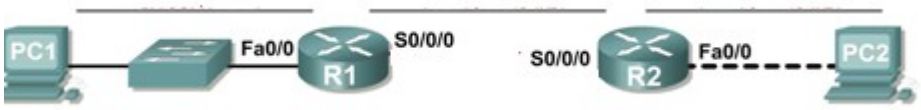
Name : Pritam Rao
UID : 2018130044
TE-Comps / C-Batch
CEL 51, DCCN, Monsoon 2020
Lab 6: Subnet and Router Configuration

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

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: 3 subnets are needed for this network

1. For network connected to router R1

2. For network connected to router R2

3. For link between router R1 and router R2

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

Ans: The given address block is 192.168.1.0/24

Network: 11000000.10101000.00000001.00000000

Subnet mask: 11111111.11111111.11111111.00000000

The number of usable host IPs = 2 n – 2 = 2 8 – 2 = 254

We need 3 subnets and if we borrow 2 bits from host portion, we will get 2 n

subnets (n is no. of bits borrowed), i.e. 2 2 =4 subnets which are enough.

Hence subnet mask will be: 11111111.11111111.11111111.11000000

Dotted Decimal format od subnet mask: 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. Hence, the number of usable hosts is given as 2 H – 2 where H is host bits. Therefore 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: 192.168.1.64

   Network ID: 192.168.1.64/26

   1st usable IP: 192.168.1.65/26

   Last usable IP: 192.168.1.126/26

   Broadcast IP: 192.168.1.127/26
2. Assign subnet 2 to the link between R1 and R2.

   Subnet 2: 192.168.1.128

   Network ID: 192.168.1.128/26

   1st usable IP: 192.168.1.129/26

   Last usable IP: 192.168.1.190/26

   Broadcast IP: 192.168.1.191/26
3. Assign subnet 3 to the network attached to R2.

   Subnet 2: 192.168.1.192

   Network ID: 192.168.1.192/26

   1st usable IP: 192.168.1.193/26

   Last used IP: 192.168.1.254/26

   Broadcast IP: 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.

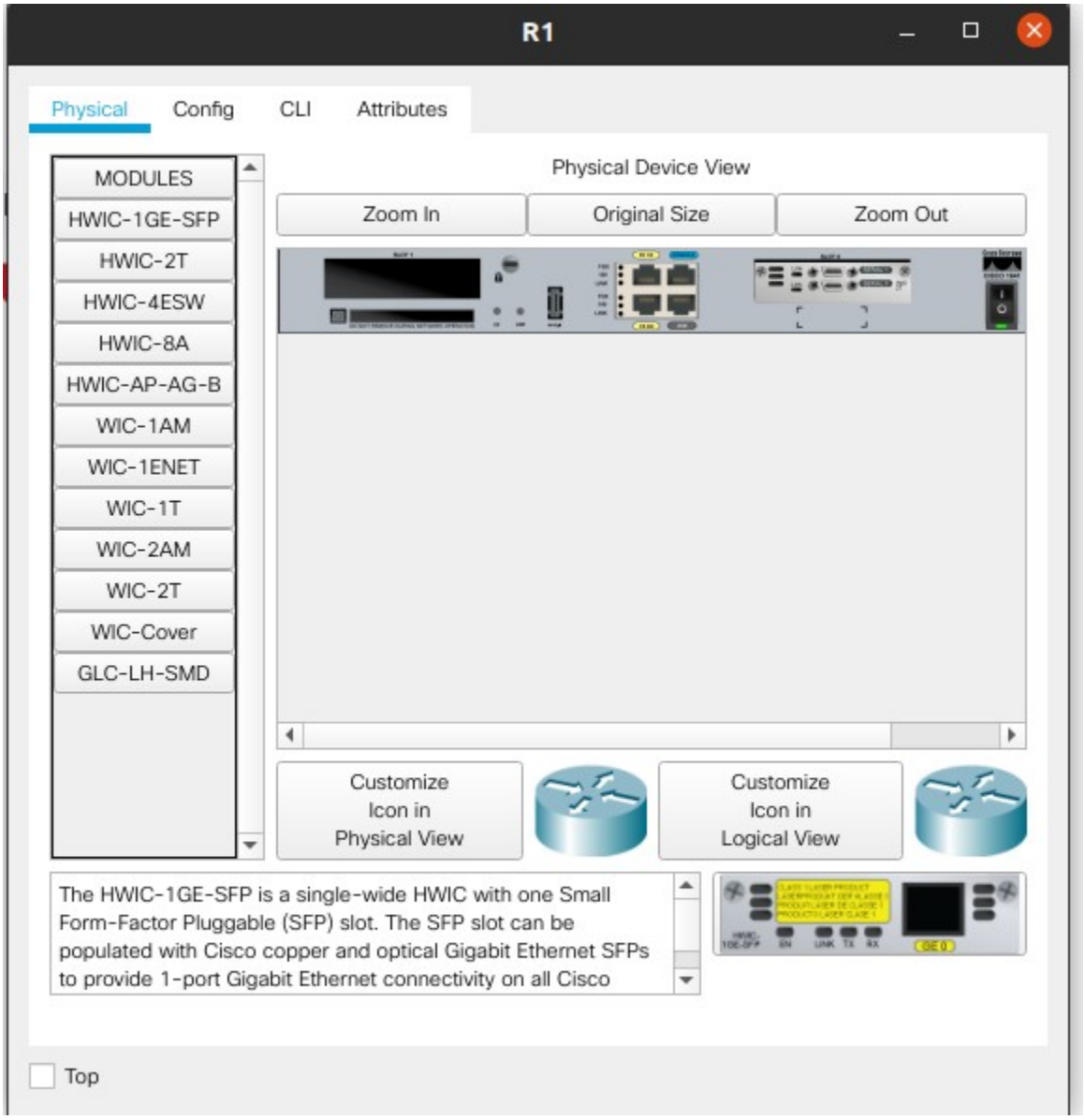
   Ans: 192.168.1.254

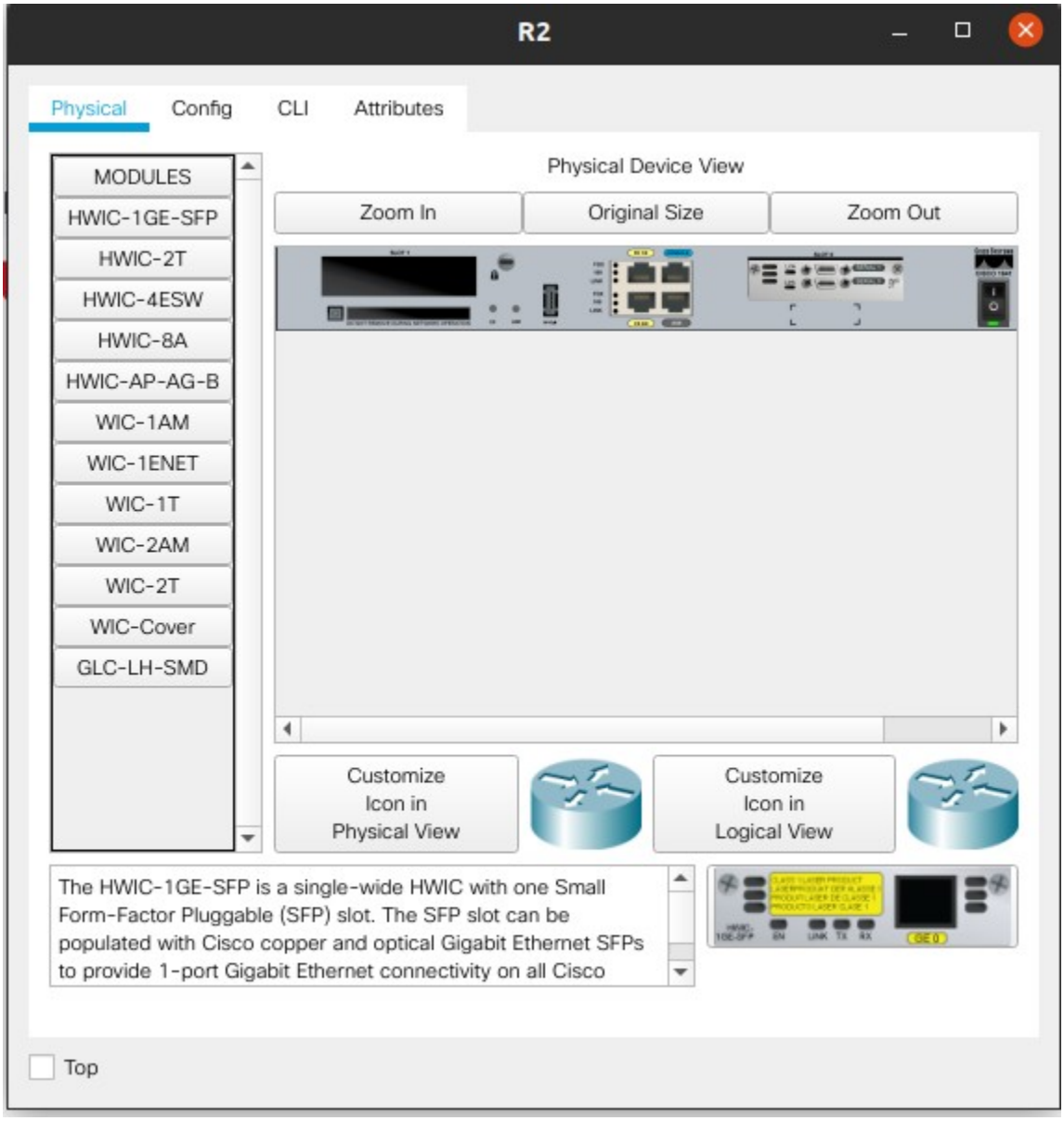
Step 2: Document the addresses to be used in the table provide under the Topology Diagram.

