Data Communication and Networks Lab
Experiment 6

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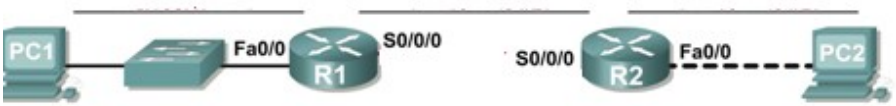
CEL 51, DCCN, Monsoon 2020
Lab 6: Subnet and Router Configuration

Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	192.168.1.1	255.255.255.224	N/A
	S0/0/0	192.168.1.33	255.255.255.224	N/A
R2	Fa0/0	192.168.1.65	255.255.255.224	N/A
	S0/0/0	192.168.1.62	255.255.255.224	N/A
PC1	NIC	192.168.1.30	255.255.255.224	192.168.1.1
PC2	NIC	192.168.1.94	255.255.255.224	192.168.1.65

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?

3 subnets -

1. One subnet to connect R1 to 15 hosts.
2. One subnet to connect R1 to R2.
3. And one subnet to connect R2 to 30 hosts.

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

Since we are assigned network given by 192.168.1.0/24. Hence we have the 2^8 devices that we can connect to this network.

The largest subnet required needs to be able to connect 30 hosts. Considering 'n' as the number of bits required to represent the subnet and 'h' as the number of hosts to be connected we get $2^n - 2 = h$ as we don't assign the first and the last addresses. As the first address is used as a representation the network and the last will be used for broadcast.

N	2^n
1	2
2	4
3	8
4	16
5	32

$h = 2^5 - 2 = 32 - 2 = 30$

Therefore we need the rightmost 5 binary bits.

Therefore binary representation : 11111111.11111111.11111111.11100000

Therefore dotted decimal format : 255.255.255.224

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

Since the binary dotted representation is 11111111.11111111.11111111.11100000

Since the number of ones is 27 therefore the subnet mask is /27.

How many usable hosts are there per subnet?

The number of hots is given by $h = 2^n - 2$, n = 5 therefore

m = 32 - 2

m = 30

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

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

   192.168.1.0/27

   Network Address – 192.168.1.0

   Broadcast Address – 192.168.1.31
2. Assign subnet 2 to the link between R1 and R2.

   192.168.1.32/27

   Network Address – 192.168.1.32

   Broadcast Address – 192.168.1.63
3. Assign subnet 3 to the network attached to R2.

   192.168.1.64/27

   Network Address – 192.168.1.64

   Broadcast Address – 192.168.1.95

Task 2: Determine Interface Addresses.

Step 1: Assign appropriate addresses to the device interfaces.

Note : For the first and last valid address we will not consider the first and last address in the sub-network eg. 192.168.1.0 in subnet 1

1. Assign the first valid host address in subnet 1 to the LAN interface on R1.

   192.168.1.1
2. Assign the last valid host address in subnet 1 to PC1.

   192.168.1.30
3. Assign the first valid host address in subnet 2 to the WAN interface on R1.

   192.168.1.33
4. Assign the last valid host address in subnet 2 to the WAN interface on R2.

   192.168.1.62

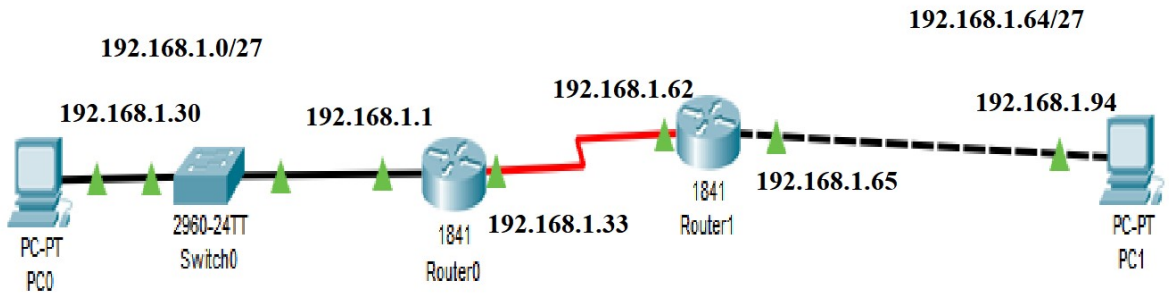
5. Assign the first valid host address in subnet 3 to the LAN interface of R2.
   192.168.1.65
6. Assign the last valid host address in subnet 3 to PC2.
   192.168.1.94

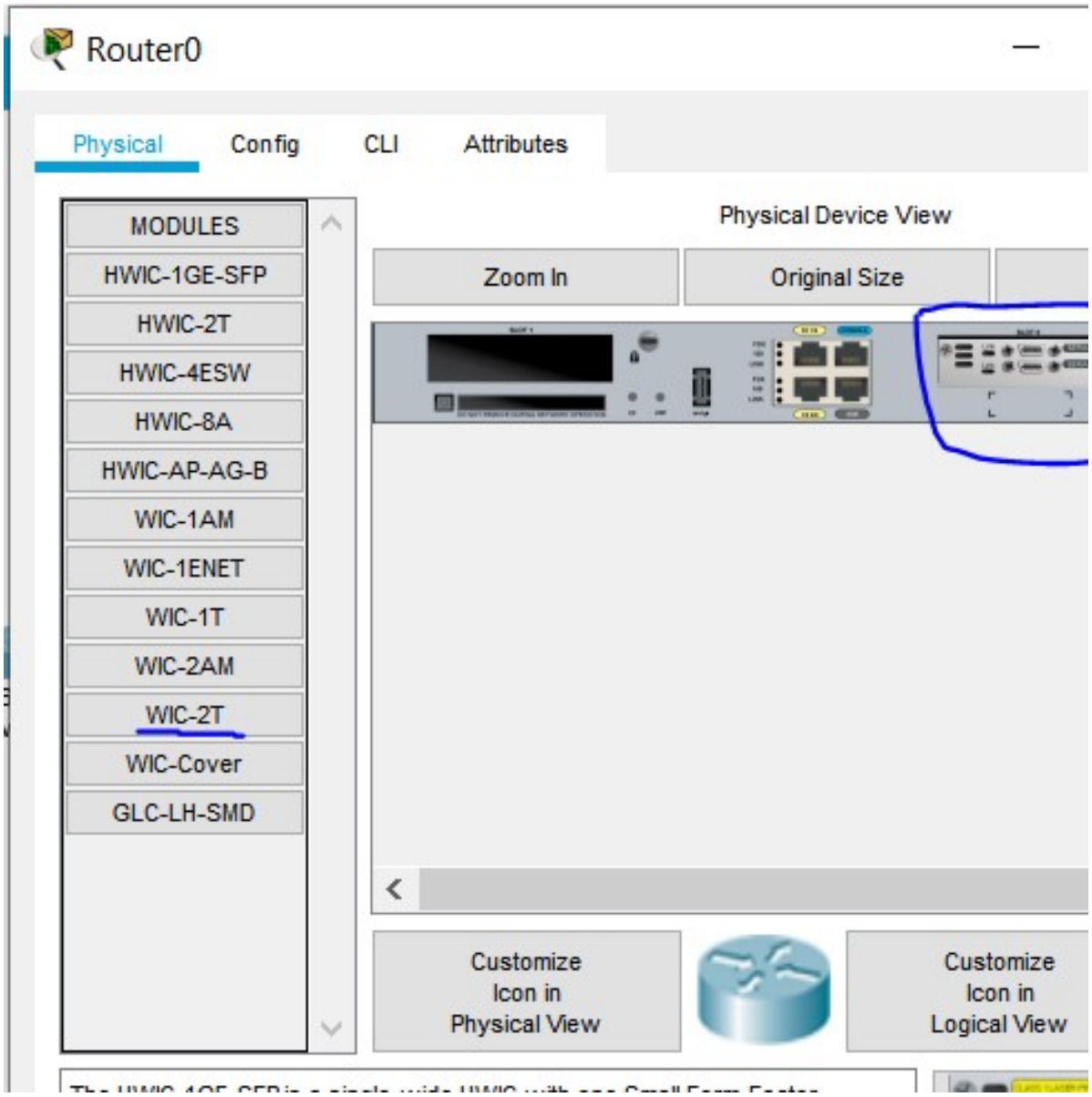
Step 2: Document the addresses to be used in the table provide under the Topology Diagram

