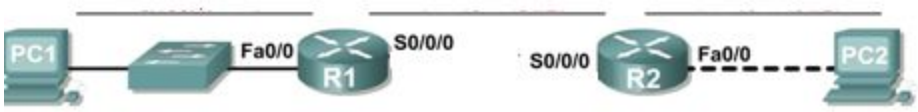
CEL 51, DCCN, Monsoon 2020
Lab 6: Subnet and Router Configuration

Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0			N/A
	S0/0/0			N/A
R2	Fa0/0			N/A
	S0/0/0			N/A
PC1	NIC			
PC2	NIC			

Learning Objectives

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

- Subnet an address space given requirements.
- Assign appropriate addresses to interfaces and documents.
- 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.

1. How many subnets are needed for this network?

Ans. For this network,three subnets are needed for particularly:

i) network connected to router R1

ii) network connected to router R2 and

iii) link between router R1 and router R2

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

Ans. The given address block is 192.168.1.0/24.

To convert in dotted decimal format, first convert it into a binary subnet mask.

Network in binary: 11000000.10101000.00000001.00000000

Subnet mask: 11111111.11111111.11111111.000000006

We require three subnets for this network hence borrowing two bits from the host portion as

$2^n >= 3$

So, the subnet mask becomes: 11111111.11111111.11111111.11000000 i.e. 255.255.255.192

3. 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, the subnet mask for the network in slash format is /26.

4. How many usable hosts are there per subnet?

Ans. The number of usable hosts is calculated using $2^H - 2$ where H=Number of 0s in the subnet mask.

We have,

Six zeros hence H=6 and $2^6 - 2 = 62$.

Step 3: Assign subnetwork addresses to the Topology Diagram.

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

Ans. 192.168.1.64-198.162.1.127

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

Ans. 192.168.1.128-198.162.1.191

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

Ans. 192.168.1.192-198.162.1.255

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

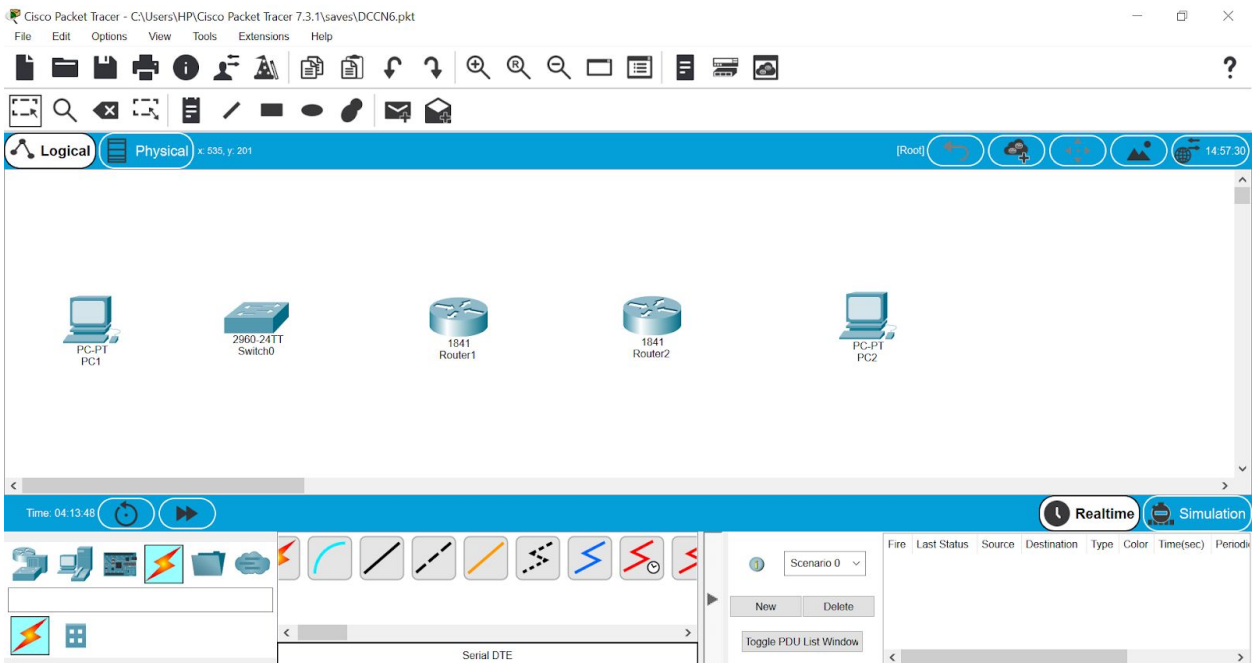
Step 2: Document the addresses to be used in the table provided under the Topology Diagram.

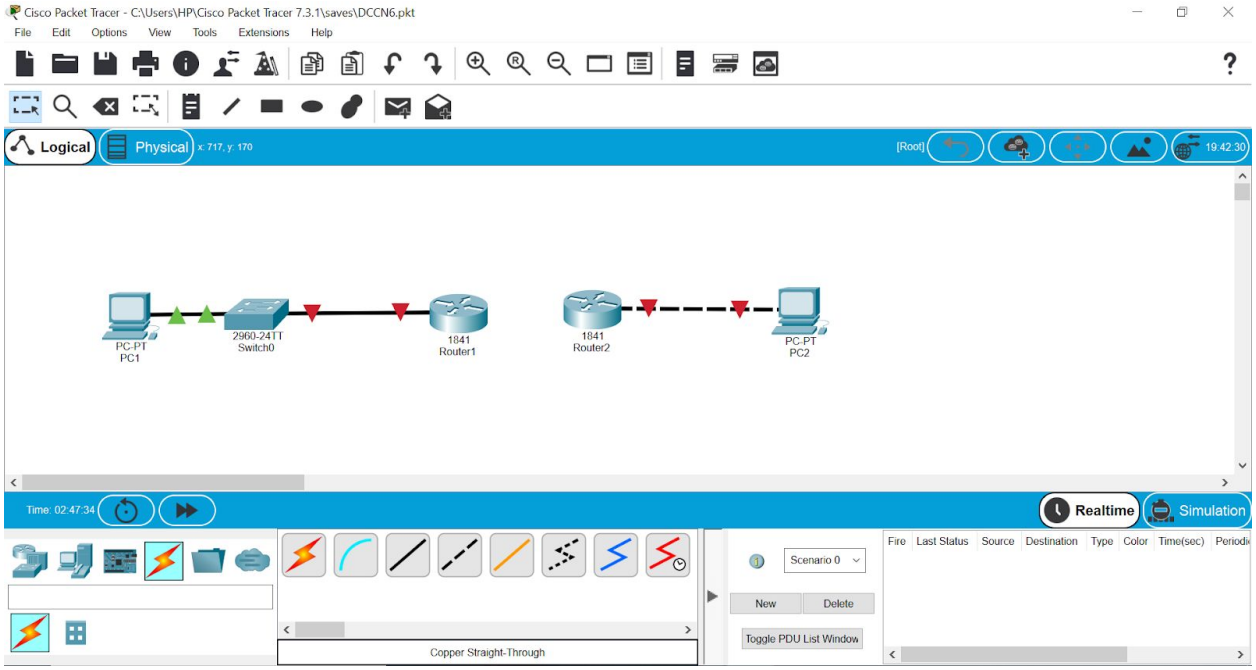
Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	**Fa0/0**	192.168.1.65	255.255.255.192	**N/A**
	S0/0/0	192.168.1.129	255.255.255.192	**N/A**
R2	**Fa0/0**	192.168.1.193	255.255.255.192	**N/A**
	S0/0/0	192.168.1.190	255.255.255.192	**N/A**
PC1	**NIC**	192.168.1.126	255.255.255.192	192.168.1.65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

Task 3: Configure the Serial and FastEthernet Addresses.

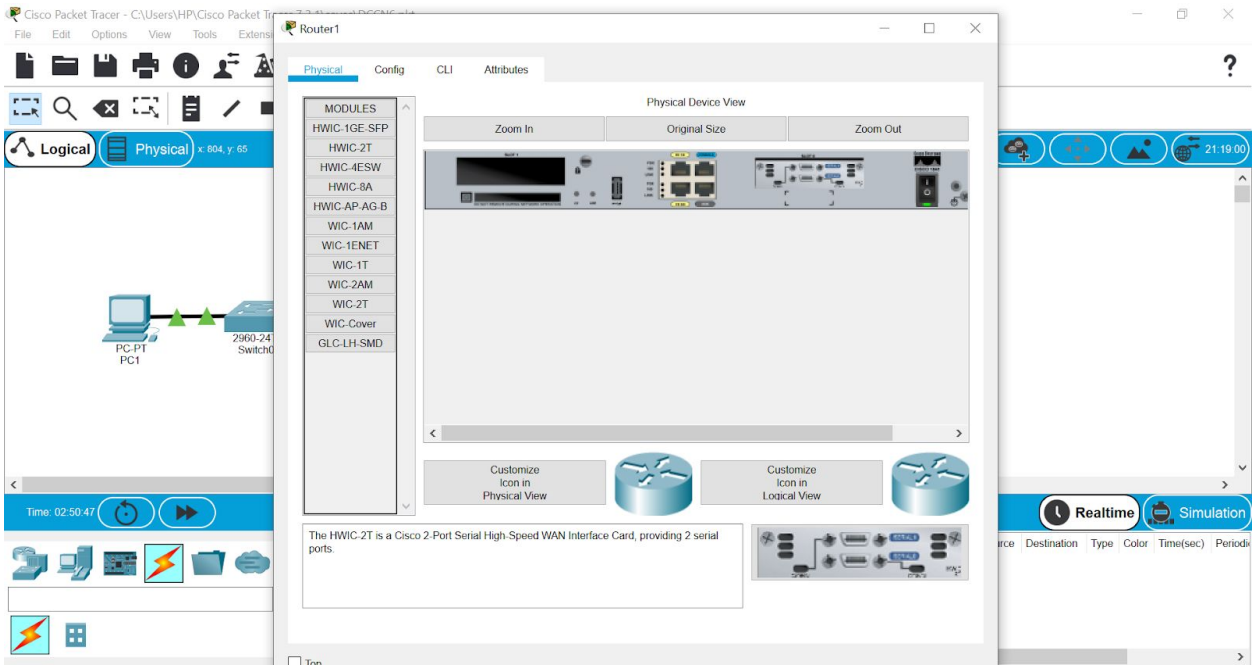
Step 1: Configure the router interfaces.

