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

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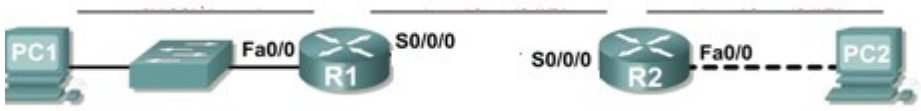
Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	192.168.1.1	255.255.255.192	N/A
	S0/0/0	192.168.1.65	255.255.255.192	N/A
R2	Fa0/0	192.168.1.129	255.255.255.192	N/A
	S0/0/0	192.168.1.126	255.255.255.192	N/A
PC1	NIC	192.168.1.62	255.255.255.192	192.168.1.1
PC2	NIC	192.168.1.190	255.255.255.192	192.168.1.129

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 required for this network: the network connected to R1, the network connected to R2, and the link to be established between R1 and R2.

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

Ans: The address space given is 192.168.1.0/24. The address starts with 192, hence it is a class C network.

Class C networks have a default subnet mask of 11111111.11111111.11111111.x, i.e., The first three octets are dedicated to the network and never change. The 4^{th} octet consists of 1s and 0s in subnet bits depending on the subnet.

Since there are 3 subnets, we require 2 bits for subnets, so the first 2 bits in the 4^{th} octet are 1, hence the binary form of the subnet mask will be 11111111.11111111.11111111.11000000.

The last 6 bits are for host specification in this case.

Converting 11111111.11111111.11111111.11100000 to decimal form, we get 255.255.255.192. Hence the subnet mask is **255.255.255.192**.

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

Ans: Since there are 8*3+2=26 1s in the subnet mask, the slash format is **/26**.

How many usable hosts are there per subnet?

Ans: The last 6 digits are for hosts. There are $2^6 = 64$ possible combinations, out of which 2 are reserved for the network and broadcast. Hence the number of usable hosts per subnet is 64-2 = **62**.

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

1. Assign subnet 1 to the network attached to R1. **192.168.1.1**
2. Assign subnet 2 to the link between R1 and R2. **192.168.1.65**
3. Assign subnet 3 to the network attached to R2. **192.168.1.129**

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. **192.168.1.1**

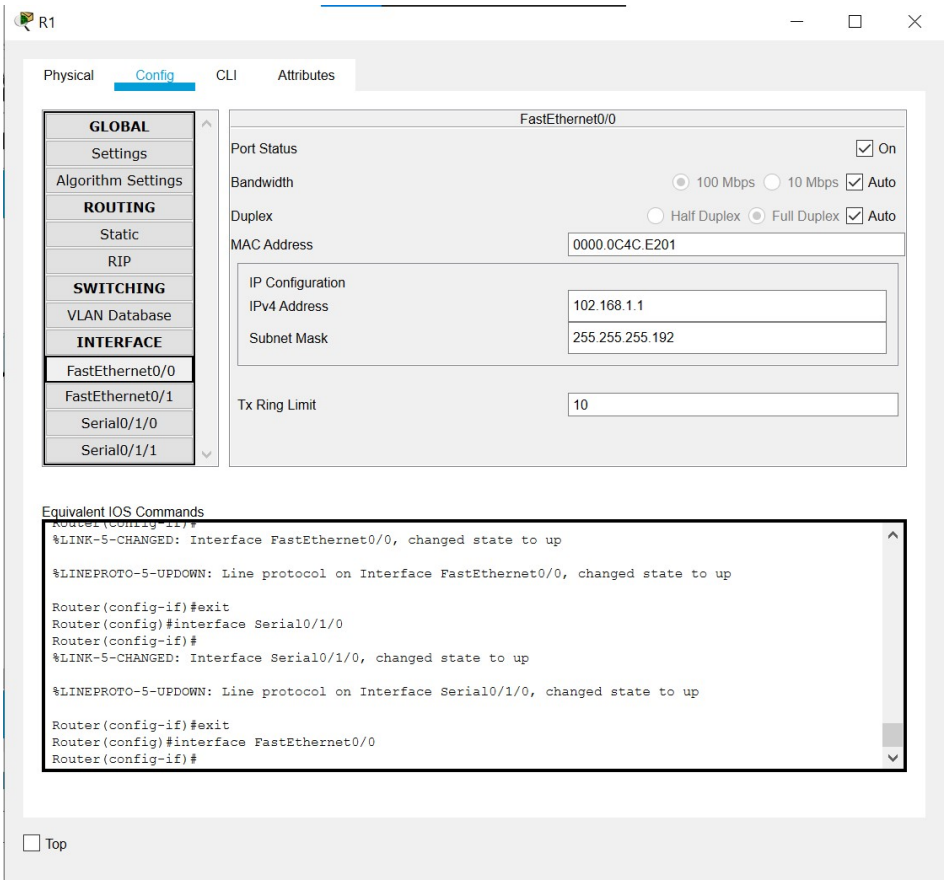
2. Assign the last valid host address in subnet 1 to PC1. **192.168.1.62**
3. Assign the first valid host address in subnet 2 to the WAN interface on R1. **192.168.1.65**
4. Assign the last valid host address in subnet 2 to the WAN interface on R2. **192.168.1.126**
5. Assign the first valid host address in subnet 3 to the LAN interface of R2. **192.168.1.129**
6. Assign the last valid host address in subnet 3 to PC2. **192.168.1.190**

