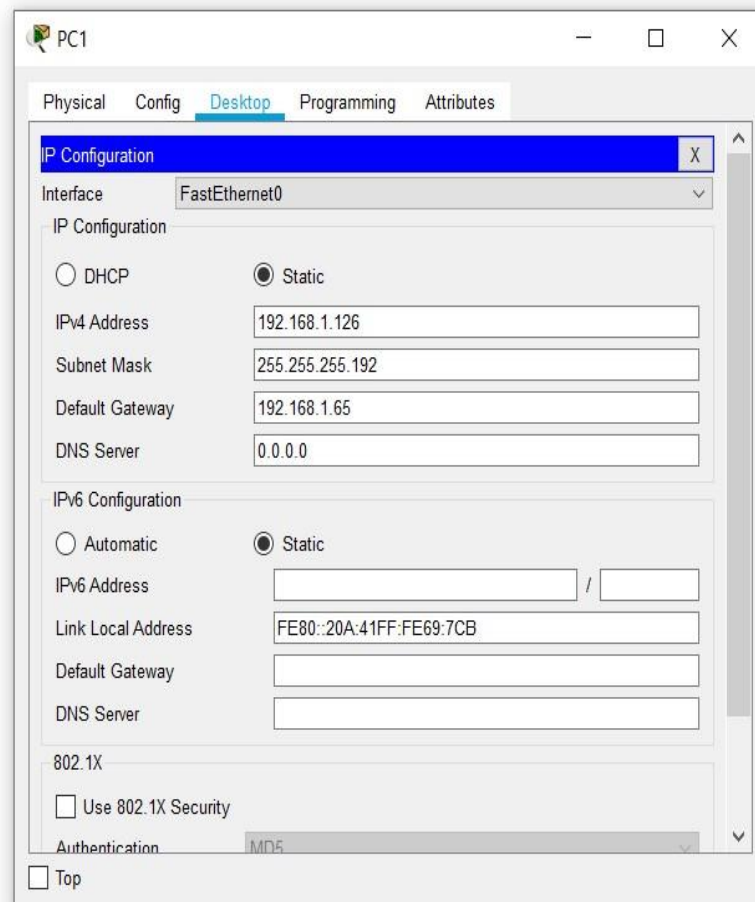
Step 1: Configure the router interfaces.

Configure the interfaces on the R1 and R2 routers with the IP addresses from your network design. Please note, to complete the activity in Packet Tracer you will be using the Config Tab. When you have finished, be sure to save the running configuration to the NVRAM of the router.

Step 2: Configure the PC interfaces.

Configure the Ethernet interfaces of PC1 and PC2 with the IP addresses and default gateways from your network design.

Configuration of PC1

The screenshot shows the 'PC1' configuration window in Packet Tracer. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Interface' is 'FastEthernet0'. The 'Static' radio button is selected. The fields are filled with: IPv4 Address: 192.168.1.126, Subnet Mask: 255.255.255.192, Default Gateway: 192.168.1.65, and DNS Server: 0.0.0.0. Under 'IPv6 Configuration', the 'Static' radio button is also selected. The fields are: IPv6 Address (empty), Link Local Address: FE80::20A:41FF:FE69:7CB, Default Gateway (empty), and DNS Server (empty). At the bottom, there is a section for '802.1X' with 'Use 802.1X Security' unchecked and 'Authentication' set to 'MD5'. A 'Top' button is at the bottom left.

Configuration of 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 settings are: IP Address 192.168.1.254, Subnet Mask 255.255.255.192, Default Gateway 192.168.1.193, and DNS Server 0.0.0.0. The IPv6 settings are: Static selected, Link Local Address FE80::20B:BEFF:FE1A:3CA7, and empty fields for IPv6 Address, Default Gateway, and DNS Server. The '802.1X' section is collapsed, and the 'Authentication' dropdown is set to 'MD5'. A 'Top' button is at the bottom left.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP <input checked="" type="radio"/> Static	
IPv4 Address	192.168.1.254
Subnet Mask	255.255.255.192
Default Gateway	192.168.1.193
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic <input checked="" type="radio"/> Static	
IPv6 Address	/
Link Local Address	FE80::20B:BEFF:FE1A:3CA7
Default Gateway	
DNS Server	
802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5

☐ Top

Configuration of Router 1

The screenshot shows the 'Router1' configuration window with the 'Config' tab selected. The 'Global Settings' section is expanded, showing fields for 'Display Name' (Router1) and 'Hostname' (Router). There are buttons for 'Erase', 'Save', 'Load...', 'Export...', and 'Merge...' for NVRAM, Startup Config, and Running Config. The 'Equivalent IOS Commands' section shows a command prompt: 'Would you like to enter the initial configuration dialog? [yes/no]: n' and 'Press RETURN to get started!'. A 'Top' button is at the bottom left.

GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1

Global Settings

Display Name: Router1

Hostname: Router

NVRAM: Erase Save

Startup Config: Load... Export...

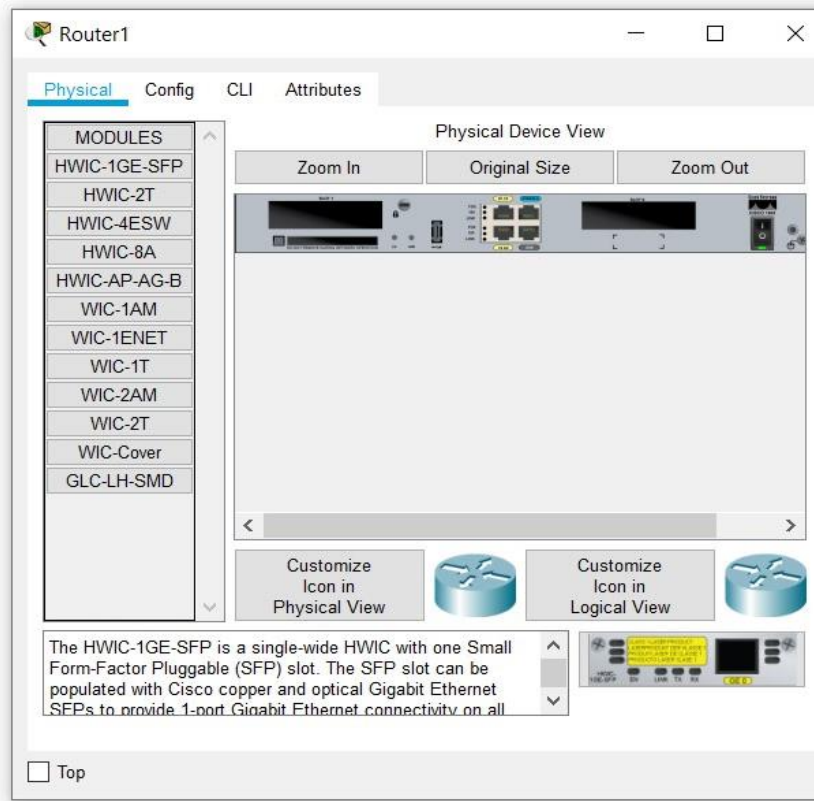
Running Config: Export... Merge...