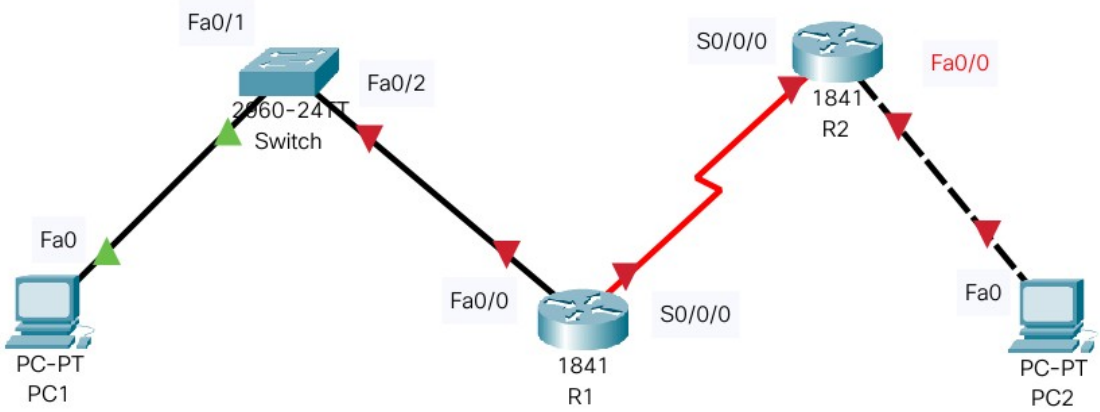
Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	192.168.1.65	255.255.255.192	N/A
	S0/0/0	192.168.1.129	255.255.255.192	N/A
R2	Fa0/0	192.168.1.193	255.255.255.192	N/A
	S0/0/0	192.168.1.190	255.255.255.192	N/A
PC1	NIC	192.168.1.126	255.255.255.192	192.168.1.65
PC2	NIC	192.168.1.254	255.255.255.192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

Task 3: Configure the Serial and FastEthernet Addresses.

Connect PC1 and switch with copper straight through cable at FastEthernet0 and Fast Ethernet 0/1 respectively:

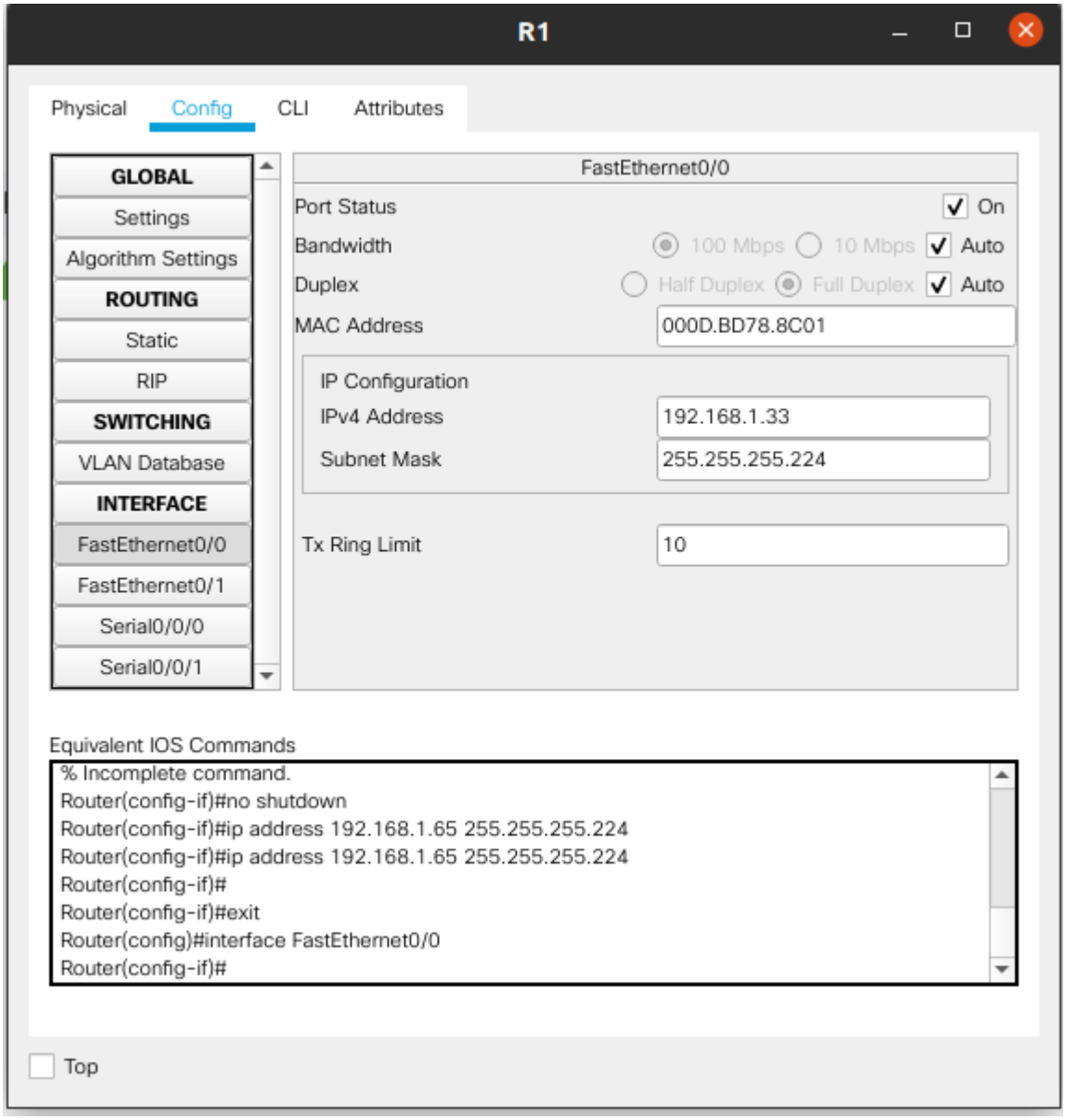

R1
Physical
Config
CLI
Attributes
MODULES
HWIC-1GE-SFP
HWIC-2T
HWIC-4ESW
HWIC-8A
HWIC-AP-AG-B
WIC-1AM
WIC-1ENET
WIC-1T
WIC-2AM
WIC-2T
WIC-Cover
GLC-LH-SMD
Physical Device View
Zoom In
Original Size
Zoom Out
Customize Icon in Physical View
Customize Icon in Logical View
The HWIC-1GE-SFP is a single-wide HWIC with one Small Form-Factor Pluggable (SFP) slot. The SFP slot can be populated with Cisco copper and optical Gigabit Ethernet SFPs to provide 1-port Gigabit Ethernet connectivity on all Cisco
Top

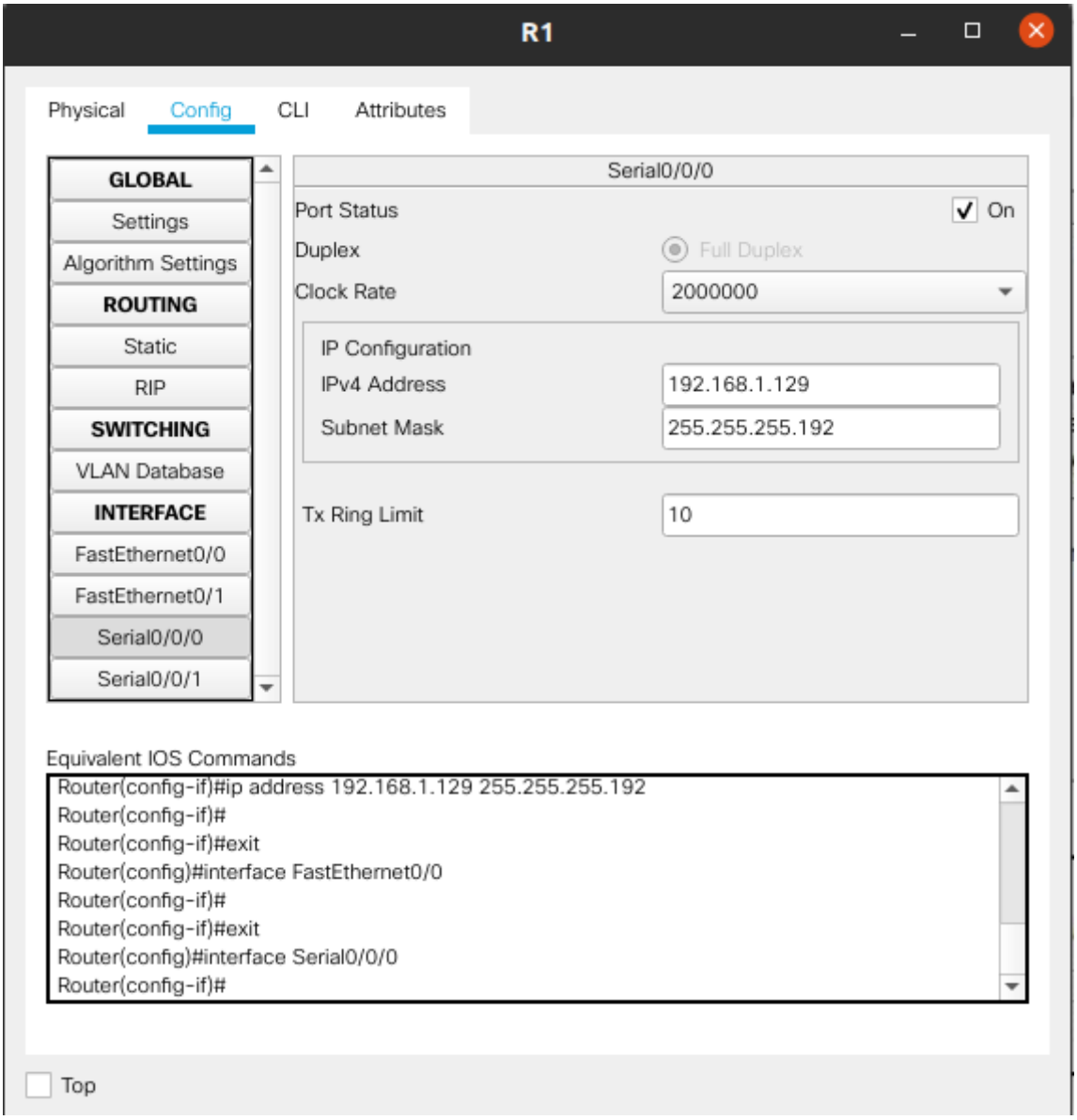

R2
Physical
Config
CLI
Attributes
MODULES
HWIC-1GE-SFP
HWIC-2T
HWIC-4ESW
HWIC-8A
HWIC-AP-AG-B
WIC-1AM
WIC-1ENET
WIC-1T
WIC-2AM
WIC-2T
WIC-Cover
GLC-LH-SMD
Physical Device View
Zoom In
Original Size
Zoom Out
Customize Icon in Physical View
Customize Icon in Logical View
The HWIC-1GE-SFP is a single-wide HWIC with one Small Form-Factor Pluggable (SFP) slot. The SFP slot can be populated with Cisco copper and optical Gigabit Ethernet SFPs to provide 1-port Gigabit Ethernet connectivity on all Cisco
Top