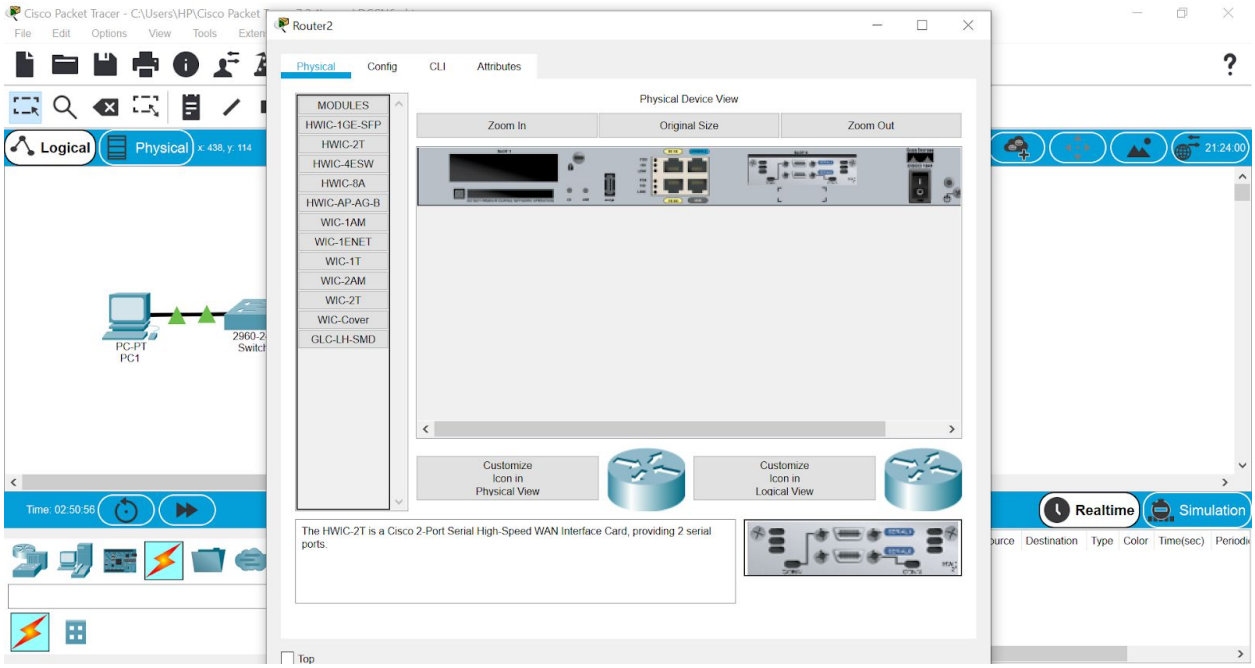
Configure the interfaces on the R1 and R2 routers with the IP addresses from your network design. Please note, to complete the activity in Packet Tracer you will be using the Config Tab. When you have finished, be sure to save the running configuration to the NVRAM of the router.