Equivalent IOS Commands

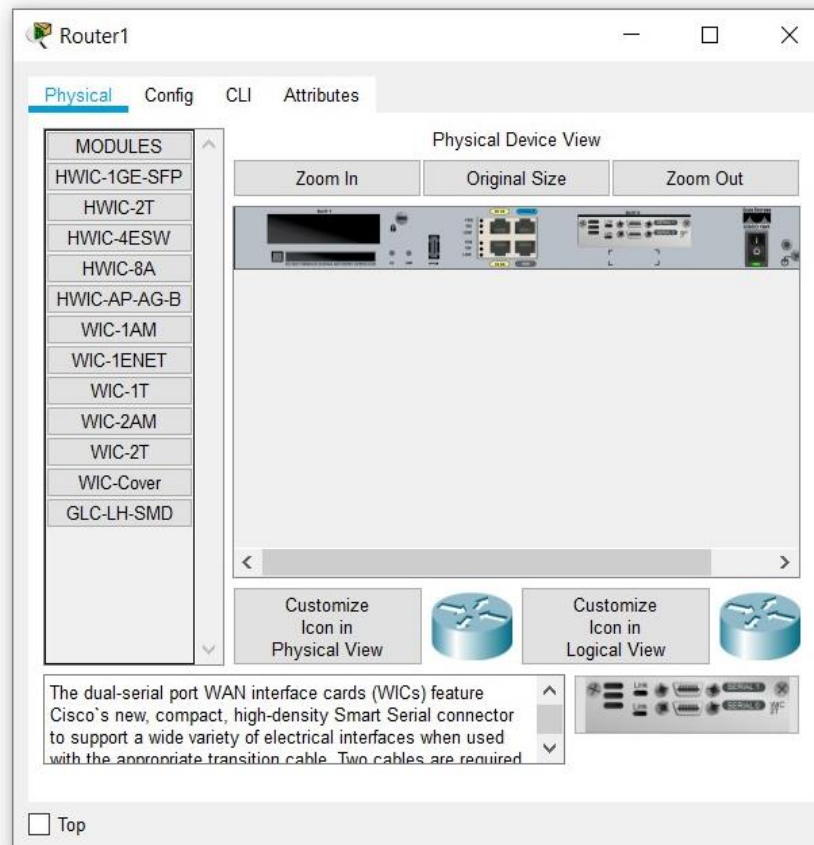
```
Would you like to enter the initial configuration dialog? [yes/no]: n

Press RETURN to get started!
```

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Adding WIC-2T card for serial port



Router1

Physical **Config** CLI Attributes

GLOBAL

- Settings
- Algorithm Settings
- ROUTING**
- Static
- RIP
- SWITCHING**
- VLAN Database
- INTERFACE**
- FastEthernet0/0
- FastEthernet0/1
- Serial0/0/0
- Serial0/0/1

FastEthernet0/0

Port Status ☐ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☒ Half Duplex ☐ Full Duplex ☒ Auto

MAC Address 00D0.FF7C.0801

IP Configuration

IPv4 Address

Subnet Mask

Tx Ring Limit 10

Equivalent IOS Commands

```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
```

☐ Top

Changing hostname to Router1

Router1

Physical **Config** CLI Attributes

GLOBAL

- Settings**
- Algorithm Settings
- ROUTING**
- Static
- RIP
- SWITCHING**
- VLAN Database
- INTERFACE**
- FastEthernet0/0
- FastEthernet0/1
- Serial0/0/0
- Serial0/0/1