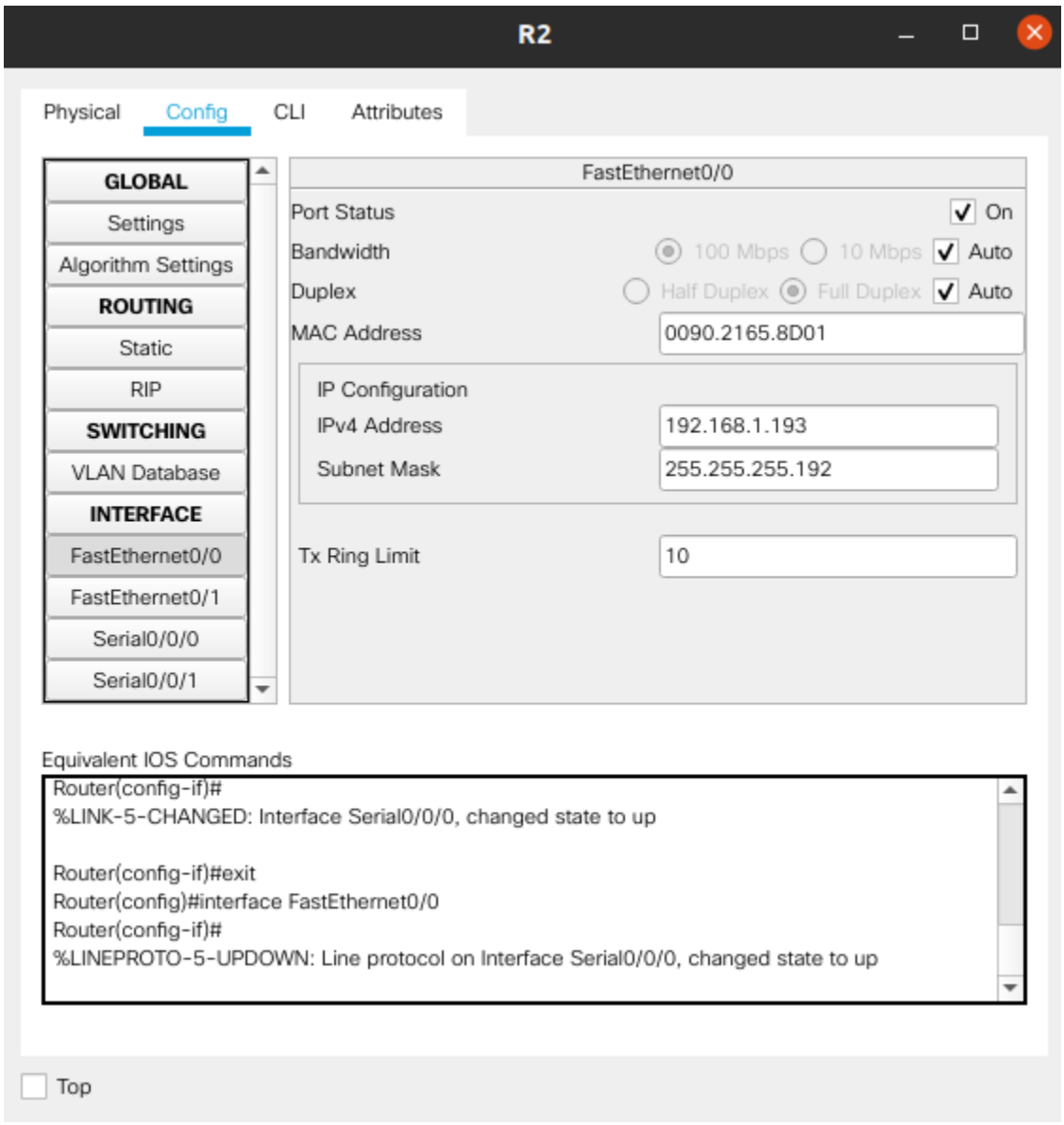

Fa0/1
Fa0/2
2960-24TT
Switch
S0/0/0
Fa0/0
1841
R2
Fa0
Fa0/0
S0/0/0
Fa0
PC-PT
PC1
1841
R1
PC-PT
PC2

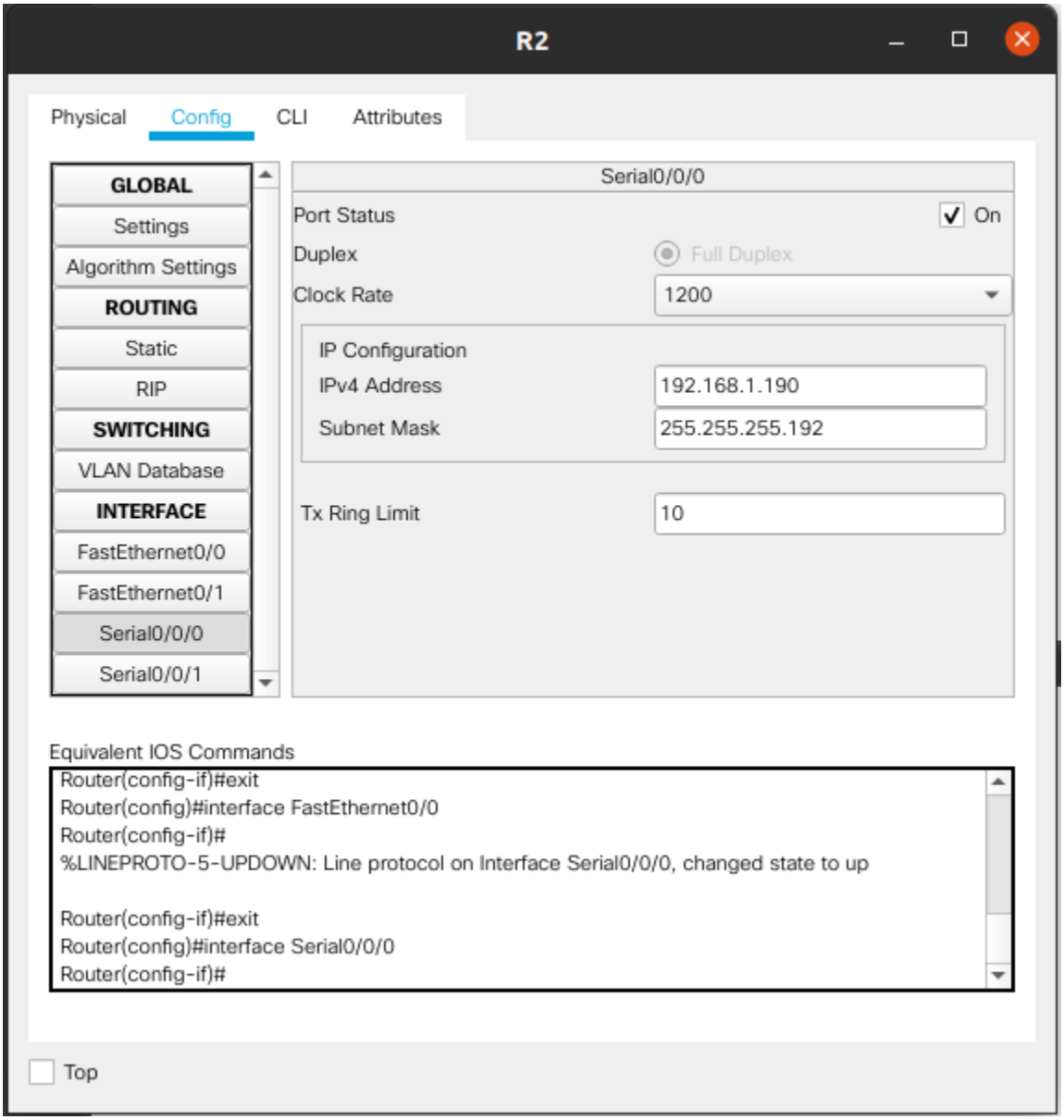
Step 1: Configure the router interfaces.