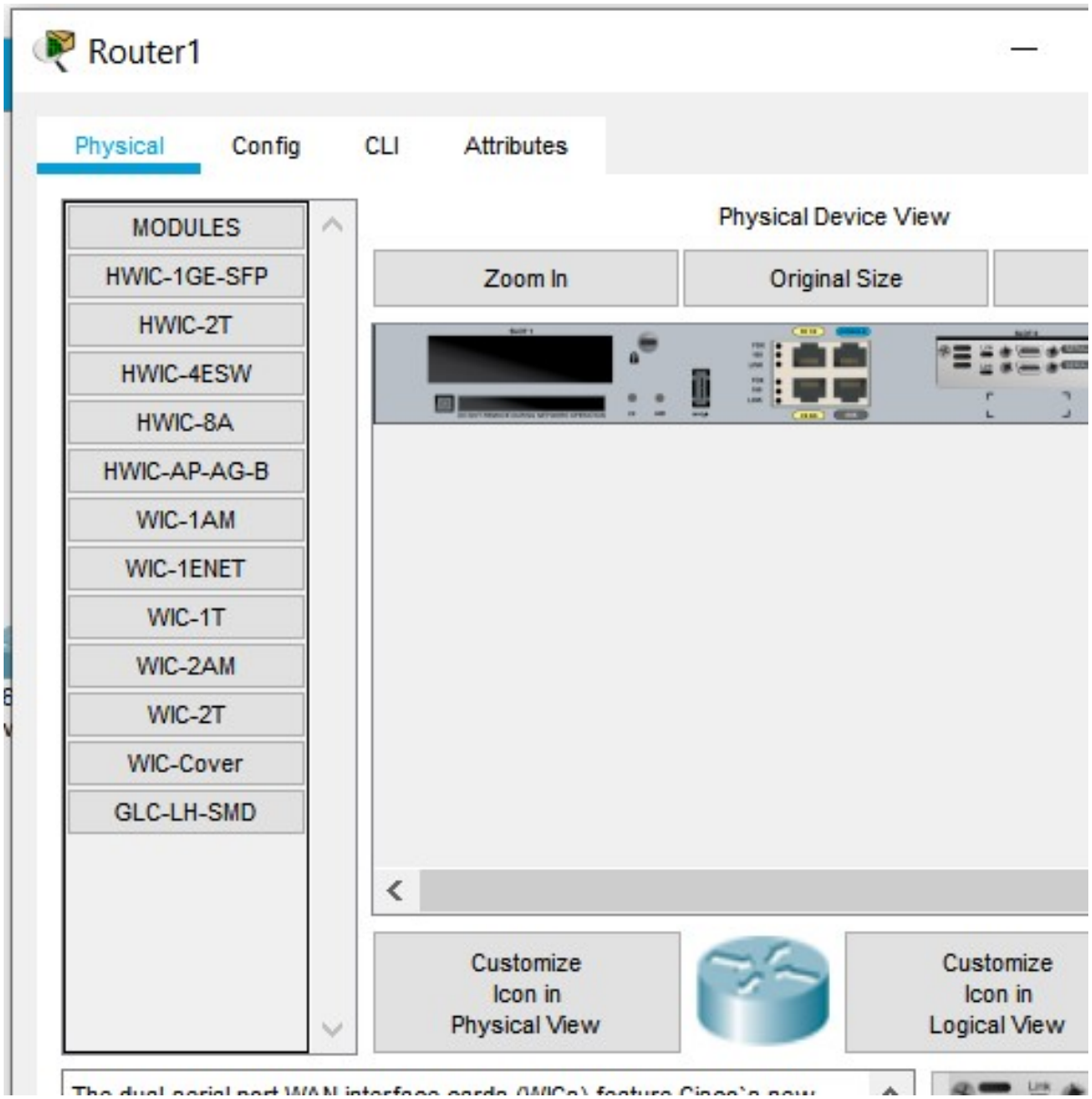
Check the table above.

Task 3: Configure the Serial and FastEthernet Addresses.

We first set up the connections :




Router0
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
Customize
Icon in
Physical View
Customize
Icon in
Logical View



WIC-2T :

The dual-serial port WAN interface cards (WICs) for the Cisco 2600 and 1700 series 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 the two ports on the WIC. Each port on a WIC is a different physical interface and can support different protocols such as Point-to-Point protocol (PPP) or Frame Relay and Data Terminal Equipment/Data Communications Equipment (DTE/DCE).

Why do we use DCE?