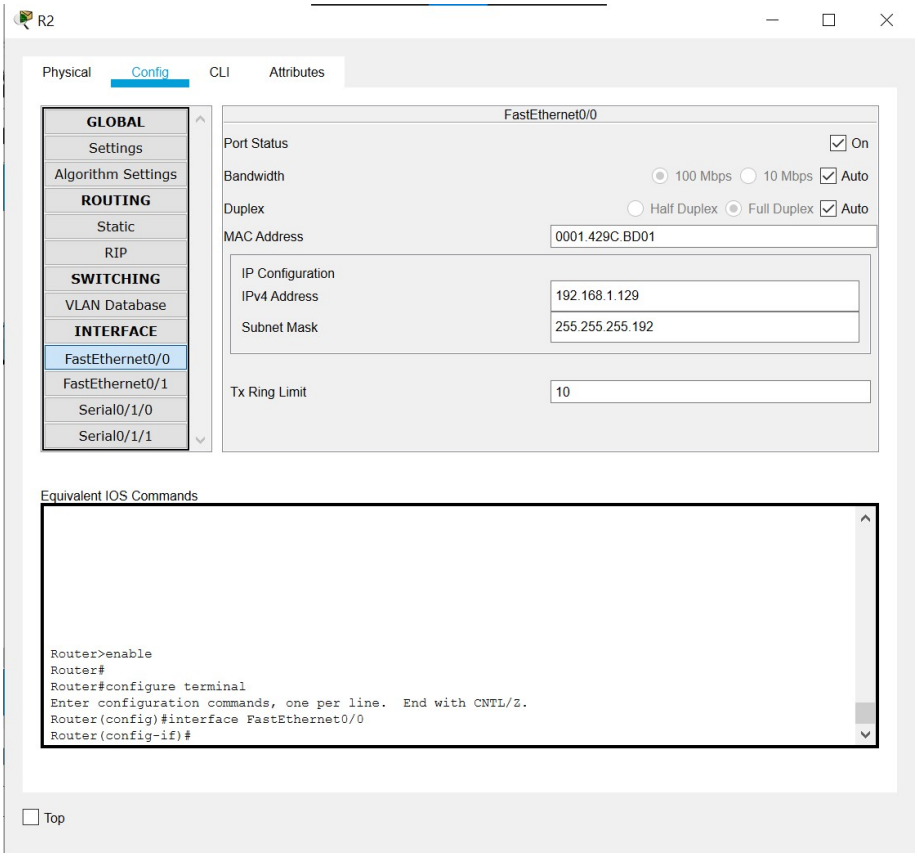
Step 2: Document the addresses to be used in the table provide under the Topology Diagram.

Task 3: Configure the Serial and FastEthernet Addresses.

Step 1: Configure the router interfaces.