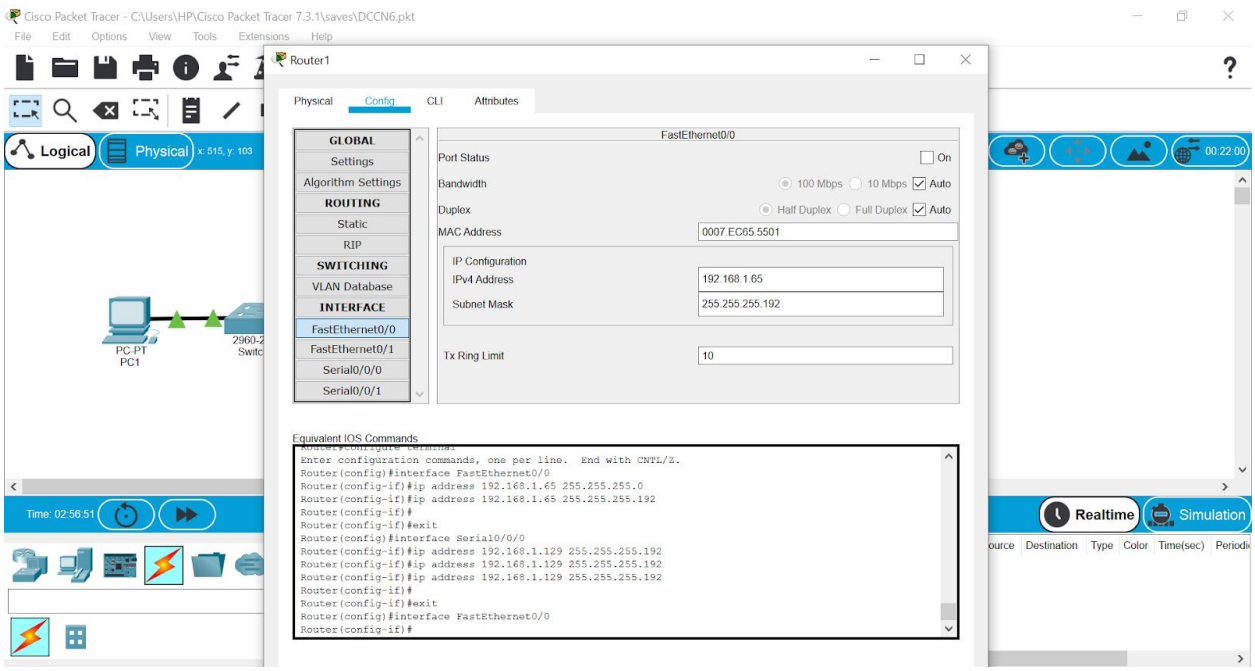


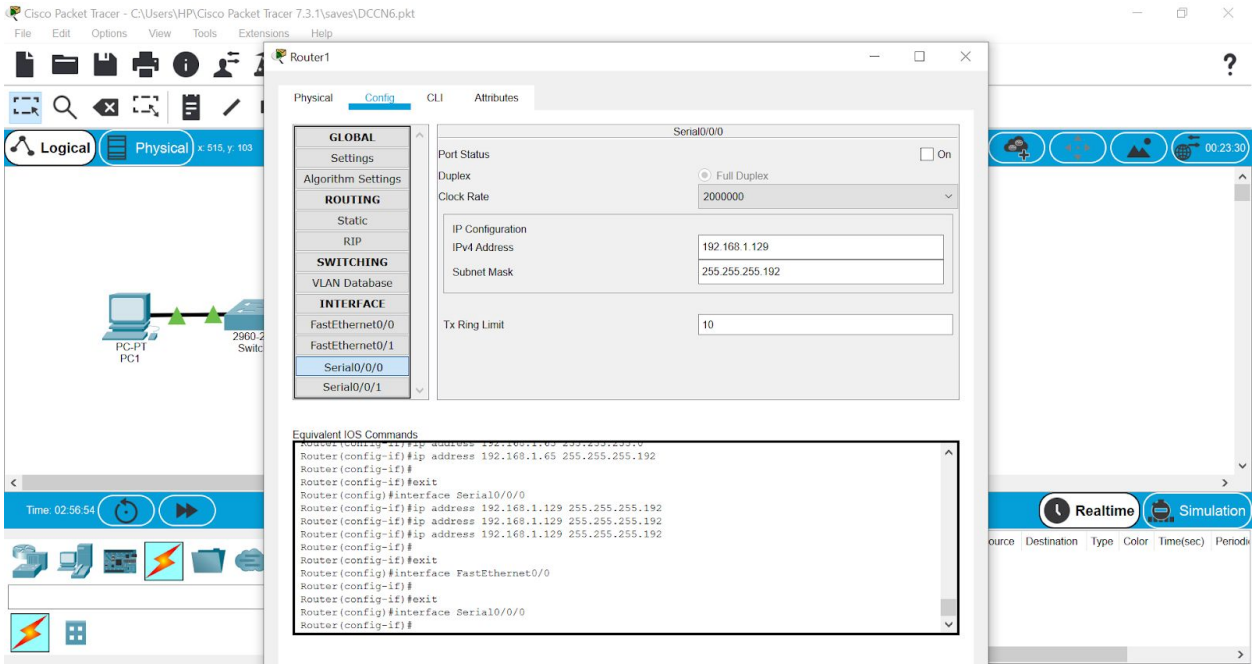


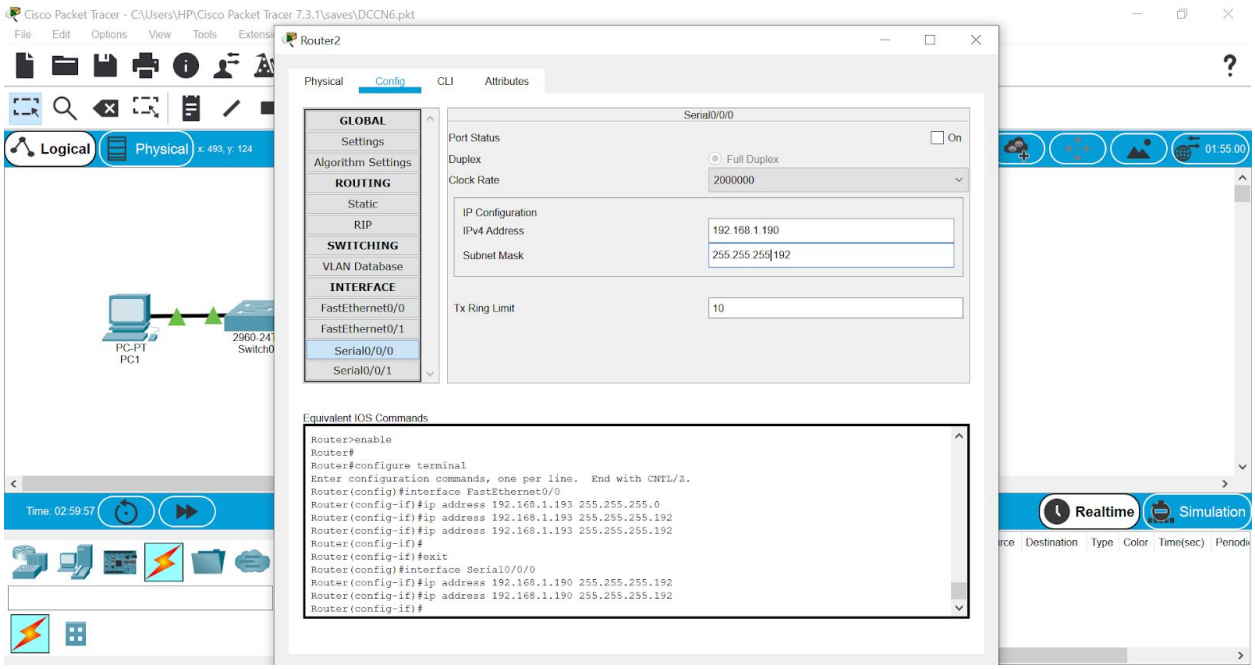
Adding the HWIC-2T card for serial port

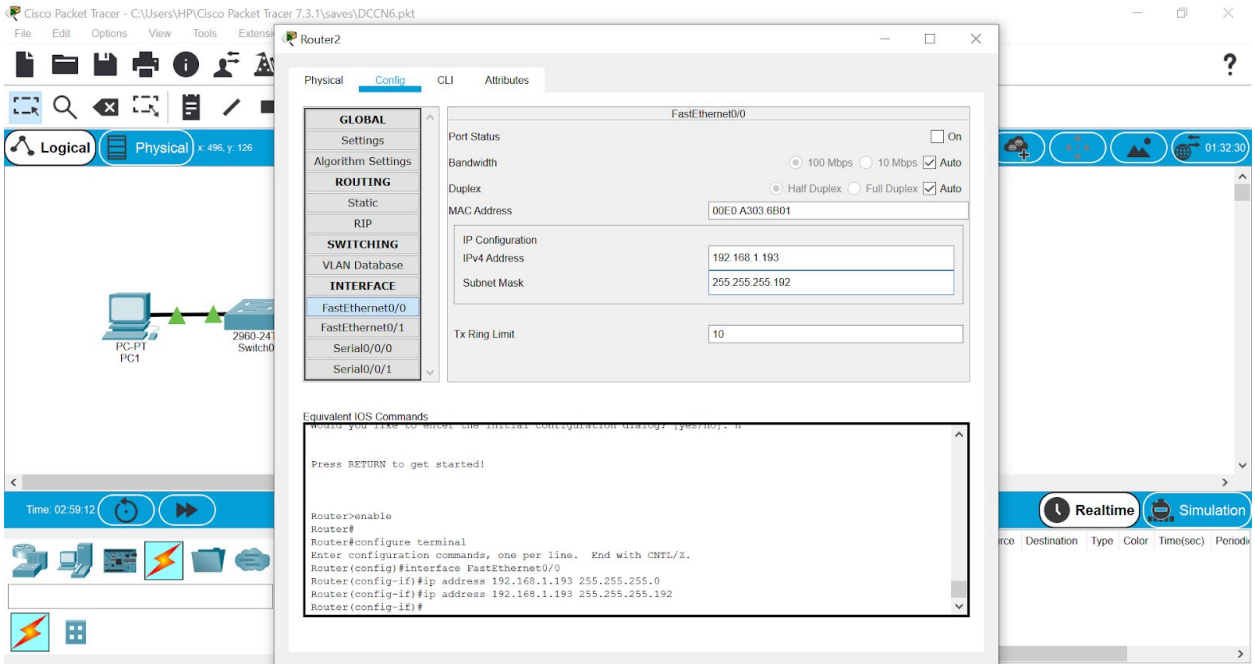

Router1
Physical
Config
CLI
Attributes
MODULES
HWIC-1GE-SFP
HWIC-2T
HWIC-4ESW
HWIC-8A
HWIC-AP-AG-B
WIC-1AM
WIC-1ENET
WIC-1T
WIC-2AM
WIC-2T
WIC-Cover
GLC-LH-SMD
Physical Device View
Zoom In
Original Size
Zoom Out
Customize Icon in Physical View
Customize Icon in Logical View
The HWIC-2T is a Cisco 2-Port Serial High-Speed WAN Interface Card, providing 2 serial ports.
Top
Logical
Physical
Time: 02:50:47
Realtime
Simulation


Router2
Physical
Config
CLI
Attributes
MODULES
HWIC-1GE-SFP
HWIC-2T
HWIC-4ESW
HWIC-8A
HWIC-AP-AG-B
WIC-1AM
WIC-1ENET
WIC-1T
WIC-2AM
WIC-2T
WIC-Cover
GLC-LH-SMD
Physical Device View
Zoom In
Original Size
Zoom Out
Customize Icon in Physical View
Customize Icon in Logical View
The HWIC-2T is a Cisco 2-Port Serial High-Speed WAN Interface Card, providing 2 serial ports.
Top
Logical
Physical
Time: 02:50:56
Realtime
Simulation

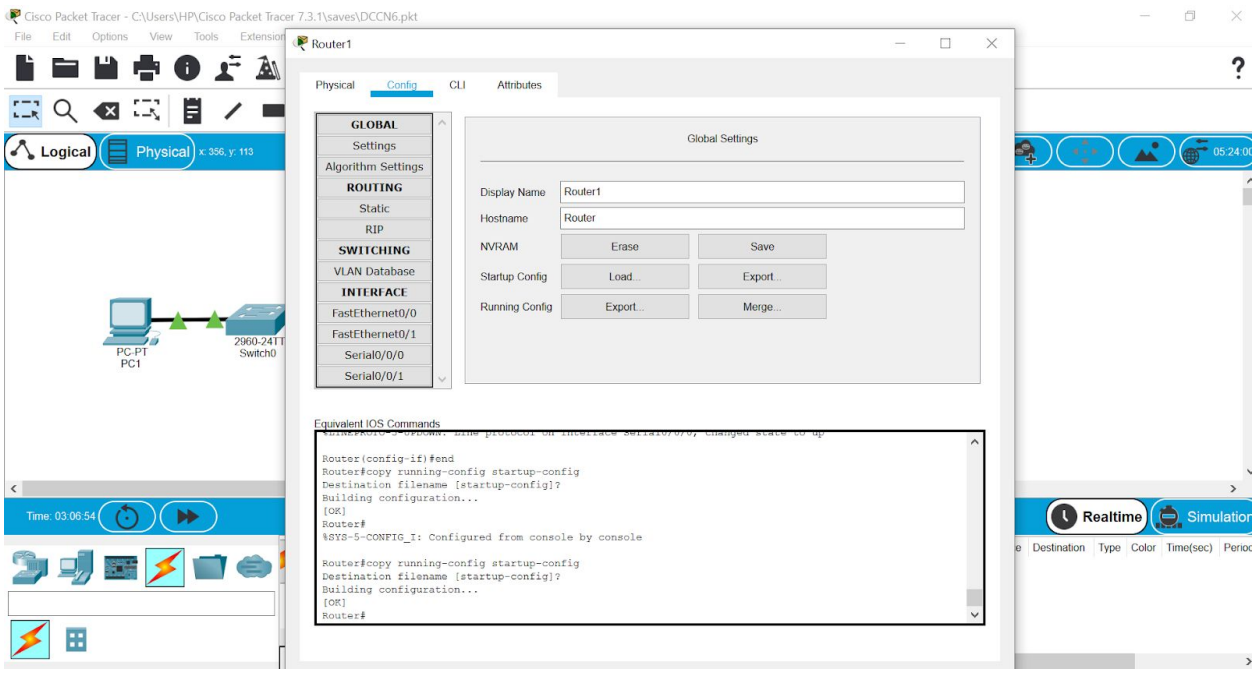

Cisco Packet Tracer - C:\Users\HP\Cisco Packet Tracer 7.3.1\saves\DCCN6.pkt
File Edit Options View Tools Extensions Help
Router1
Physical Config CLI Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
FastEthernet0/0
Port Status
On
Bandwidth
100 Mbps 10 Mbps Auto
Duplex
Half Duplex Full Duplex Auto
MAC Address
0007.EC65.5501
IP Configuration
IPv4 Address
192.168.1.65
Subnet Mask
255.255.255.192
Tx Ring Limit
10
Equivalent IOS Commands
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 192.168.1.65 255.255.255.0
Router(config-if)#ip address 192.168.1.65 255.255.255.192
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/0/0
Router(config-if)#ip address 192.168.1.129 255.255.255.192
Router(config-if)#ip address 192.168.1.129 255.255.255.192
Router(config-if)#ip address 192.168.1.129 255.255.255.192
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Logical Physical
Time: 02:56:51
Realtime Simulation
Destination Type Color Time(sec)

