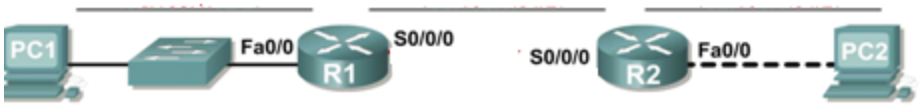
CEL 51, DCCN, Monsoon 2020
Lab 6: Subnet and Router Configuration

Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	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 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:- 3 subnets are needed.

- First subnet - the network connected to router R1
- Second subnet - the link between R1 and R2
- Third subnet - the network connected to router R2.

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

Ans:- 192.168.1.0/24 belongs to Class C as 192(first octet) comes in the range of class C.

Subnet mask: 255.255.255.0 is the default.

The first three octets are dedicated to the network and don't change.

Since our requirement is of 3 subnets, the subnet mask will be calculated as

$2^n >= 3$

Thus, **n=2**

We use 2 bits for the subnet in the last 8 bits of IP Address and 6 bits as host bits. The binary format is represented as **11111111.11111111.11111111.11000000**

Converting this to dotted decimal format – **255.255.255.192**

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

Ans: It is the total number of 1's in the binary form of the subnet mask. So, the subnet mask for the network in slash format is **/26.**

How many usable hosts are there per subnet?

Ans: Usable hosts= $2^h - 2 = 2^6 - 2$ **= 62**

h= number of zero in the binary form of subnet mask = 6

First address of the subnet - network identification. Last address of the subnet - broadcast.

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

1. Assign Subnet 1 to the network attached to R1 = **192.168.1.64-198.162.1.127**
2. Assign subnet 2 to the link between R1 and R2. = **192.168.1.128-198.162.1.191**
3. Assign subnet 3 to the network attached to R2 = **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.

   => Fa0/0 = 192.168.1.65

2. Assign the last valid host address in subnet 1 to PC1.

   =>192.168.1.126

3. Assign the first valid host address in subnet 2 to the WAN interface on R1.

   => S0/0/0 = 192.168.1.129

4. Assign the last valid host address in subnet 2 to the WAN interface on R2.

   => S0/0/0 = 192.168.1.190

5. Assign the first valid host address in subnet 3 to the LAN interface of R2.

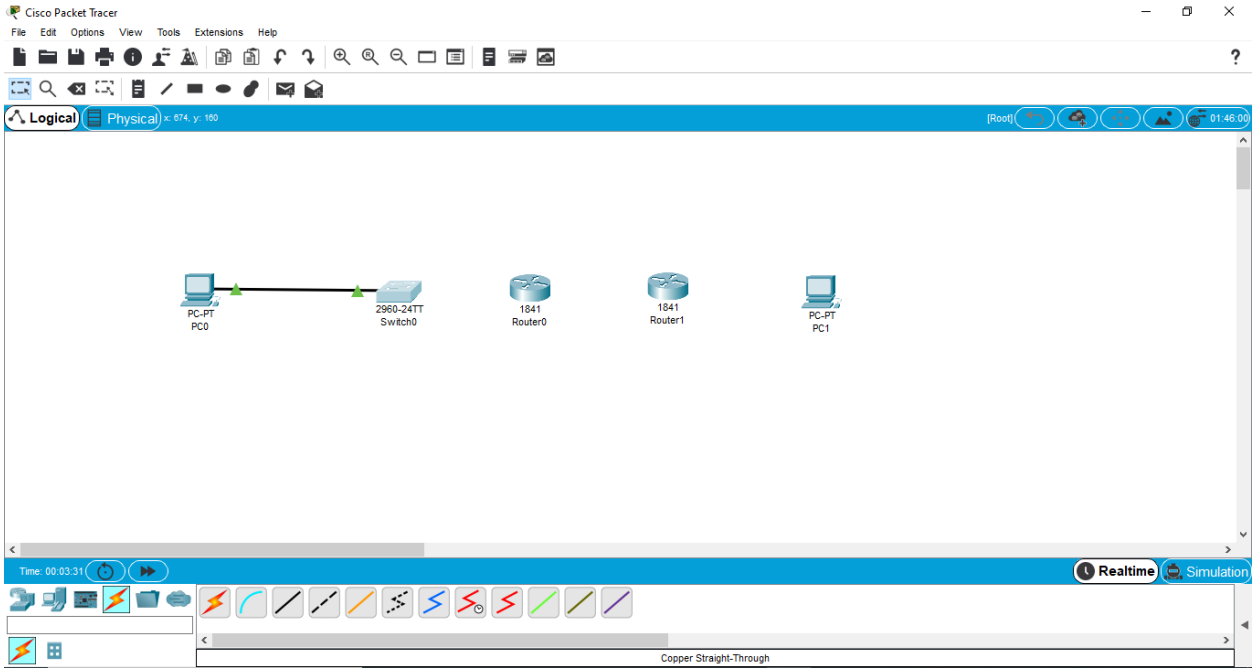
   => Fa0/0 = 192.168.1.193

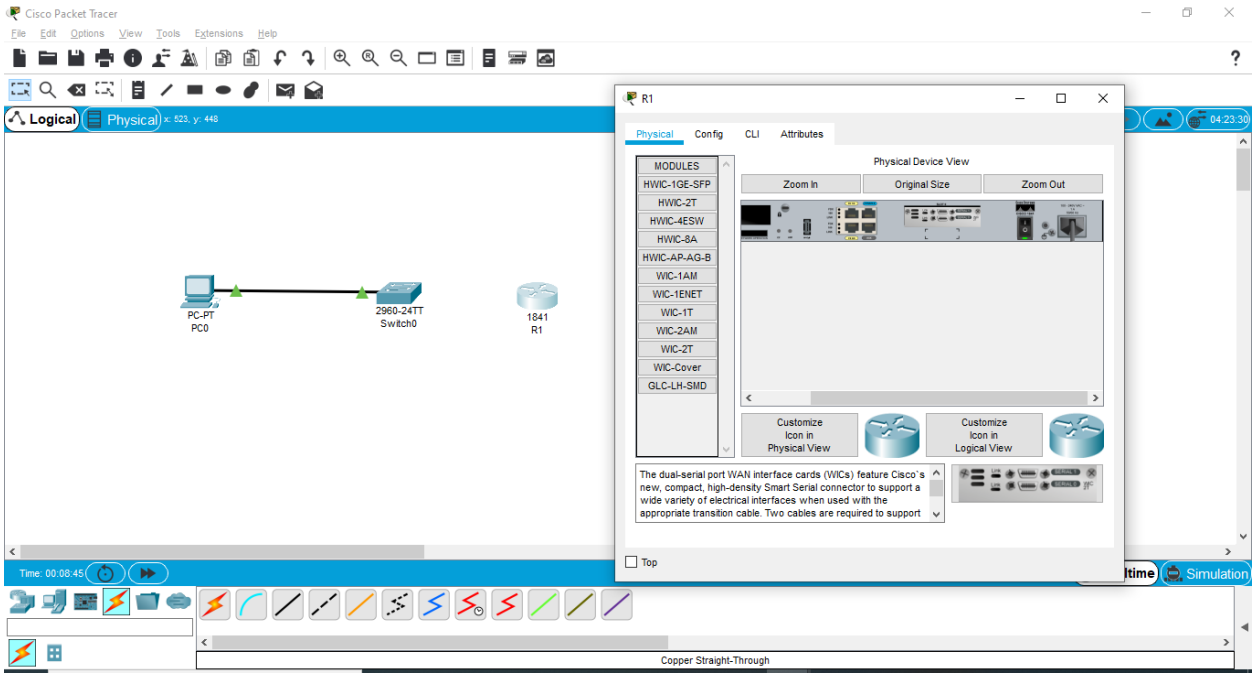
6. Assign the last valid host address in subnet 3 to PC2.

