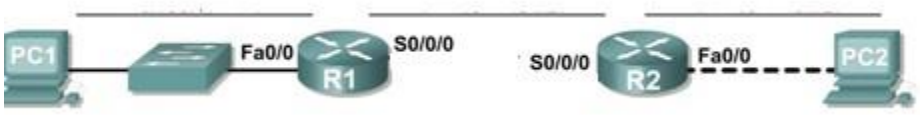
CEL 51, DCCN, Monsoon 2020

Lab 6: Subnet and Router Configuration

Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0			N/A
	S0/0/0			N/A
R2	Fa0/0			N/A
	S0/0/0			N/A
PC1	NIC			
PC2	NIC			

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. Q. How many subnets are needed for this network?

Ans: 3 subnets will be needed for this network:

1. For the network connected to R1
2. For the network between the routers R1 and R2
3. For the network connected to R2

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

Ans: 192.168.1.0/24 is a class C type of network for which the default subnet mask is 255.255.255.0 which in binary is = 11111111.11111111.11111111.0. Hence the first 3 octets are reserved for the network id and the last octet for the subnet and host. Since the no. of subnets needed are 3, hence a maximum of 2 bits in the last octet will be required for the subnet ID. Therefore, the subnet mask of the network in binary format is 11111111.11111111.11111111.11000000 which in the decimal format is **255.255.255.192**

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

Ans: Binary form of the subnet mask as written above is 11111111.11111111.11111111.11000000. The slash format indicates the no. of 1s in the binary format of the subnet mask. So in this case, the slash format is **/26**

Q. How many usable hosts are there per subnet?

Ans: The no. of usable hosts in a subnet is given by the formula – $2^B - 2$, where B is the no. of 0s in the binary format of the subnet mask. In this case, B = 6 ,and hence $2^6 – 2 = 62$. Therefore, there are **62** useable hosts.

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

Out of 8 subnets, only 2 are required. And for each subnet, out of the 64 possible IDs only 62 are useable (as the other 2 IDs are reserved for the Network ID and Broadcast ID). Hence assigning the subnets as follows:

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.

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: R1 - Fa0/0 = 192.168.1.1

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

Ans: PC1 - 192.168.1.62

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

Ans: R1 - S0/0/0 = 192.168.1.65

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

Ans: R2 - S0/0/0 = 192.168.1.126

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

Ans: R2 - Fa0/0 = 192.168.1.129

6. Assign the last valid host address in subnet 3 to PC2.

Ans: PC2 - 192.168.1.190

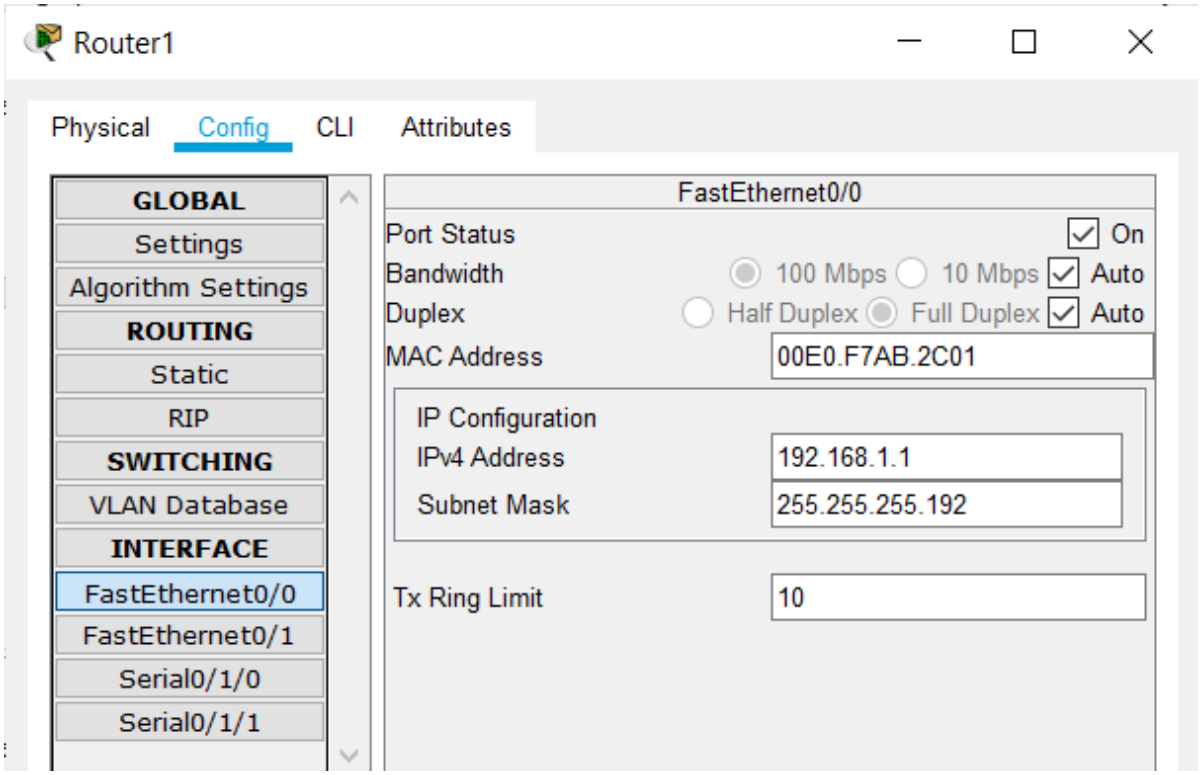
Step 2: Document the addresses to be used in the table provide under the Topology Diagram.