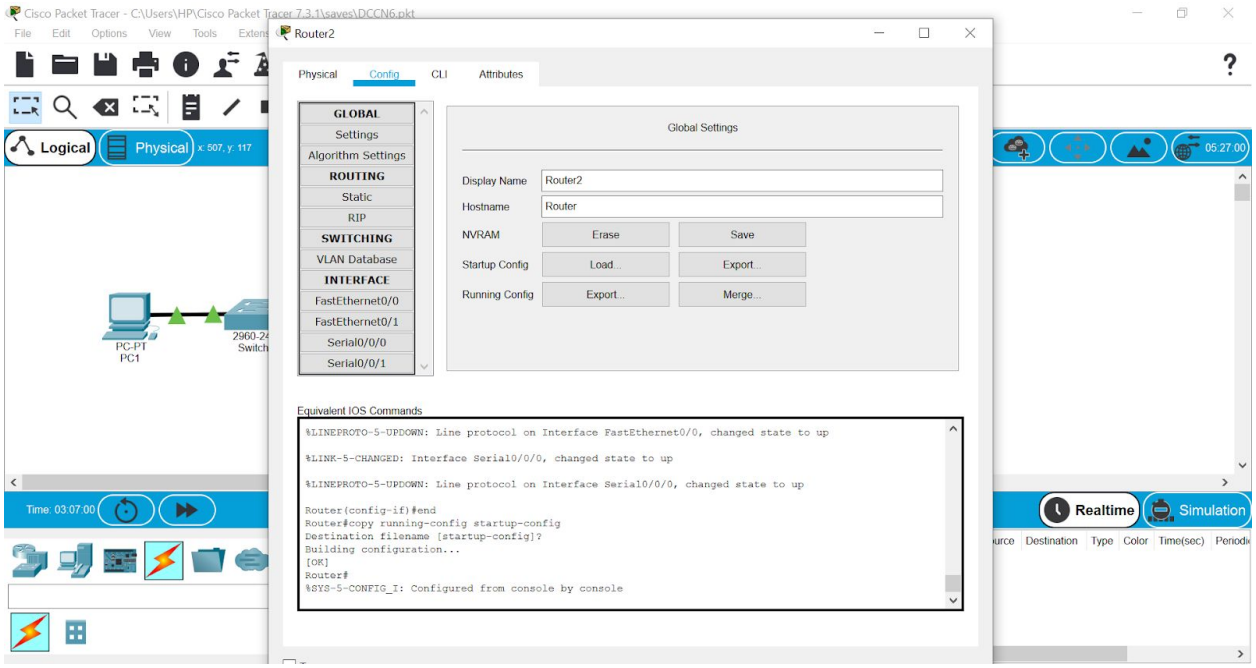

Cisco Packet Tracer - C:\Users\HP\Cisco Packet Tracer 7.3.1\saves\DCCN6.pkt
File Edit Options View Tools Extensions Help
Router1
Physical Config CLI Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
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
Router(config-if)#ip address 192.168.1.65 255.255.255.192
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/0/0
Router(config-if)#ip address 192.168.1.129 255.255.255.192
Router(config-if)#ip address 192.168.1.129 255.255.255.192
Router(config-if)#ip address 192.168.1.129 255.255.255.192
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/0/0
Router(config-if)#
Logical Physical
Time: 02:56:54
Realtime Simulation
Destination Type Color Time(sec)