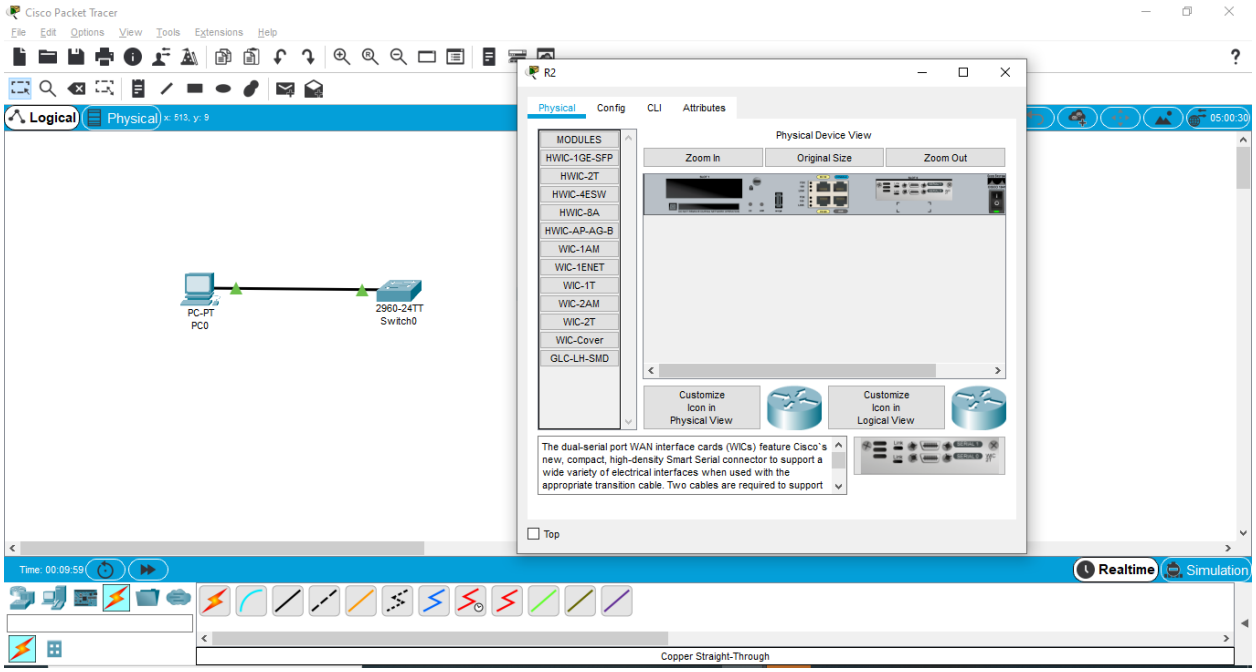
   => 192.168.1.254

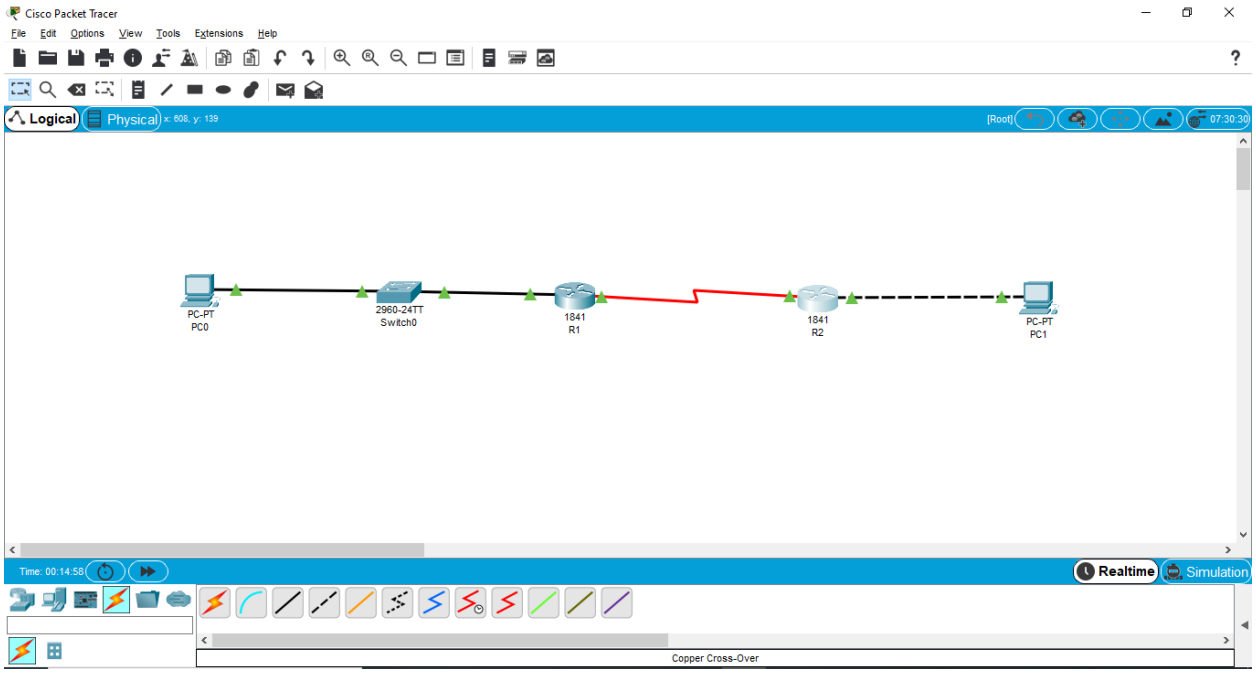
Step 2: Document the addresses to be used in the table provided under the Topology Diagram.

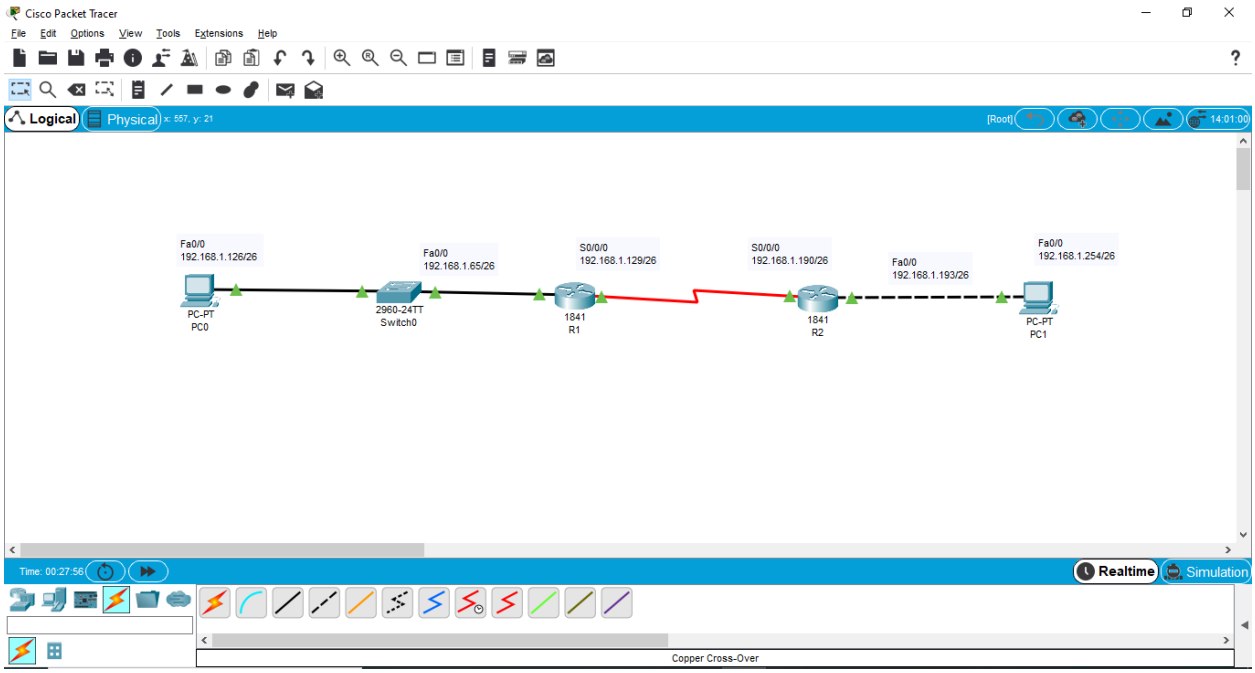
Task 3: Configure the Serial and FastEthernet Addresses.

