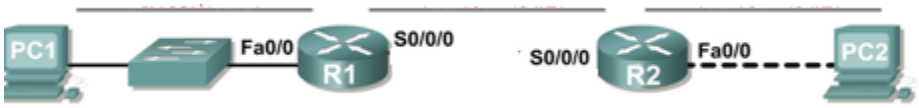
Topology Diagram



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 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?

   We will have **3 subnets** in this network –

   - The network connected to router R1.
   - The network connected to router R2.
   - The link between router R1 and router R2.

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

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

   $2^n >= 3$

   ⇨ n = 2

   Thus, we use 2 bits from the last 8 bits of the IP address as the subnet mask.
   In binary format, it 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?

   /26

4. How many usable hosts are there per subnet?

   Number of usable hosts = 2^{32-n} -2 where n = subnet mask

   ⇨ Number of usable hosts in each subnet = **2^6 -2 = 62 hosts.**

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

1. Assign subnet 1 to the network attached to R1.
2. Assign subnet 2 to the link between R1 and R2.
3. Assign subnet 3 to the network attached to R2.

Subnet 0 – 192.168.1.0 – 192.168.1.63

Subnet 1 – 192.168.1.64 – 192.168.1.127

Subnet 2 – 192.168.1.128 – 192.168.1.191

Subnet 3 – 192.168.1.192 – 192.168.1.255

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.

   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.

   192.168.1.129

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

   192.168.1.190

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

   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 provide under the Topology Diagram.

Task 3: Configure the Serial and FastEthernet Addresses.

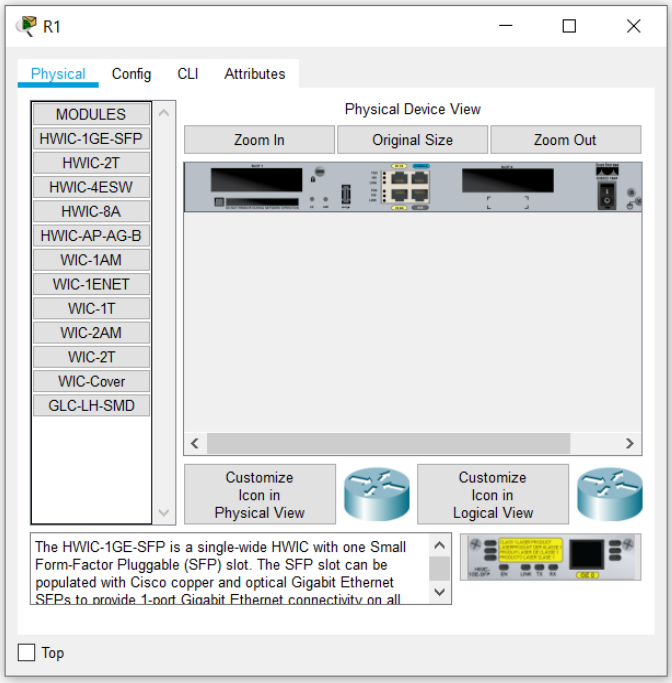
Step 1: Configure the router interfaces.

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.