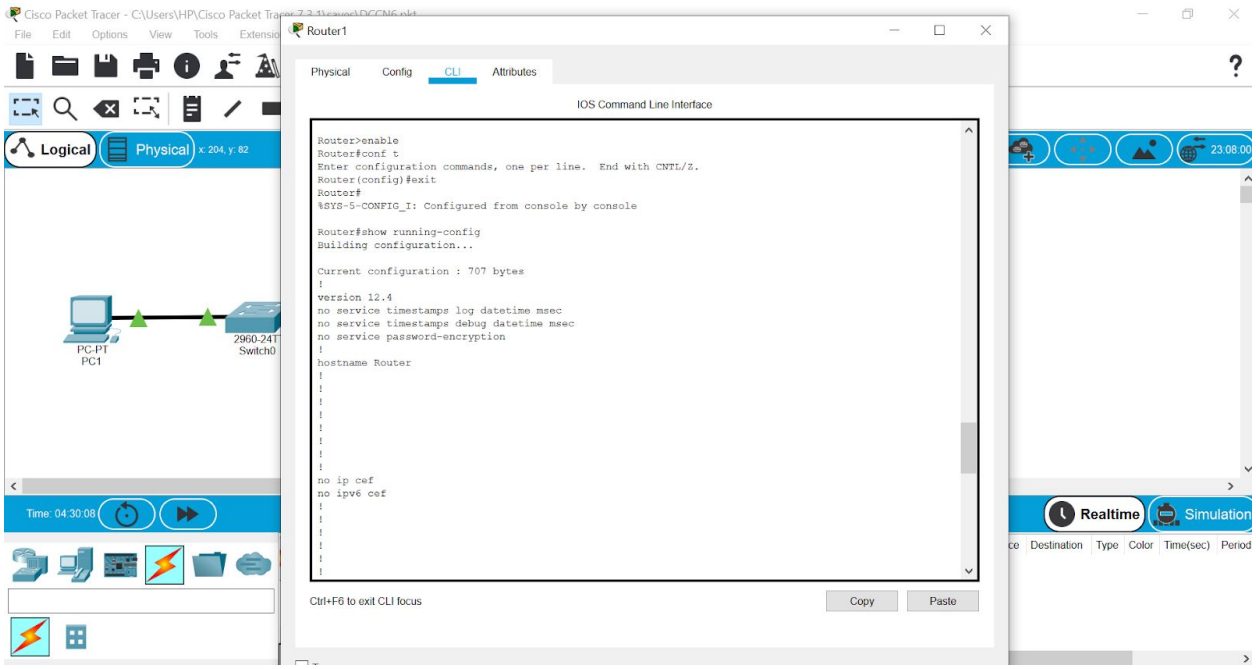


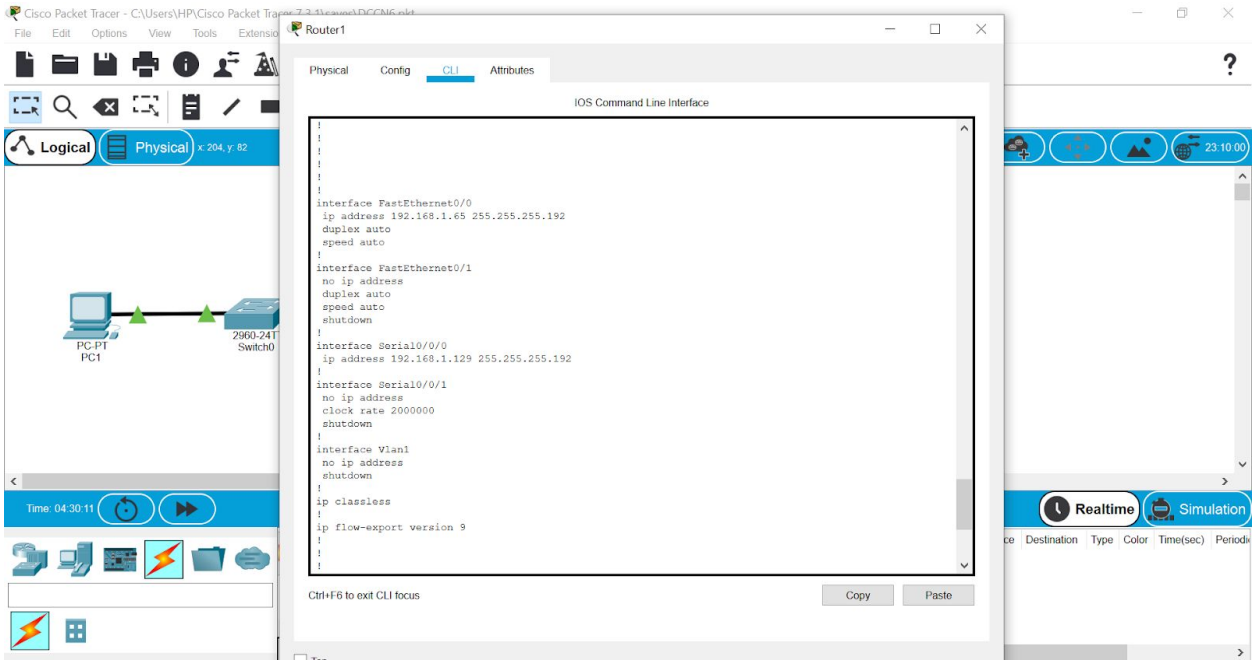


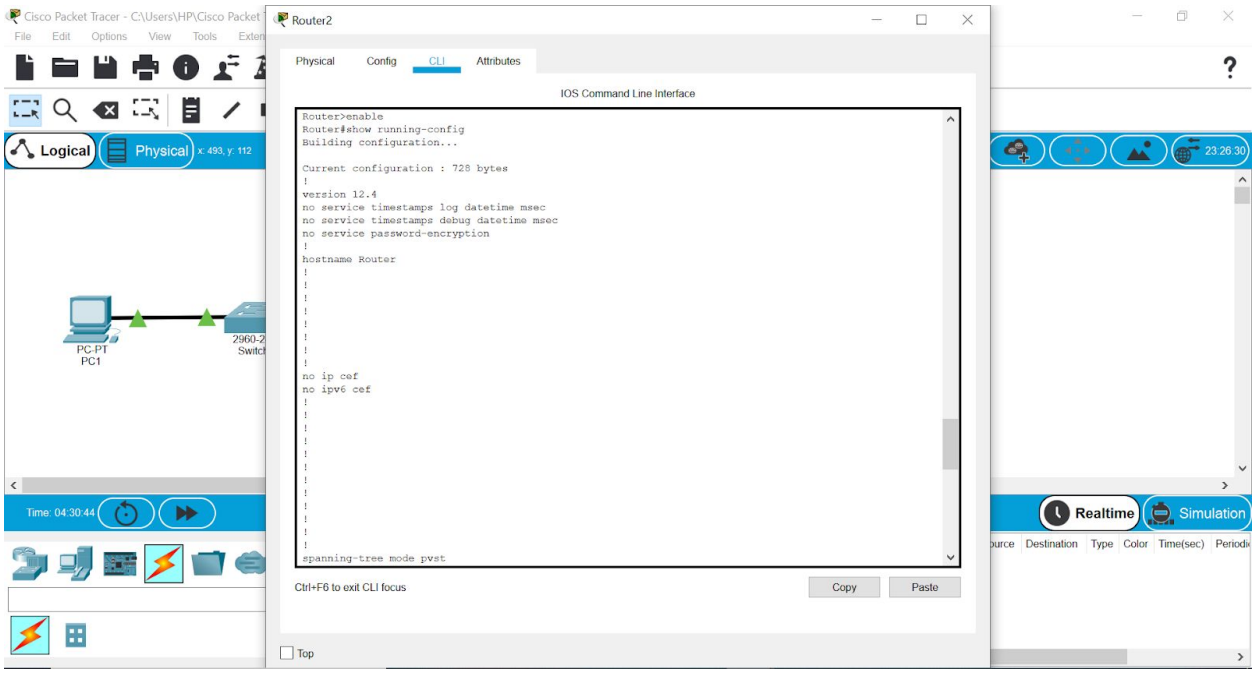
Saving the running configuration to NVRAM for Routers 1 and 2 respectively

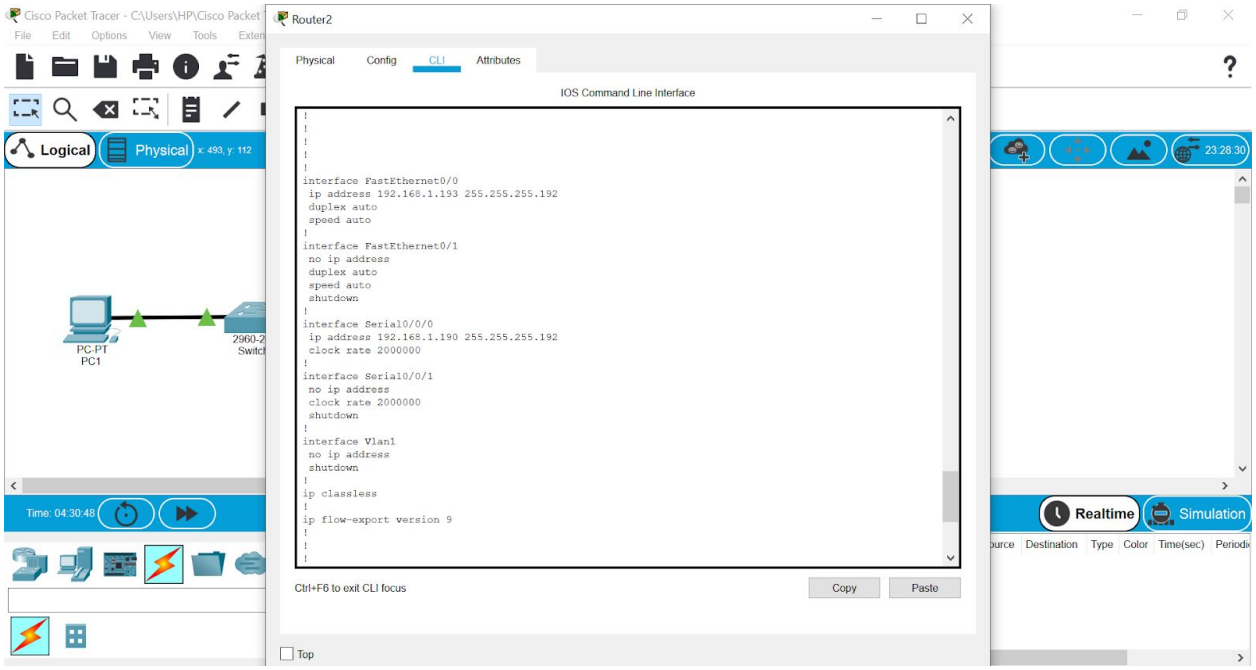

Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
Global Settings
Display Name
Router1
Hostname
Router
NVRAM
Erase
Save
Startup Config
Load...
Export...
Running Config
Export...
Merge...
Equivalent IOS Commands
Router(config-if)#end
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
Logical
Physical
PC-PT
PC1
2960-24TT
Switch0
Realtime
Simulation


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
Global Settings
Display Name
Router2
Hostname
Router
NVRAM
Erase
Save
Startup Config
Load...
Export...
Running Config
Export...
Merge...
Equivalent IOS Commands
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
Router(config-if)#end
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
%SYS-5-CONFIG_I: Configured from console by console
Logical
Physical
PC-PT
PC1
Realtime
Simulation


Router1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#show running-config
Building configuration...
Current configuration : 707 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
!
no ip cef
no ipv6 cef
!
!
!
!
!
!
Ctrl+F6 to exit CLI focus
Copy
Paste
Logical
Physical
PC-PT
PC1
2960-24T
Switch0
Realtime
Simulation

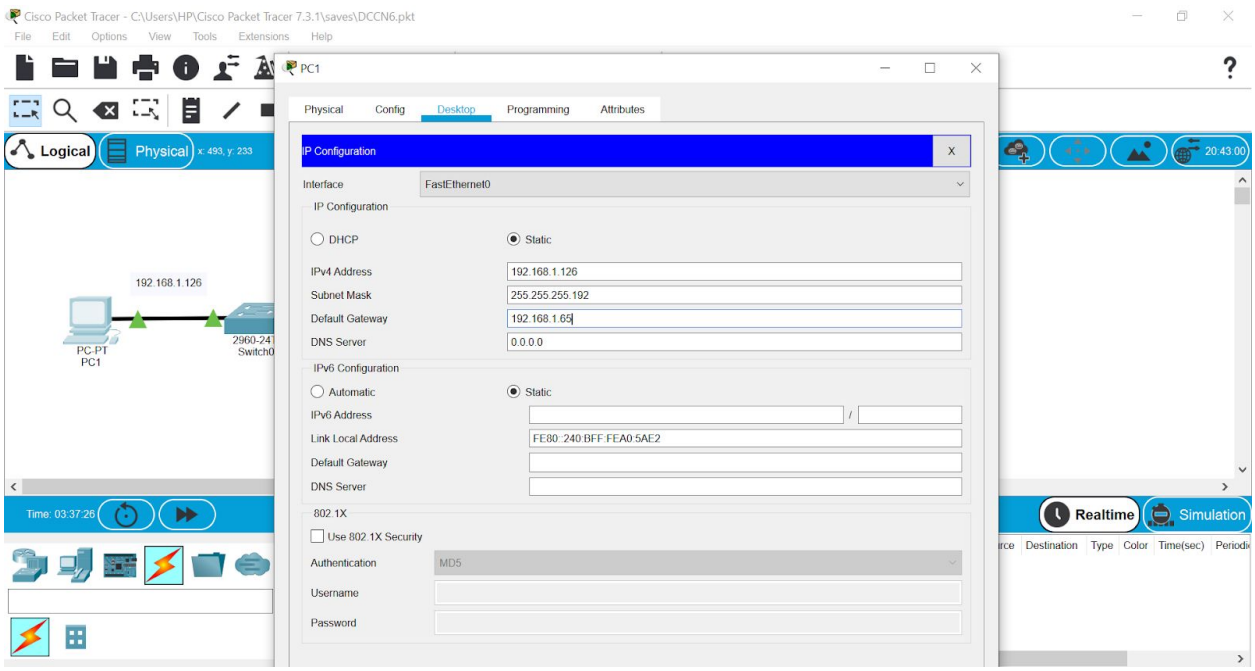

Router1
Physical
Config
CLI
Attributes
IOS Command Line Interface
!
!
!
!
!
!
interface FastEthernet0/0
 ip address 192.168.1.65 255.255.255.192
 duplex auto
 speed auto
!
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface Serial0/0/0
 ip address 192.168.1.129 255.255.255.192
!
interface Serial0/0/1
 no ip address
 clock rate 2000000
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
ip classless
!
ip flow-export version 9
!
!
!
Ctrl+F6 to exit CLI focus
Copy
Paste
Logical
Physical
PC-PT
PC1
2960-24T
Switch0
Realtime
Simulation