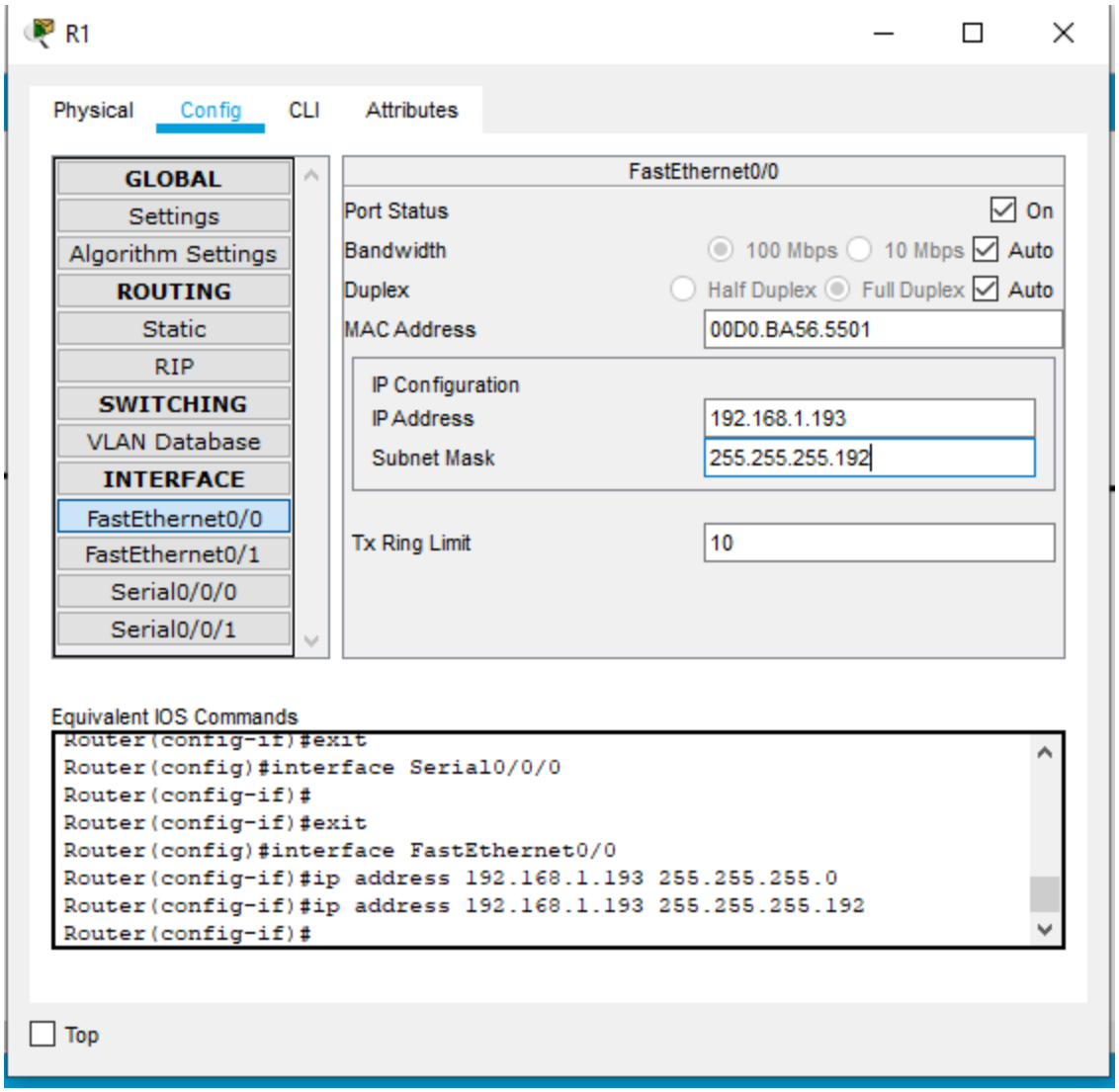


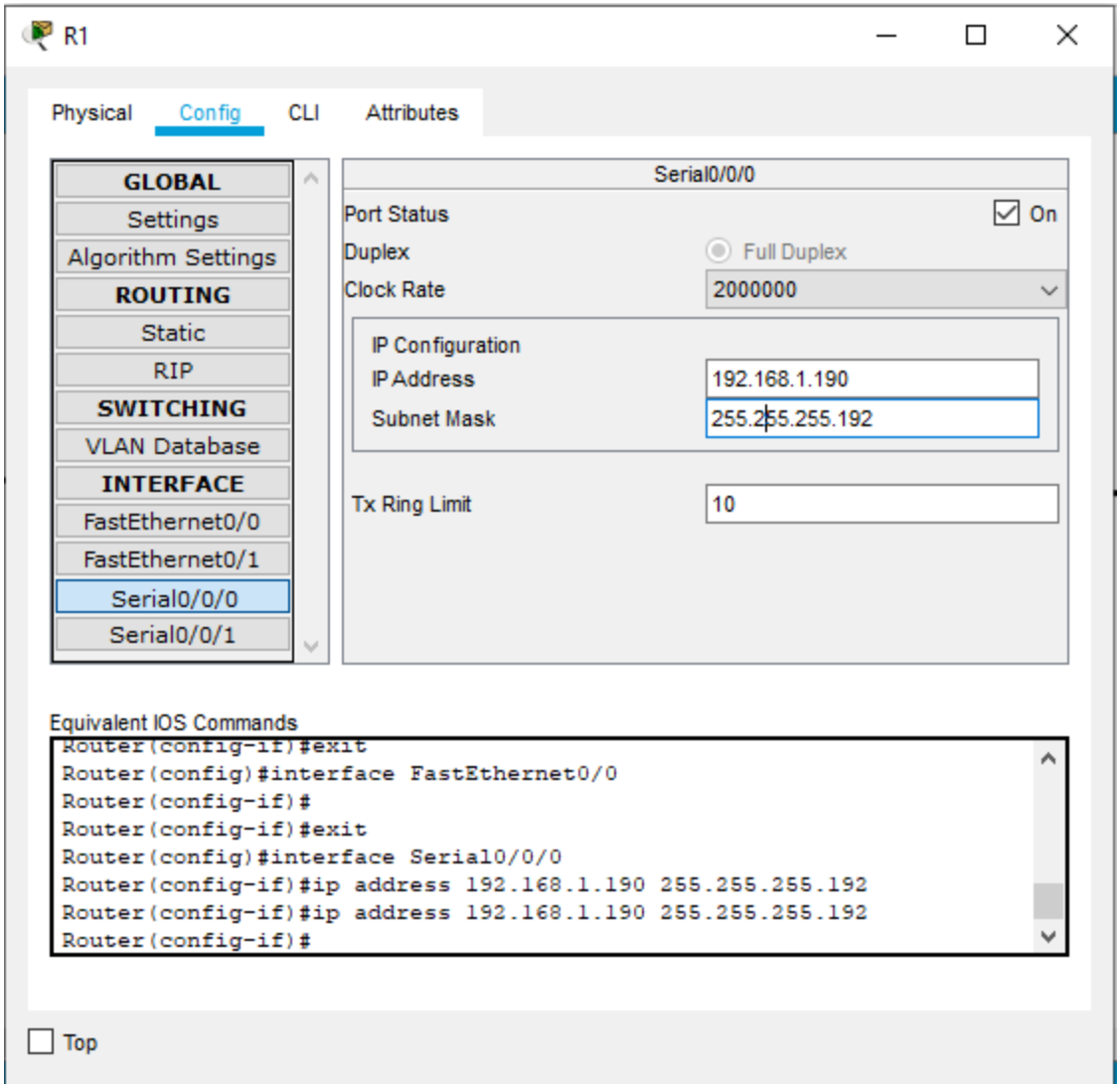


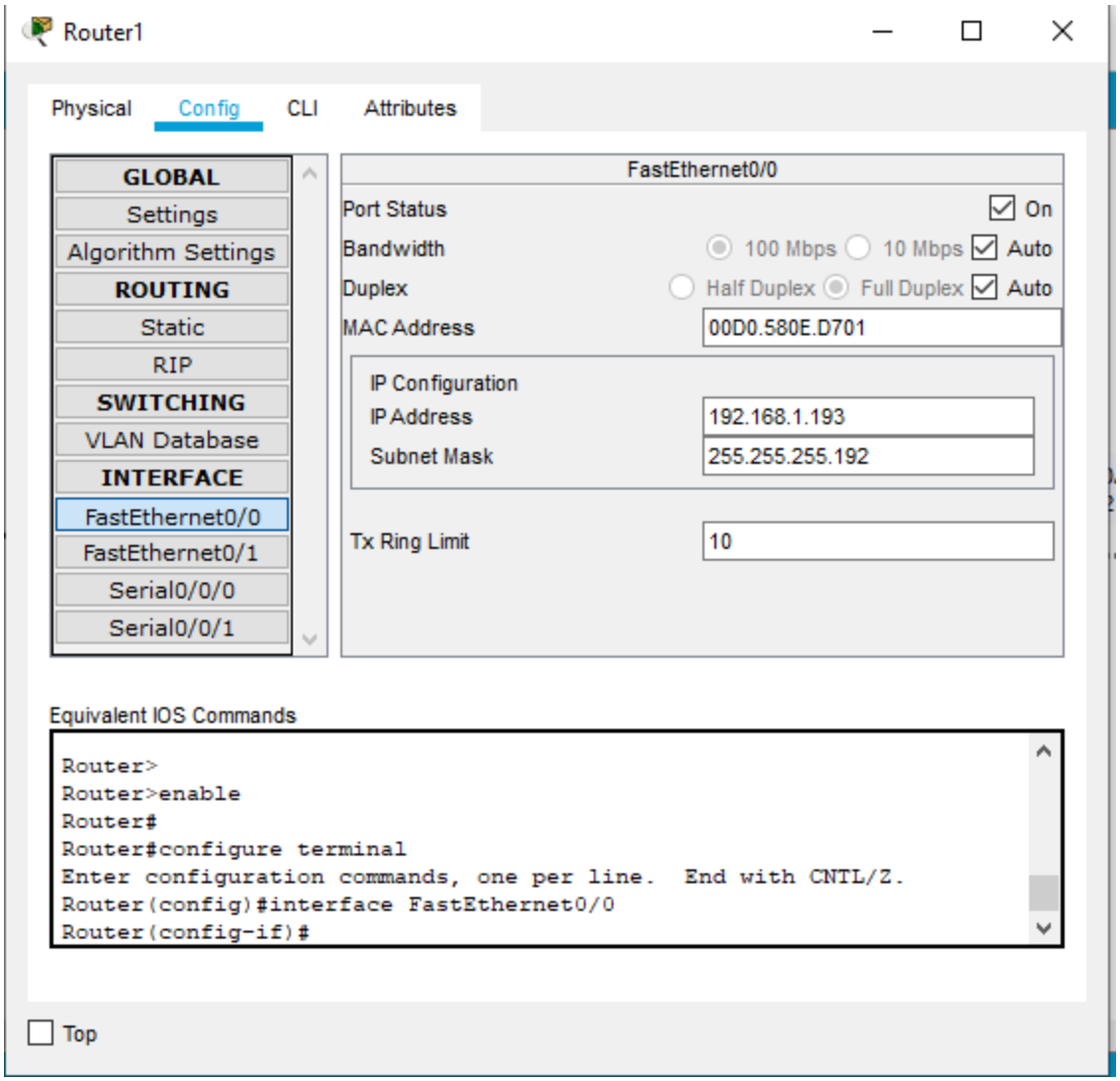

Cisco Packet Tracer
File Edit Options View Tools Extensions Help
Logical Physical x: 513, y: 9
05:00:30
PC-PT
PC0
2960-24TT
Switch0
R2
Physical Config CLI Attributes
MODULES
HWIC-1GE-SFP
HWIC-2T
HWIC-4ESW
HWIC-8A
HWIC-AP-AG-B
WIC-1AM
WIC-1ENET
WIC-1T
WIC-2AM
WIC-2T
WIC-Cover
GLC-LH-SMD
Physical Device View
Zoom In
Original Size
Zoom Out
Customize Icon in Physical View
Customize Icon in Logical View
The dual-serial port WAN interface cards (WICs) feature Cisco's new, compact, high-density Smart Serial connector to support a wide variety of electrical interfaces when used with the appropriate transition cable. Two cables are required to support
Top
Time: 00:09:59
Realtime
Simulation
Copper Straight-Through