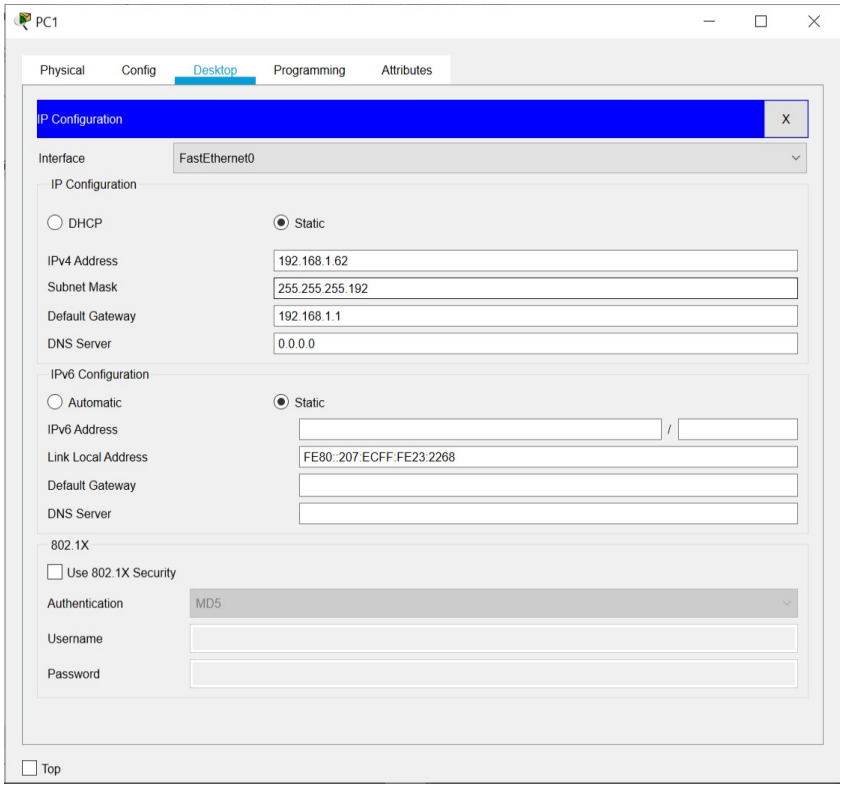
Configure the interfaces on the R1 and R2 routers with the IP addresses from your network design. Please note, to complete the activity in Packet Tracer you will be using the Config Tab. When you have finished, be sure to save the running configuration to the NVRAM of the router.

