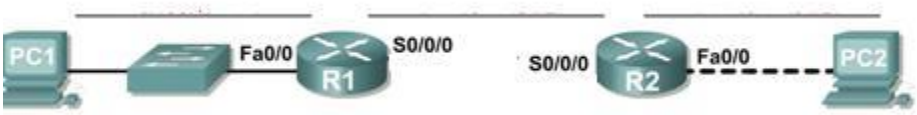
# CEL 51, DCCN, Monsoon 2020
# Lab 6: Subnet and Router Configuration

### 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 Fast Ethernet 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.** First we see which network needs the highest number of hosts. The R2 network has 30 hosts so we will need 5($2^5$ = 32 ) host bits and thus **3 subnet.**

- The network connected to router R1
- The network connected to router R2
- Link between router R1 and R2

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

**Ans.** Class C network as the IP address is 192.168.1.0. The default subnet mask for class C is 255.255.255.0. The first three octets are dedicated to 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 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**

3. **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.**

4. **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

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

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

   Subnet 1: **192.168.1.64-198.162.1.127**

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

Subnet 2: **192.168.1.128-198.162.1.191**

3. Assign subnet 3 to the network attached to R2.
   Subnet 3: **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

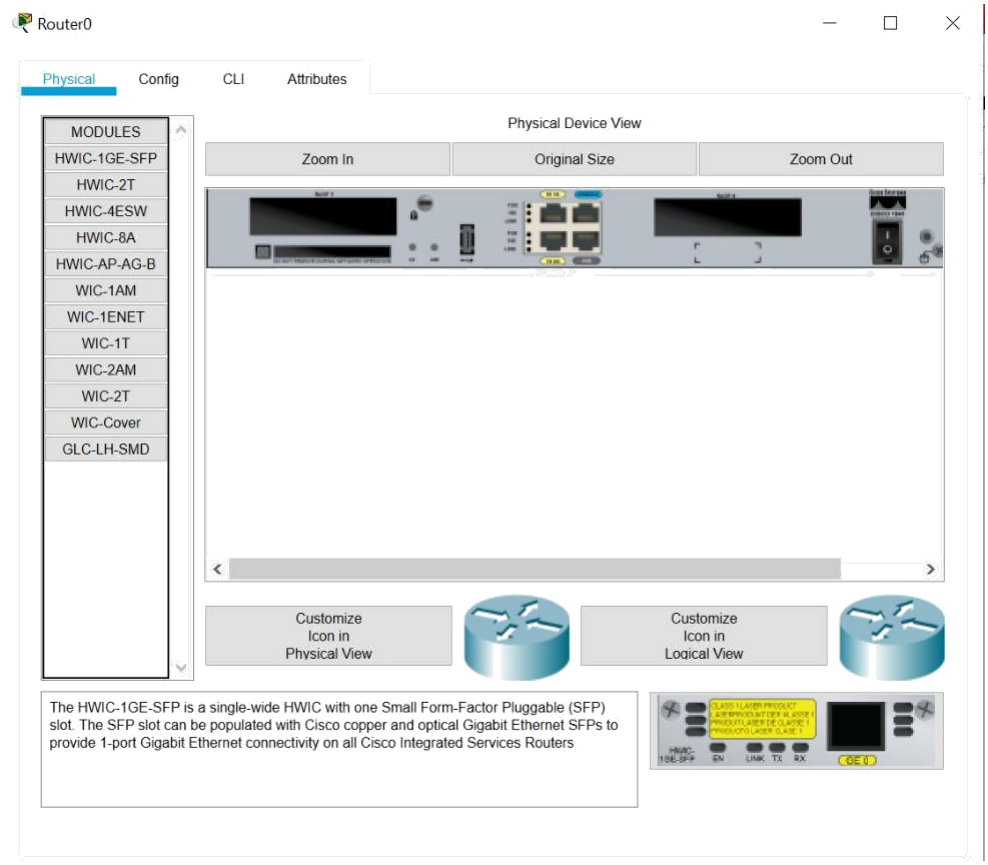
**Step 2: Document the addresses to be used in the table provide under the Topology Diagram.**

## Task 3: Configure the Serial and FastEthernet Addresses.

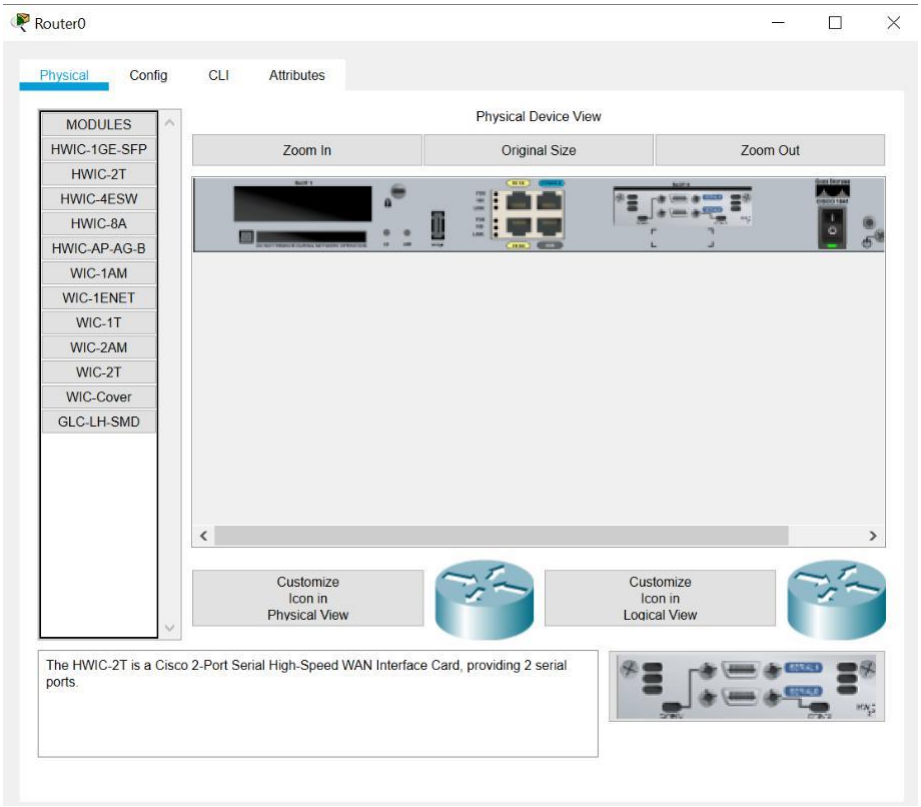
**Step 1: Configure the router interfaces.**

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.