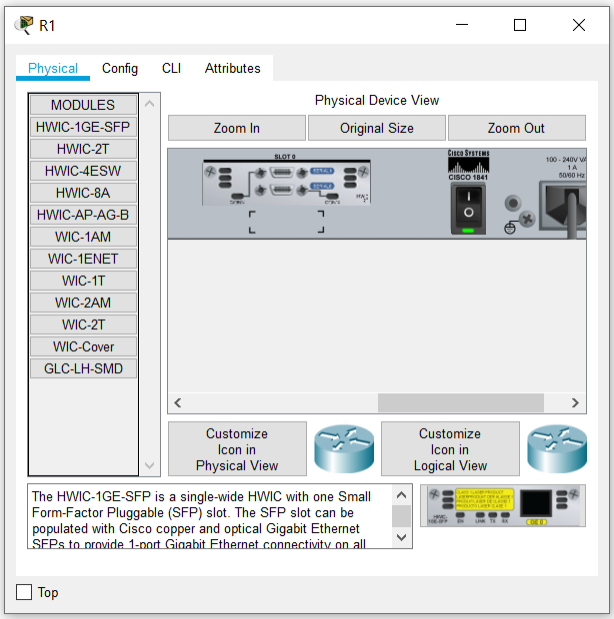
Fig 1. Network devices

Adding Serial Ports to Routers

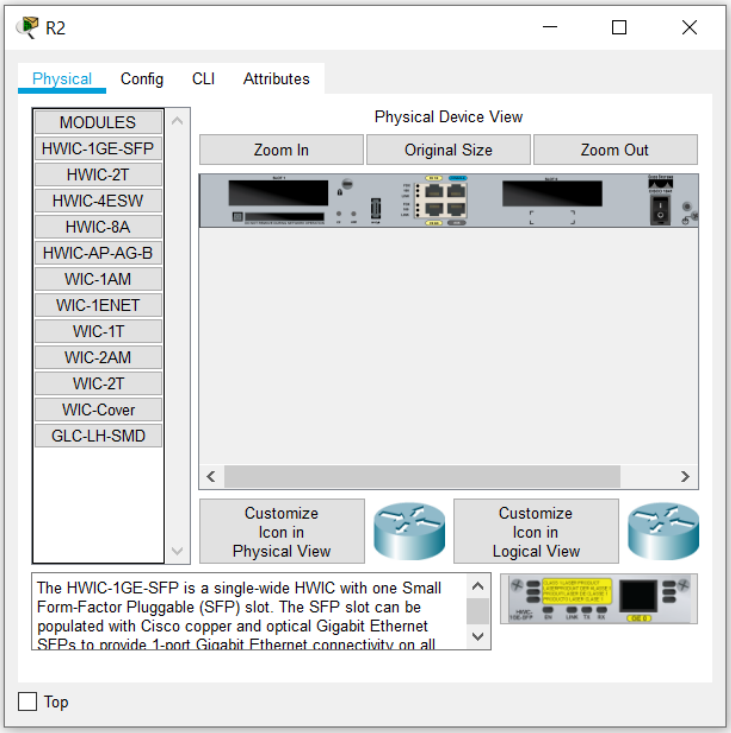
a. Turn Router off in Physical Tab

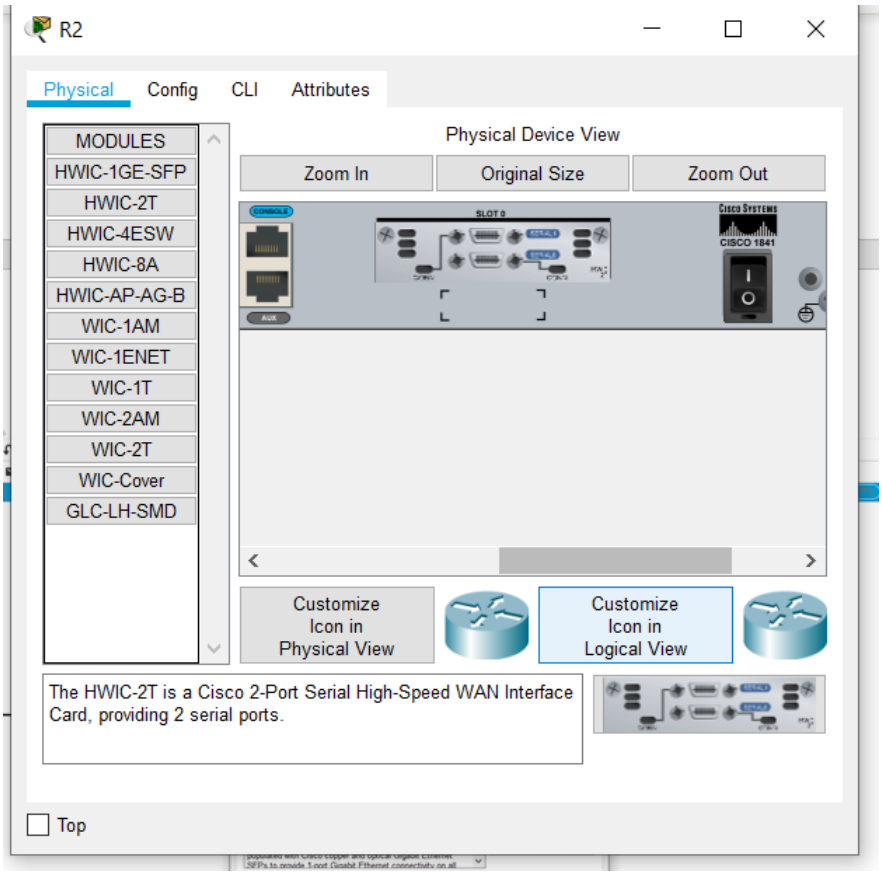


b. Click on HWIC-2T tab and drag Cisco HWIC-2T 2-Port Serial WAN Interface Card to router then turn router on