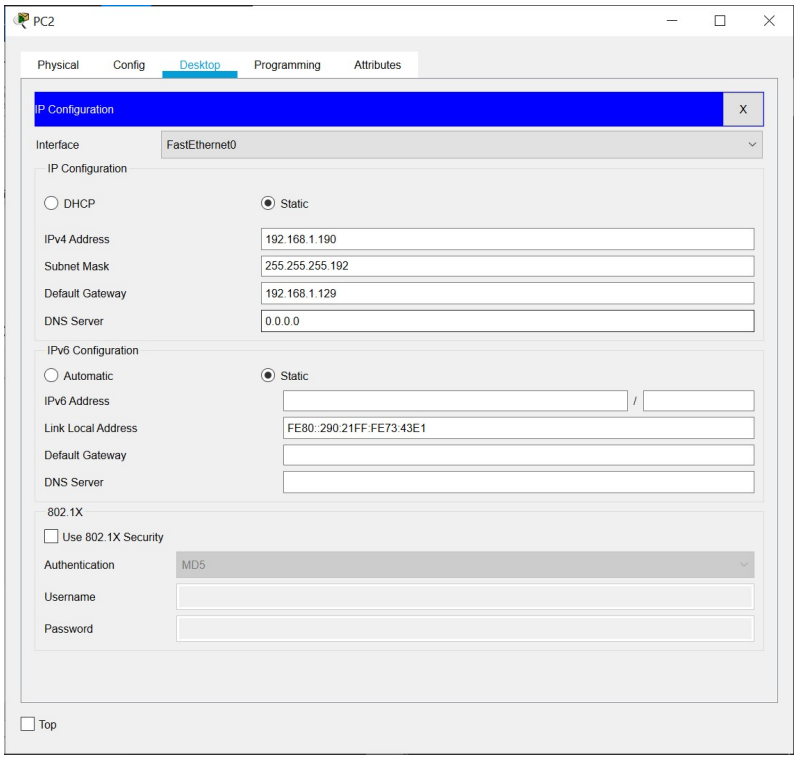


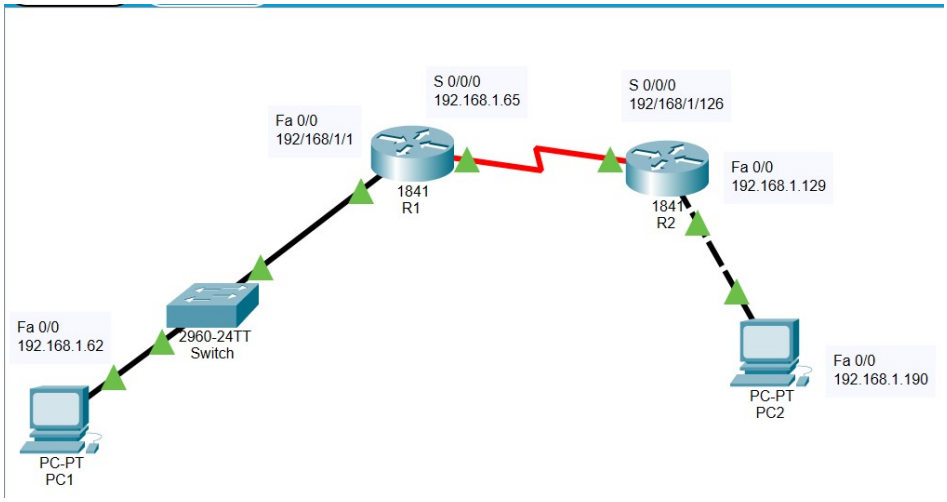


Step 2: Configure the PC interfaces.