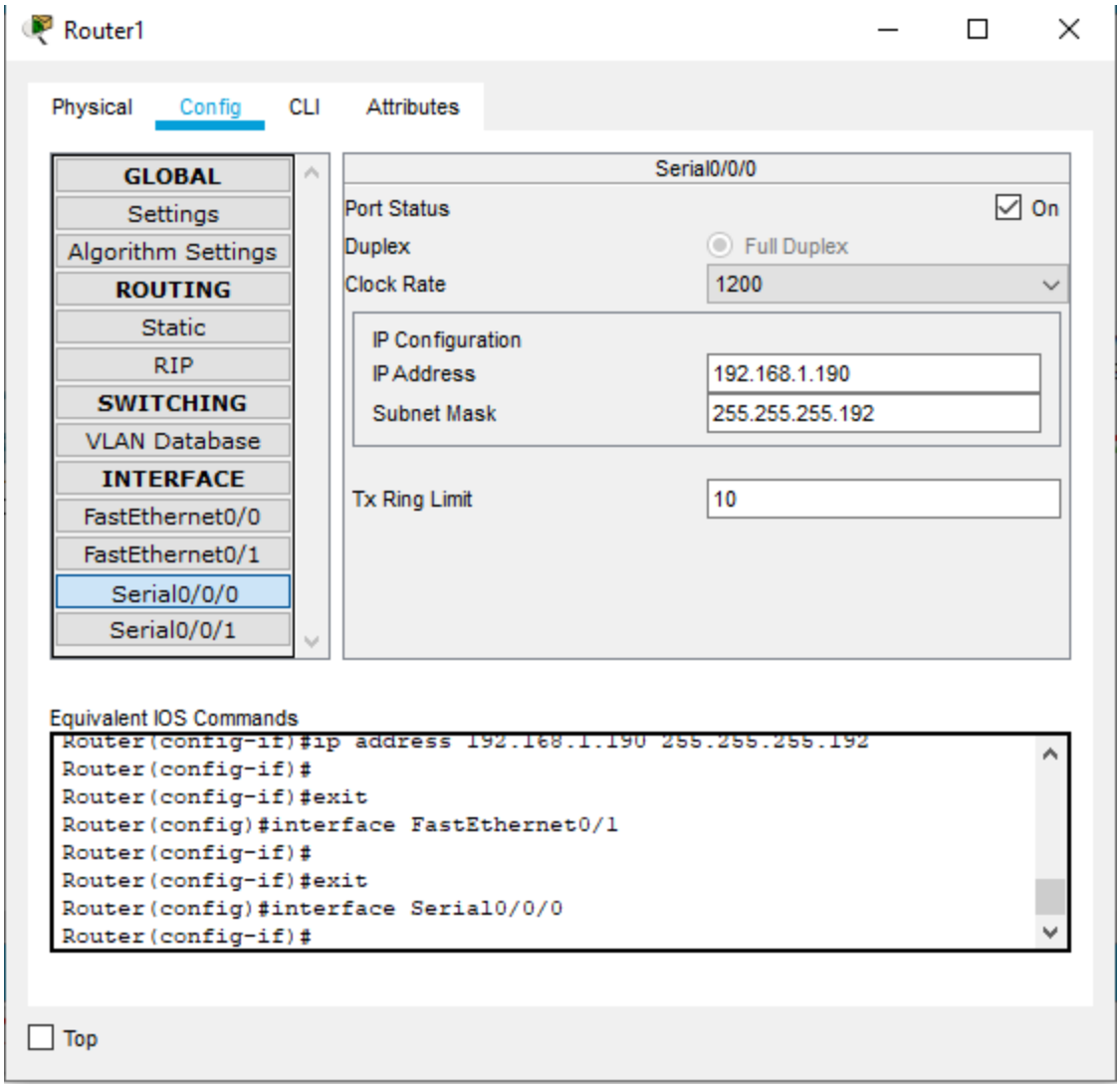

Cisco Packet Tracer
File Edit Options View Tools Extensions Help
Logical Physical x: 608, y: 139
[Root]
07:30:30
PC-PT
PC0
2960-24TT
Switch0
1841
R1
1841
R2
PC-PT
PC1
Time: 00:14:58
Realtime
Simulation
Copper Cross-Over

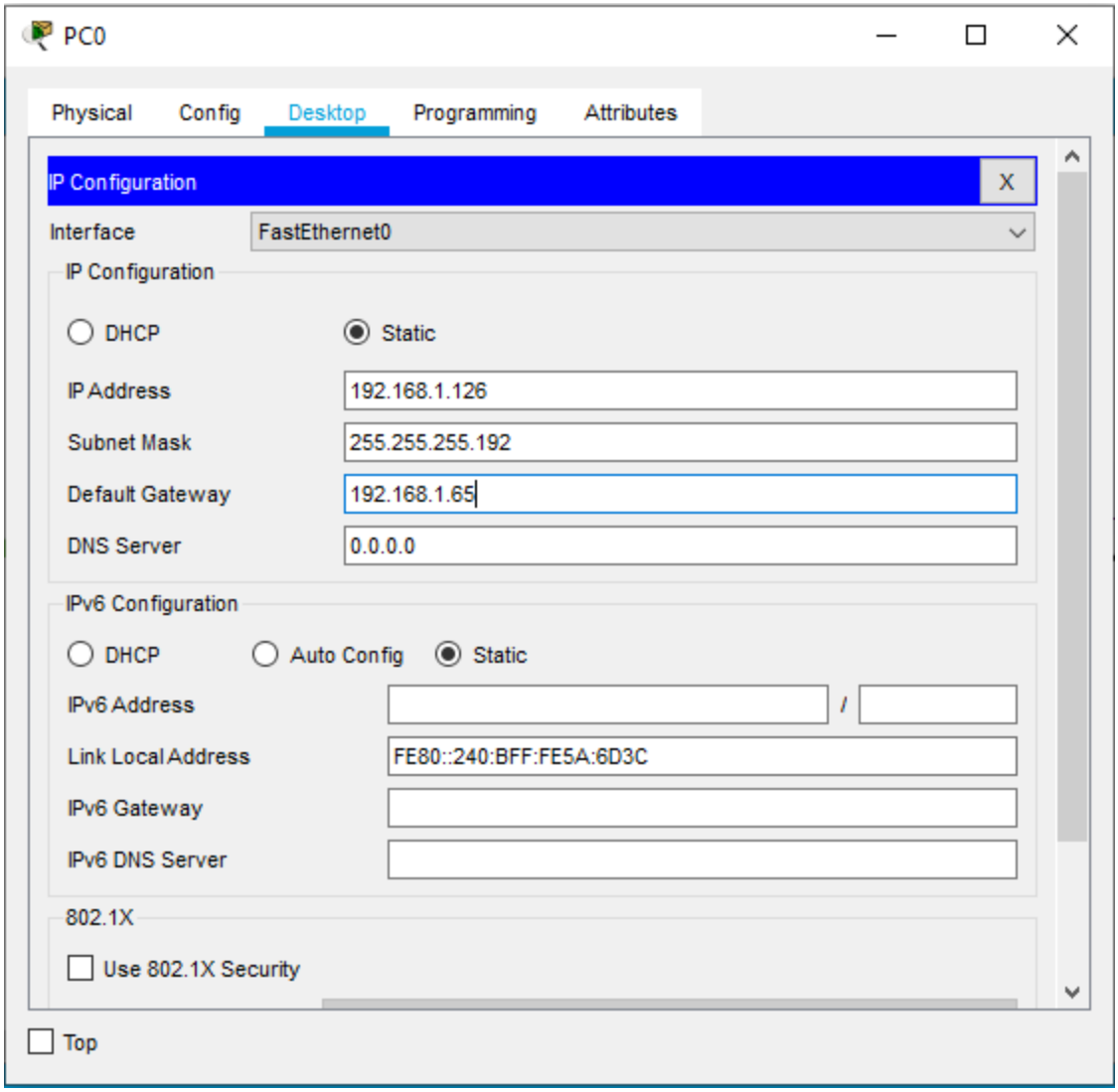

Cisco Packet Tracer
File Edit Options View Tools Extensions Help
Logical
Physical
x: 557, y: 21
[Root]
14:01:00
Fa0/0
192.168.1.126/26
PC-PT
PC0
Fa0/0
192.168.1.65/26
2960-24TT
Switch0
S0/0/0
192.168.1.129/26
1841
R1
S0/0/0
192.168.1.190/26
1841
R2
Fa0/0
192.168.1.193/26
Fa0/0
192.168.1.254/26
PC-PT
PC1
Time: 00:27:56
Realtime
Simulation
Copper Cross-Over

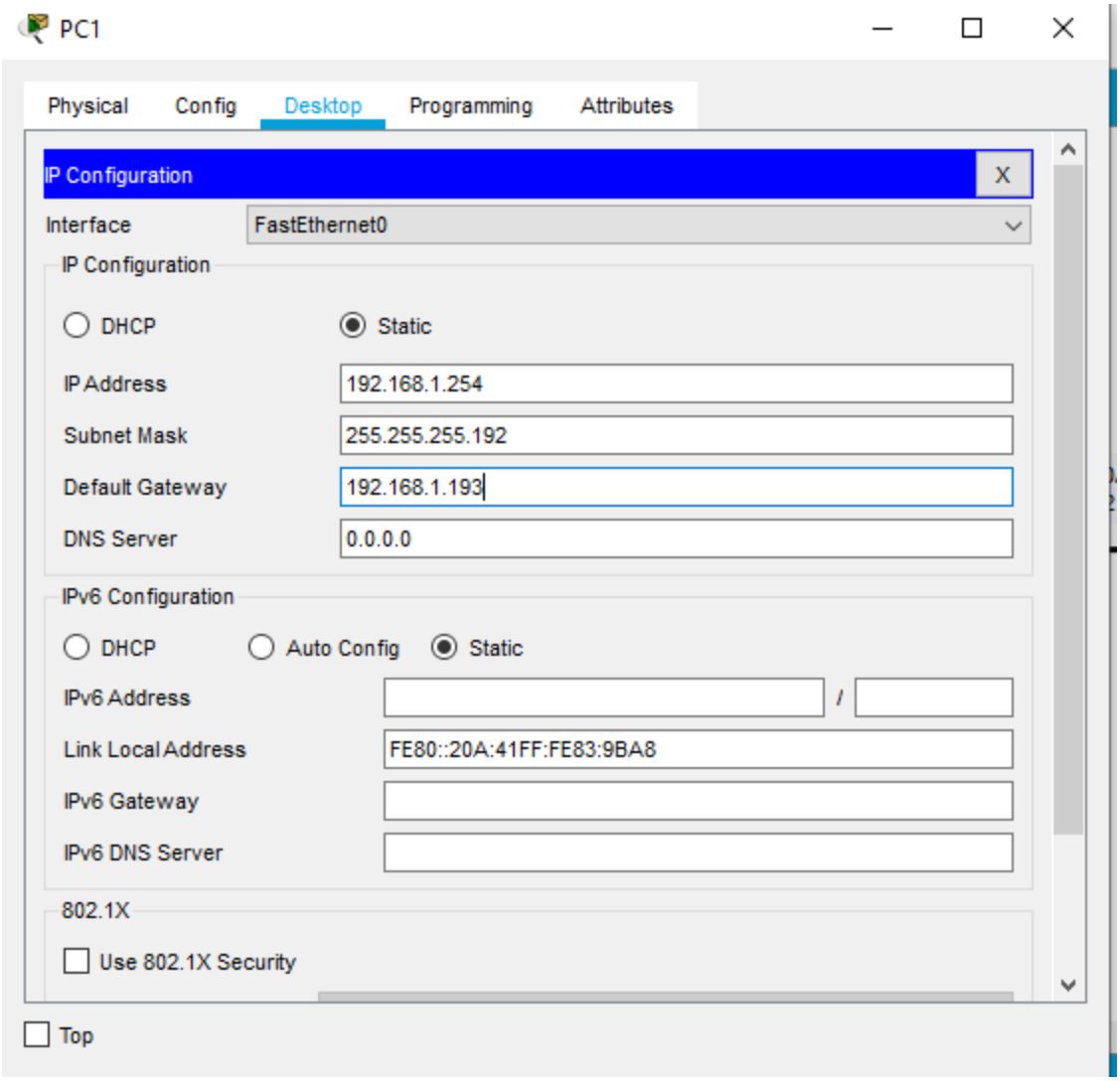

R1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
FastEthernet0/0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
00D0.BA56.5501
IP Configuration
IP Address
192.168.1.193
Subnet Mask
255.255.255.192
Tx Ring Limit
10
Equivalent IOS Commands
Router(config-if)#exit
Router(config)#interface Serial0/0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 192.168.1.193 255.255.255.0
Router(config-if)#ip address 192.168.1.193 255.255.255.192
Router(config-if)#
Top