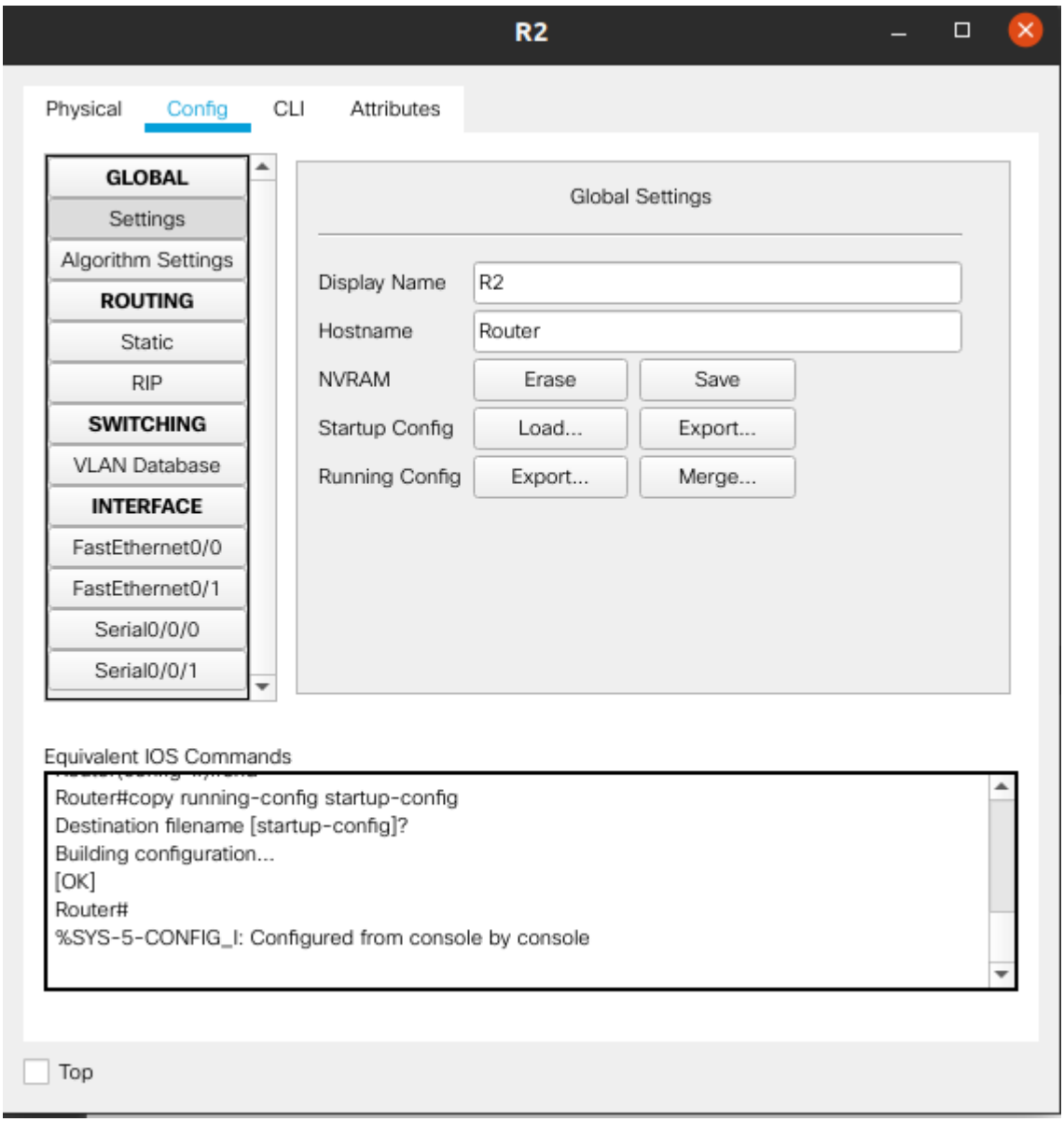
Configure the interfaces on the R1 and R2 routers with the IP addresses from your network design. Please note, to complete the activity in Packet Tracer you will be using the Config Tab. When you have finished, be sure to save the running configuration to the NVRAM of the router.

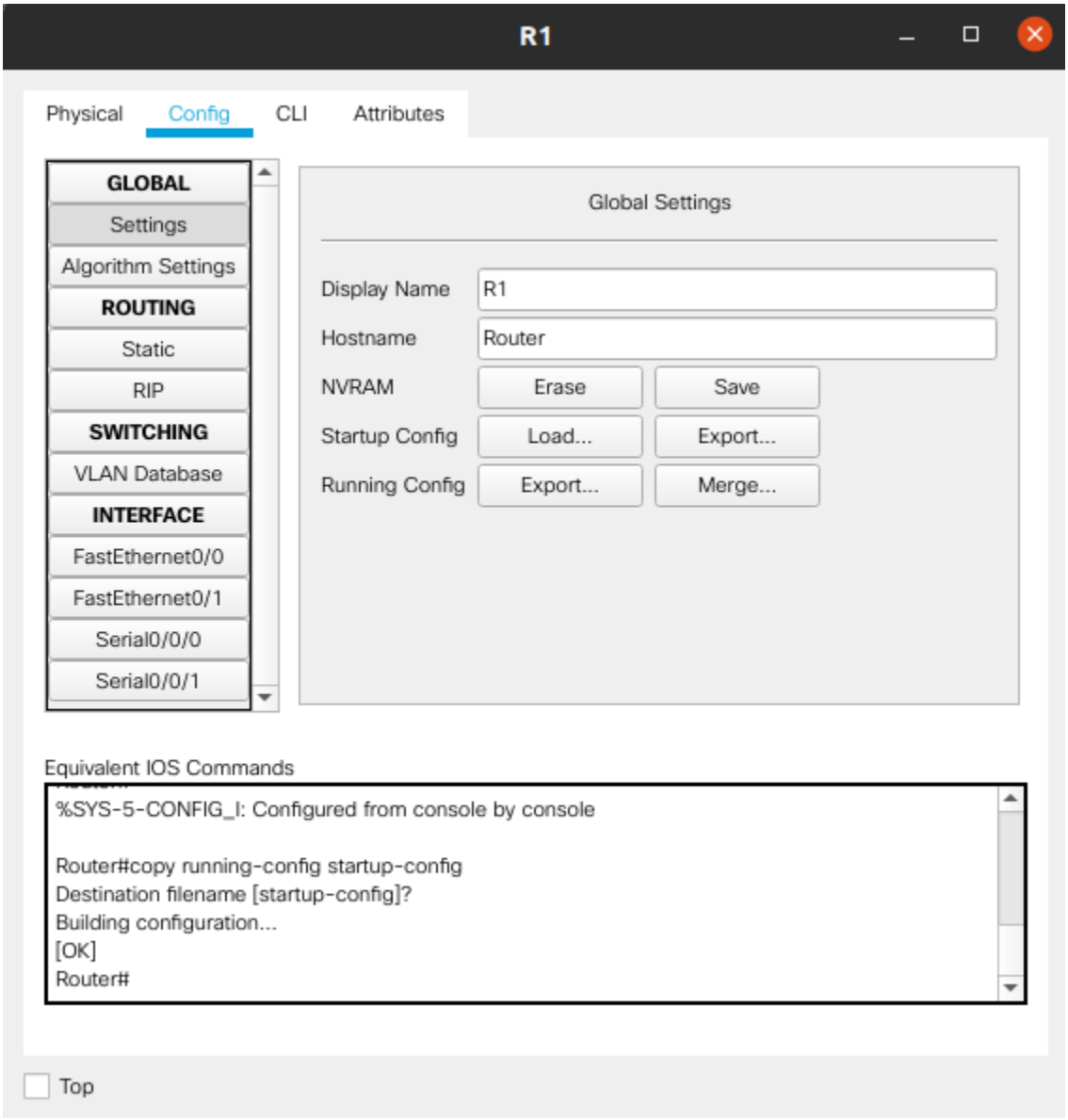


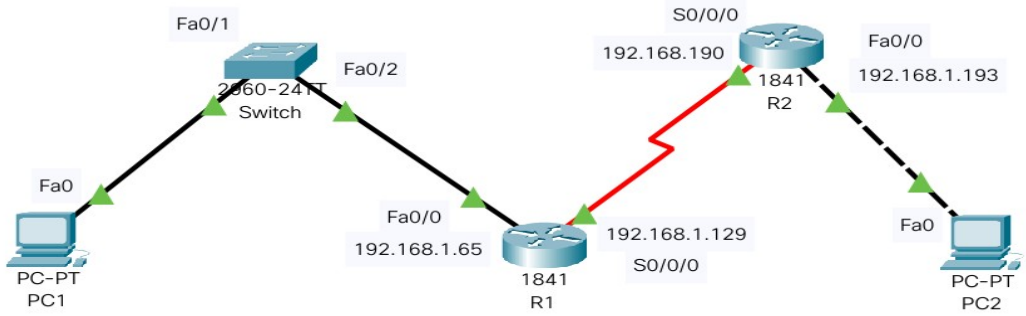

R1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
Serial0/0/0
Port Status
On
Duplex
Full Duplex
Clock Rate
2000000
IP Configuration
IPv4 Address
192.168.1.129
Subnet Mask
255.255.255.192
Tx Ring Limit
10
Equivalent IOS Commands
Router(config-if)#ip address 192.168.1.129 255.255.255.192
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)#
Top


R2
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
0090.2165.8D01
IP Configuration
IPv4 Address
192.168.1.193
Subnet Mask
255.255.255.192
Tx Ring Limit
10
Equivalent IOS Commands
Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
Top


R2
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
IPv4 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)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
Router(config-if)#exit
Router(config)#interface Serial0/0/0
Router(config-if)#
Top