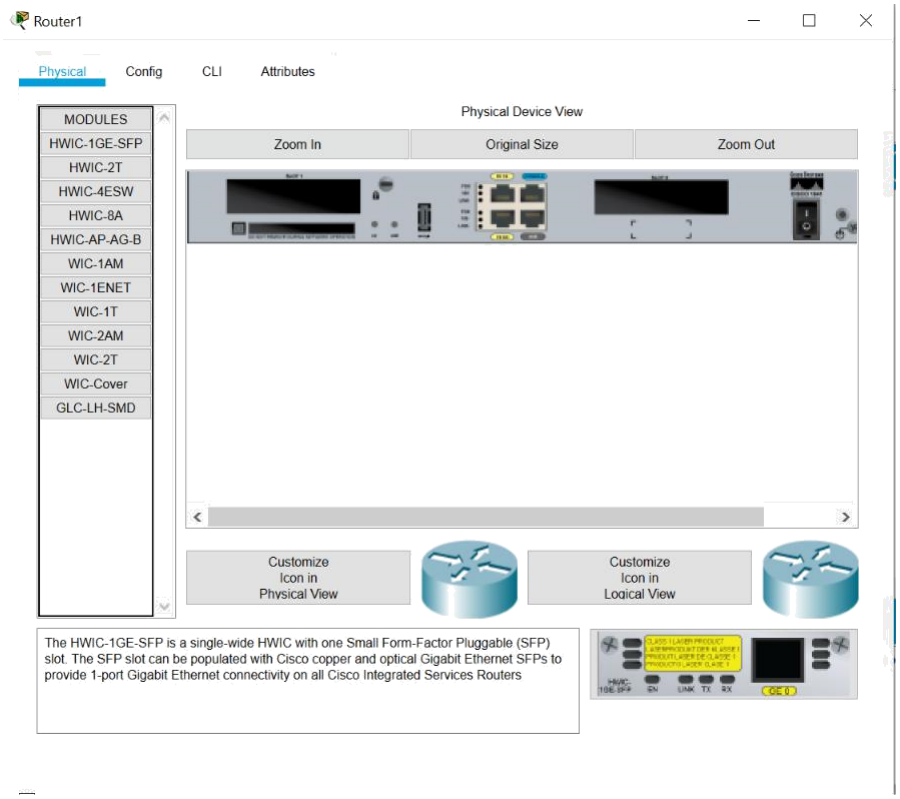

**Adding Serial Ports to Router**



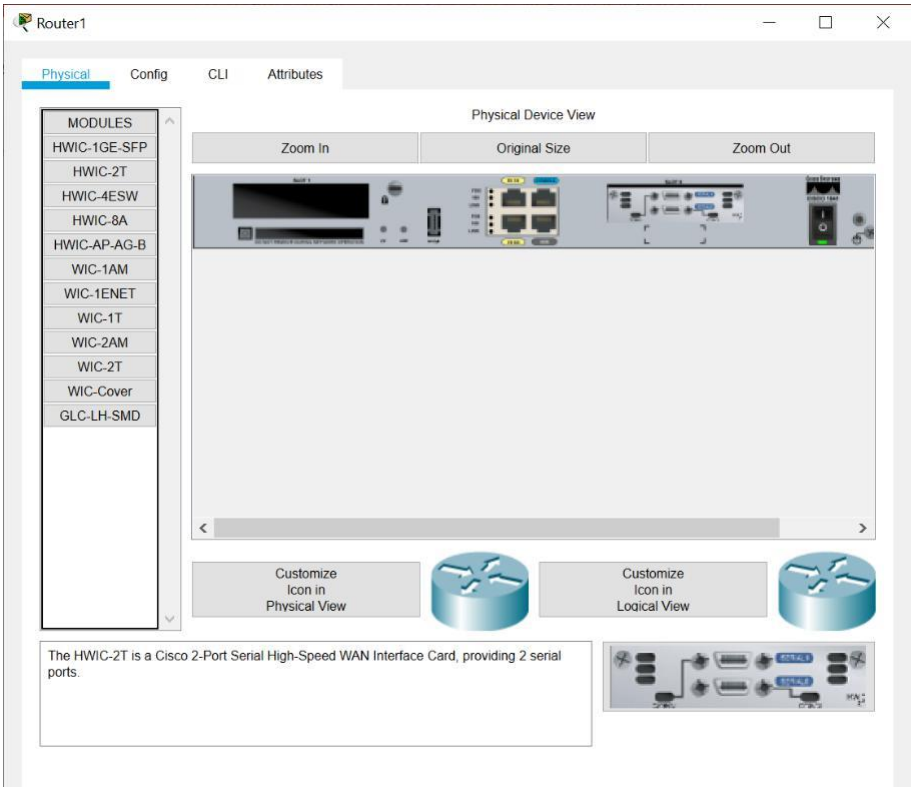

**Turn the Router 0 off**




**Click on HWIC-2T tab and drag HWIC-2T 2-Port Serial WAN Interface Card to router and turn the router on**

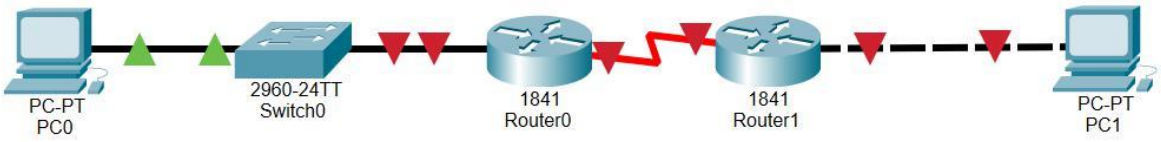