Global Settings

Display Name Router1

Hostname Router1

NVRAM

Startup Config

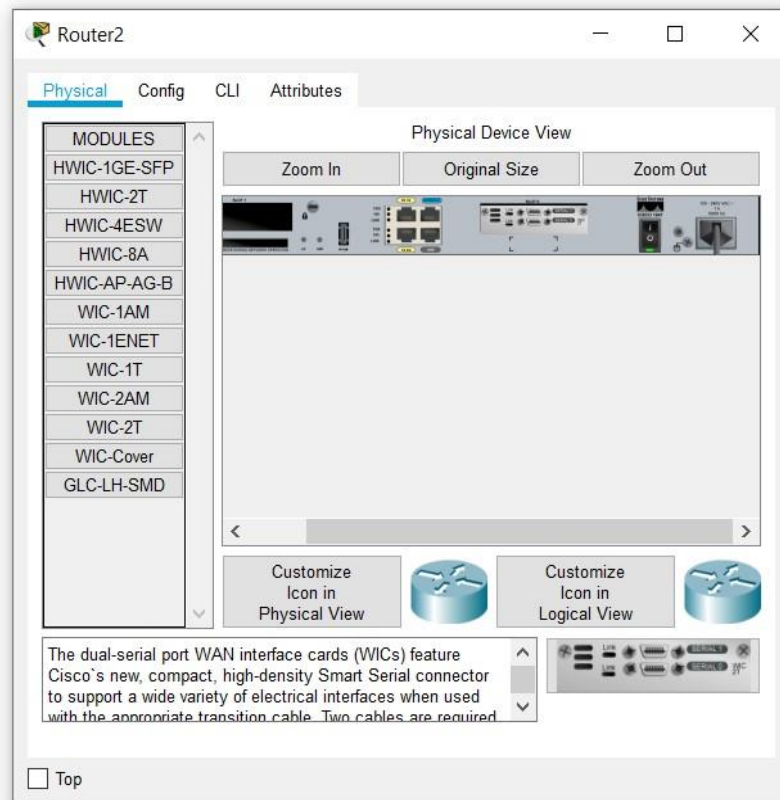
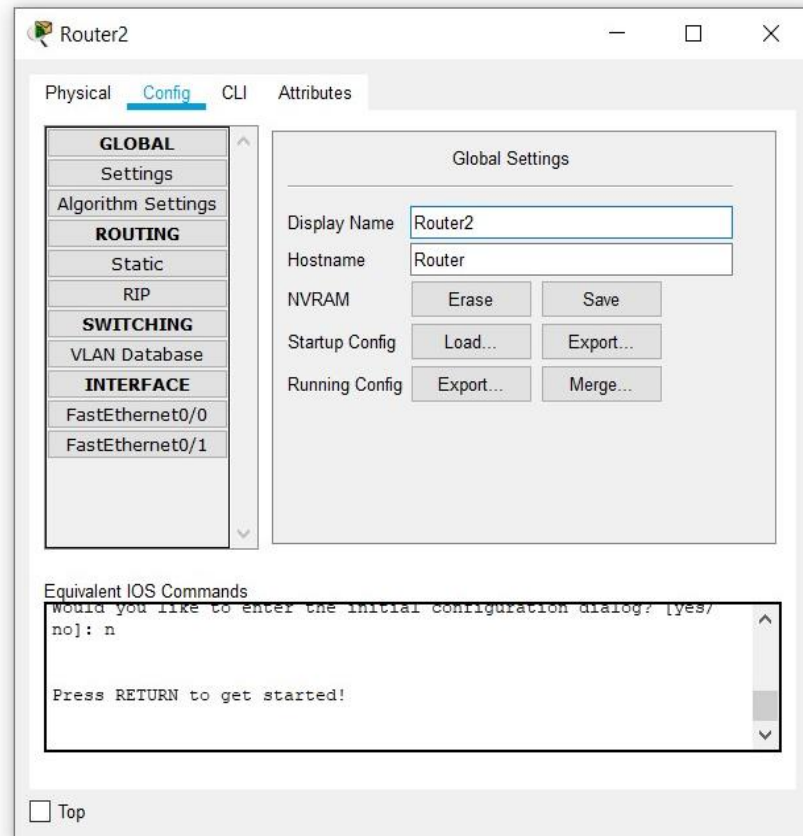
Running Config