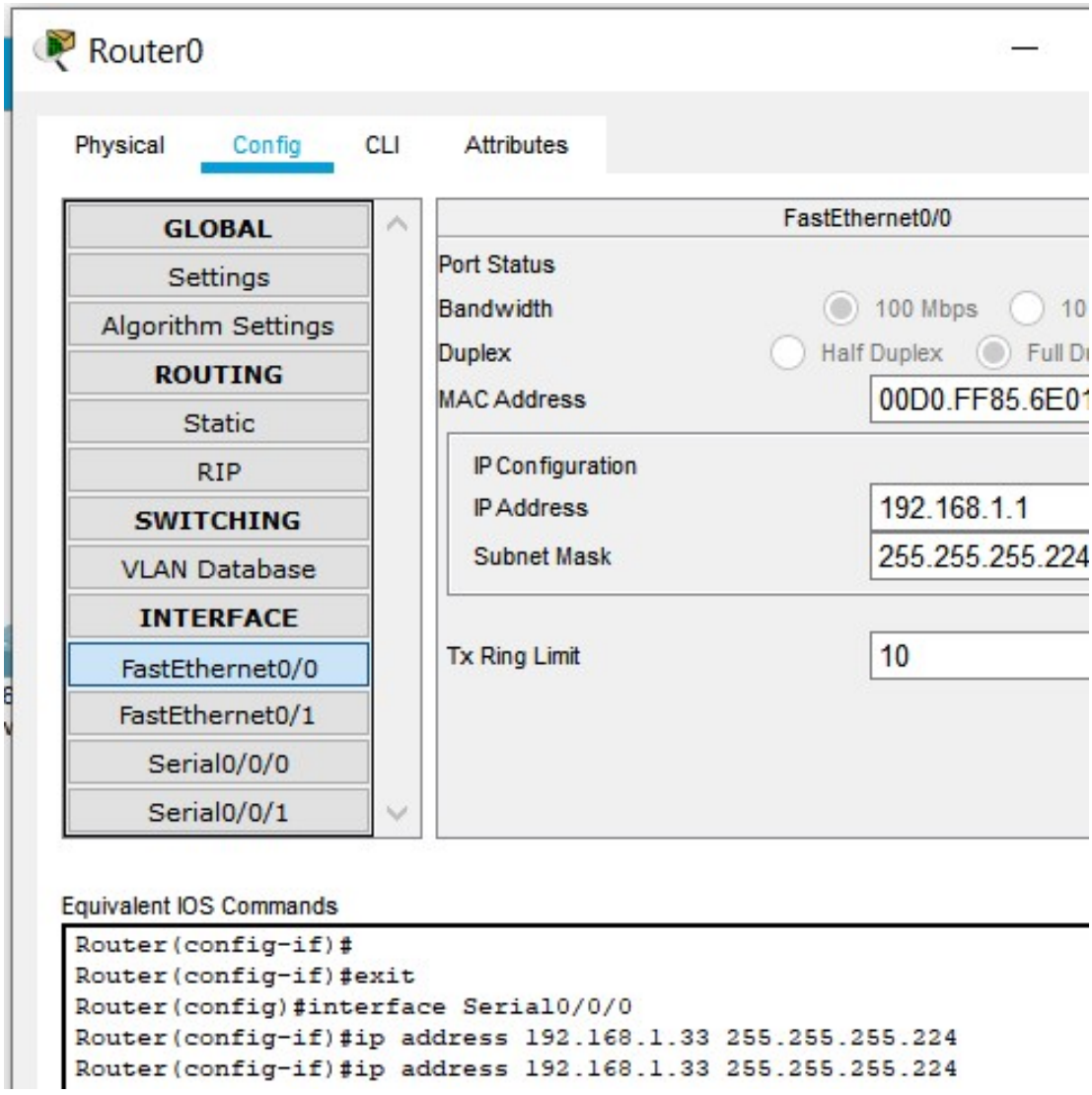
Data Communications Equipment, or DCE, is any device that supports data transmission over a serial telecommunications link. Typically, data communications equipment (DCE) refers to modems, Channel Service Unit/Data Service Units (CSU/DSUs), multiplexers, and similar devices. The purpose of a DCE is to provide termination for the telecommunications link and an interface for connecting data terminal equipment (DTE) to the link. And since we are connecting two routers we will use a DCE connector.

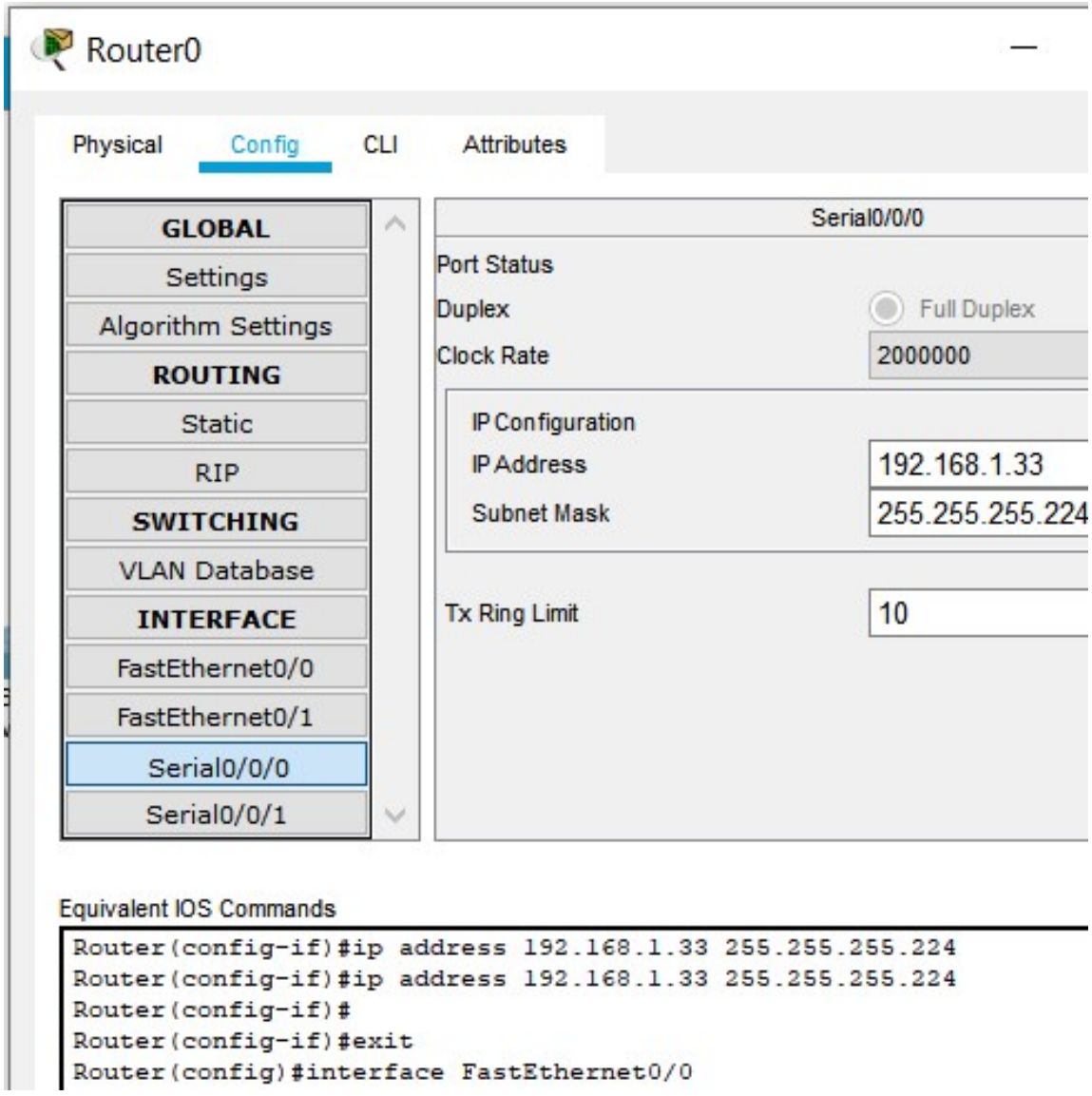
Step 1: Configure the router interfaces.