**Turn the Router 1 off**

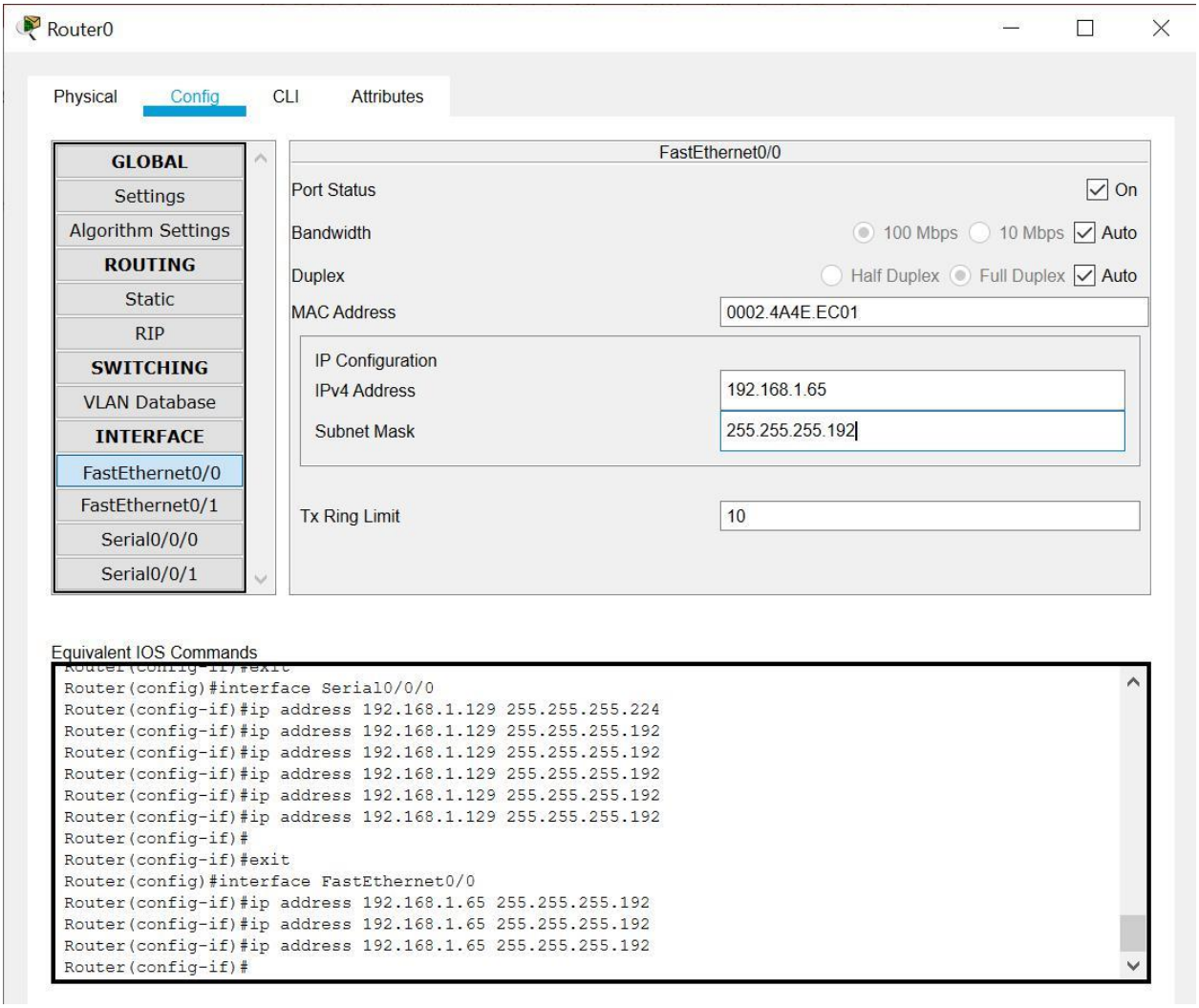



**Click on HWIC-2T tab and drag HWIC-2T 2-Port Serial WAN Interface Card to router and turn the router on**

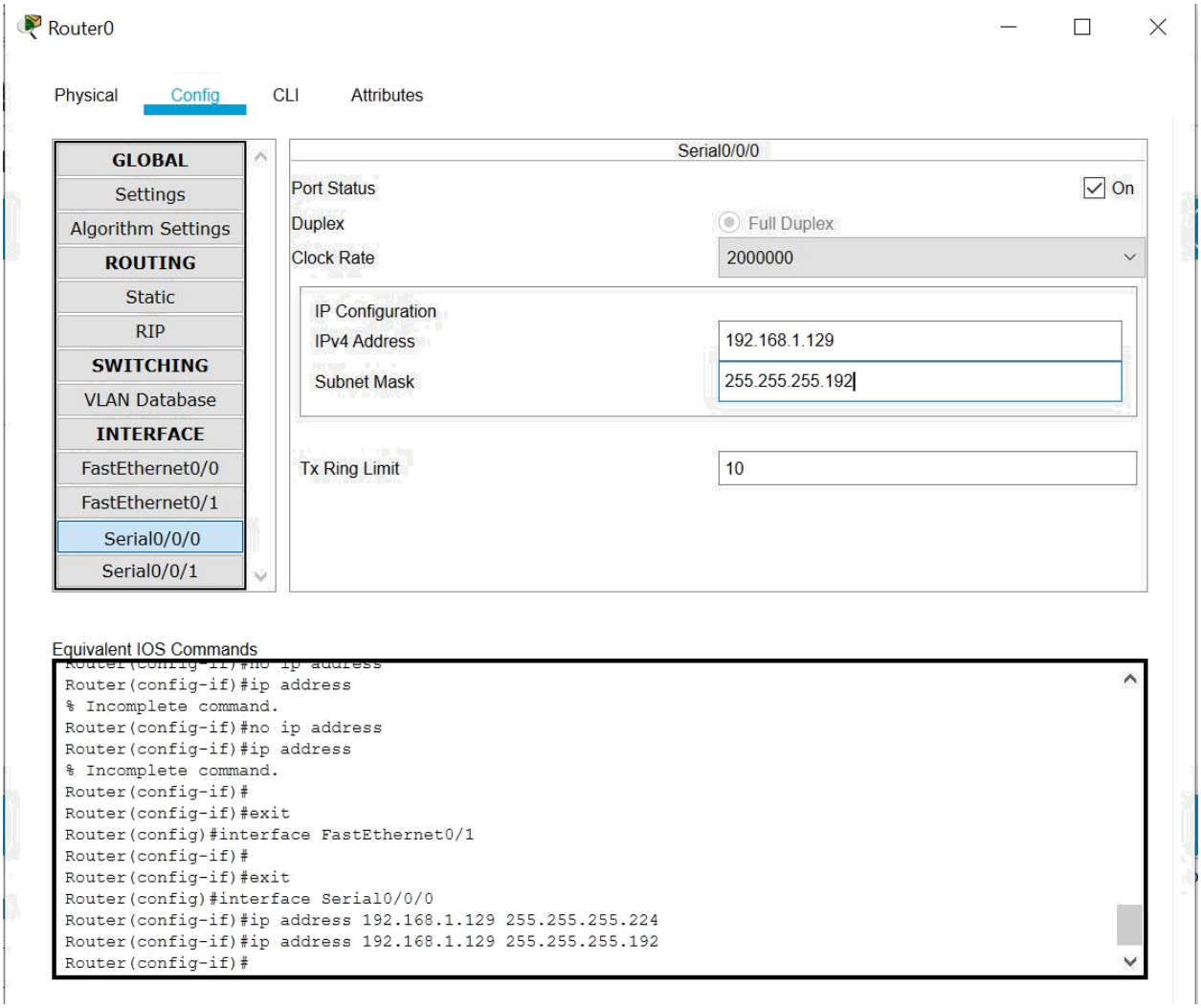
**Now we can connect R1 andR2 using serial DTE**