Similarly, 2 serial ports are added to R2

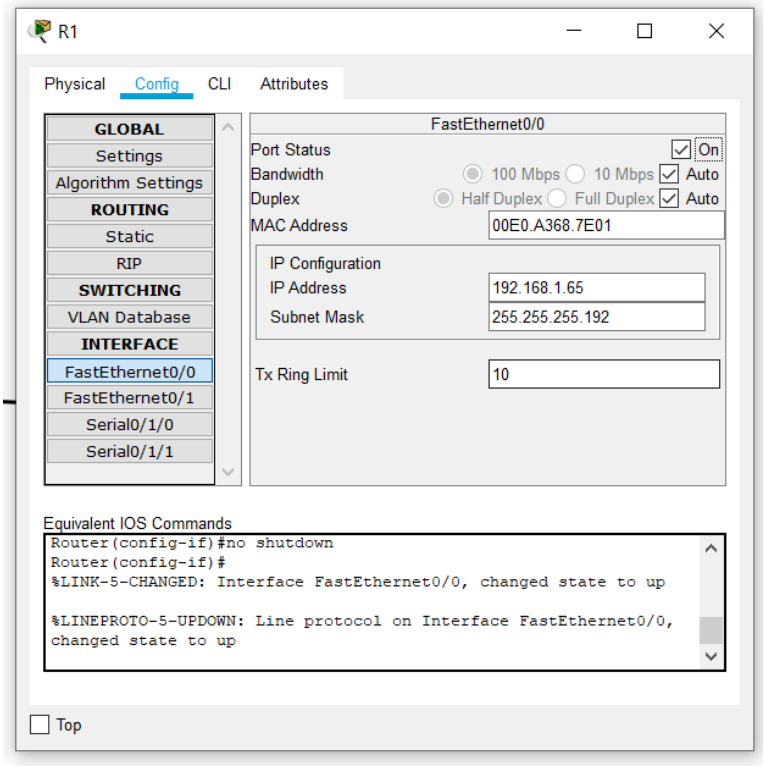




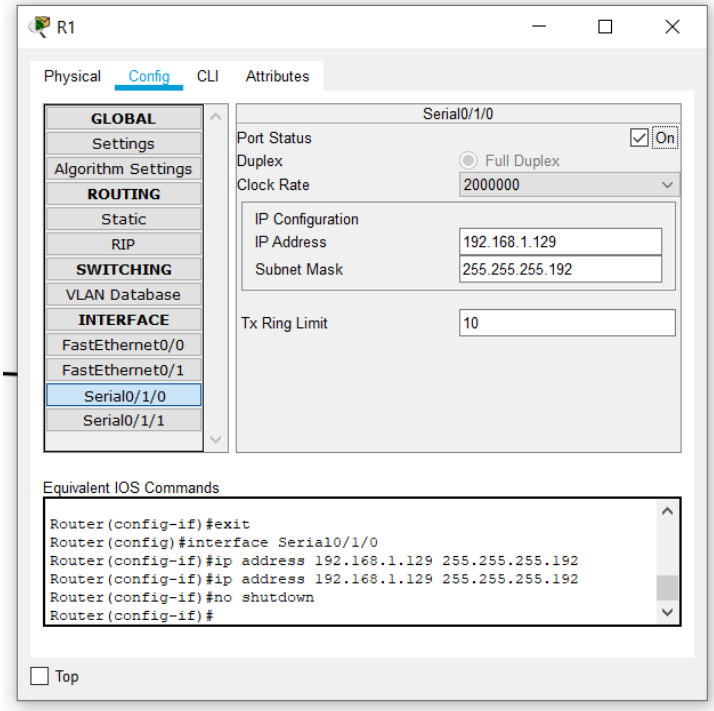
Now, we can connect R1 and R2 using DTE

Router Configuration

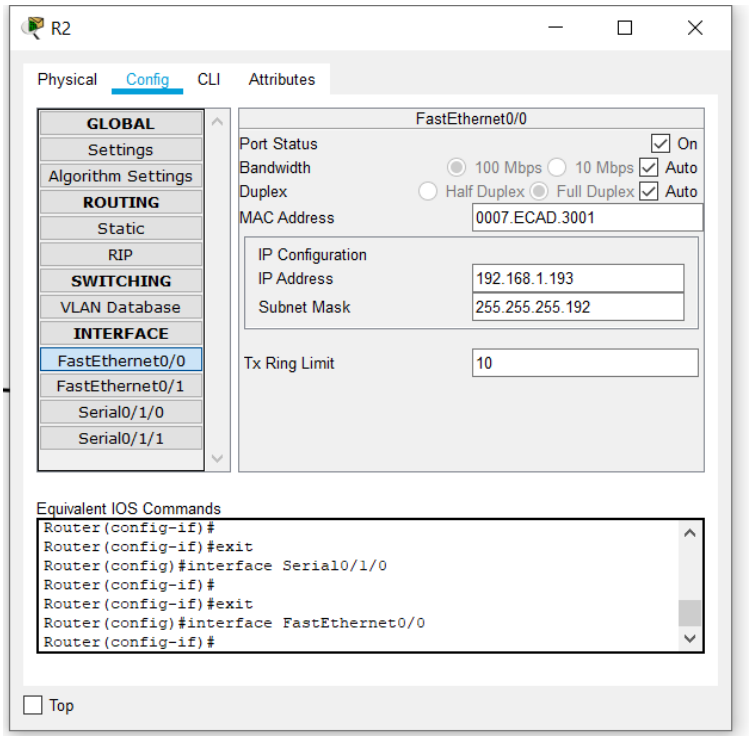
Interface Fa0/0 of R1