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.

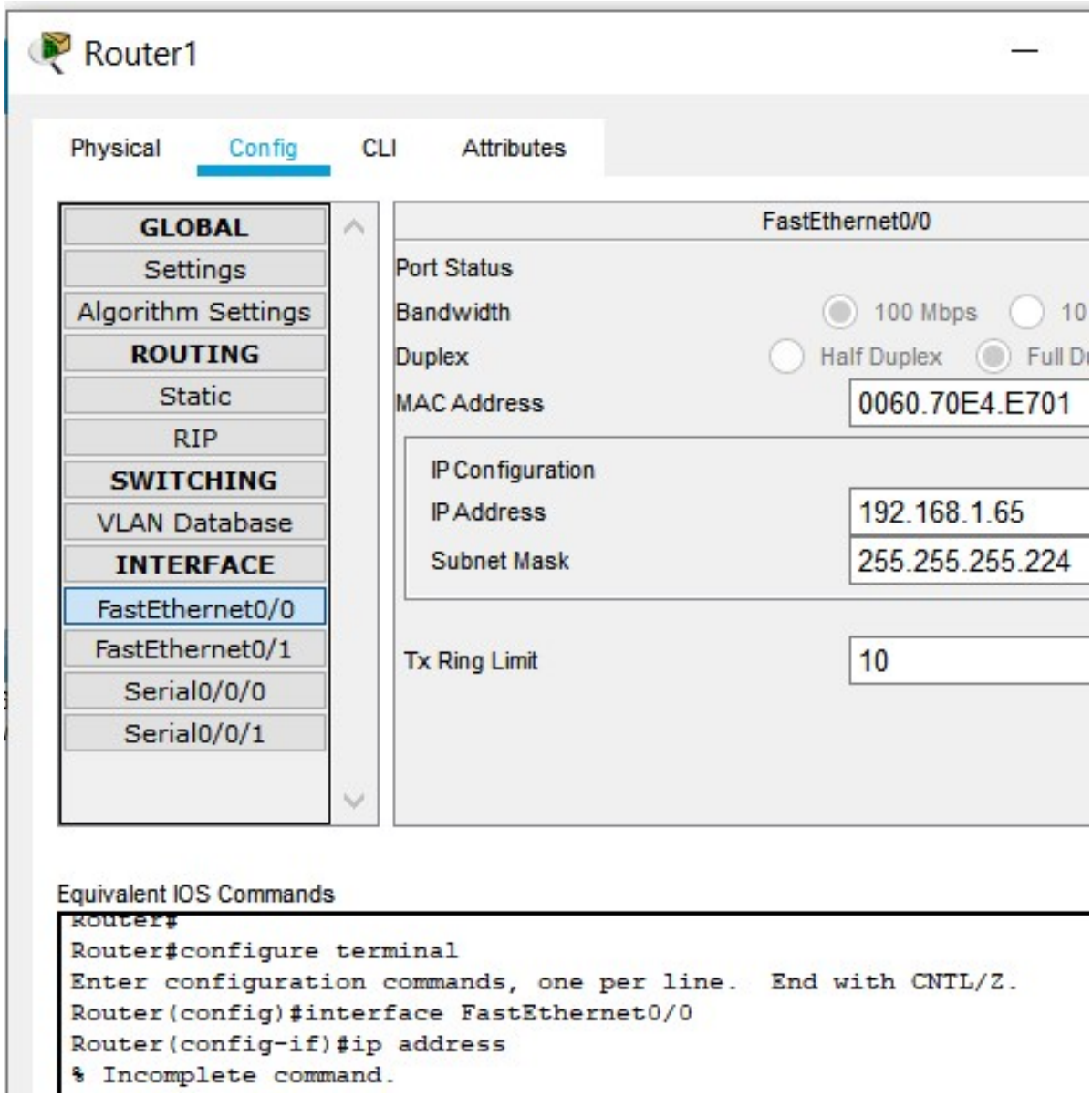
```
Router#copy running-config startup-config
Destination filename [startup-config]? star
Building configuration...
[OK]
```

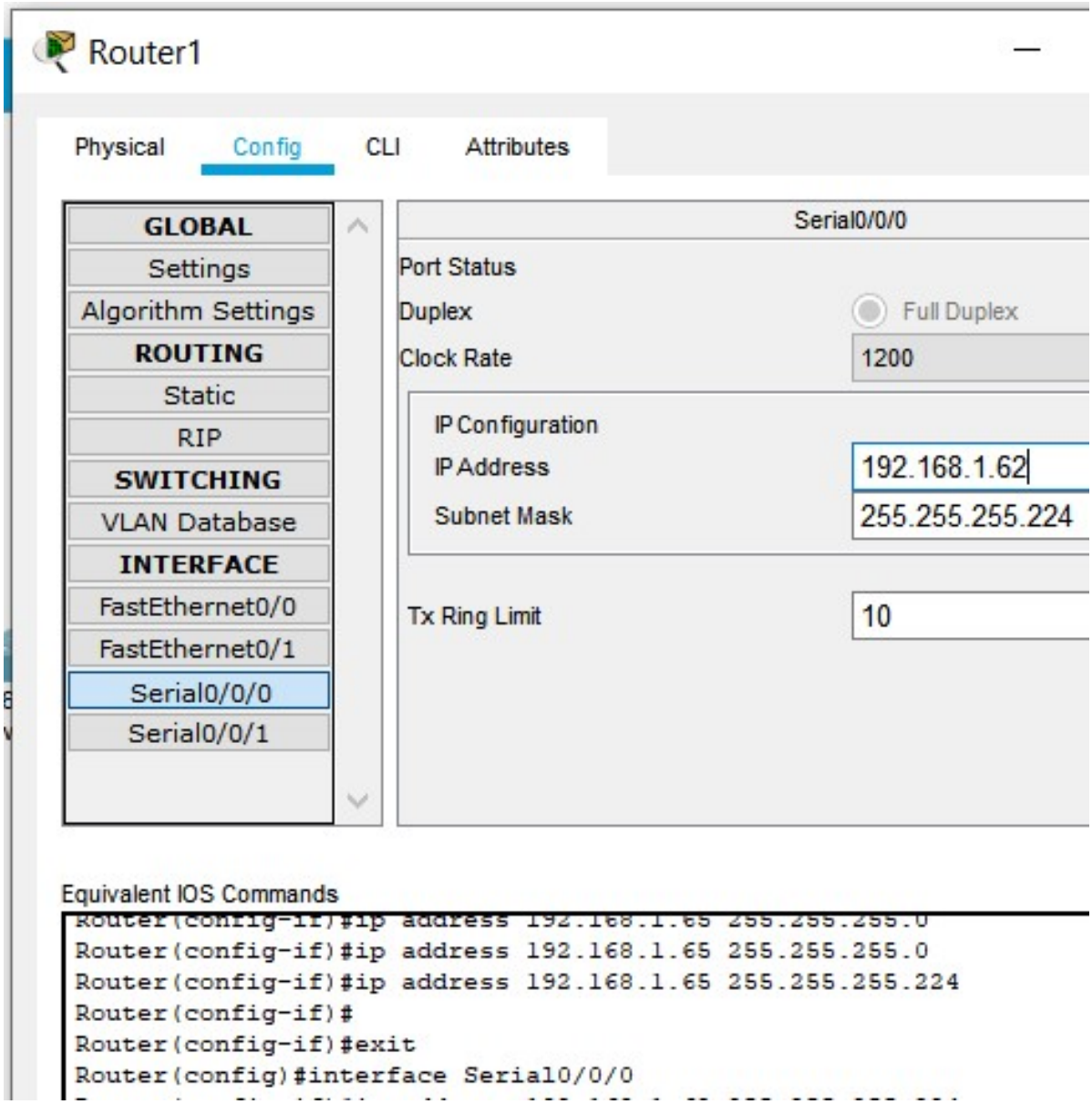
Router 0 : (R1)