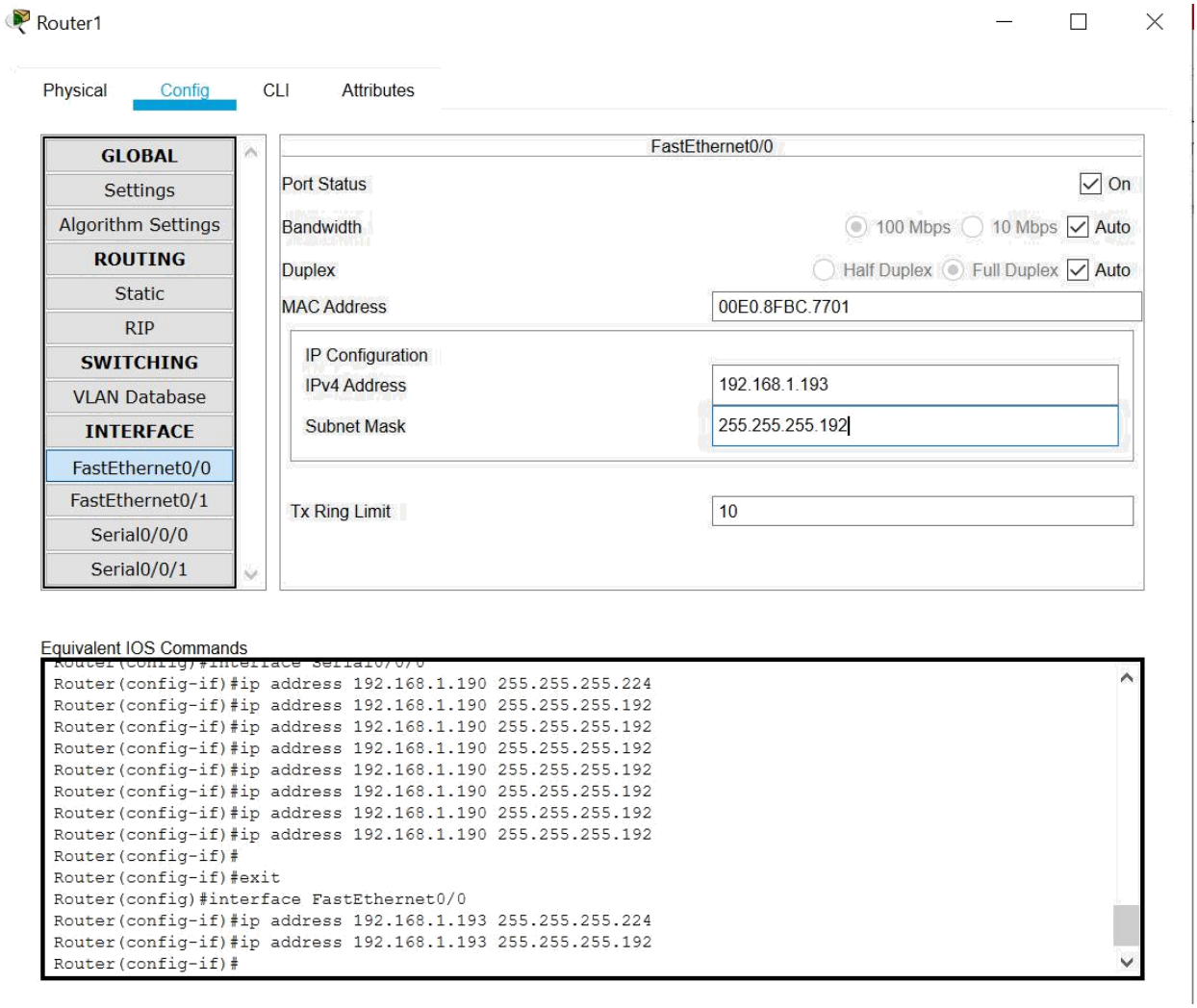

**Router Configuration**



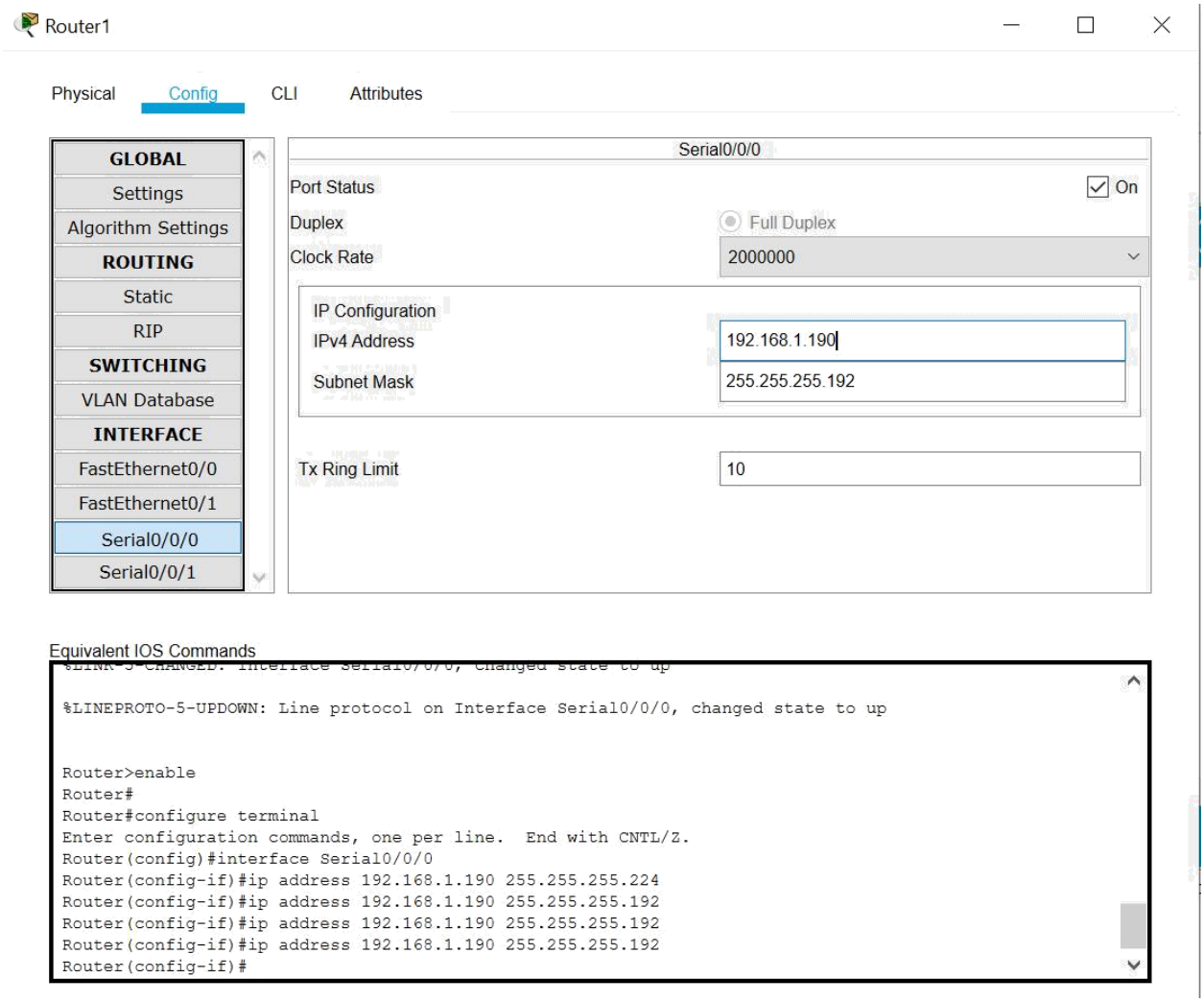

**Configuration of Fa0/0 of R0**




**Configuration of S0/0/0 of R0**



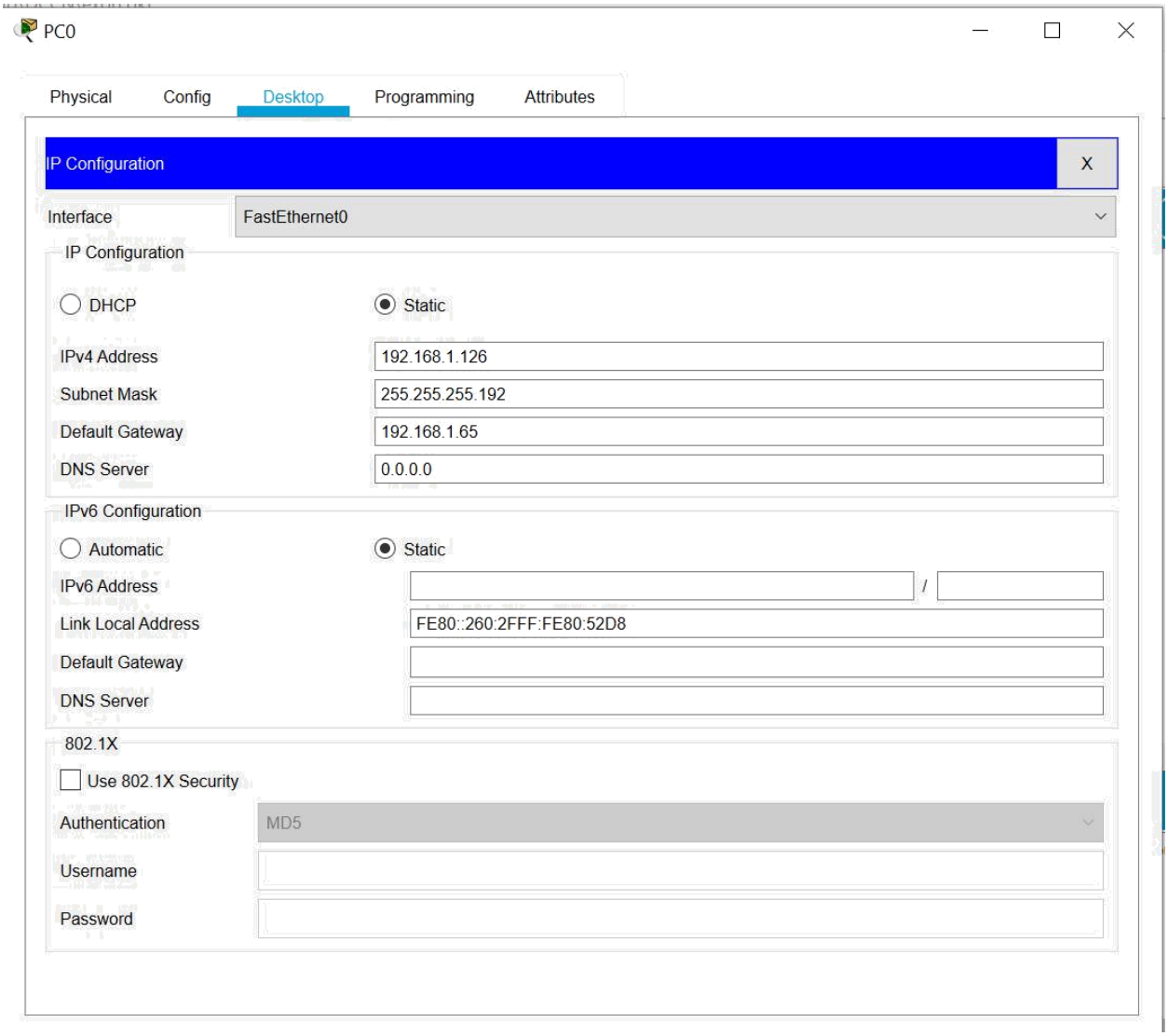

**Configuration of Fa0/0 of R1**



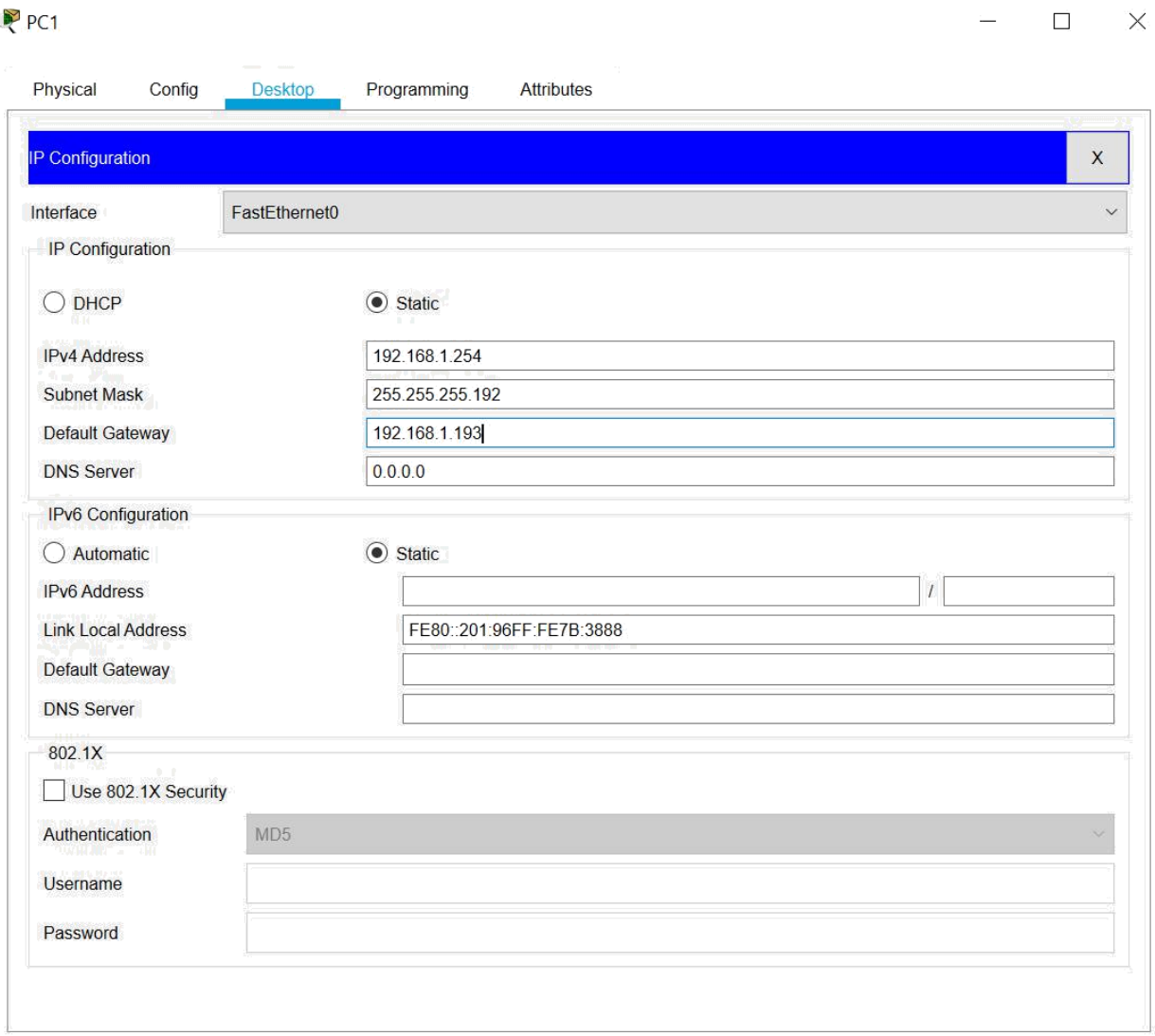

**Configuration of S0/0/0 of R1**

**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.