R1
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
IP Address
192.168.1.190
Subnet Mask
255.255.255.192
Tx Ring Limit
10
Equivalent IOS Commands
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)#ip address 192.168.1.190 255.255.255.192
Router(config-if)#ip address 192.168.1.190 255.255.255.192
Router(config-if)#
Top


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
00D0.580E.D701
IP Configuration
IP Address
192.168.1.193
Subnet Mask
255.255.255.192
Tx Ring Limit
10
Equivalent IOS Commands
Router>
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


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
1200
IP Configuration
IP Address
192.168.1.190
Subnet Mask
255.255.255.192
Tx Ring Limit
10
Equivalent IOS Commands
Router(config-if)#ip address 192.168.1.190 255.255.255.192
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/0/0
Router(config-if)#
Top

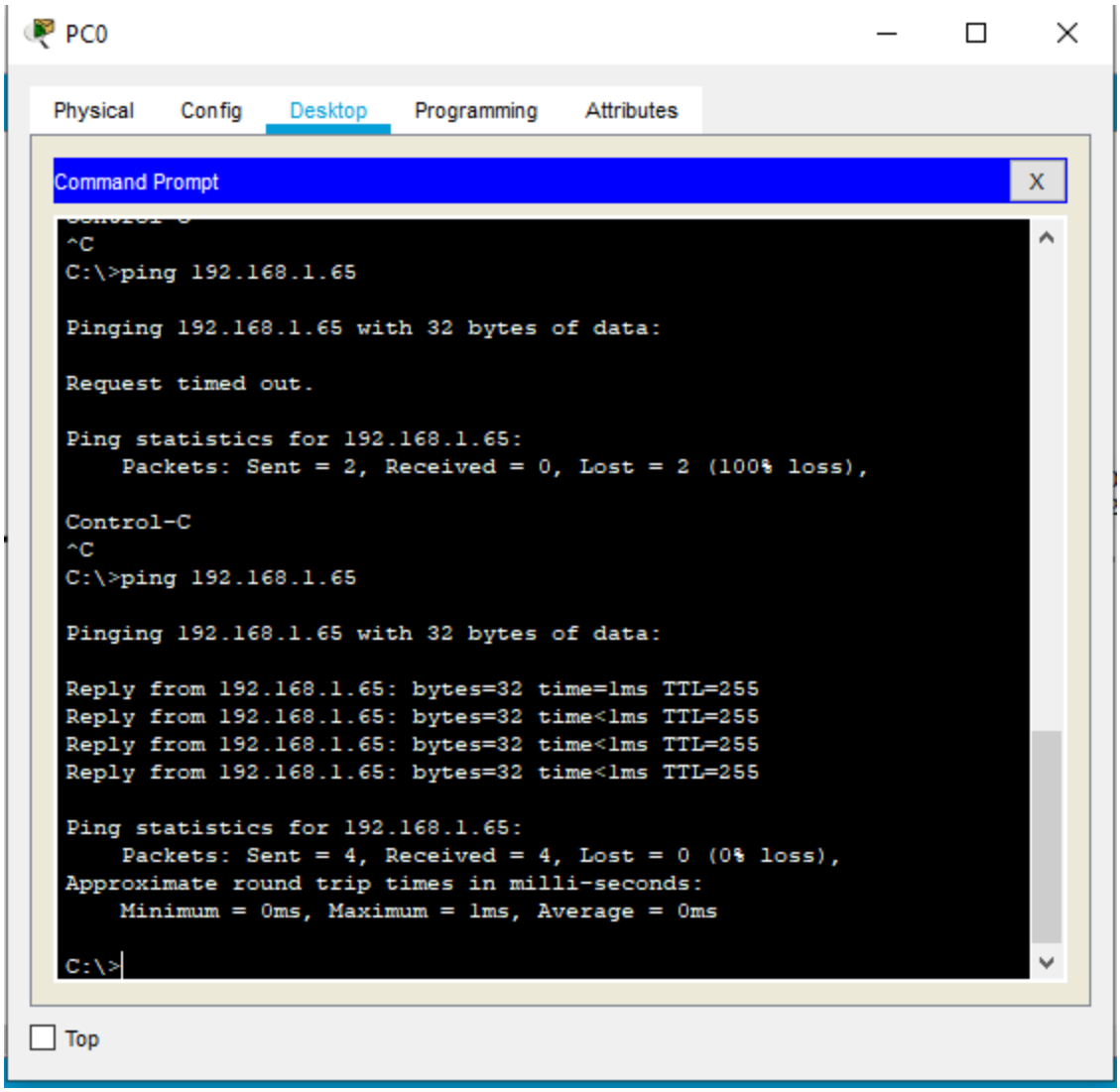

PC0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IP Address
192.168.1.126
Subnet Mask
255.255.255.192
Default Gateway
192.168.1.65
DNS Server
0.0.0.0
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
/
Link Local Address
FE80::240:BFF:FE5A:6D3C
IPv6 Gateway
IPv6 DNS Server
802.1X
Use 802.1X Security
Top



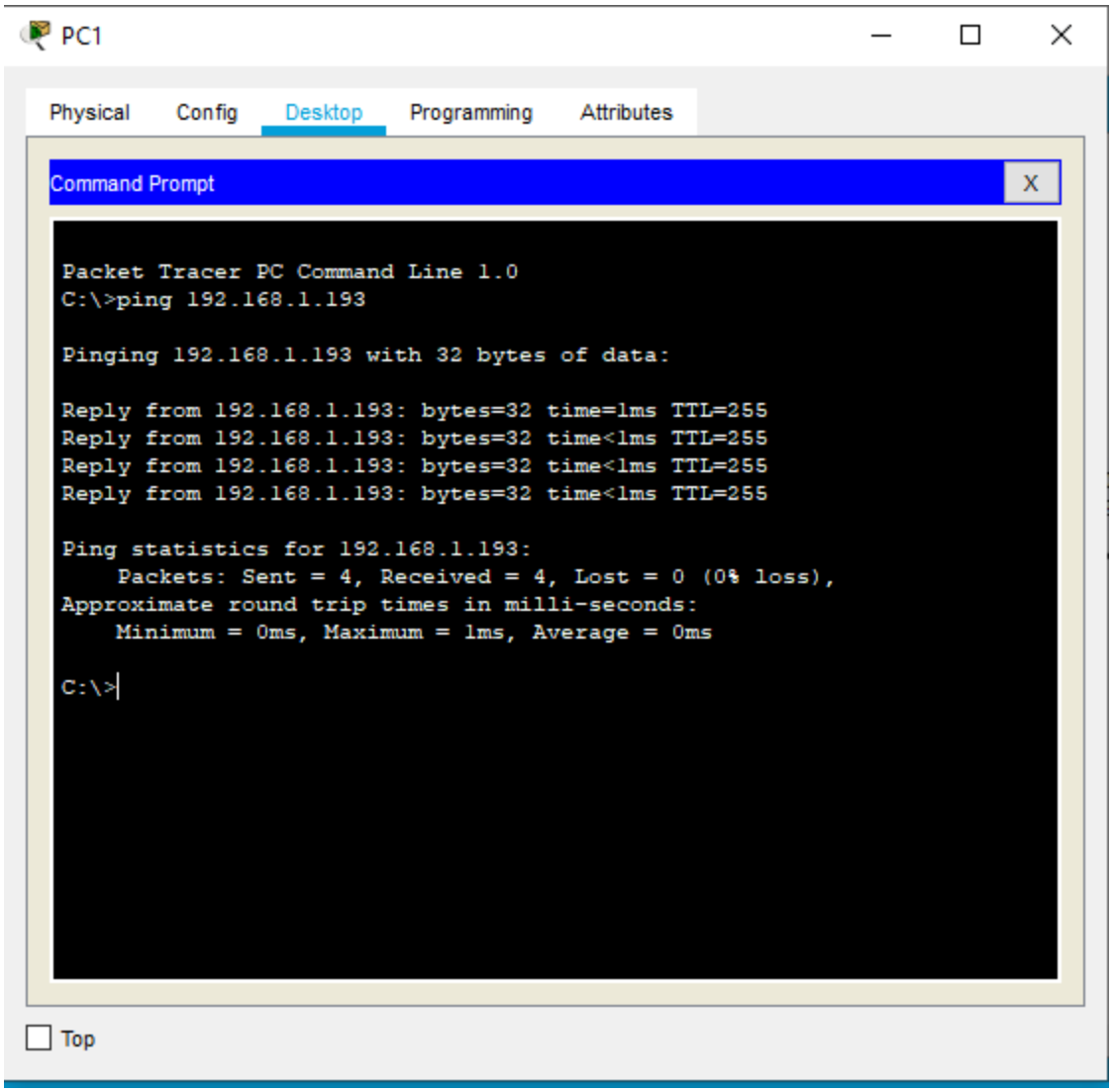
Task 4: Verify the Configurations.