Router0
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
Duplex
Full Duplex
Clock Rate
2000000
IP Configuration
IP Address
192.168.1.33
Subnet Mask
255.255.255.224
Tx Ring Limit
10
Equivalent IOS Commands
Router(config-if)#ip address 192.168.1.33 255.255.255.224
Router(config-if)#ip address 192.168.1.33 255.255.255.224
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0

Router 1 : (R2)

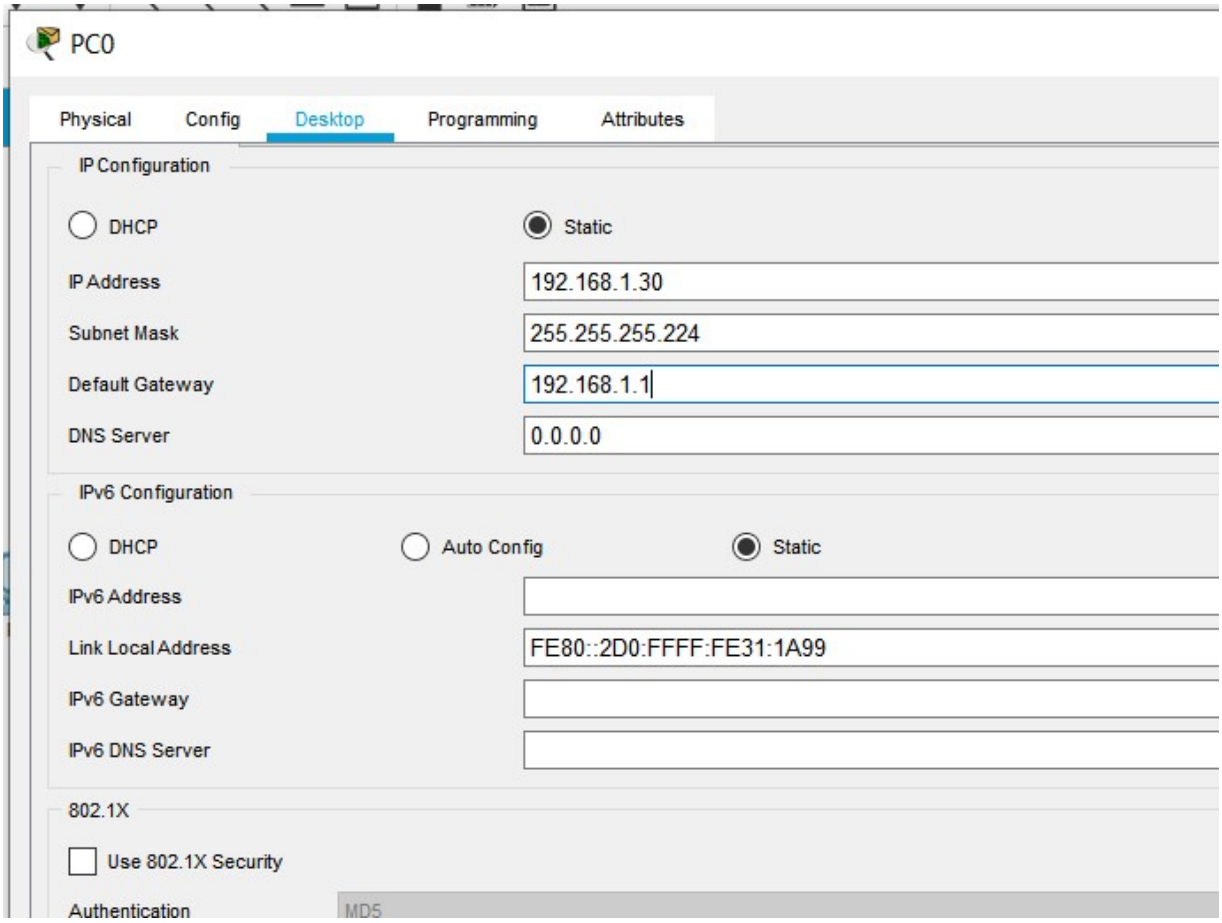

Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
FastEthernet0/0
Port Status
Bandwidth
100 Mbps
Duplex
Half Duplex
MAC Address
0060.70E4.E701
IP Configuration
IP Address
192.168.1.65
Subnet Mask
255.255.255.224
Tx Ring Limit
10
Equivalent IOS Commands
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address
% Incomplete command.