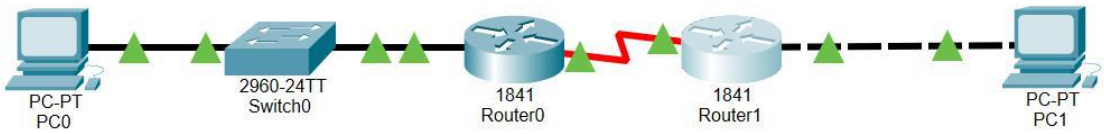


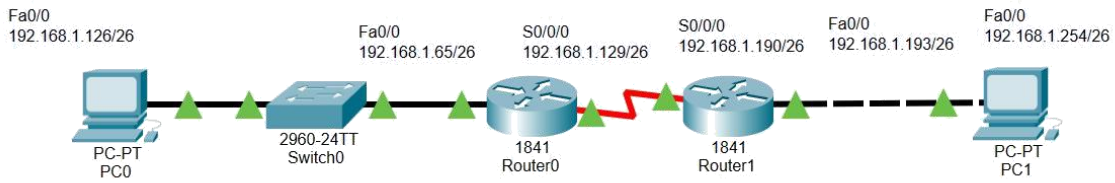

**Configuration of Fa0/0 of PC0**




**Configuration of Fa0/0 of PC1**

**The Network is now connected**






**Final Network**

## Save the running configuration to NVRAM of router

```
Router#enable
Router#show startup-config
startup-config is not present
Router#
```