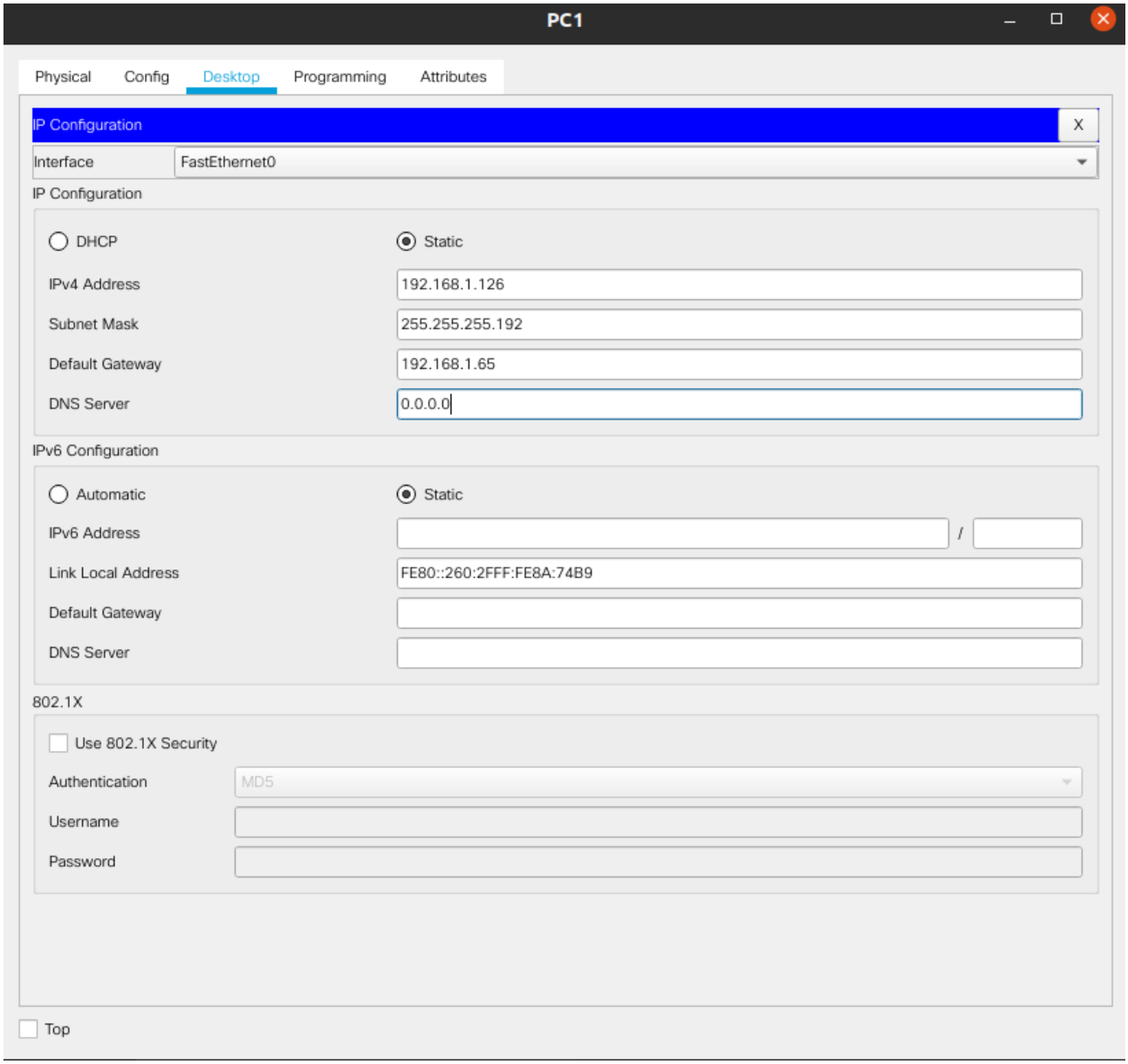

R2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
Global Settings
Display Name
R2
Hostname
Router
NVRAM
Erase
Save
Startup Config
Load...
Export...
Running Config
Export...
Merge...
Equivalent IOS Commands
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
%SYS-5-CONFIG_I: Configured from console by console
Top

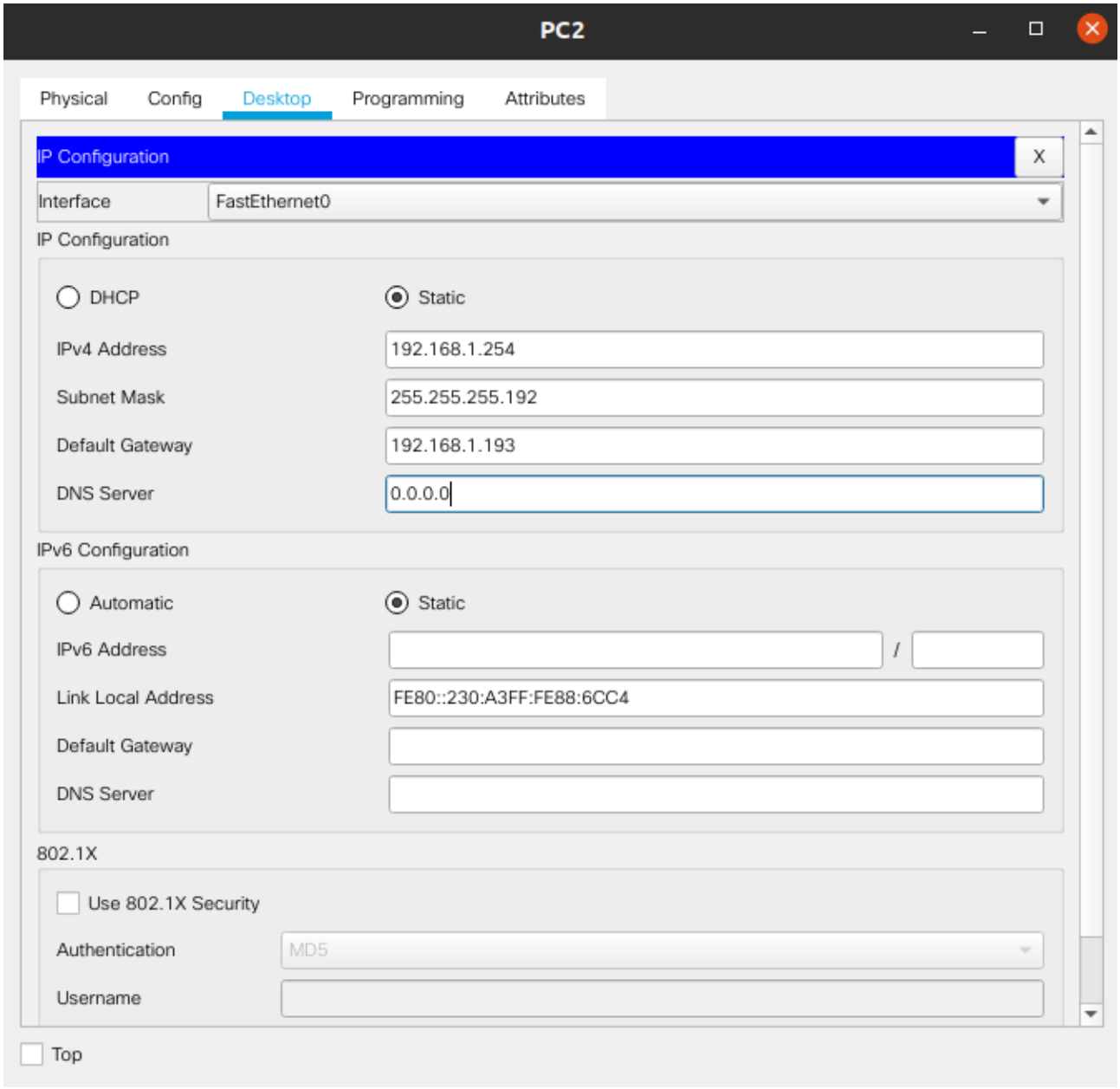

R1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
Global Settings
Display Name
R1
Hostname
Router
NVRAM
Erase
Save
Startup Config
Load...
Export...
Running Config
Export...
Merge...
Equivalent IOS Commands
%SYS-5-CONFIG_I: Configured from console by console
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
Top