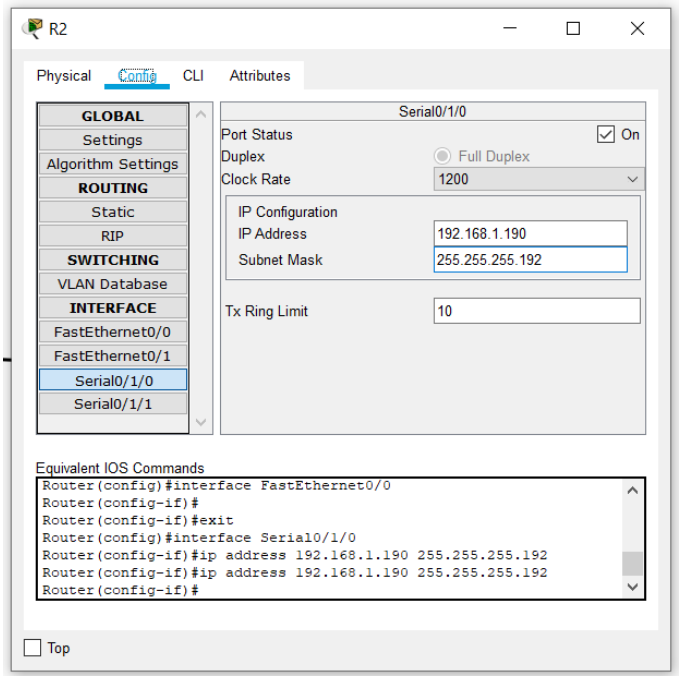
Interface S0/0/0 of R1



Interface Fa0/0 of R2



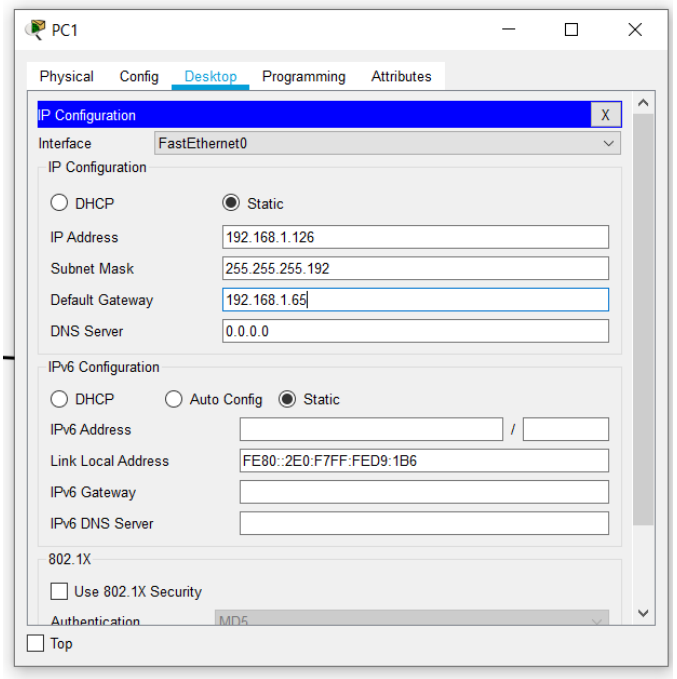
Interface S0/0/0 of R2



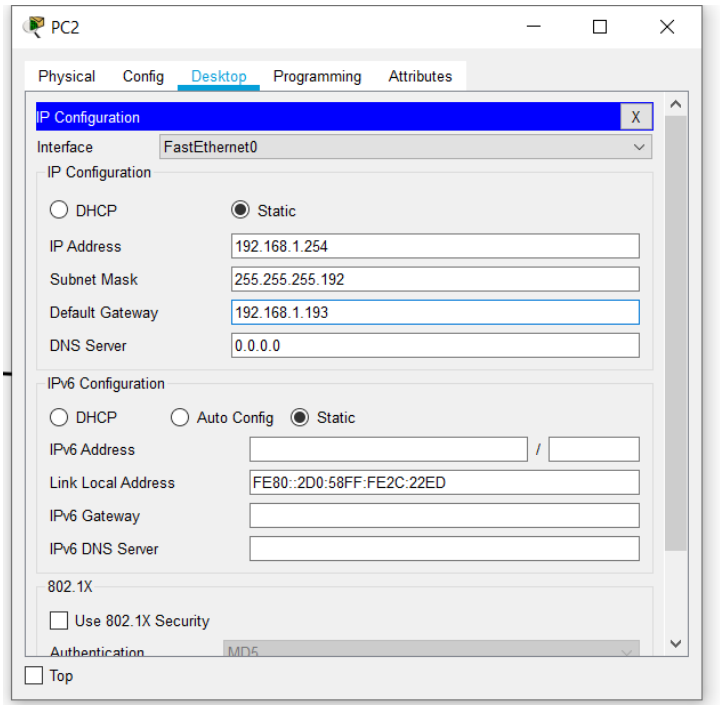
Step 2: Configure the PC interfaces.