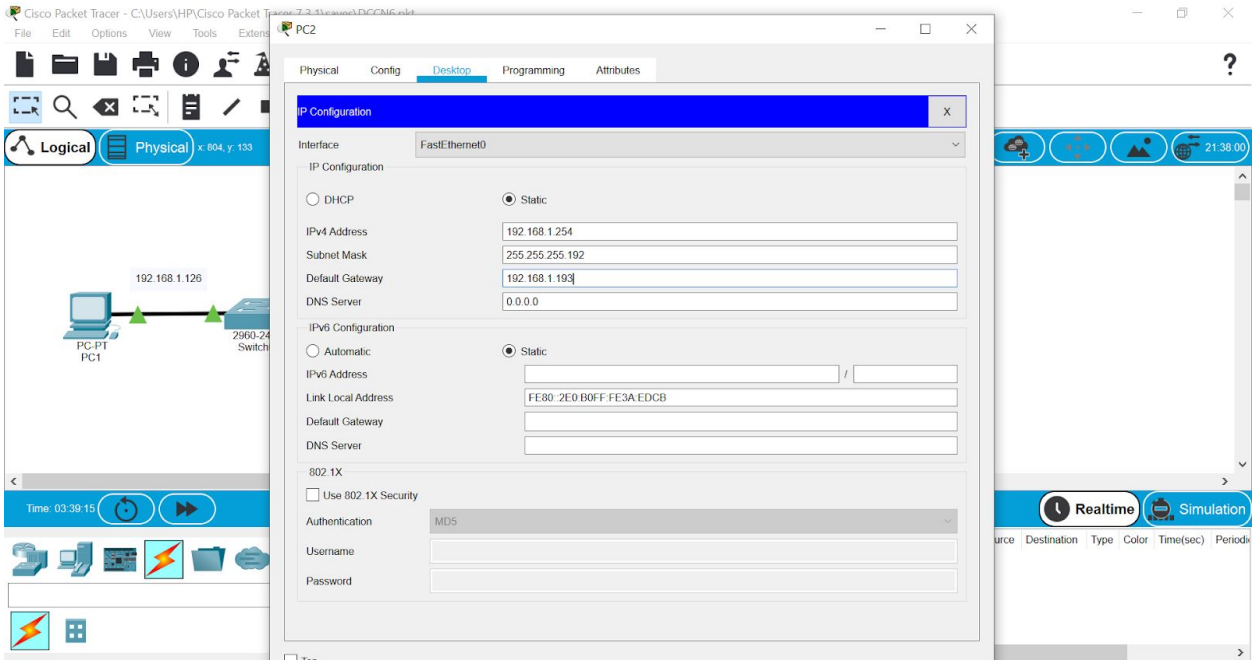




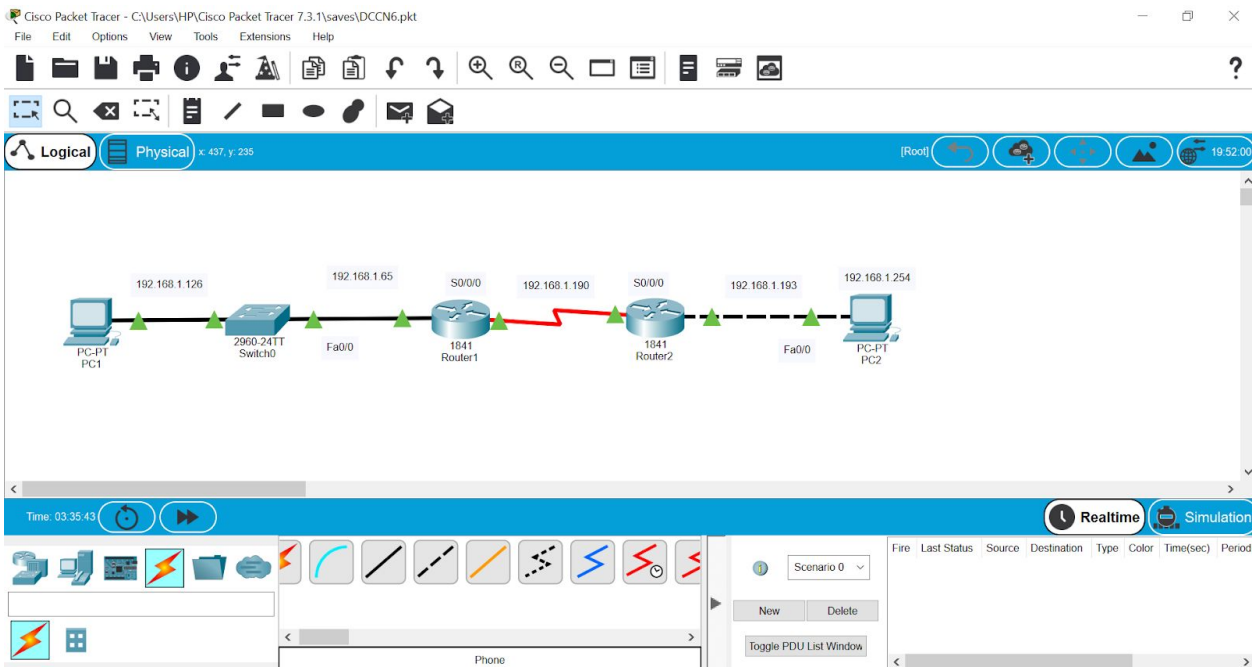
Step 2: Configure the PC interfaces.

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





The complete network

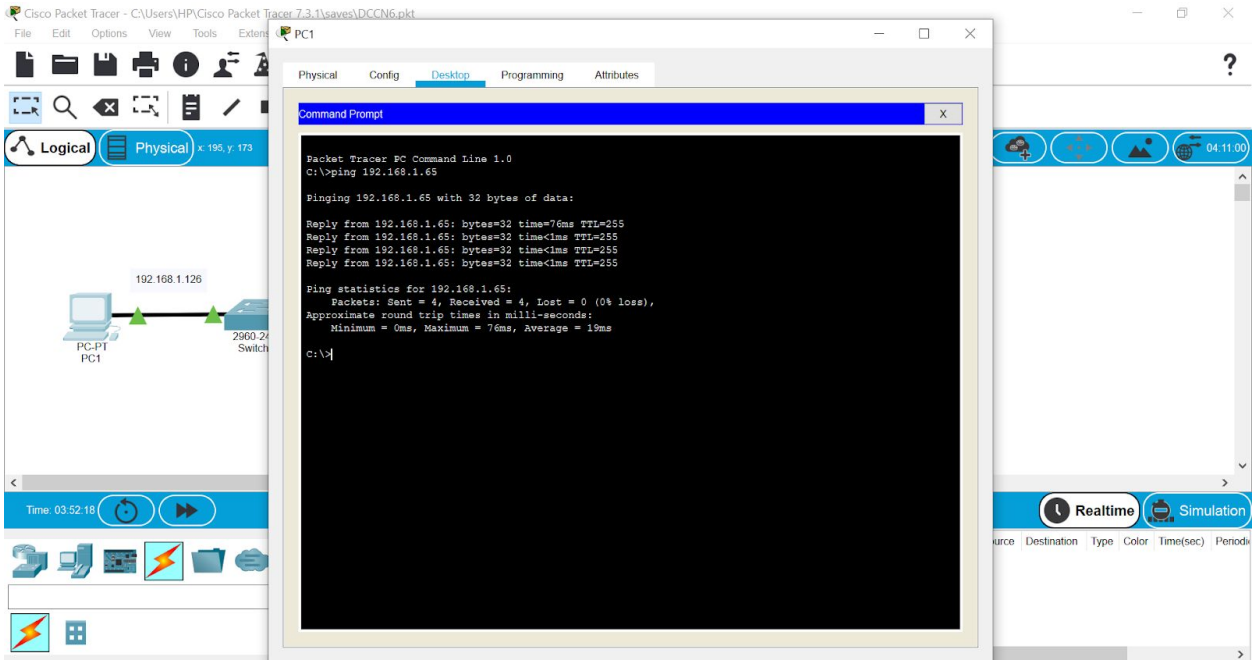


Task 4: Verify the Configurations.