## Saving running-config as startup-config

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#enable
Router#show startup-config
startup-config is not present
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#show startup-config
Using 706 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
!
!
!
!
!
!
```

**For R0**

```
!
!
spanning-tree mode pvst
!
!
!
!
!
!
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 Serial0/1/0
 ip address 192.168.1.129 255.255.255.192
 clock rate 2000000
!
interface Serial0/1/1
 no ip address
 clock rate 2000000
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
ip classless
!
ip flow-export version 9
!
!
!
!
!
!
 --More-- |
```

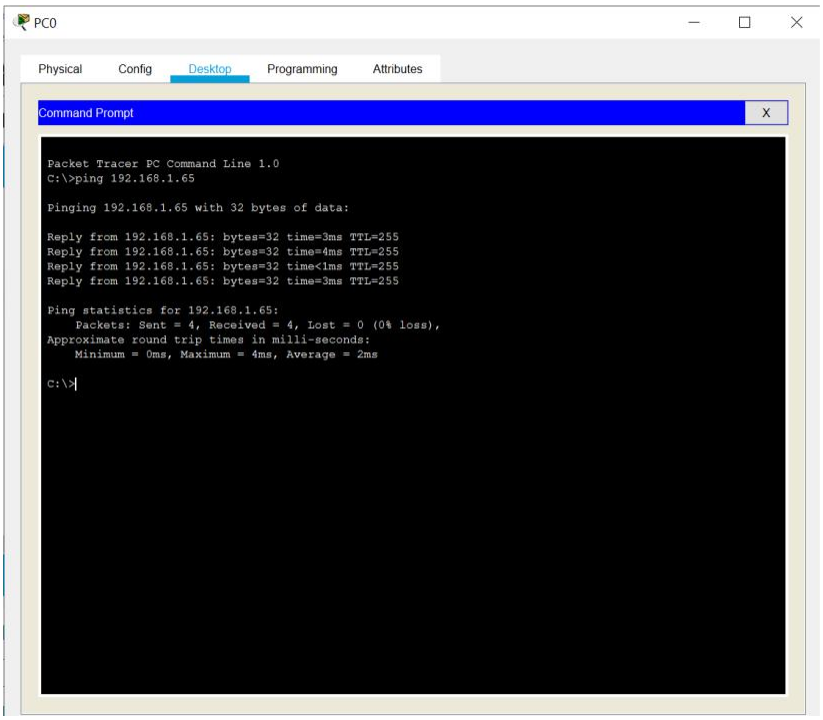
**For R1**