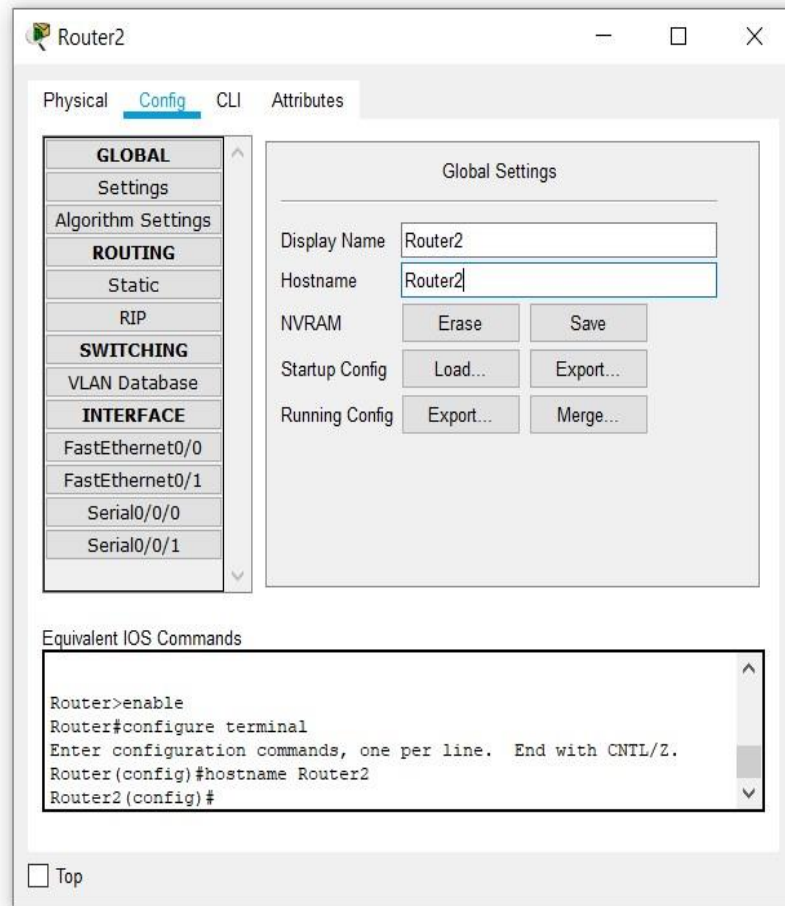
Equivalent IOS Commands

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Router1
Router1(config)#
%SYS-5-CONFIG_I: Configured from console by console
Router1(config)#
```

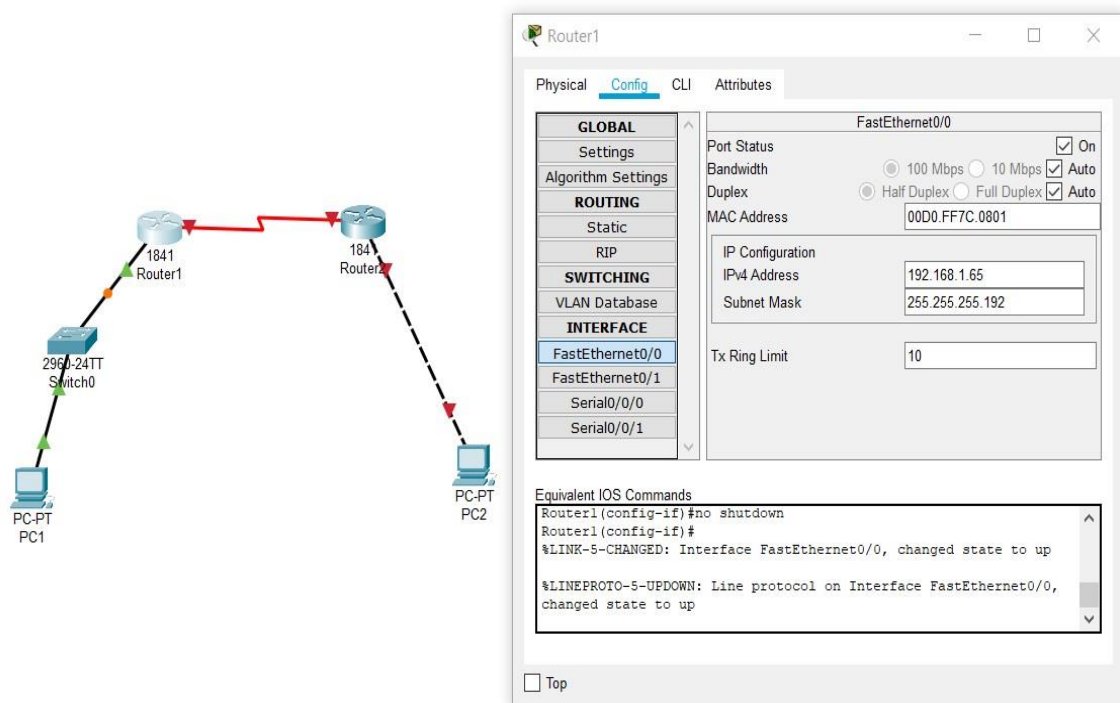
☐ Top

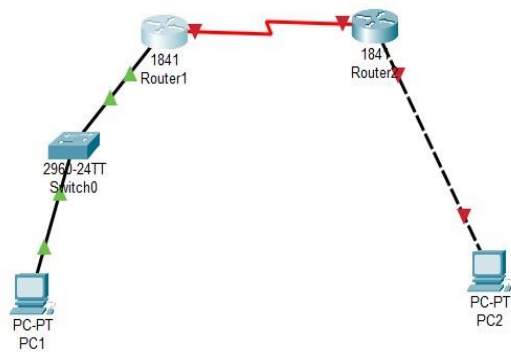
Configuration of Router 2





Assigning IP addresses to Router 1





Router1

Physical **Config** CLI Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

FastEthernet0/0

FastEthernet0/1

Serial0/0/0

Serial0/0/1

Serial0/0/0

Port Status ☒ On

Duplex ☒ Full Duplex

Clock Rate 2000000

IP Configuration

IPv4 Address 192.168.1.129

Subnet Mask 255.255.255.192

Tx Ring Limit 10

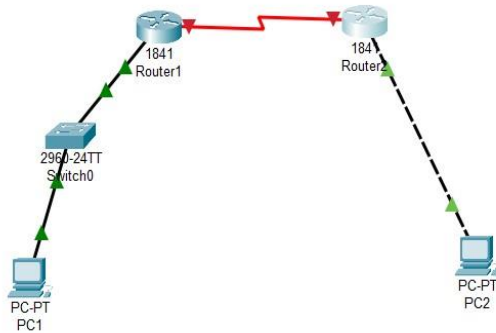
Equivalent IOS Commands

```

Router1(config-if)#ip address 192.168.1.129 255.255.255.192
Router1(config-if)#ip address 192.168.1.129 255.255.255.192
Router1(config-if)#
Router1(config-if)#exit
Router1(config)#interface Serial0/0/0
Router1(config-if)#no shutdown
Router1(config-if)#
  
```

☐ Top

Assigning IP addresses to Router 2



Router2

Physical **Config** CLI Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

FastEthernet0/0

FastEthernet0/1

Serial0/0/0

Serial0/0/1

FastEthernet0/0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☒ Half Duplex ☐ Full Duplex ☒ Auto

MAC Address 0001.42AC.AD01

IP Configuration

IPv4 Address 192.168.1.193

Subnet Mask 255.255.255.192

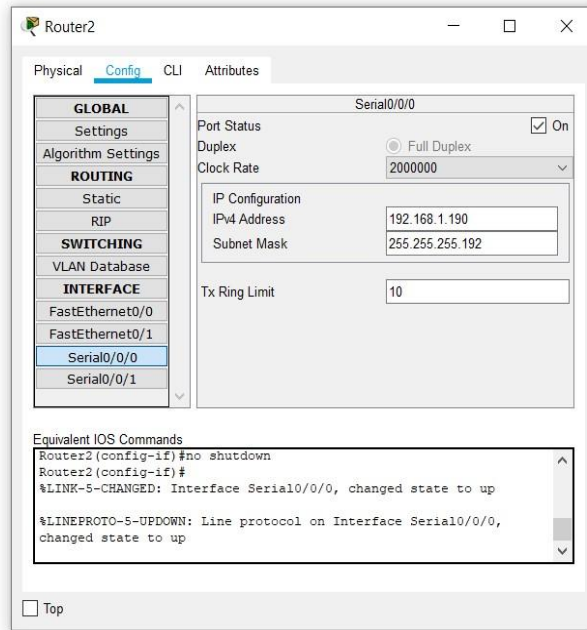
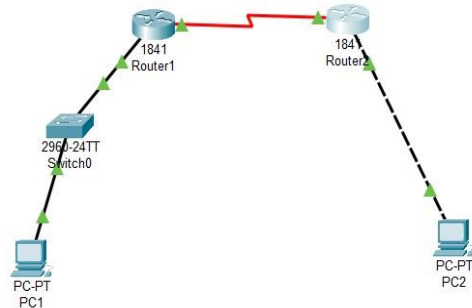
Tx Ring Limit 10

Equivalent IOS Commands

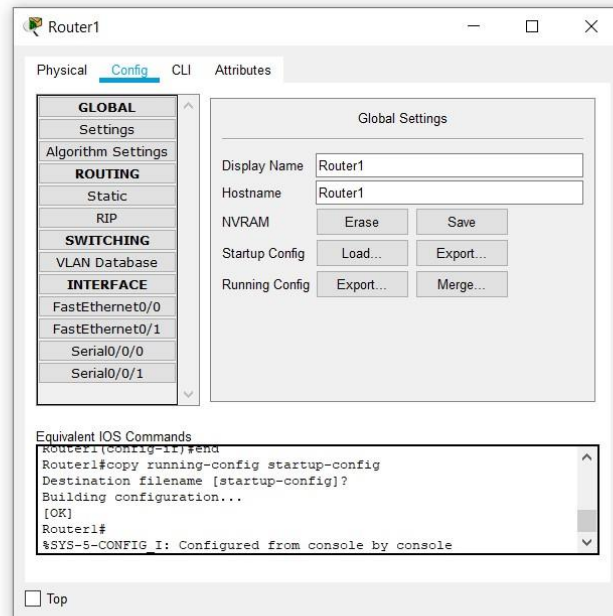
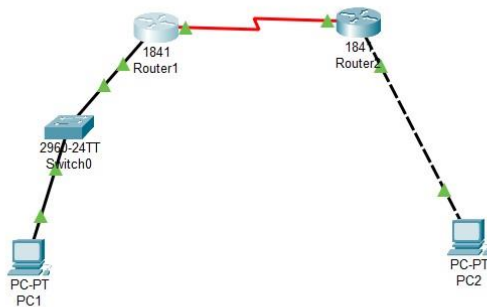
```