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

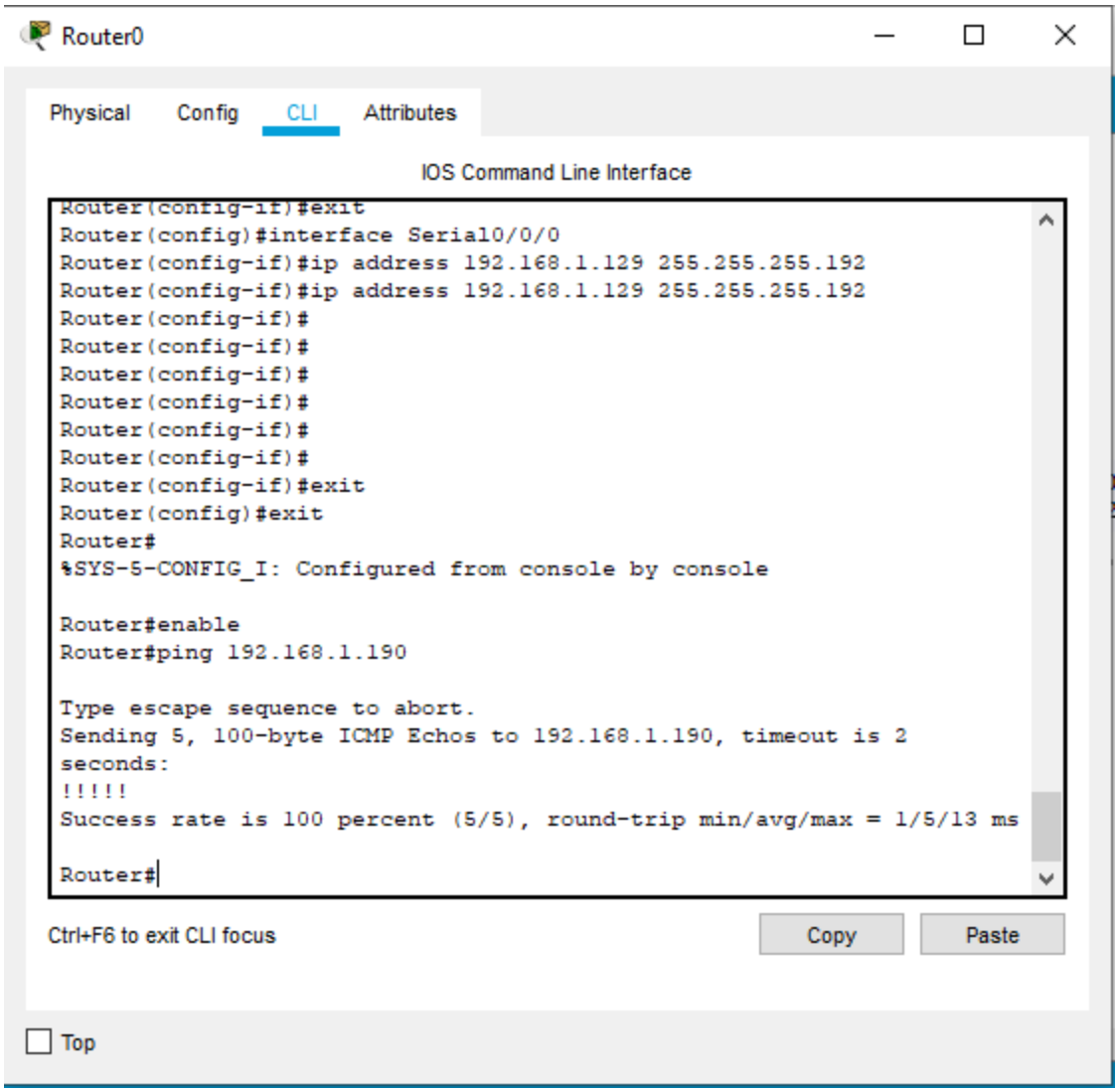
From the host attached to R1, is it possible to ping the default gateway?Yes



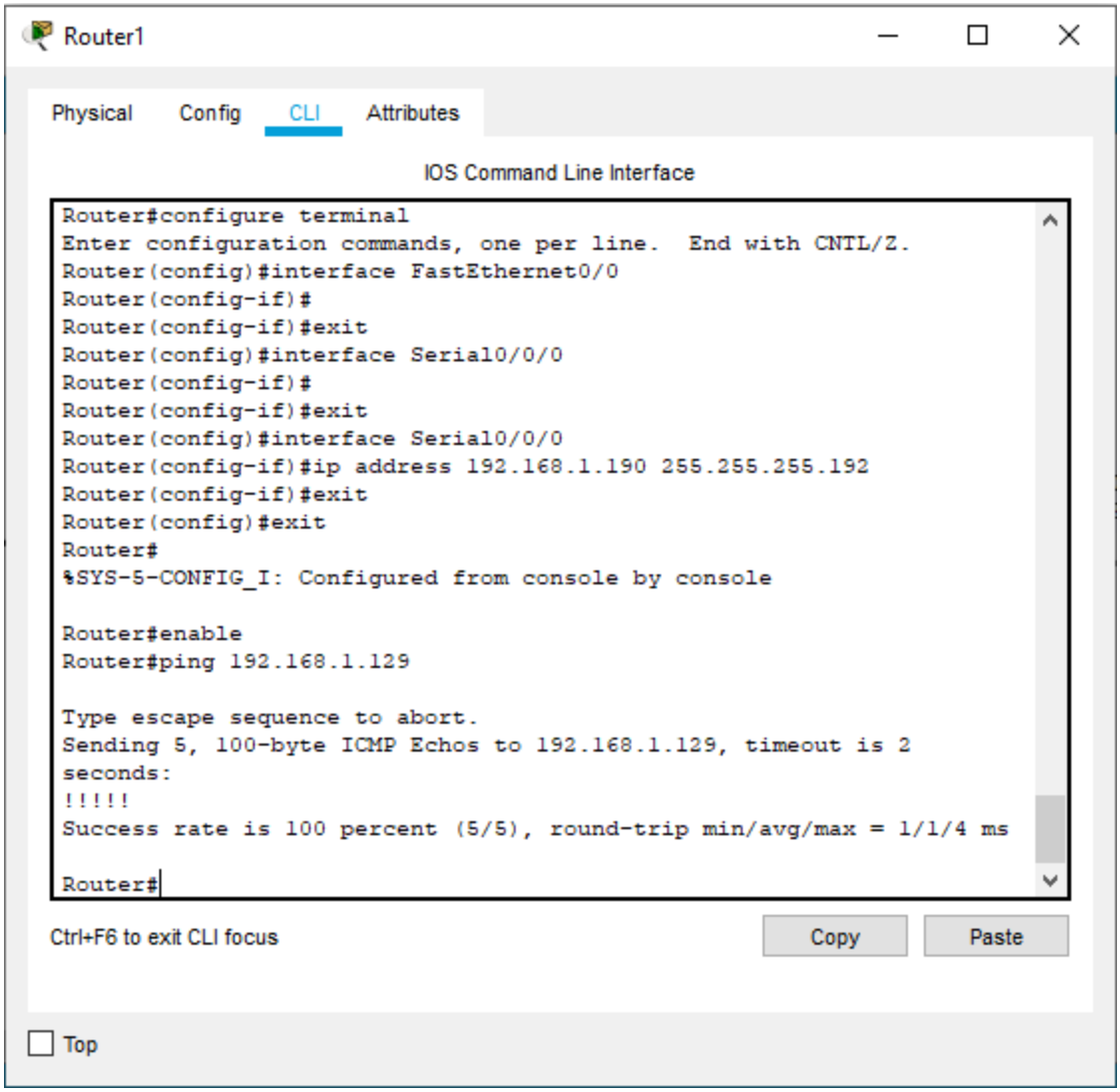
From the host attached to R2, is it possible to ping the default gateway? Yes