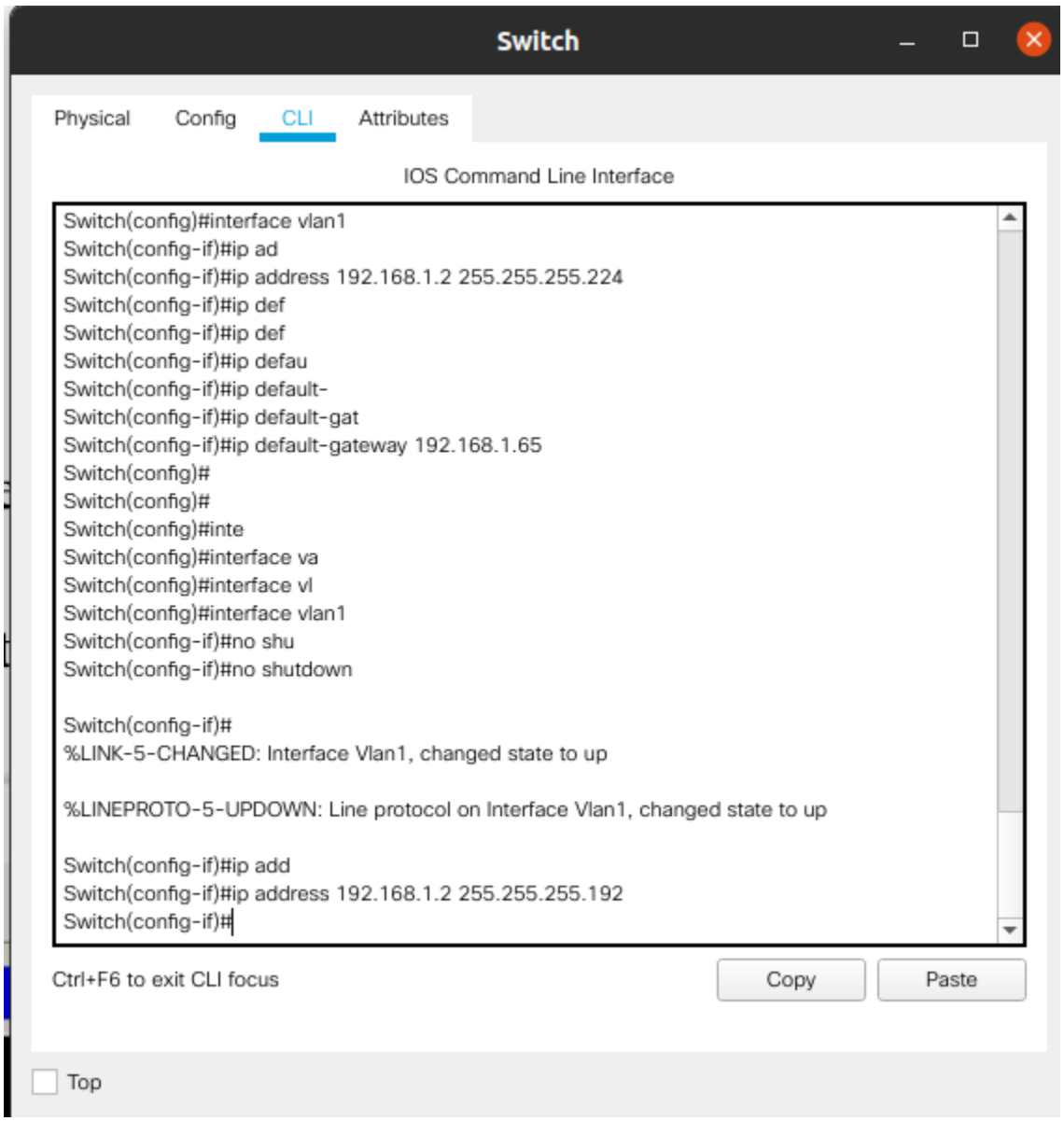

Fa0/1
Fa0/2
2960-24TT
Switch
Fa0
PC-PT
PC1
Fa0/0
192.168.1.65
1841
R1
192.168.1.129
S0/0/0
S0/0/0
192.168.190
1841
R2
Fa0/0
192.168.1.193
Fa0
PC-PT
PC2

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.



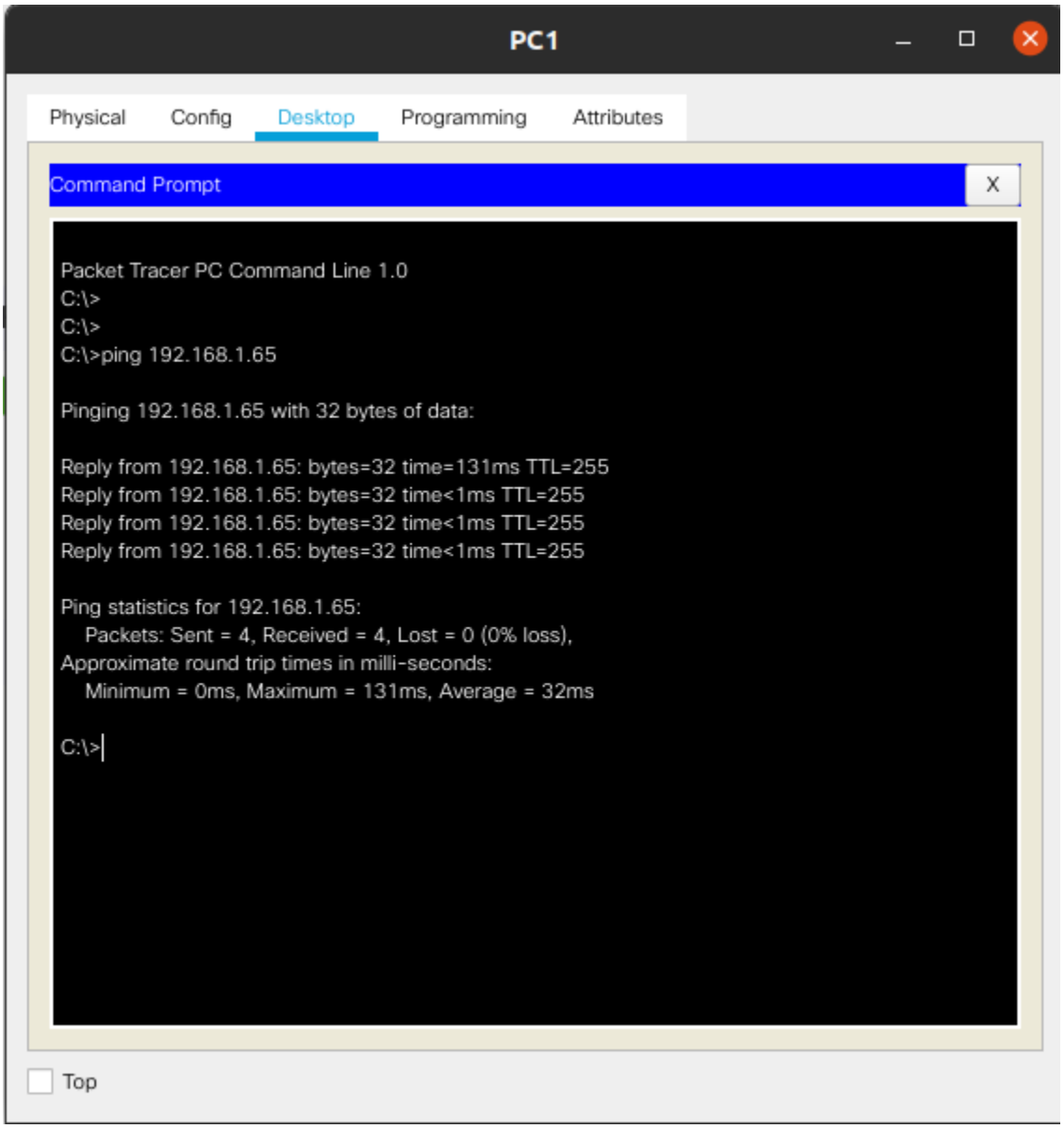

PC2
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.254
Subnet Mask
255.255.255.192
Default Gateway
192.168.1.193
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::230:A3FF:FE88:6CC4
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Top



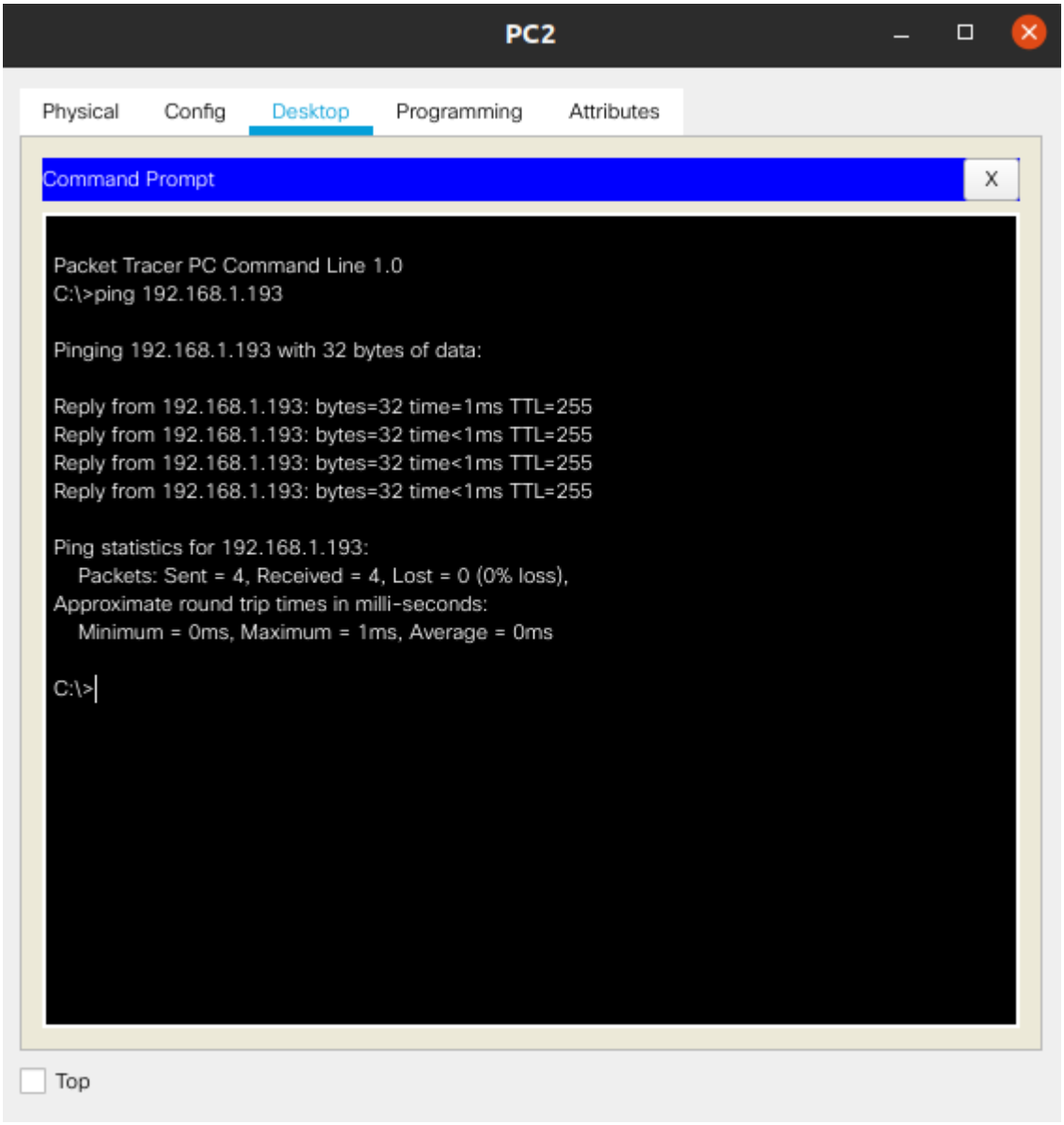
Task 4: Verify the Configurations.