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

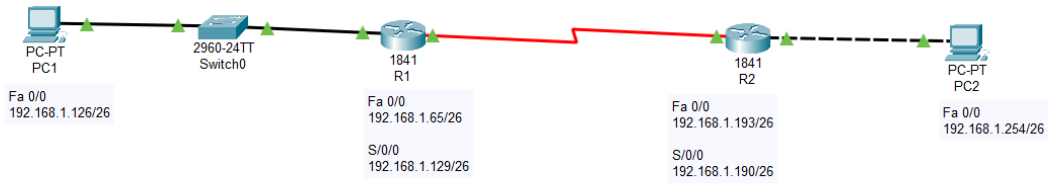
PC1 -



PC2 -

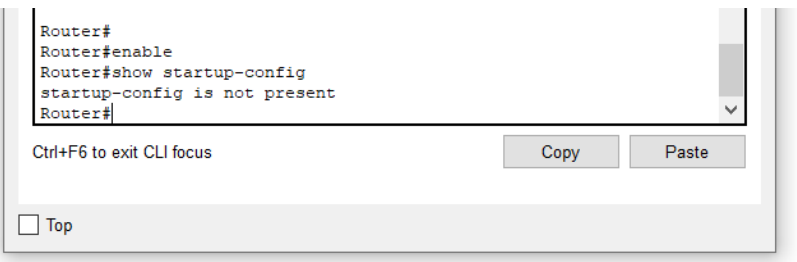


Final Network-

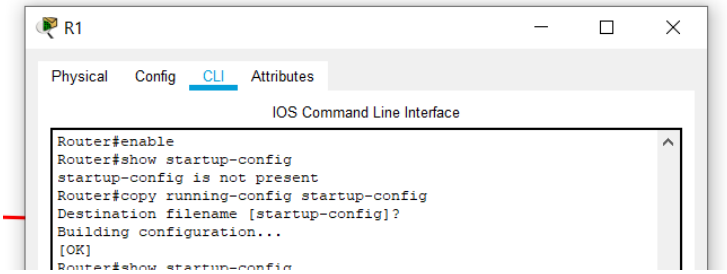


Save the running configuration to the NVRAM of the router

Initially, the both routers have no startup-config



Saving running-config as startup- config for both routers–



The startup-config shows the running-config details as expected

R1 -

```
!
!