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



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



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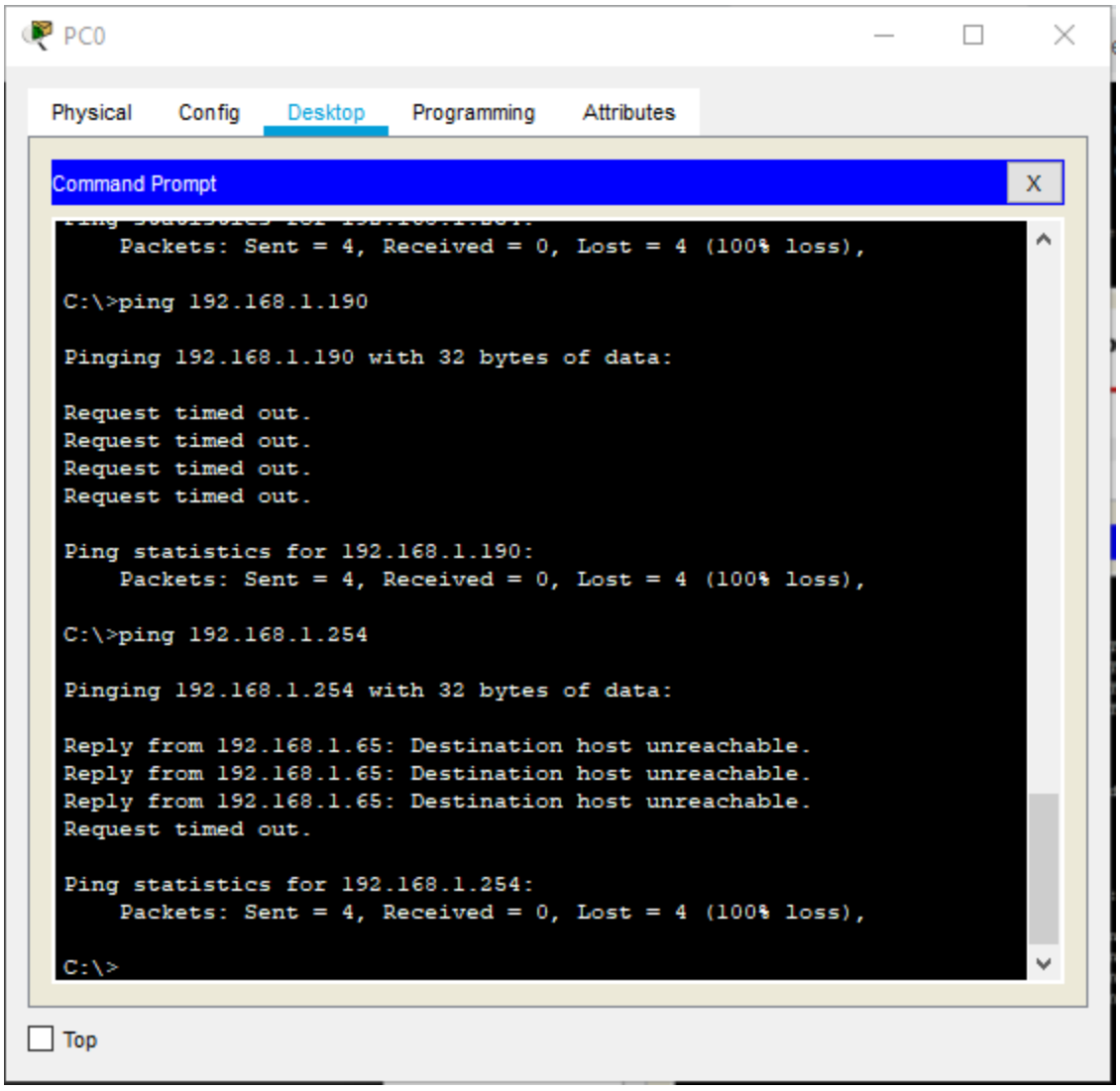
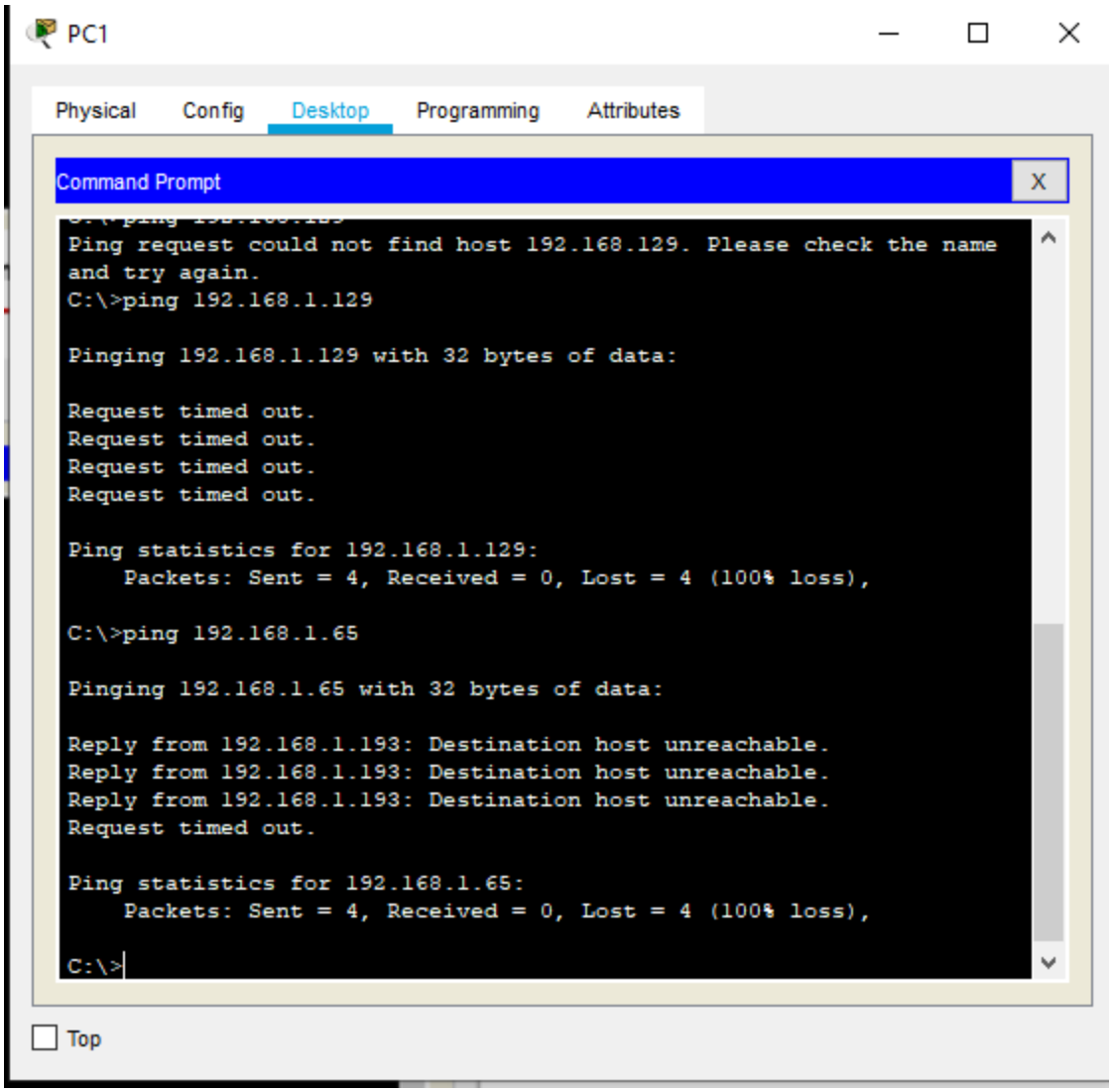
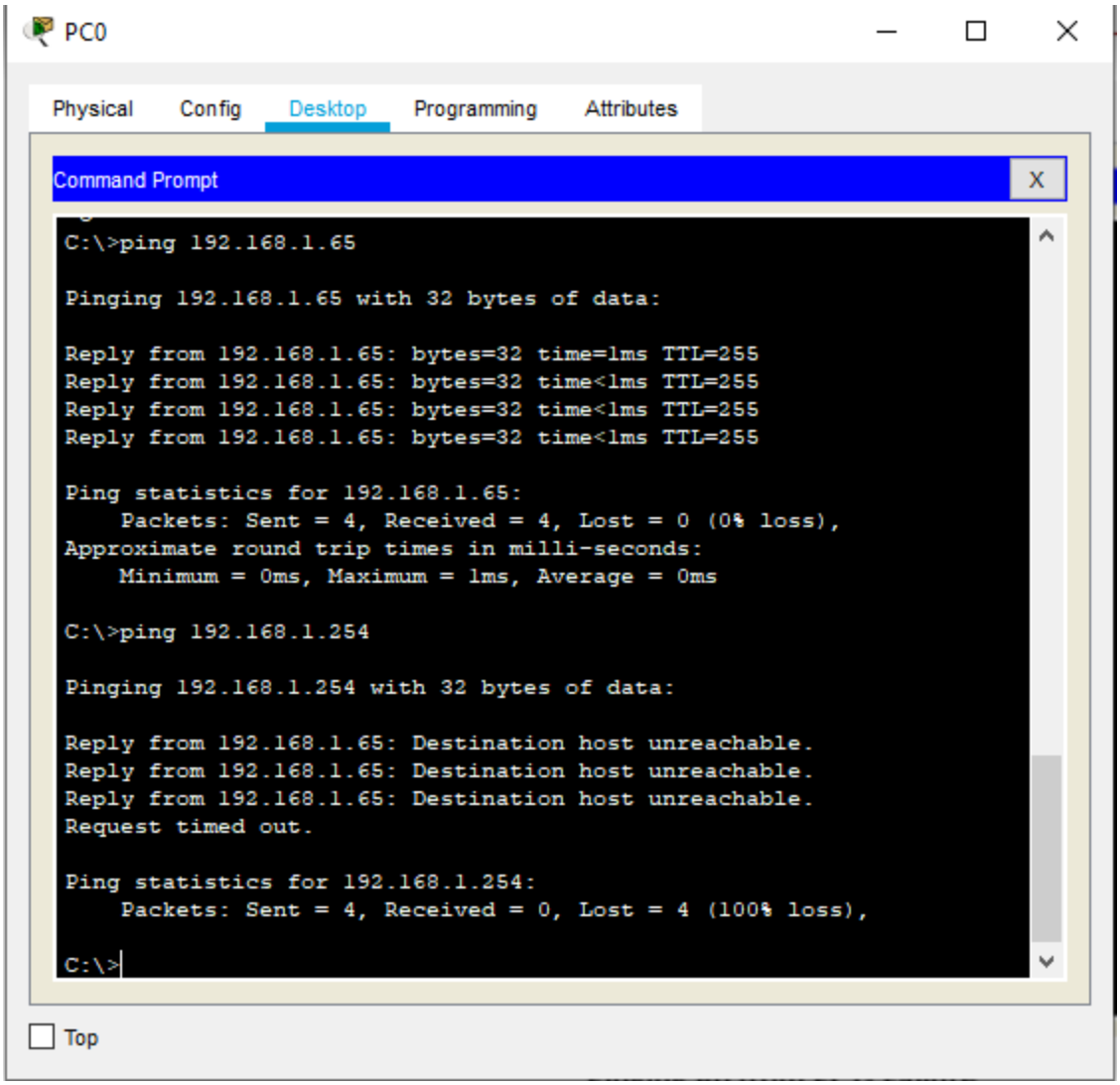
Task 5: Reflection

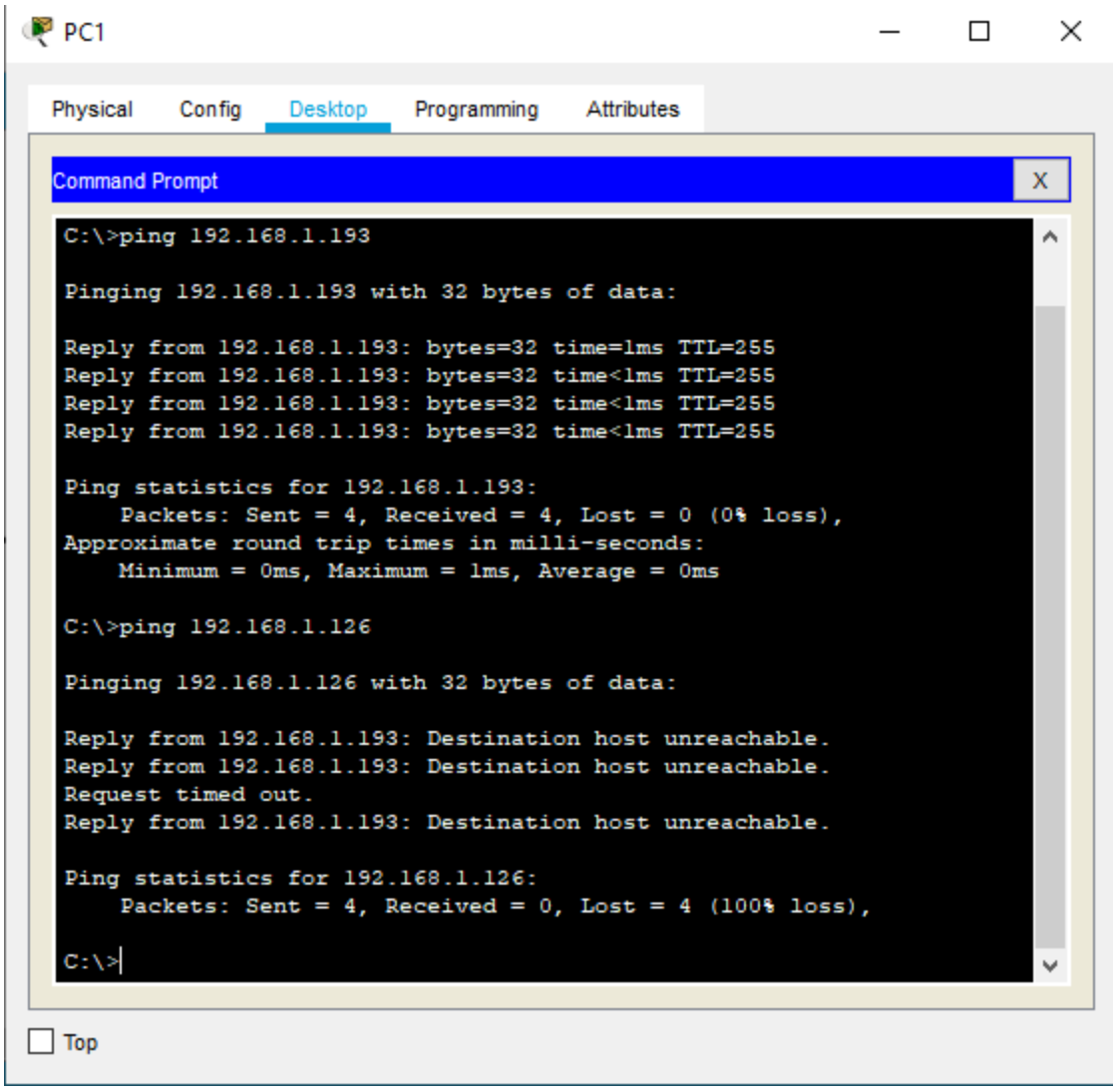
Are there any devices on the network that cannot ping each other?