Router2(config-if)#no shutdown
Router2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0,
changed state to up
  
```

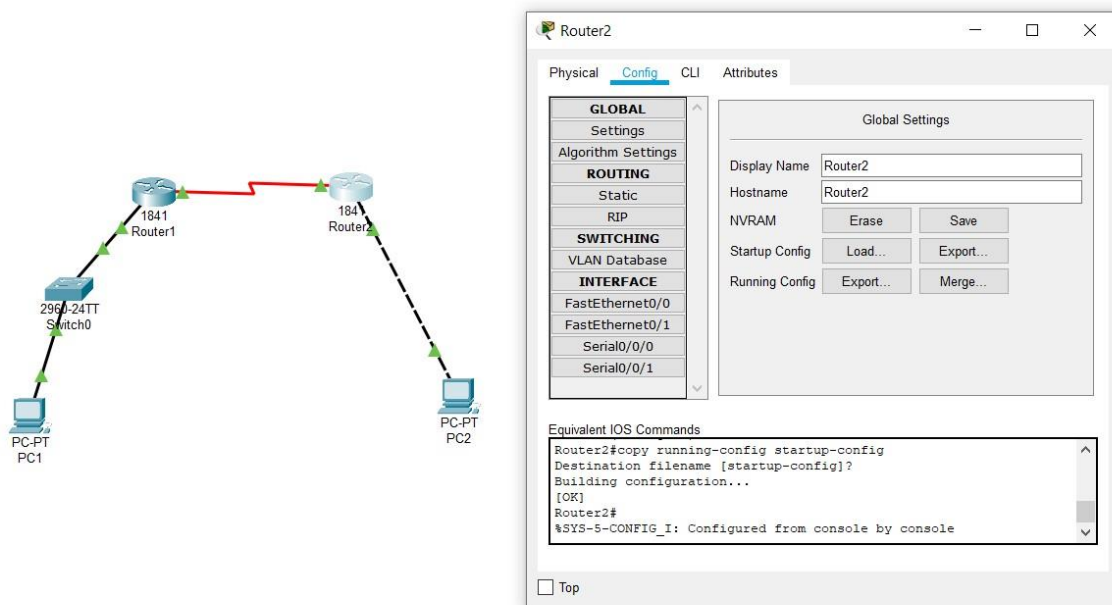
☐ Top



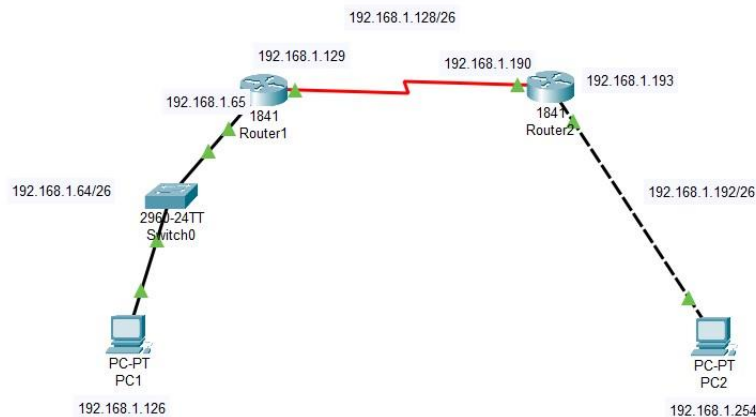
Saving the running configuration to NVRAM of Router 1



Saving the running configuration to NVRAM of Router 2



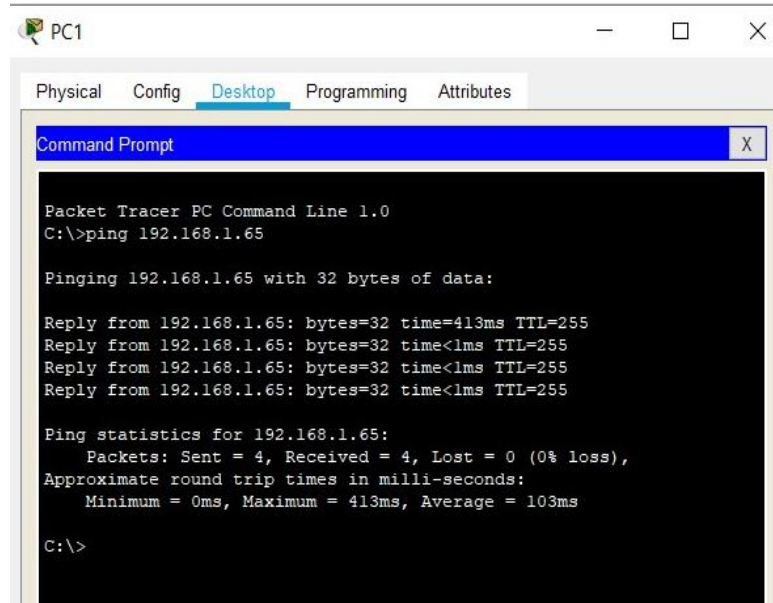
Complete Network



Task 4: Verify the Configurations.

Answer the following questions to verify that the network is operating as expected.

1. From the host attached to R1, is it possible to ping the default gateway? Ans: Yes



The screenshot shows a Packet Tracer PC window for PC1. The 'Desktop' tab is active, displaying a Command Prompt. The command 'ping 192.168.1.65' has been executed. The output shows four successful replies from 192.168.1.65 with a time of 413ms and TTL=255. The ping statistics indicate 4 packets sent, 4 received, and 0% loss, with an average round trip time of 103ms.

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.65

Pinging 192.168.1.65 with 32 bytes of data:

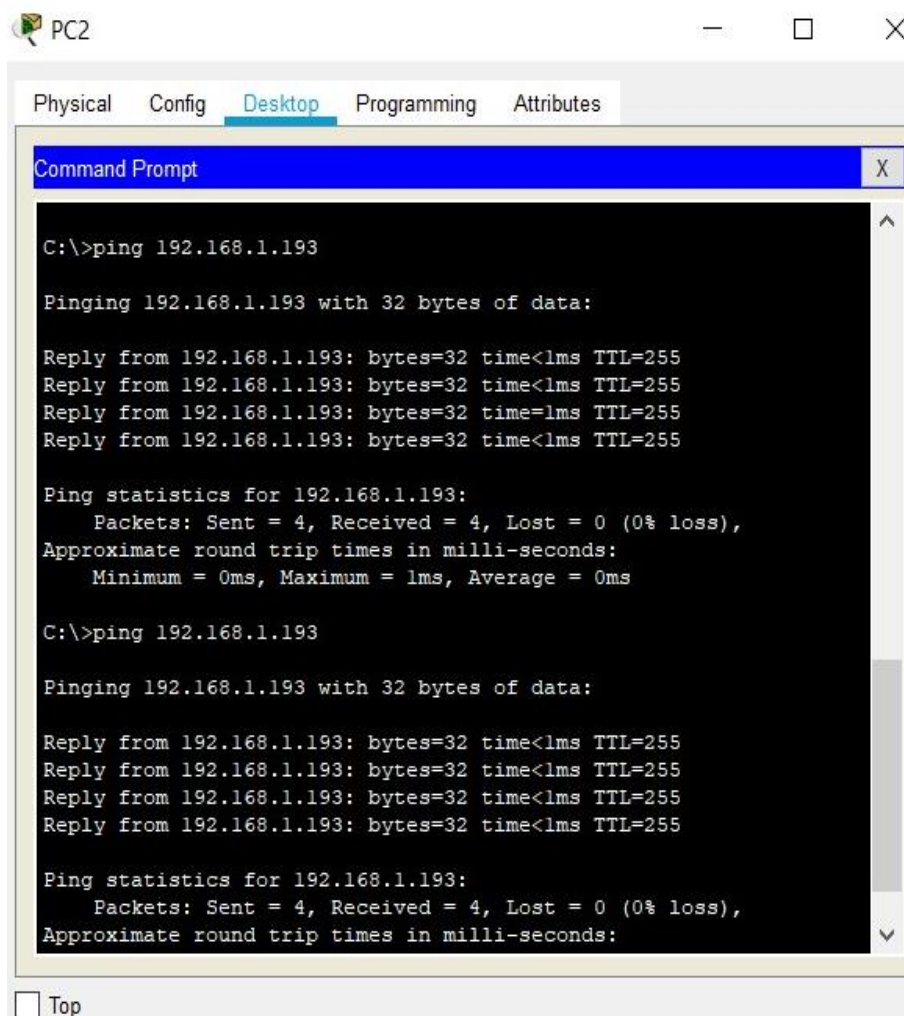
Reply from 192.168.1.65: bytes=32 time=413ms TTL=255
Reply from 192.168.1.65: bytes=32 time<1ms TTL=255
Reply from 192.168.1.65: bytes=32 time<1ms TTL=255
Reply from 192.168.1.65: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.1.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 413ms, Average = 103ms

C:\>
```