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--
```

R2 –

```
!
!
!
!
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.

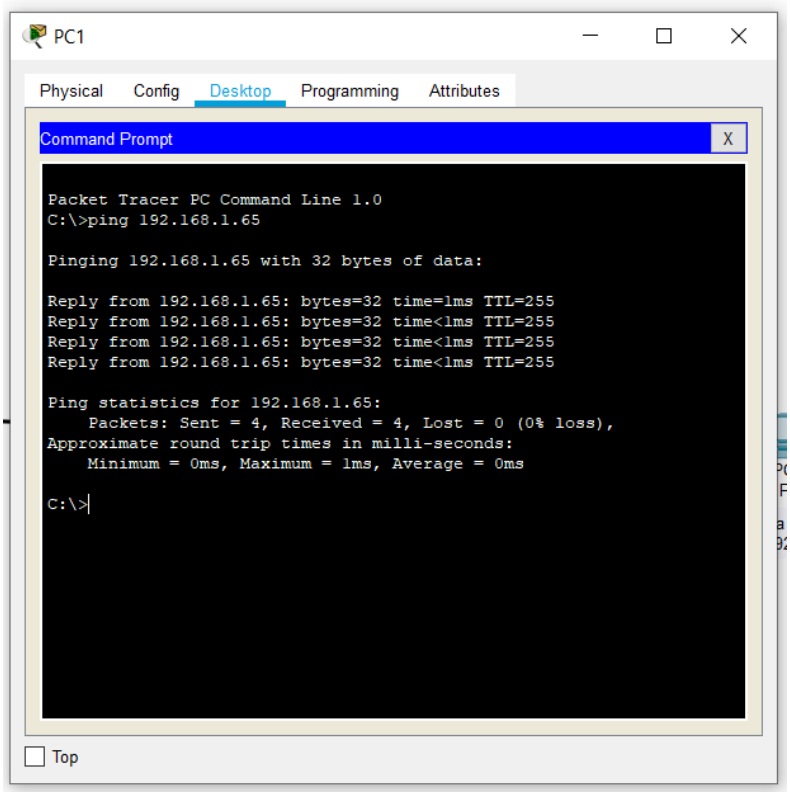
From the host attached to R1, is it possible to ping the default gateway? ___yes___

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

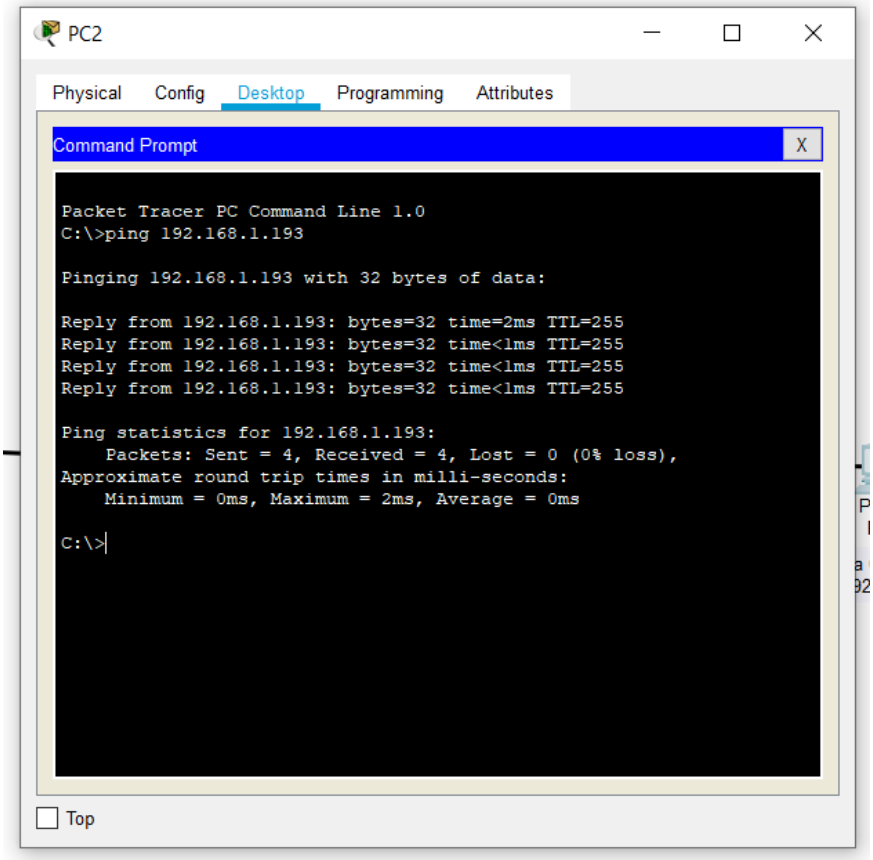
From the router R1, is it possible to ping the Serial 0/0/0 interface of R2? __yes____

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