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



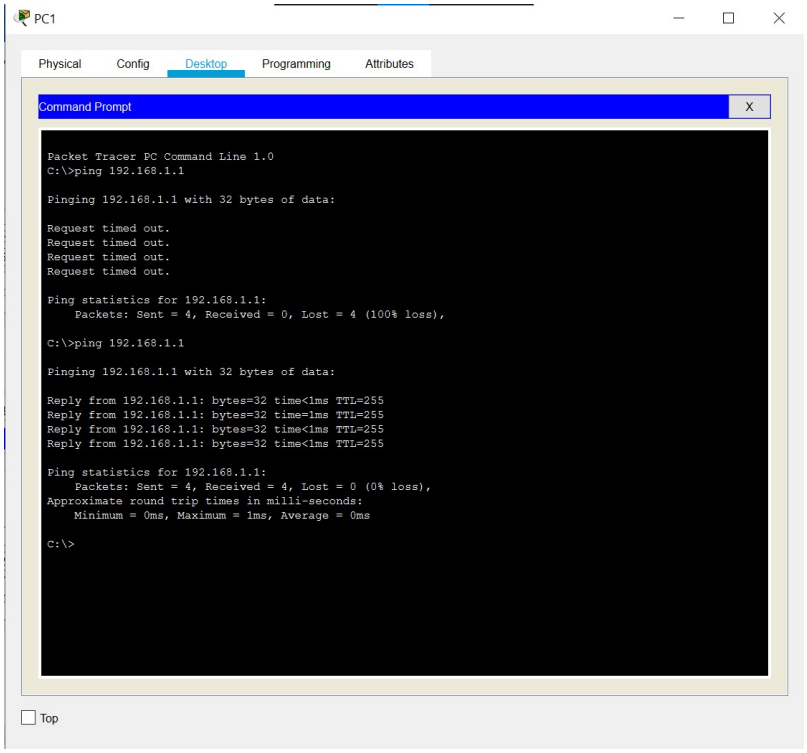




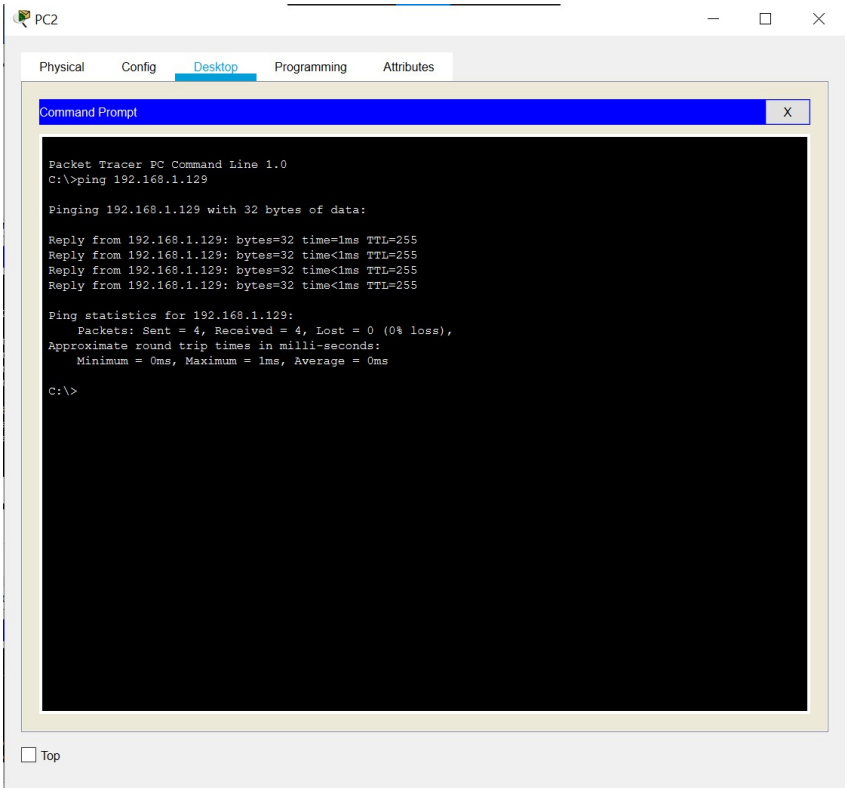
Task 4: Verify the Configurations.

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

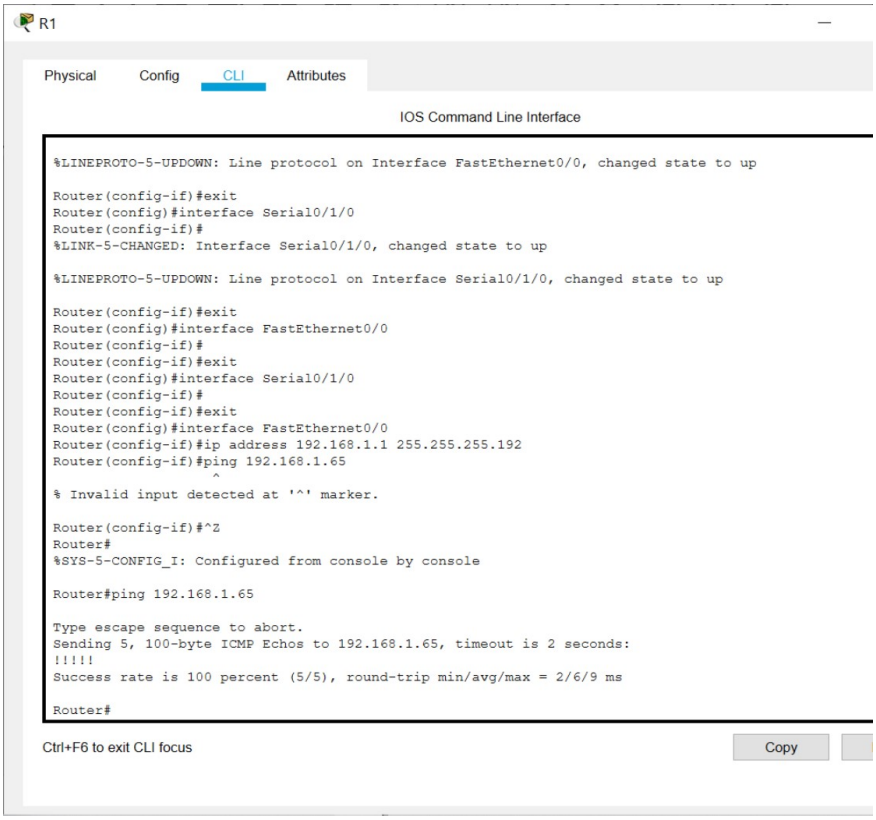
From the host attached to R1, is it possible to ping the default gateway? **Yes**