2. From the host attached to R2, is it possible to ping the default gateway?

Ans: Yes



The screenshot shows a Packet Tracer PC window for PC2. The 'Desktop' tab is active, displaying a Command Prompt. The command 'ping 192.168.1.193' has been executed twice. Both times, the output shows four successful replies from 192.168.1.193 with a time of 1ms and TTL=255. The ping statistics indicate 4 packets sent, 4 received, and 0% loss, with an average round trip time of 0ms.

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.193

Pinging 192.168.1.193 with 32 bytes of data:

Reply from 192.168.1.193: bytes=32 time<1ms TTL=255
Reply from 192.168.1.193: bytes=32 time<1ms TTL=255
Reply from 192.168.1.193: bytes=32 time=1ms TTL=255
Reply from 192.168.1.193: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.1.193:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.1.193

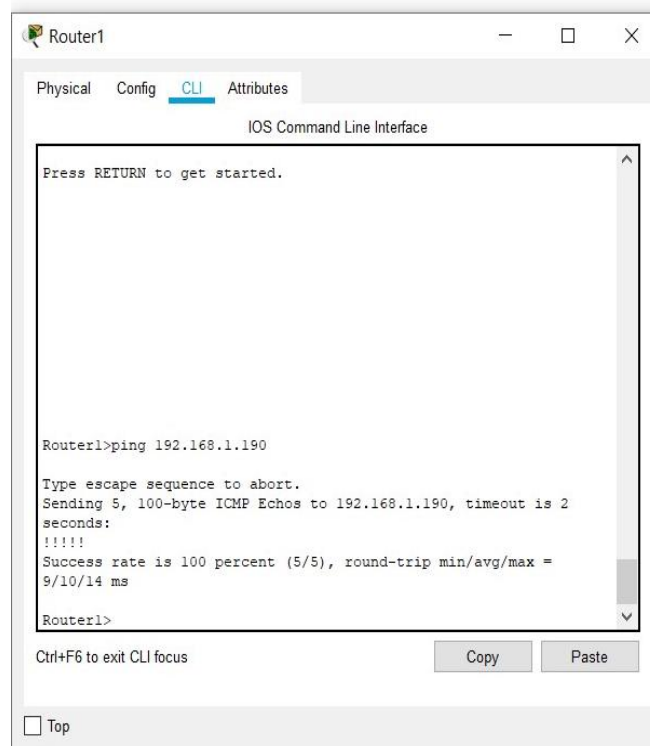
Pinging 192.168.1.193 with 32 bytes of data:

Reply from 192.168.1.193: bytes=32 time<1ms TTL=255
Reply from 192.168.1.193: bytes=32 time<1ms TTL=255
Reply from 192.168.1.193: bytes=32 time<1ms TTL=255
Reply from 192.168.1.193: bytes=32 time<1ms TTL=255

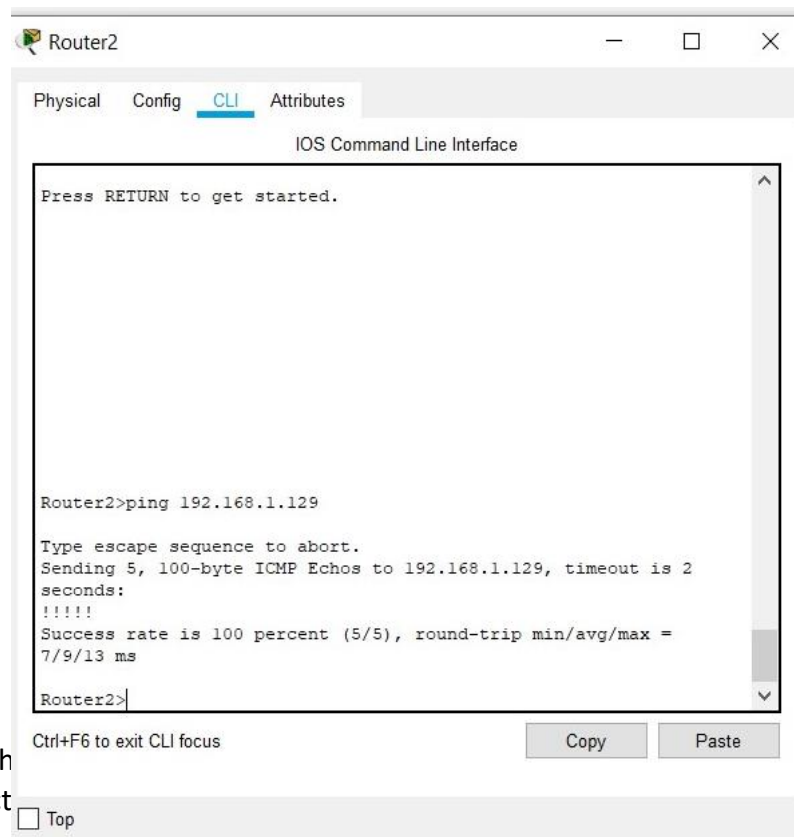
Ping statistics for 192.168.1.193:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
```

3. From the router R1, is it possible to ping the Serial 0/0/0 interface of R2?

Ans: Yes



4. From the router R2, is it possible to ping the Serial 0/0/0 interface of R1? Ans: Yes

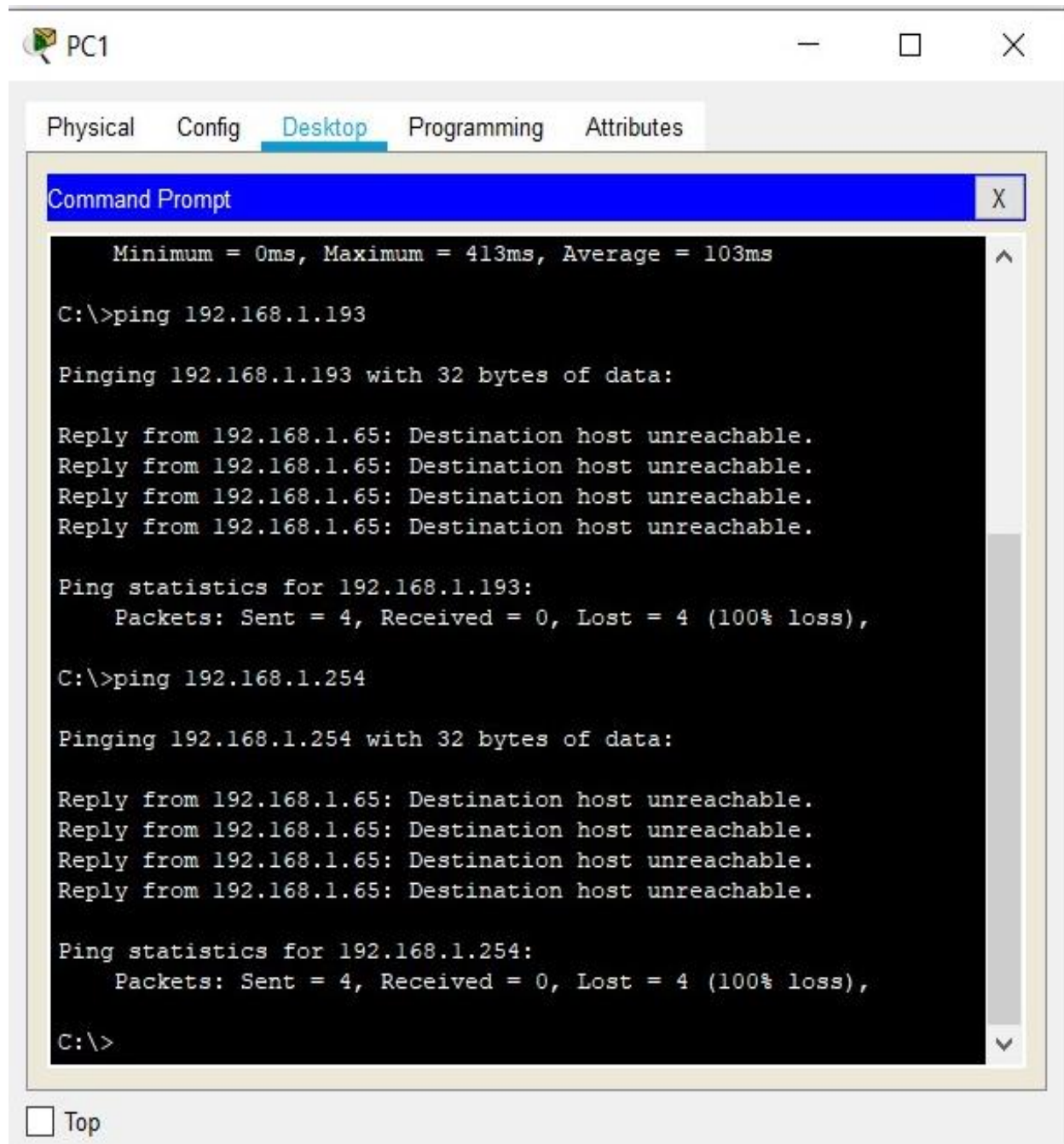


The answer to the physical connect

led, check your

Task 5: Reflection

1. Are there any devices on the network that cannot ping each other? Ans: PC1 cannot ping FastEthernet port of Router2 and PC2



The screenshot shows a window titled "PC1" with a "Desktop" tab selected. Inside the window is a "Command Prompt" window. The Command Prompt displays the output of two ping commands. The first command is "C:\>ping 192.168.1.193", which results in four "Destination host unreachable" replies and a 100% loss of packets. The second command is "C:\>ping 192.168.1.254", which also results in four "Destination host unreachable" replies and a 100% loss of packets. The Command Prompt window has a title bar with "X" and a scroll bar on the right. Below the Command Prompt window, there is a "Top" button.