Yes, devices that are not a part of the same network cannot ping each other. For example, PC1 and PC2 cannot ping each other


PC0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 192.168.1.190
Pinging 192.168.1.190 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 192.168.1.190:
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.
Request timed out.
Ping statistics for 192.168.1.254:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
Top

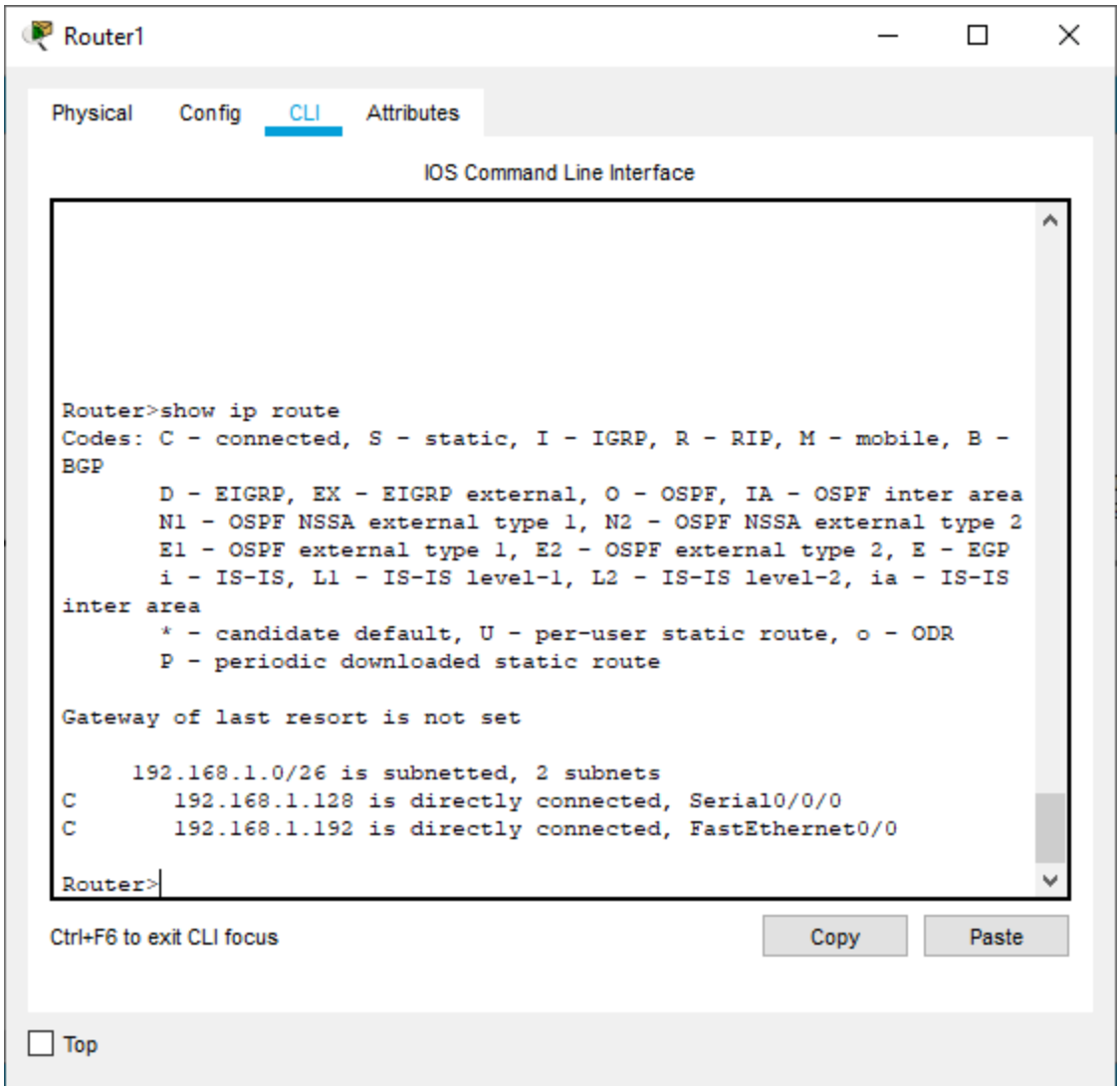

PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Ping request could not find host 192.168.129. Please check the name and try again.
C:\>ping 192.168.1.129
Pinging 192.168.1.129 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 192.168.1.129:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
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.
Request timed out.
Ping statistics for 192.168.1.65:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
Top

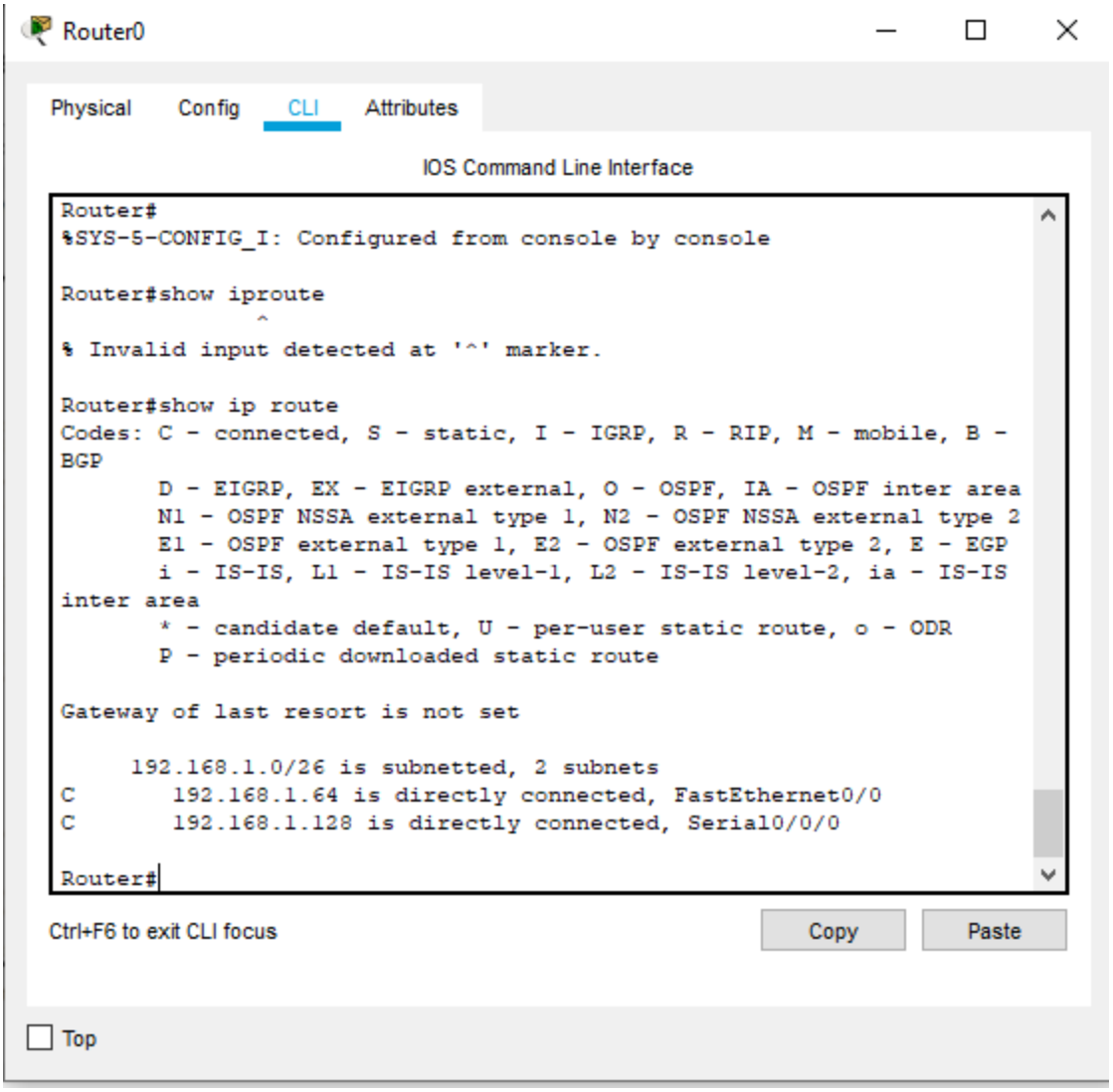

PC0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
C:\>ping 192.168.1.65
Pinging 192.168.1.65 with 32 bytes of data:
Reply from 192.168.1.65: bytes=32 time=1ms TTL=255
Reply from 192.168.1.65: bytes=32 time<1ms TTL=255
Reply from 192.168.1.65: bytes=32 time<1ms TTL=255
Reply from 192.168.1.65: 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 = 1ms, Average = 0ms
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.
Request timed out.
Ping statistics for 192.168.1.254:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
Top



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

Switch is missing in communication between the two PC. Routers in our network only have address of devices which are directly connected to its interfaces in routing table. Hence static or dynamic routing is absent.


Router1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B -
BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route
Gateway of last resort is not set
192.168.1.0/26 is subnetted, 2 subnets
C 192.168.1.128 is directly connected, Serial0/0/0
C 192.168.1.192 is directly connected, FastEthernet0/0
Router>
Ctrl+F6 to exit CLI focus
Copy
Paste
Top



Conclusion: In this experiment I learnt about subnetting a given address space and assigning subnets to various networks accordingly. I also learnt about configuring serial port on router and established a connection between two routers using serial DTE.