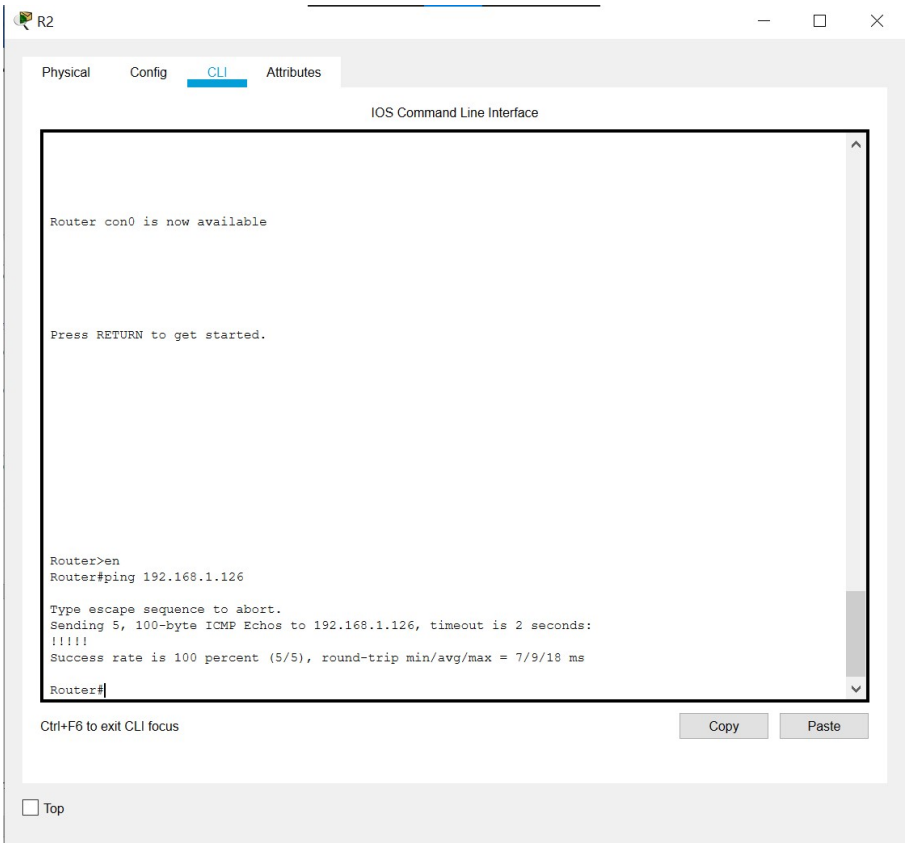
From the host attached to R2, is it possible to ping the default gateway? **Yes**