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

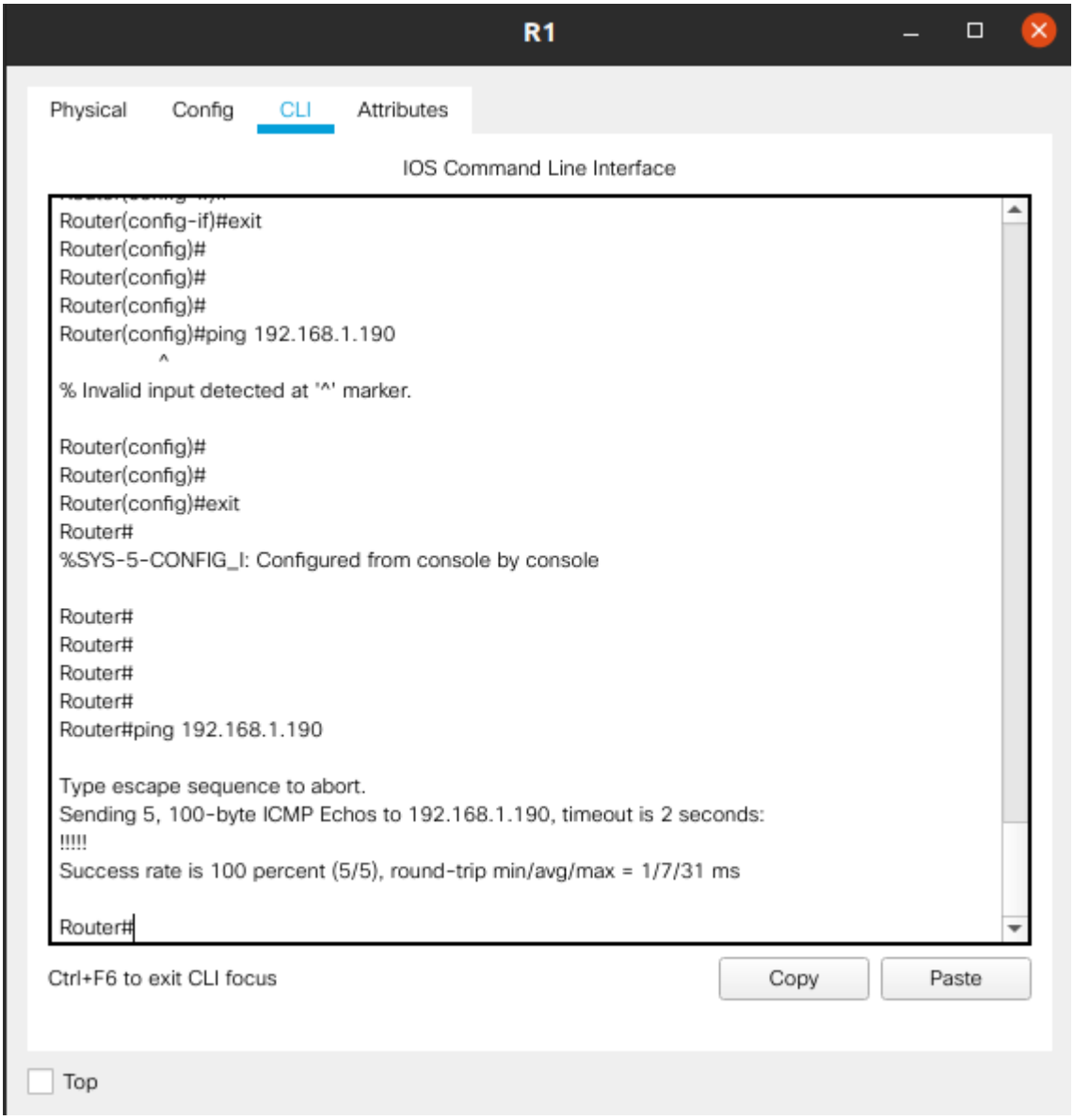
From the host attached to R1, is it possible to ping the default gateway? Yes


PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Packet Tracer PC Command Line 1.0
C:\>
C:\>
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=131ms 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 = 131ms, Average = 32ms
C:\>
Top

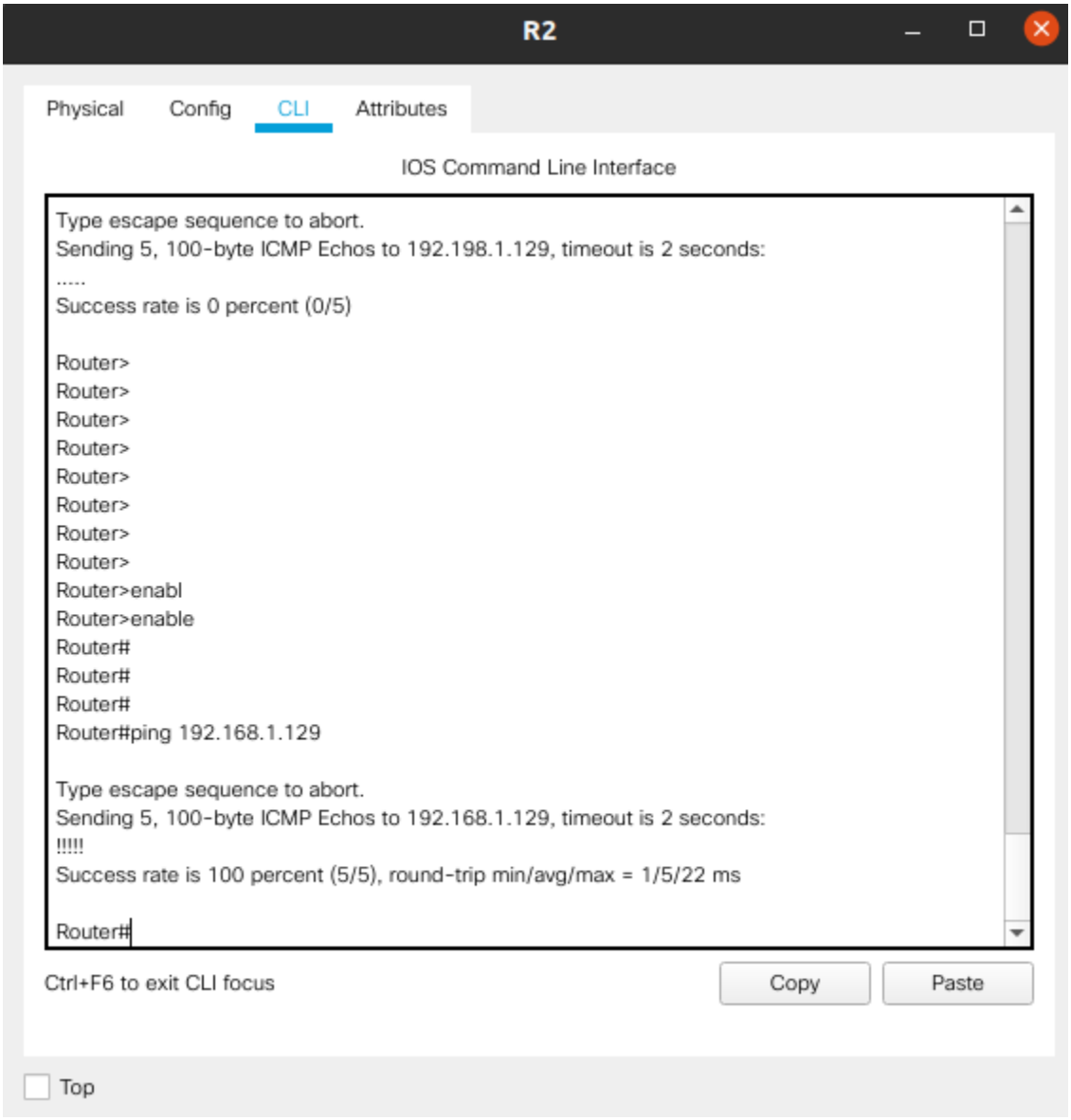
From the host attached to R2, is it possible to ping the default gateway? Yes