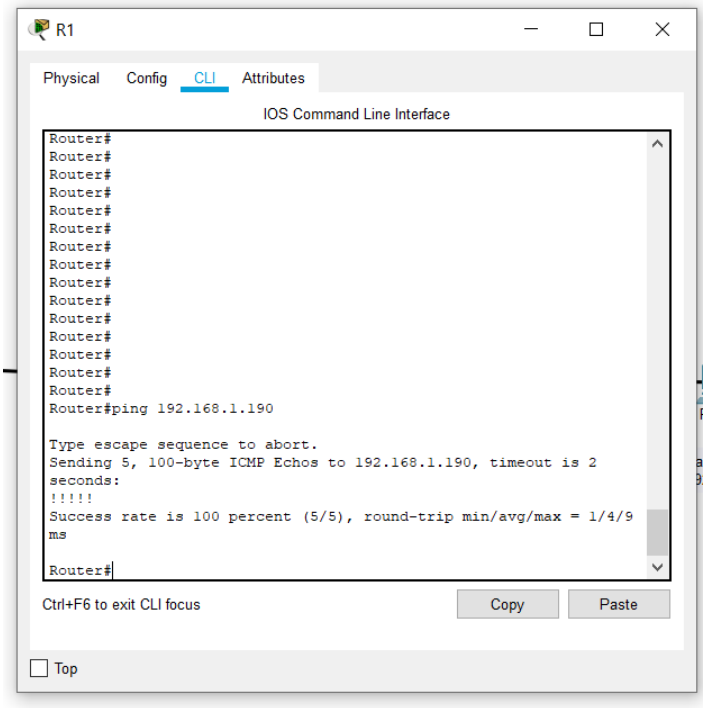
The answer to the above questions should be **yes**. If any of the above pings failed, check your physical connections and configurations.



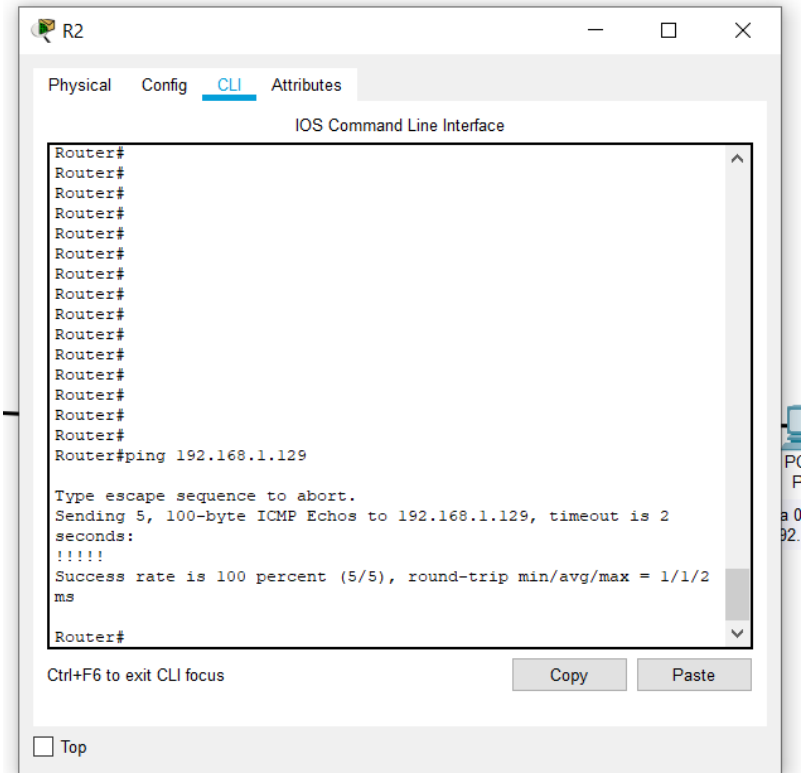
Pinging default gateway of PC1



Pinging default gateway of PC2



Pinging S0/0/0 of R2 from R1

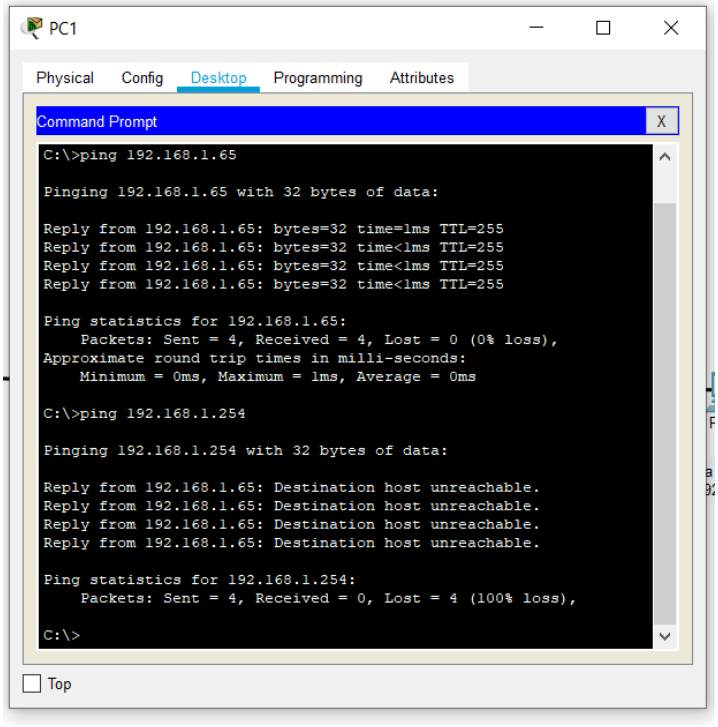


Pinging S0/0/0 of R1 from R2

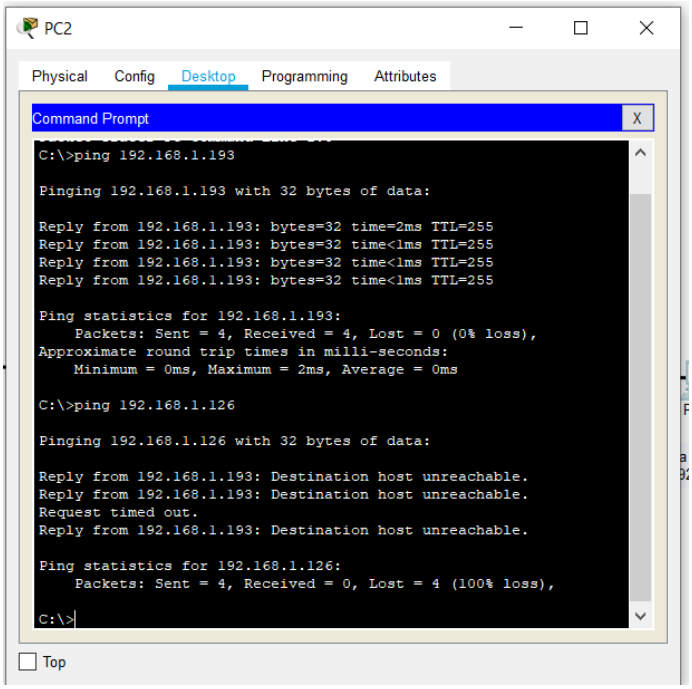
Task 5: Reflection

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