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
Duplex
Full Duplex
Clock Rate
1200
IP Configuration
IP Address
192.168.1.62
Subnet Mask
255.255.255.224
Tx Ring Limit
10
Equivalent IOS Commands
Router(config-if)#ip address 192.168.1.65 255.255.255.0
Router(config-if)#ip address 192.168.1.65 255.255.255.224
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/0/0

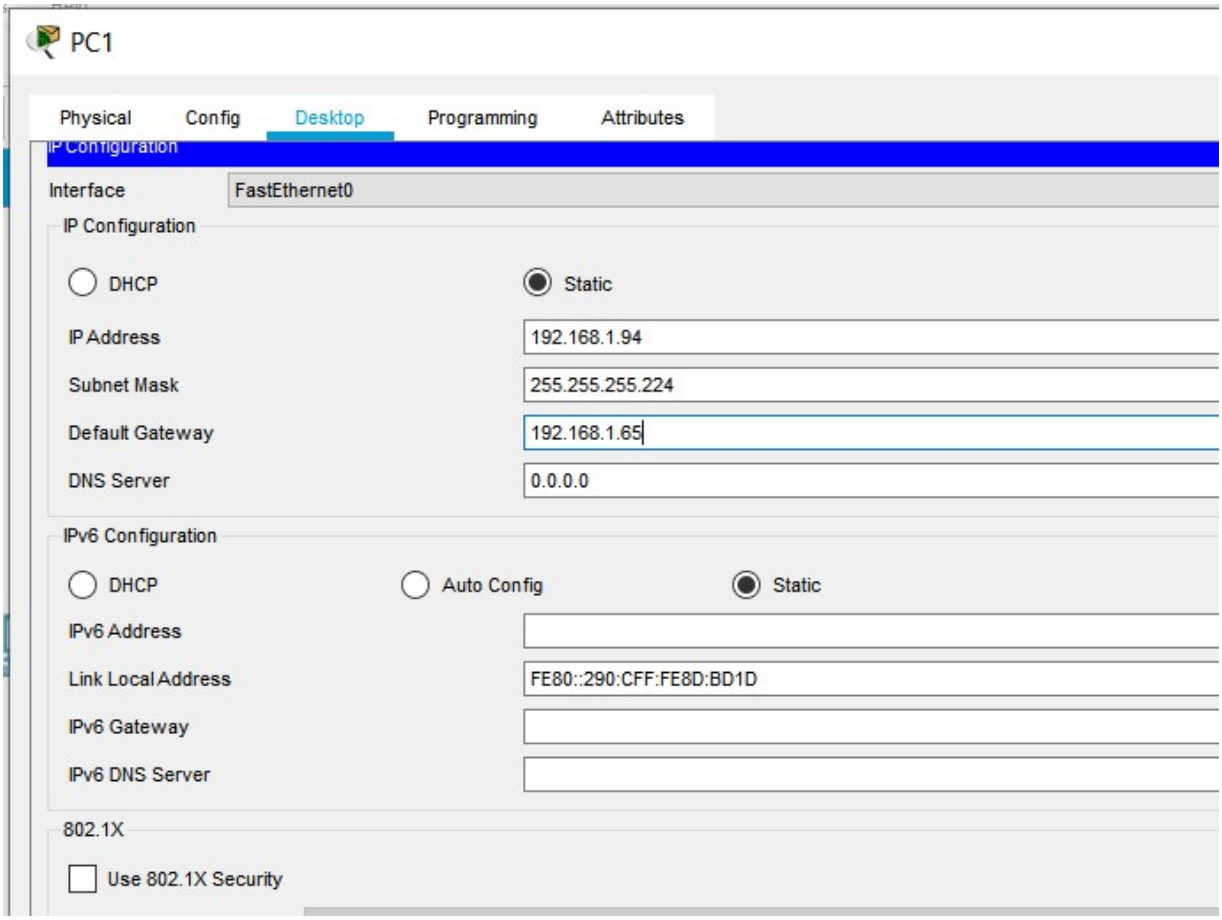
Step 2: Configure the PC interfaces.

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

PC 0: (PC1)



PC 1: (PC2)



Switch :

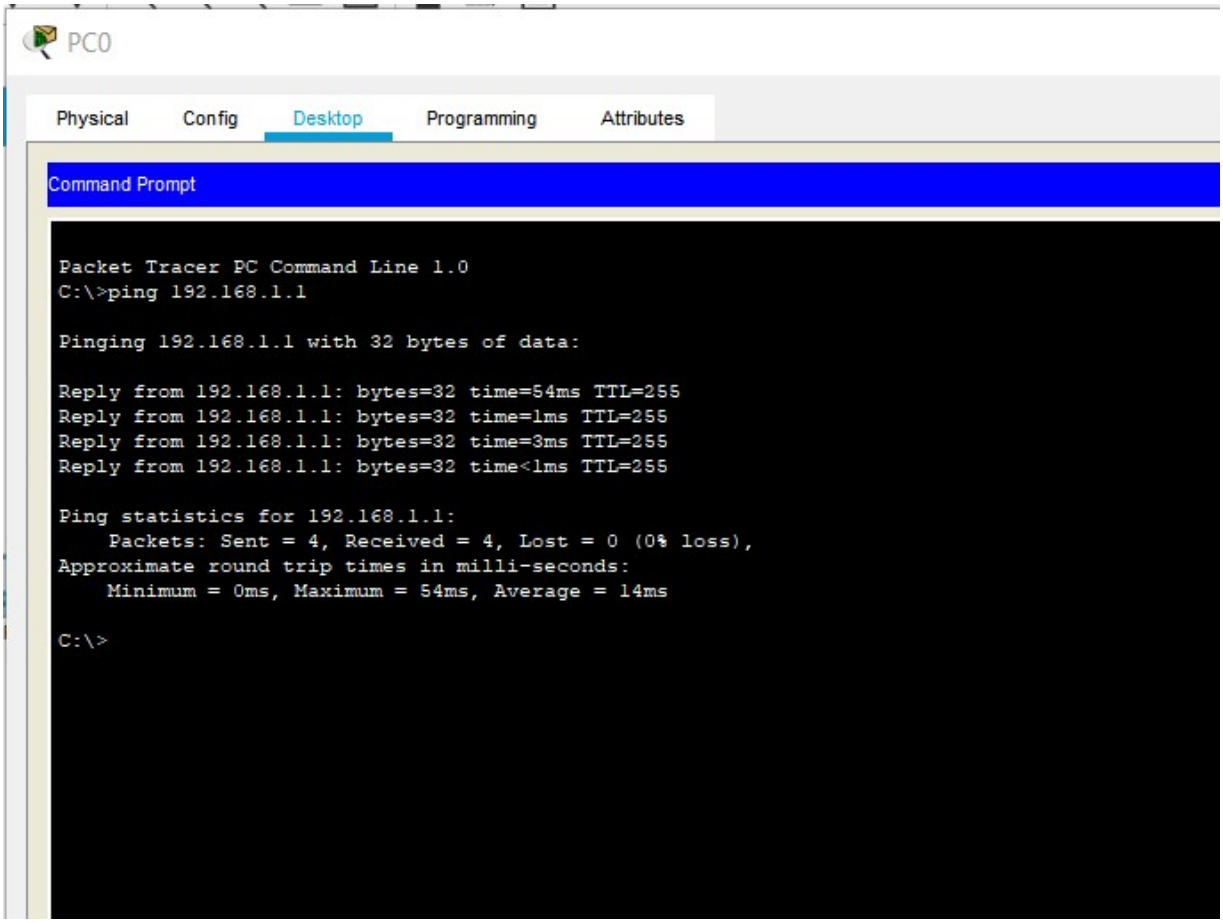
```
Switch(config-if)#ip default-gateway 192.168.1.1
Switch(config)#
```

Task 4: Verify the Configurations.