```
Minimum = 0ms, Maximum = 413ms, Average = 103ms

C:\>ping 192.168.1.193

Pinging 192.168.1.193 with 32 bytes of data:

Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.

Ping statistics for 192.168.1.193:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.1.254

Pinging 192.168.1.254 with 32 bytes of data:

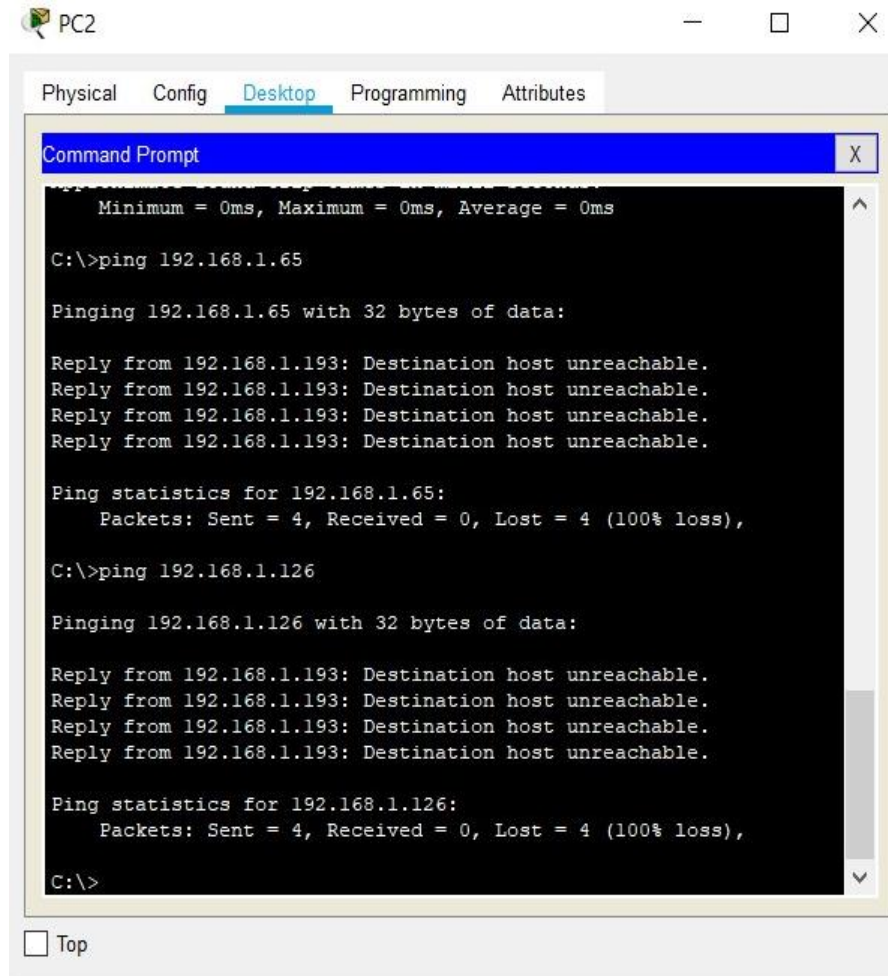
Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.

Ping statistics for 192.168.1.254:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

☐ Top

PC2 cannot ping FastEthernet port of Router1 and PC1



The screenshot shows a window titled 'PC2' with tabs for 'Physical', 'Config', 'Desktop' (selected), 'Programming', and 'Attributes'. Inside the 'Desktop' tab is a 'Command Prompt' window. The Command Prompt displays the following text:

```
Minimum = 0ms, Maximum = 0ms, Average = 0ms  
C:\>ping 192.168.1.65  
  
Pinging 192.168.1.65 with 32 bytes of data:  
  
Reply from 192.168.1.193: Destination host unreachable.  
Reply from 192.168.1.193: Destination host unreachable.  
Reply from 192.168.1.193: Destination host unreachable.  
Reply from 192.168.1.193: Destination host unreachable.  
  
Ping statistics for 192.168.1.65:  
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),  
  
C:\>ping 192.168.1.126  
  
Pinging 192.168.1.126 with 32 bytes of data:  
  
Reply from 192.168.1.193: Destination host unreachable.  
Reply from 192.168.1.193: Destination host unreachable.  
Reply from 192.168.1.193: Destination host unreachable.  
Reply from 192.168.1.193: Destination host unreachable.  
  
Ping statistics for 192.168.1.126:  
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),  
  
C:\>
```

At the bottom of the Command Prompt window, there is a 'Top' button.

What is missing from the network that is preventing communication between these devices?

AS static or dynamic routing is not present. Therefore, over here we cannot ping devices on another subnet.

Conclusion:

1. In this experiment, I learned about subnetting a given address space and assigning subnets to various networks according to their mentioned need.