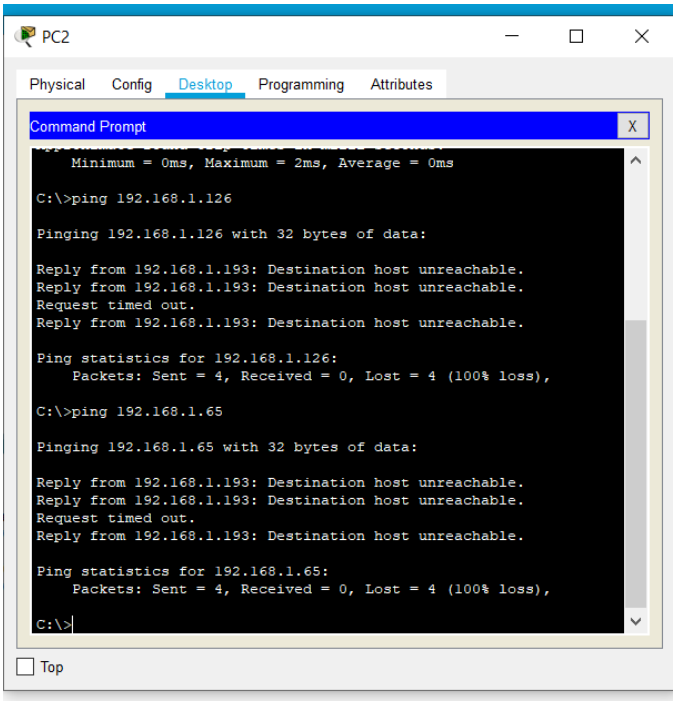
Yes, devices that are not a part of the same network cannot ping each other. For example, PC1 and PC2 cannot ping each other



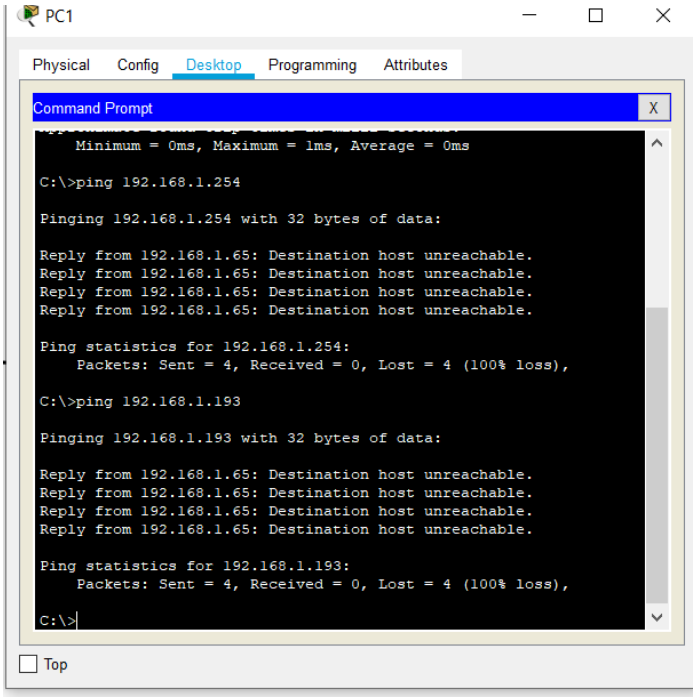
Pinging PC2 from PC1 - failed



Pinging PC1 from PC2 – failed



Failed to ping R1 from PC2



Failed to ping R2 from PC1

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

1. Switch is missing

2. 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