```
!
!
!
!
spanning-tree mode pvst
!
!
!
!
!
!
interface FastEthernet0/0
 ip address 192.168.1.193 255.255.255.192
 duplex auto
 speed auto
!
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface Serial0/1/0
 ip address 192.168.1.190 255.255.255.192
!
interface Serial0/1/1
 no ip address
 clock rate 2000000
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
ip classless
!
ip flow-export version 9
!
!
!
!
!
!
 --More--
```

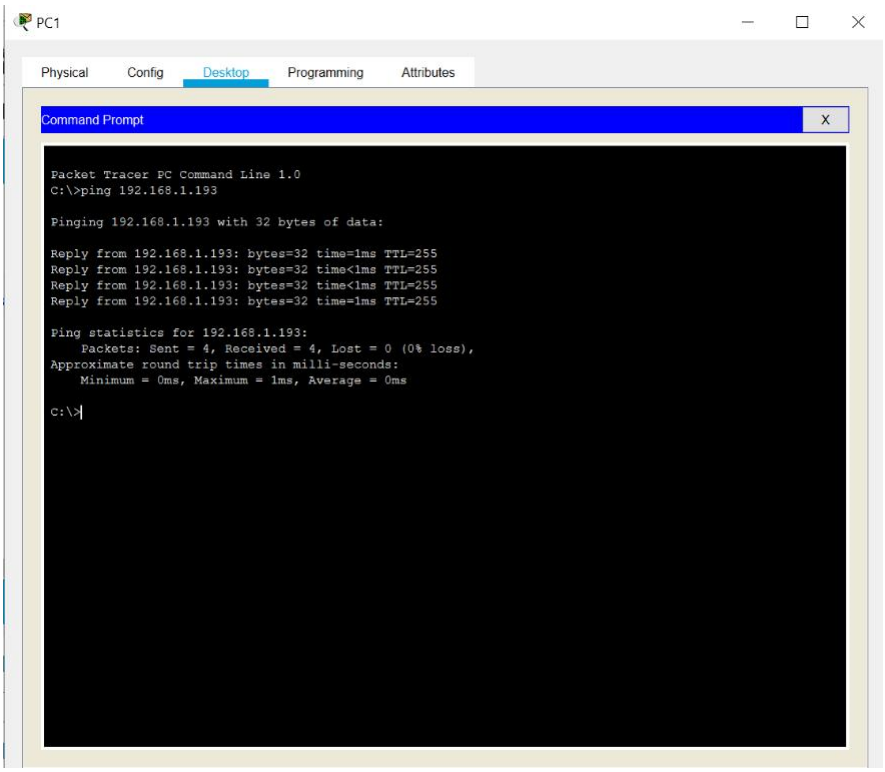
## Task 4: Verify the Configurations.

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

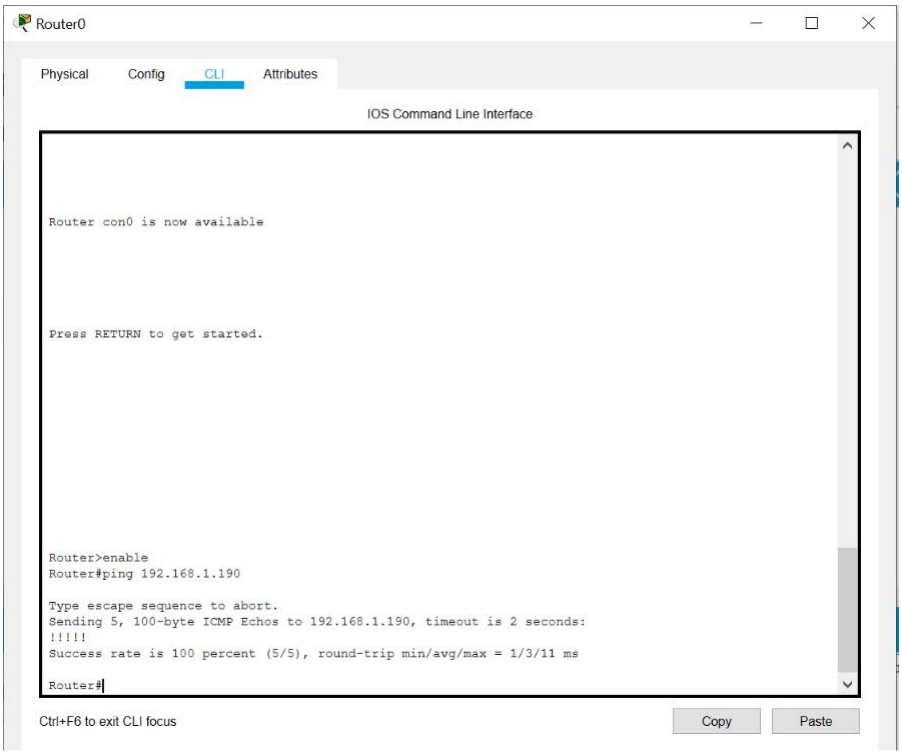
From the host attached to R1, is it possible to ping the default gateway? **Yes**



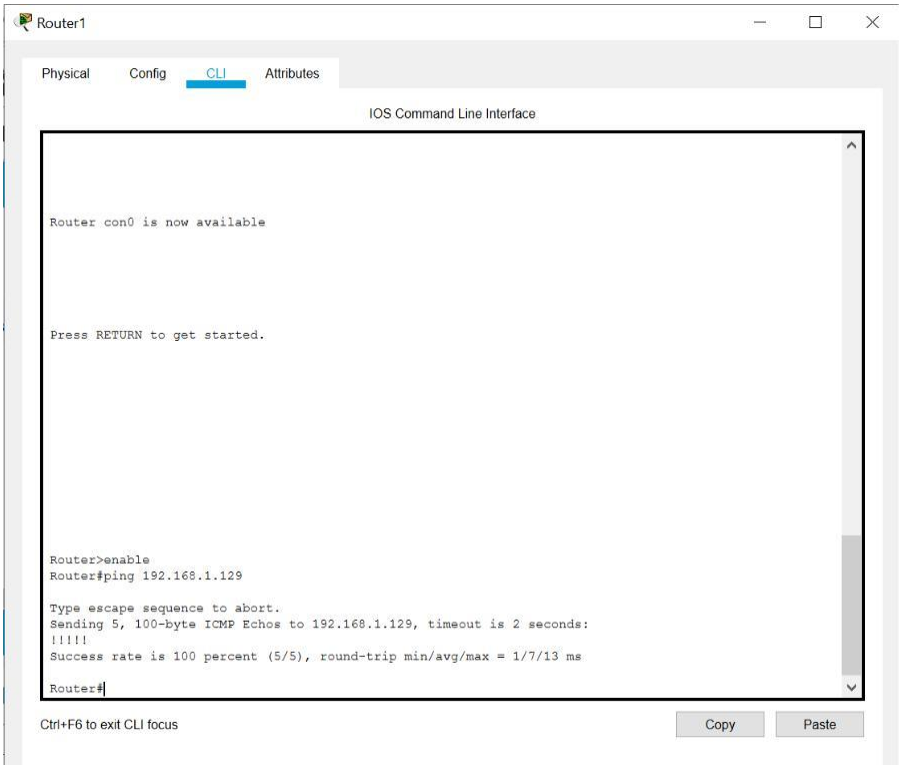

From the host attached to R2, is it possible to ping the default gateway? **Yes**



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**