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

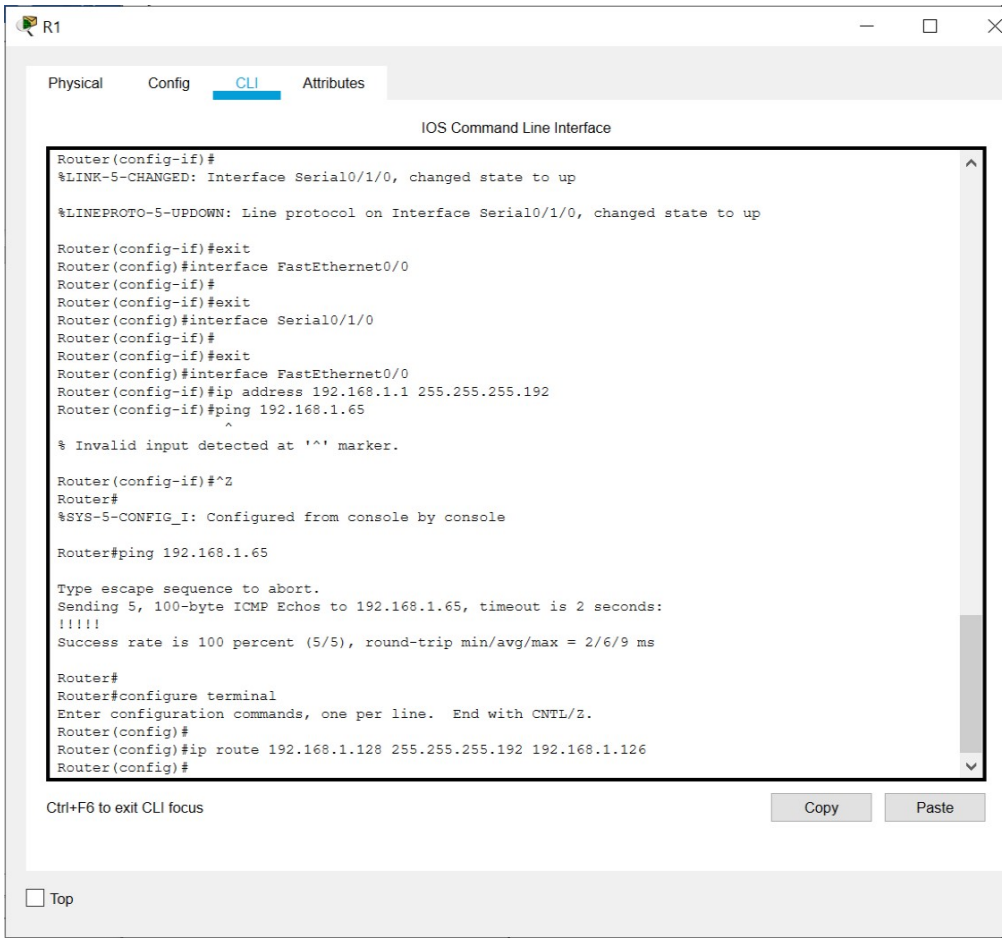
Are there any devices on the network that cannot ping each other?