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

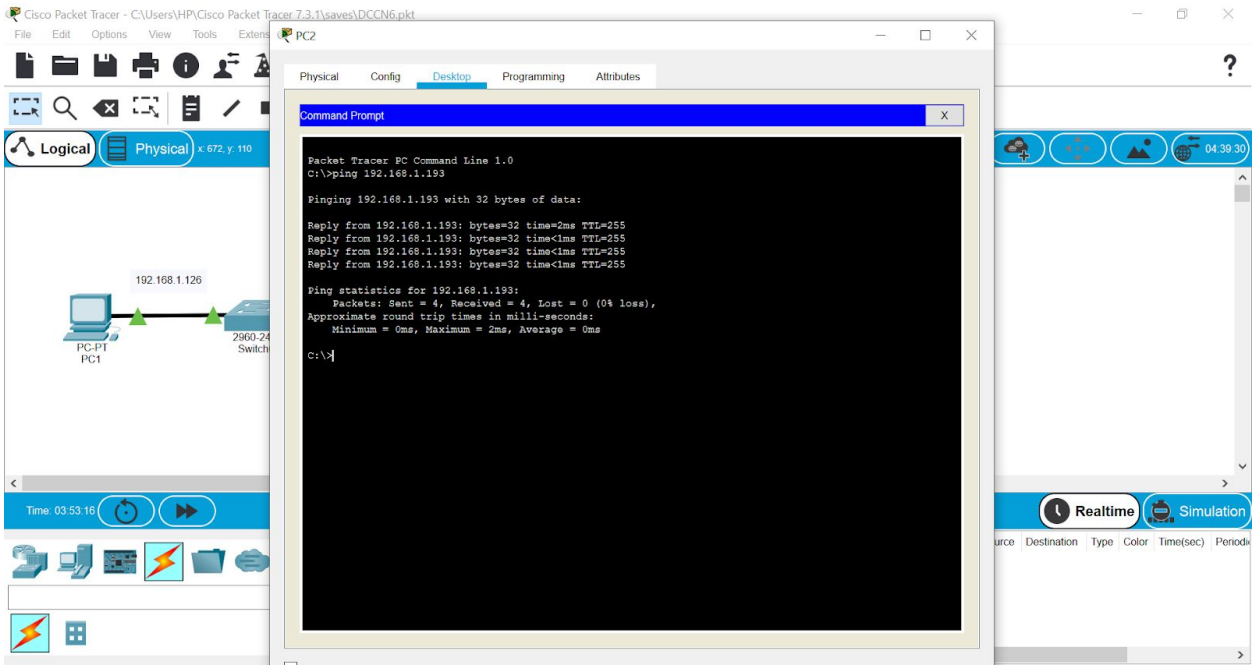
From the host attached to R1, is it possible to ping the default gateway?

Ans. Yes.



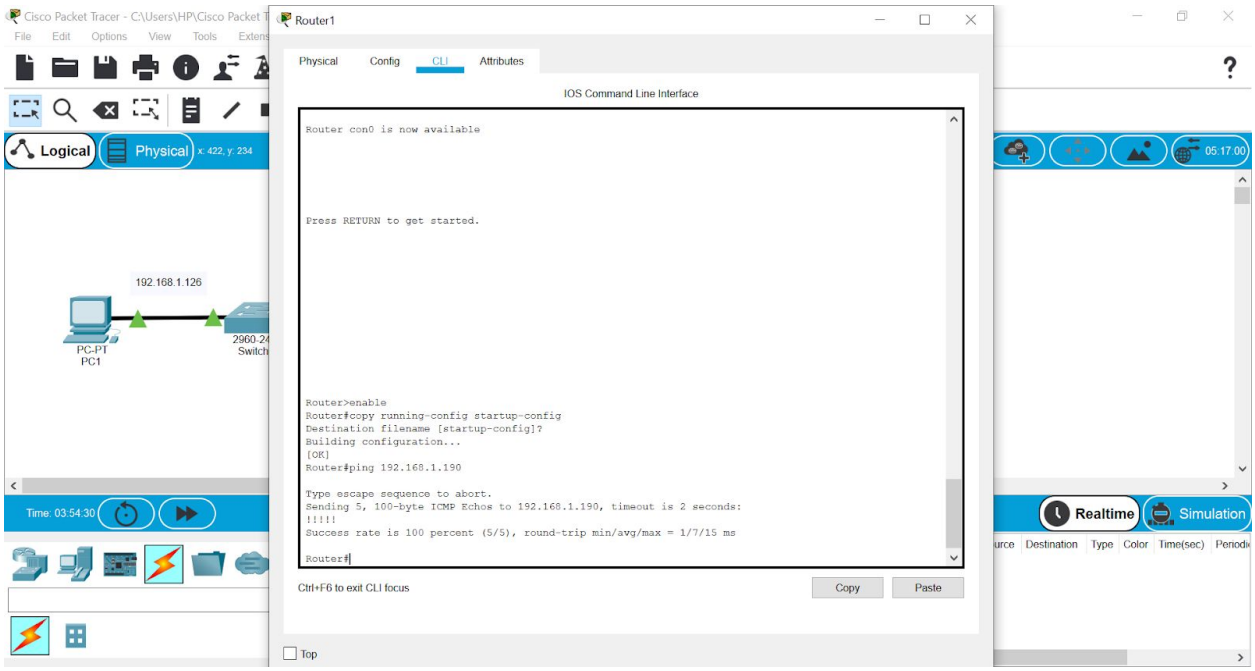
From the host attached to R2, is it possible to ping the default gateway?

Ans. Yes



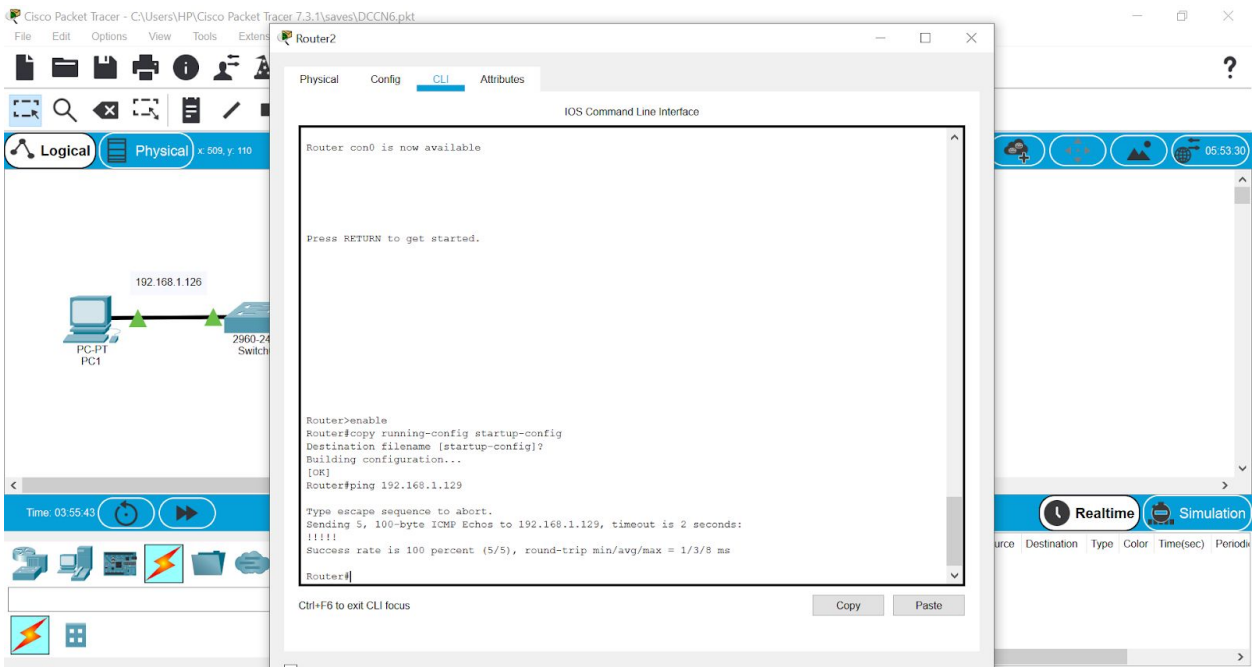
From the router R1, is it possible to ping the Serial 0/0/0 interface of R2?

Ans. Yes



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

Ans. Yes

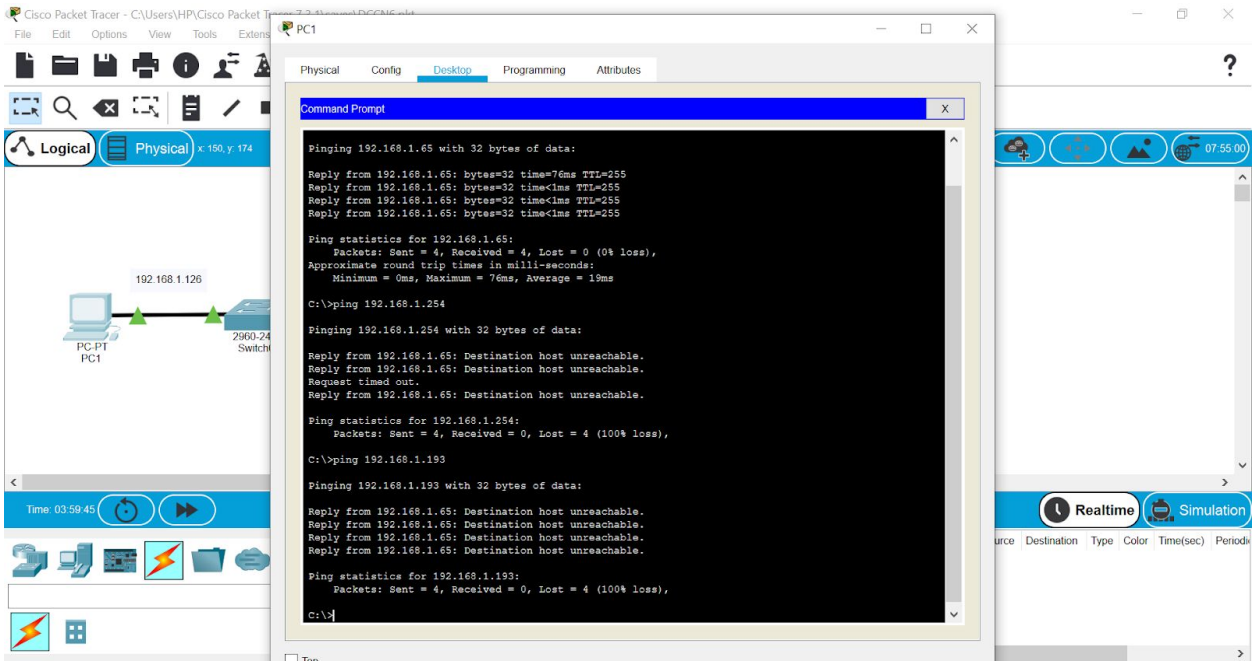


The answer to the above questions should be **yes**. If any of the above pings failed, check your physical connections and configurations.