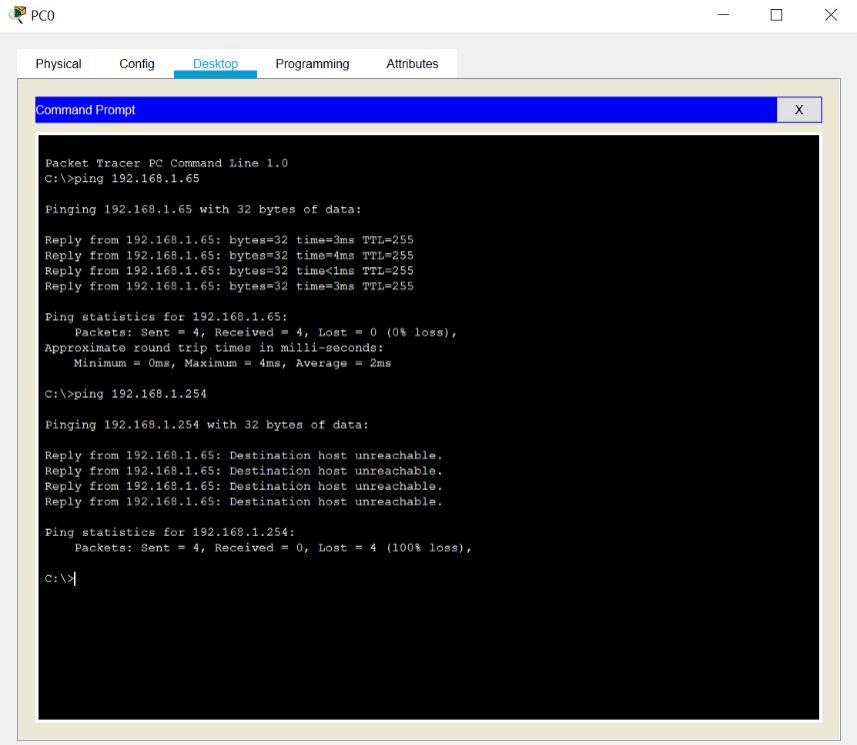



The answer to the above questions should be **yes**. If any of the above pings failed, check your physical connections and configurations.

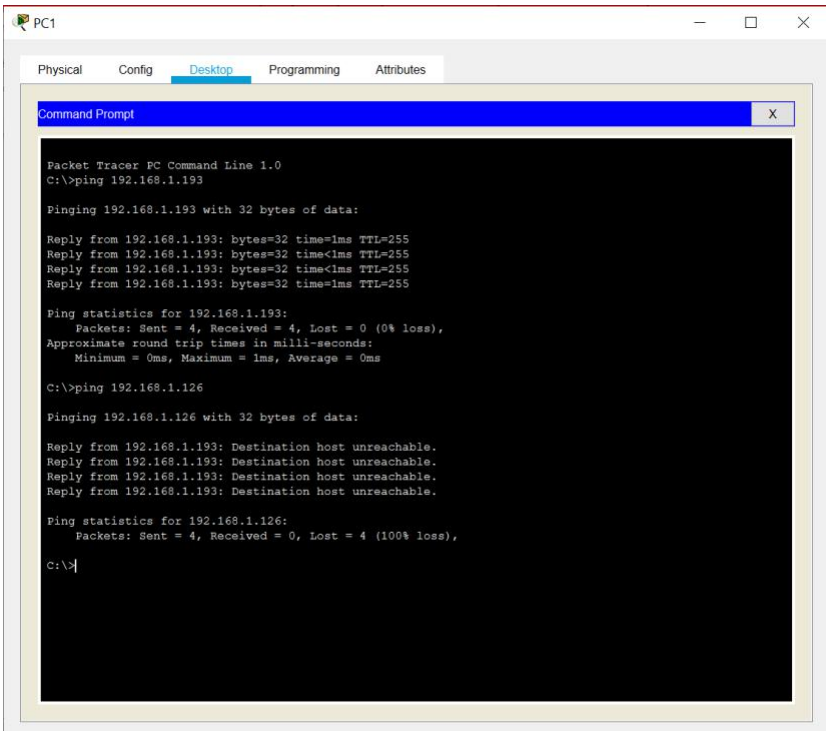
## Task 5: Reflection

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

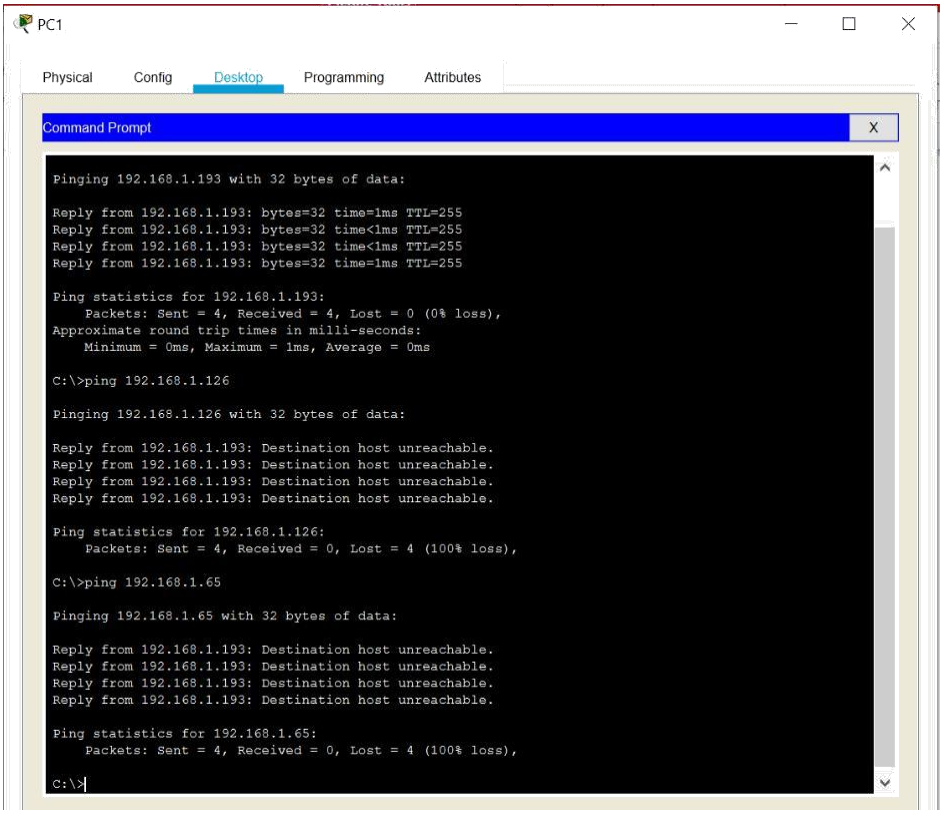
**Ans.** Yes, devices that are not a part of the same network cannot ping each other. For example, PC1 and PC2 cannot ping each other



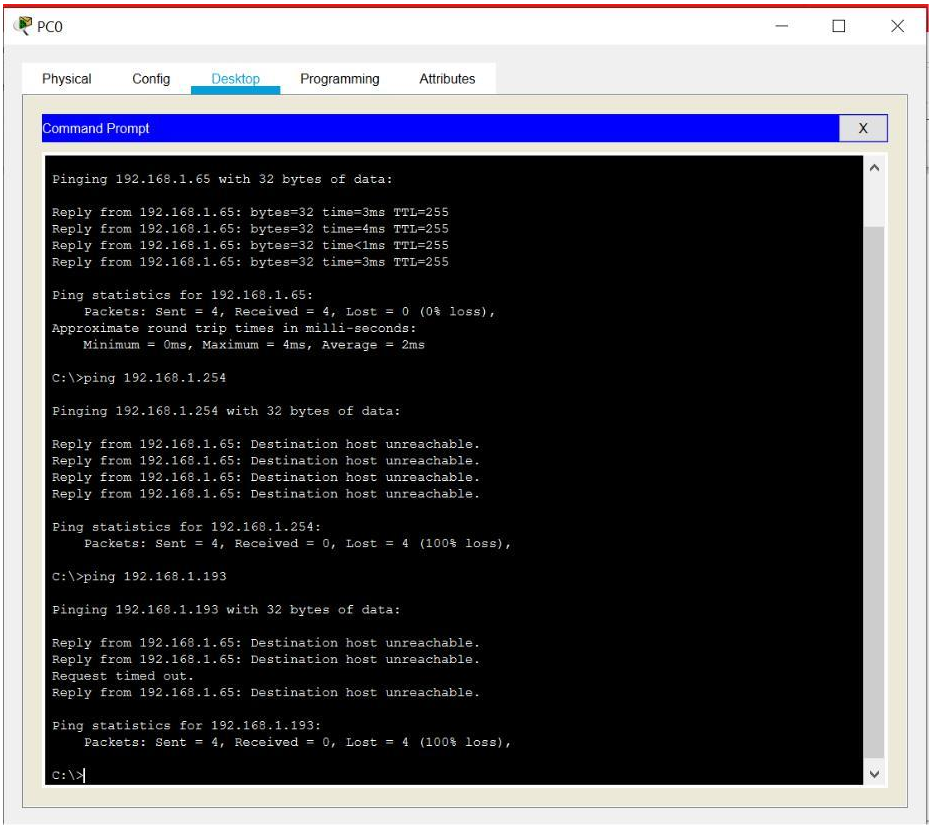

**Pinging PC1 from PC0-Failure but R0-success**




**Pinging PC0 from PC1- Failure but R1-success**



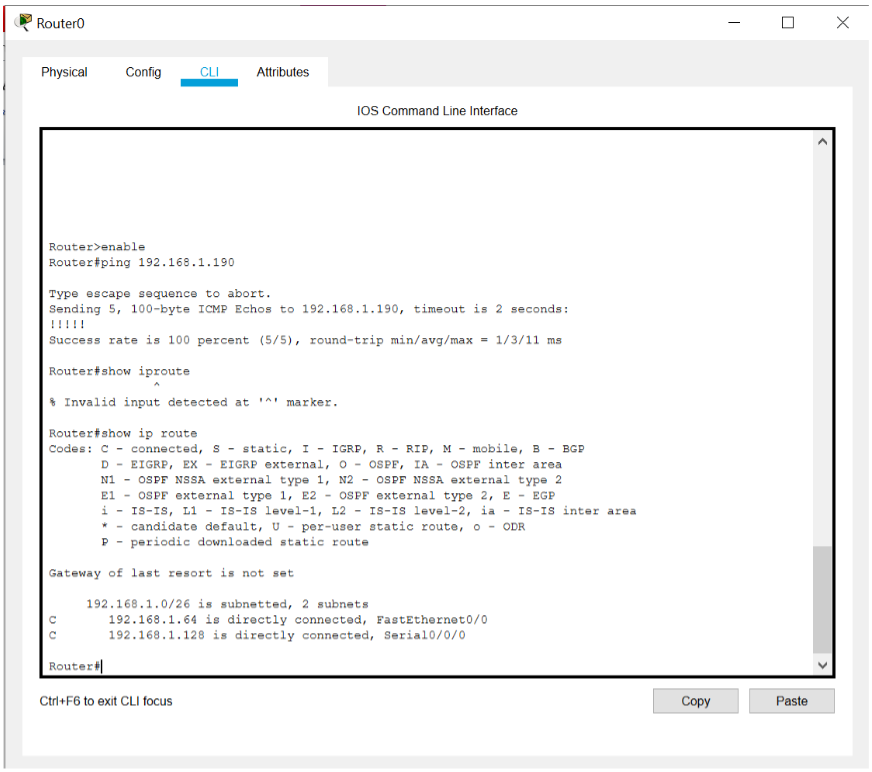

**Pinging R0 from PC1- Failure**




**Pinging R1 from PC0- Failure**

**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.




**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