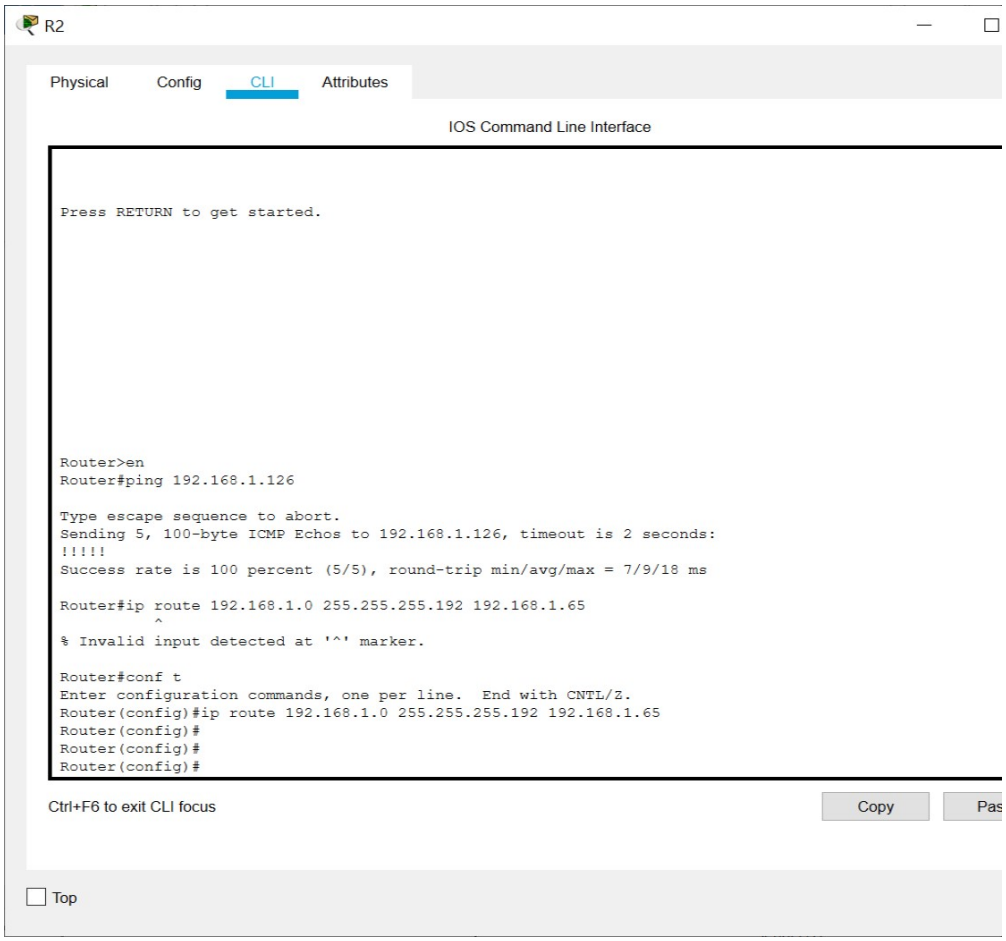
PC1 and PC2 cannot ping each other.

```
C:\>ping 192.168.1.190

Pinging 192.168.1.190 with 32 bytes of data:

Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.

Ping statistics for 192.168.1.190:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

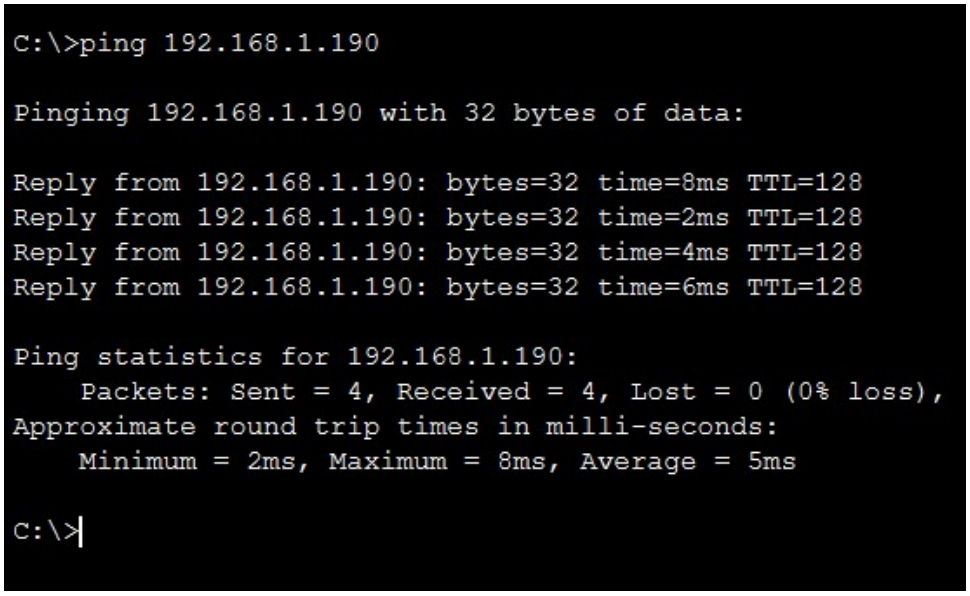
What is missing from the network that is preventing communication between these devices?

After configuring the ip routes of the routers as follows, the two PCs can ping each other.






```
C:\>ping 192.168.1.190

Pinging 192.168.1.190 with 32 bytes of data:

Reply from 192.168.1.190: bytes=32 time=7ms TTL=126
Reply from 192.168.1.190: bytes=32 time=1ms TTL=126
Reply from 192.168.1.190: bytes=32 time=1ms TTL=126
Reply from 192.168.1.190: bytes=32 time=3ms TTL=126

Ping statistics for 192.168.1.190:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 7ms, Average = 3ms

C:\>
```


C:\>ping 192.168.1.190
Pinging 192.168.1.190 with 32 bytes of data:
Reply from 192.168.1.190: bytes=32 time=8ms TTL=128
Reply from 192.168.1.190: bytes=32 time=2ms TTL=128
Reply from 192.168.1.190: bytes=32 time=4ms TTL=128
Reply from 192.168.1.190: bytes=32 time=6ms TTL=128
Ping statistics for 192.168.1.190:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 8ms, Average = 5ms
C:\>