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

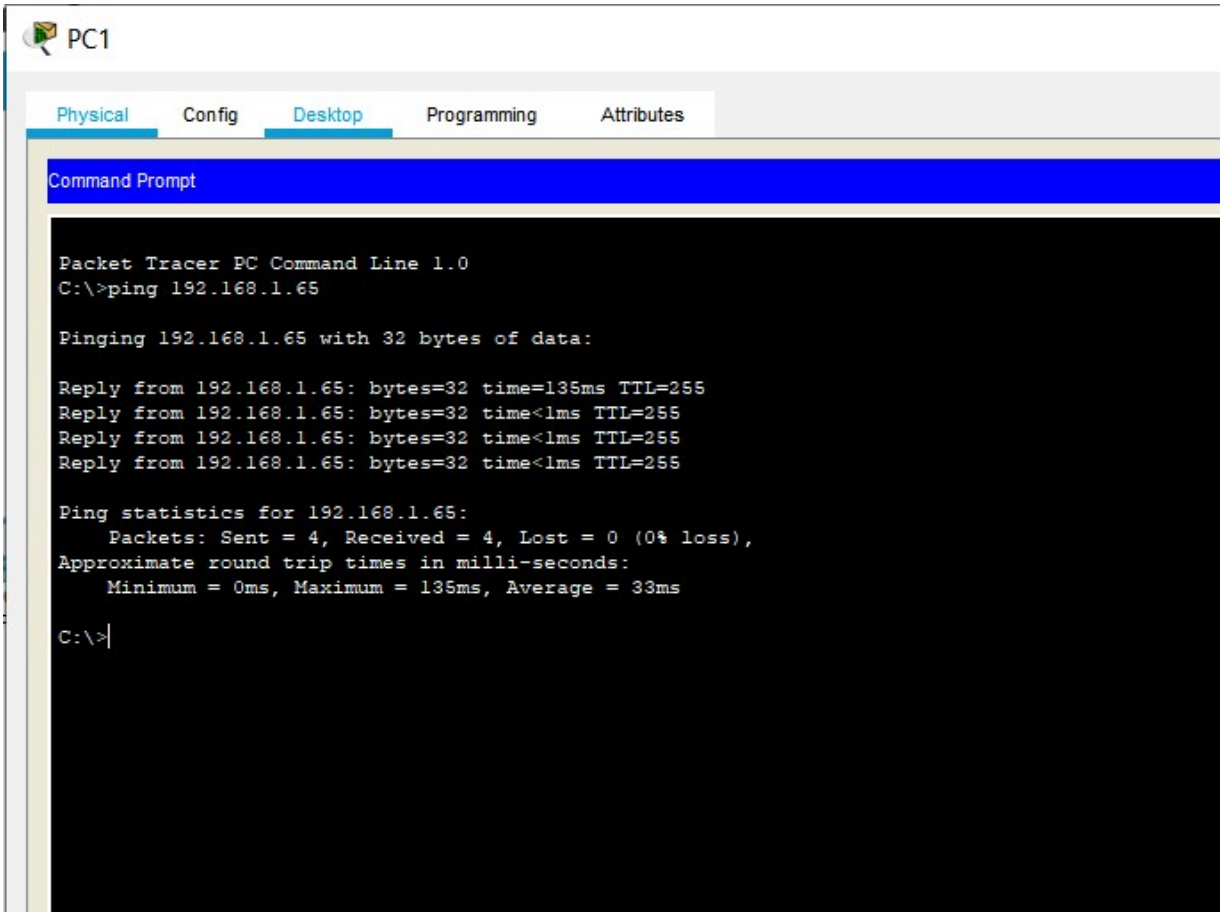
From the host attached to R1, is it possible to ping the default gateway?

Yes



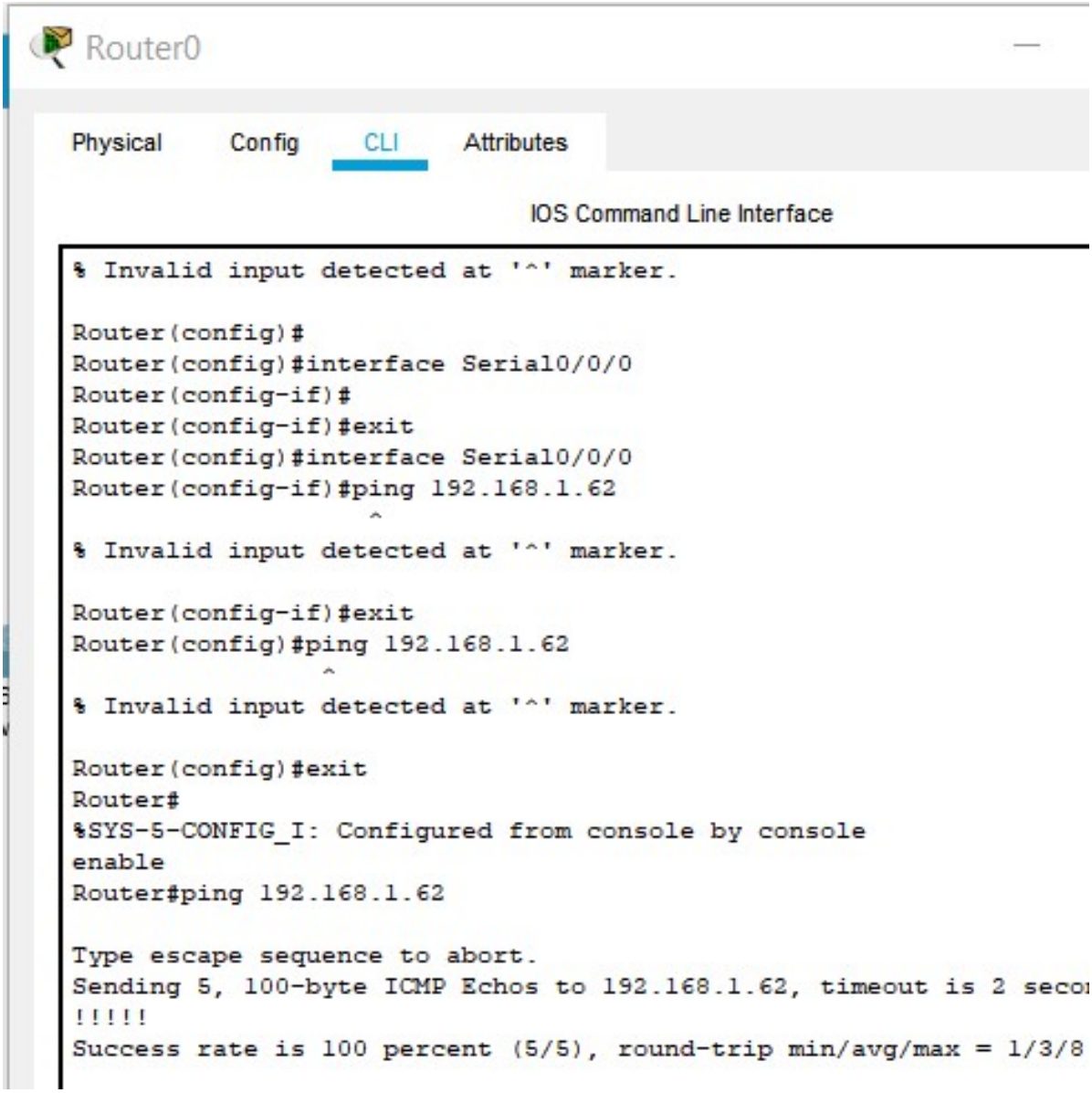
From the host attached to R2, is it possible to ping the default gateway?