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

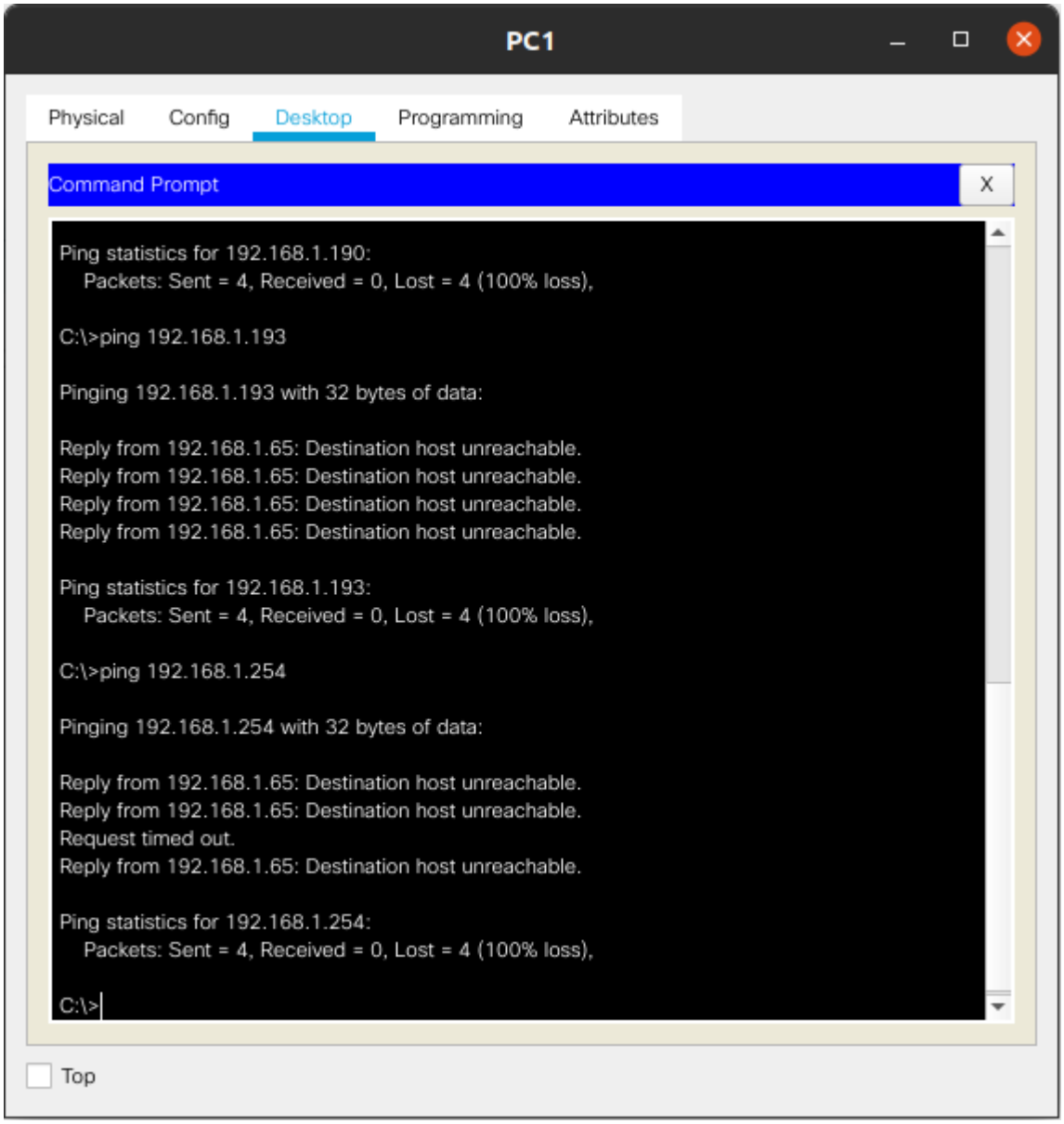


The answer to the above questions should be **yes**. If any of the above pings failed, check your physical connections and configurations.

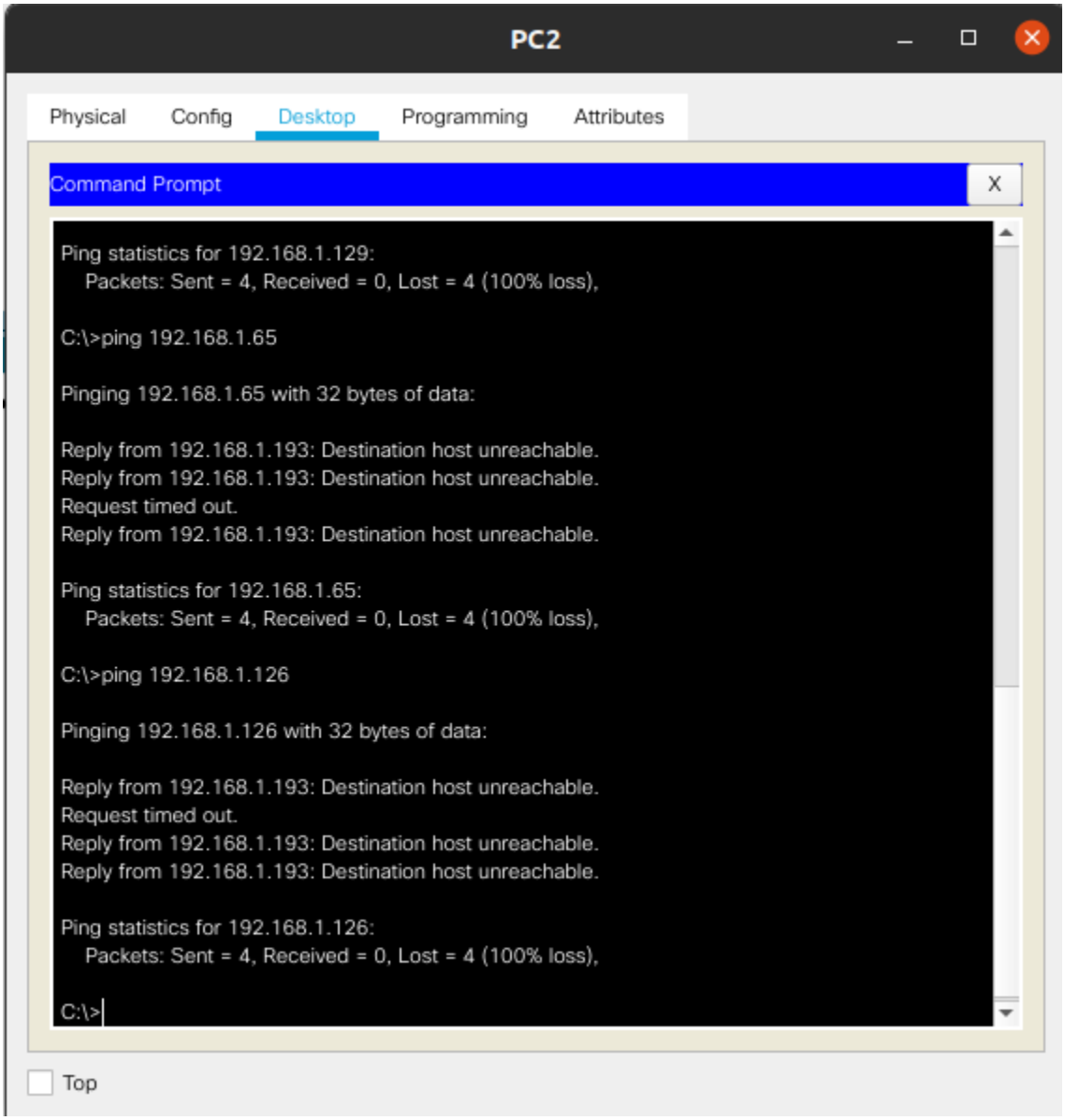
Task 5: Reflection

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

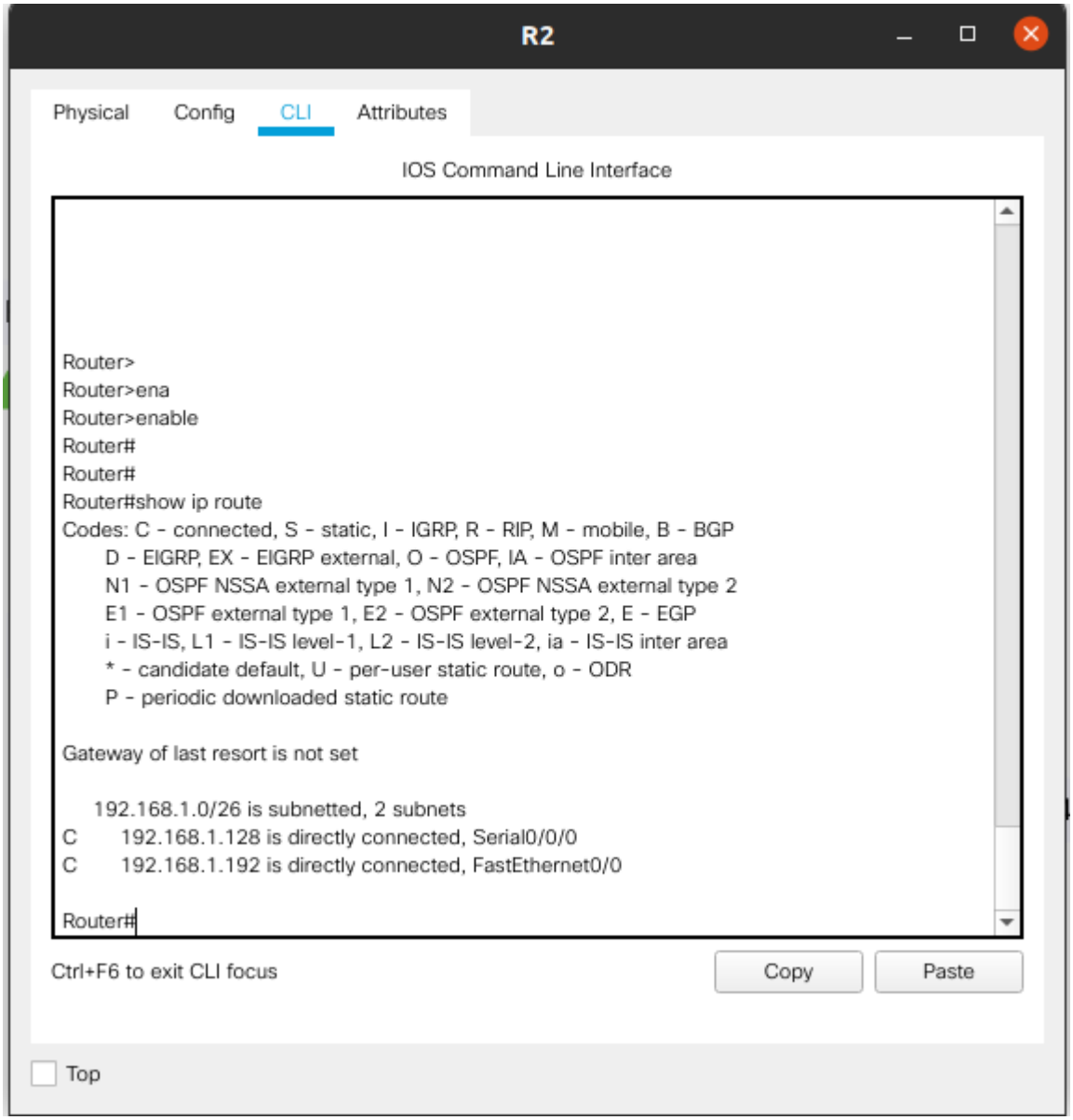
From PC1 we cannot ping FastEthernet port of Router2 and PC2



Similaryly From PC2 we cannot ping FastEthernet port of PC1 and Router1



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



From the above routing table, 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.