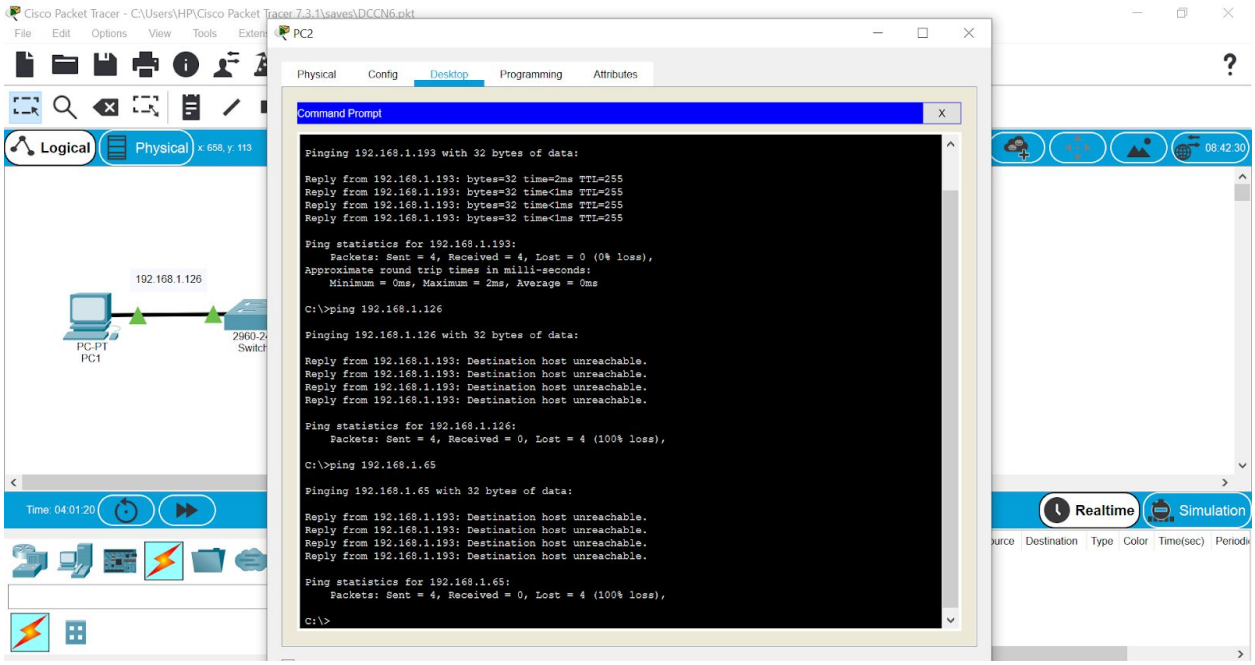
Task 5: Reflection

1. Are there any devices on the network that cannot ping each other?

Ans. Yes,PC1 cannot ping FastEthernet port of Router2 and PC2

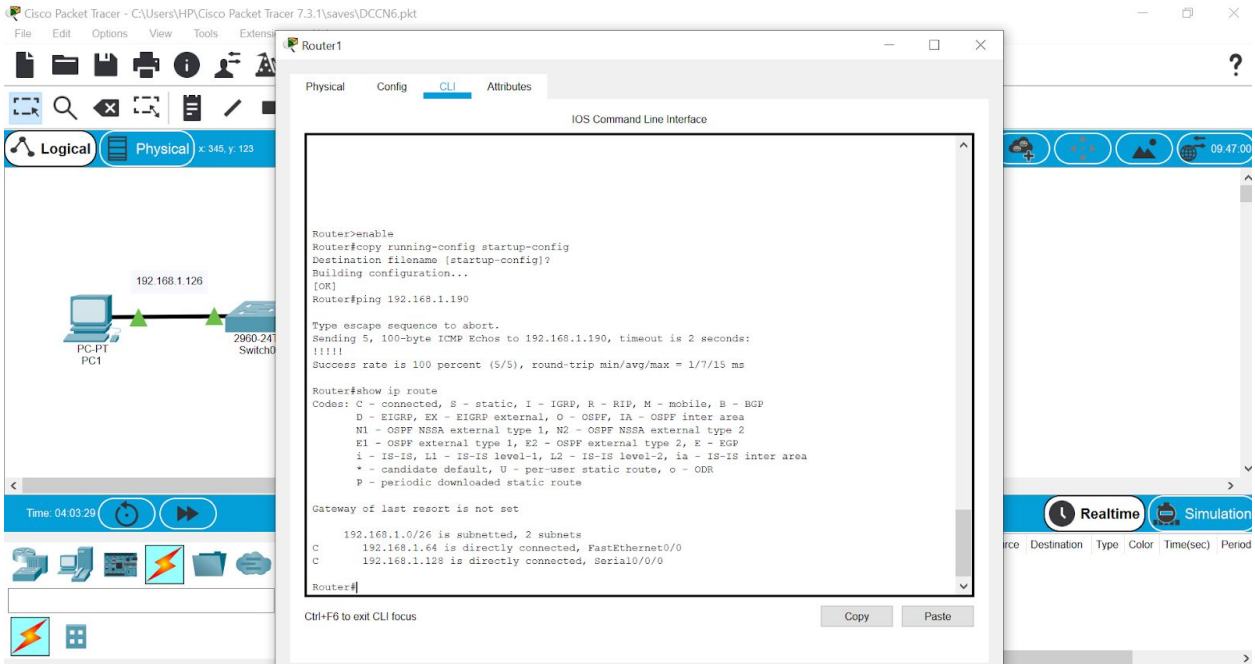


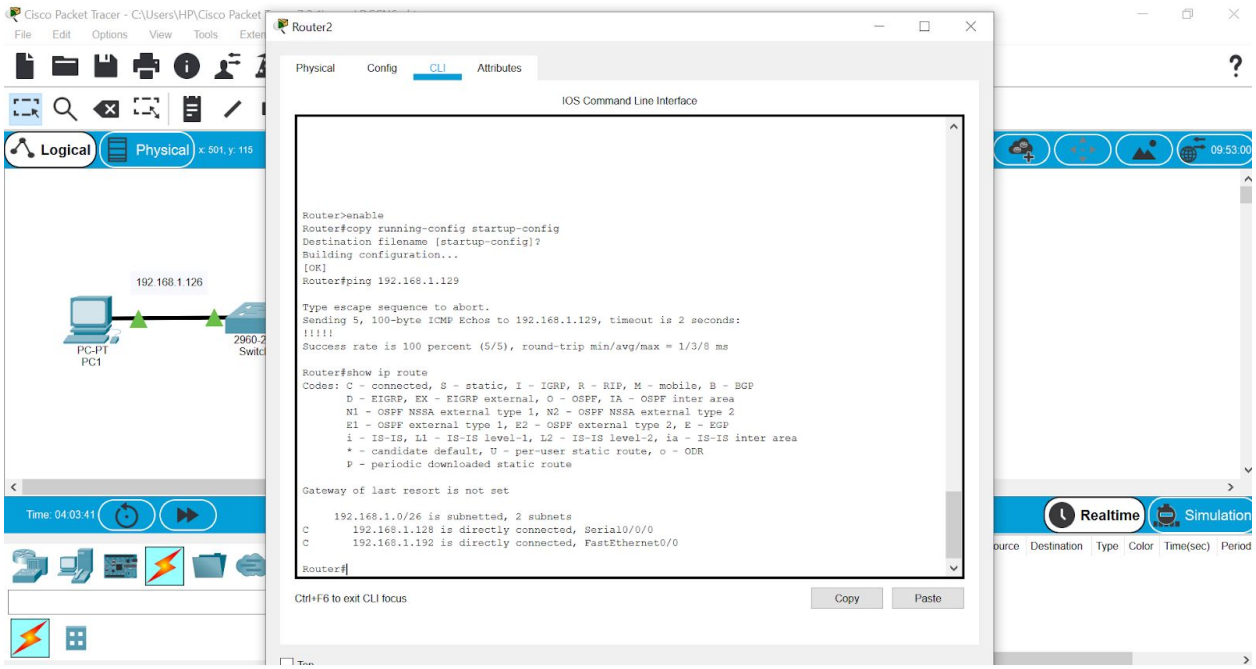
and PC2 cannot ping FastEthernet port of Router1 and PC1



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

Ans. We can see that the routers in our network only have the addresses of devices which are directly connected to its interfaces in their routing table. Hence static or dynamic routing is not present. Therefore, over here we cannot ping devices on another subnet.





CONCLUSION: From this experiment,I understood the subnetting and the router configurations of various networks.