Yes



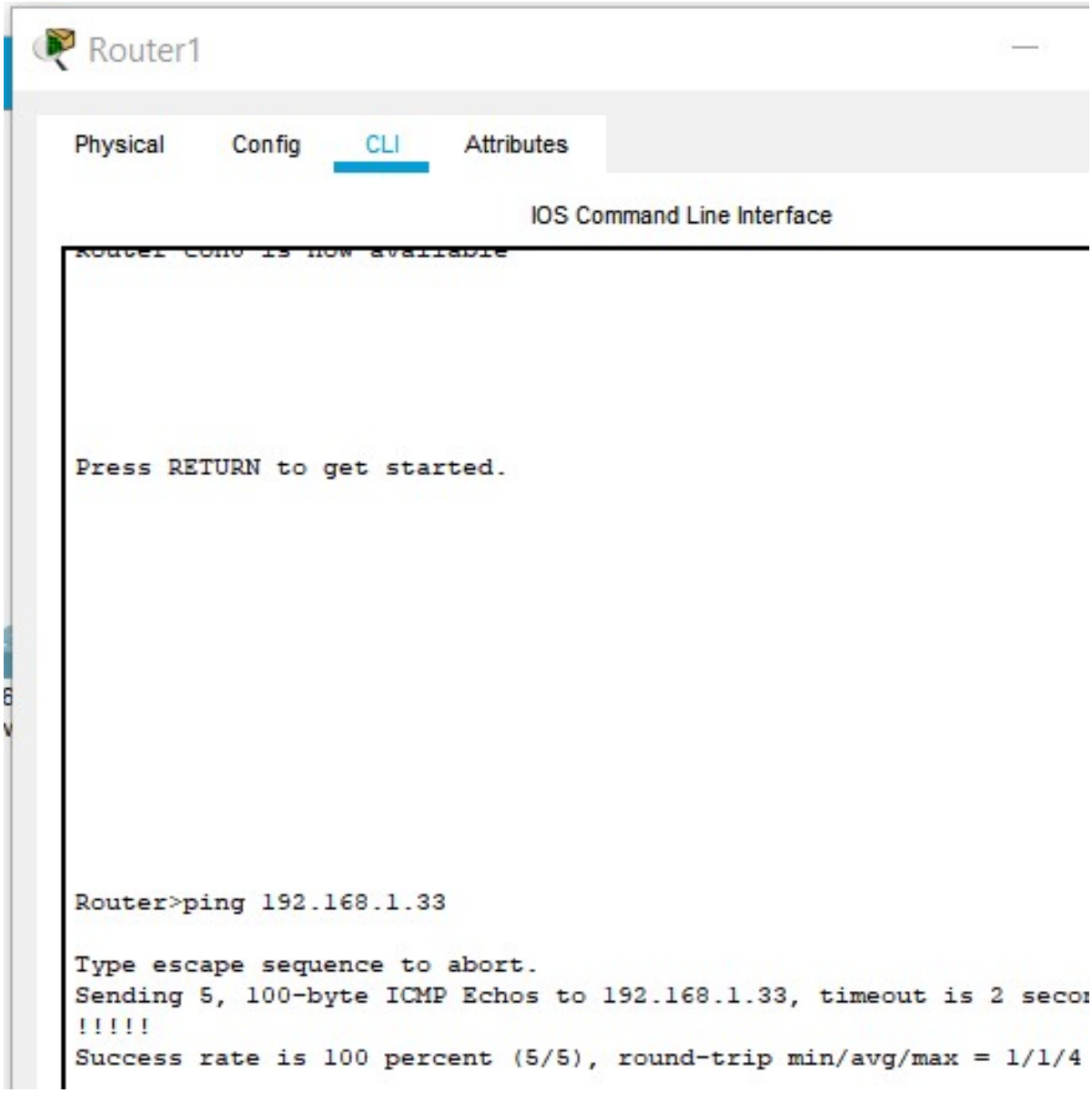
From the router R1, is it possible to ping the Serial 0/0/0 interface of R2?

Yes



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

Yes



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?

The devices on the two different LANs cannot be pinged. Therefore PC1 cannot ping PC2 and vice versa.

Pinging PC2 from PC1

```
C:\>ping 192.168.1.94

Pinging 192.168.1.94 with 32 bytes of data:

Reply from 192.168.1.1: Destination host unreachab
Reply from 192.168.1.1: Destination host unreachab
Request timed out.
Reply from 192.168.1.1: Destination host unreachab
```

Pinging PC1 from PC2

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

This is because the Routers connecting the two LANs only have the IP addresses of the devices they have been configured to. Thus if we want the devices on the different LANs to be able to ping each other we need to configure the IP addresses of the devices on the Router ARP table either dynamically or statically.

Routing Table for Router1

Type	Network	Port	Next Hop IP	Metric
C	192.168.1.32/27	Serial0/0/0	---	0/0
C	192.168.1.64/27	FastEthernet0/0	---	0/0

Routing Table for Router0

Type	Network	Port	Next Hop IP	Metric
C	192.168.1.0/27	FastEthernet0/0	---	0/0
C	192.168.1.32/27	Serial0/0/0	---	0/0

Conclusion :

1. I was able to set up subnets based on the host requirements.
2. I understood how to setup the serial port.