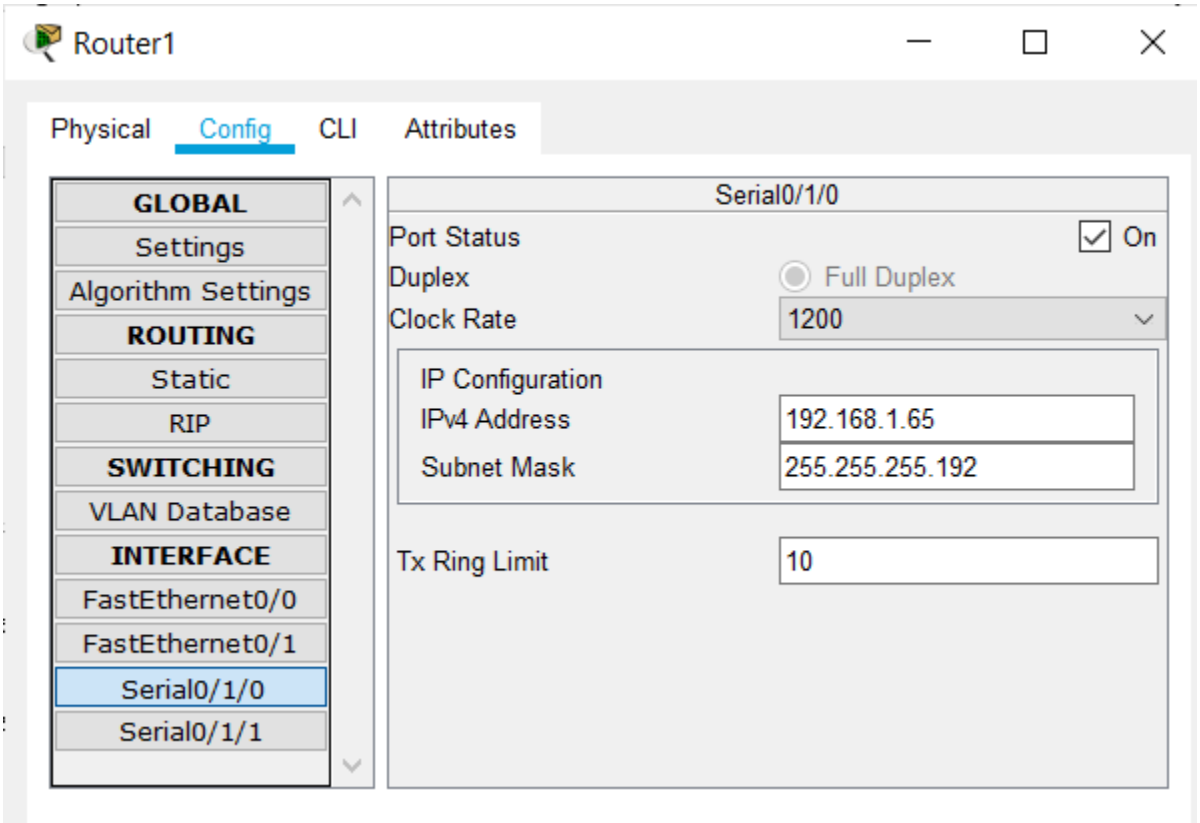
Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	**Fa0/0**	192.168.1.1	255.255.255.192	**N/A**
	S0/0/0	192.168.1.65	255.255.255.192	**N/A**
R2	**Fa0/0**	192.168.1.129	255.255.255.192	**N/A**
	S0/0/0	192.168.1.126	255.255.255.192	**N/A**
PC1	**NIC**	192.168.1.62	255.255.255.192	192.168.1.1
PC2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

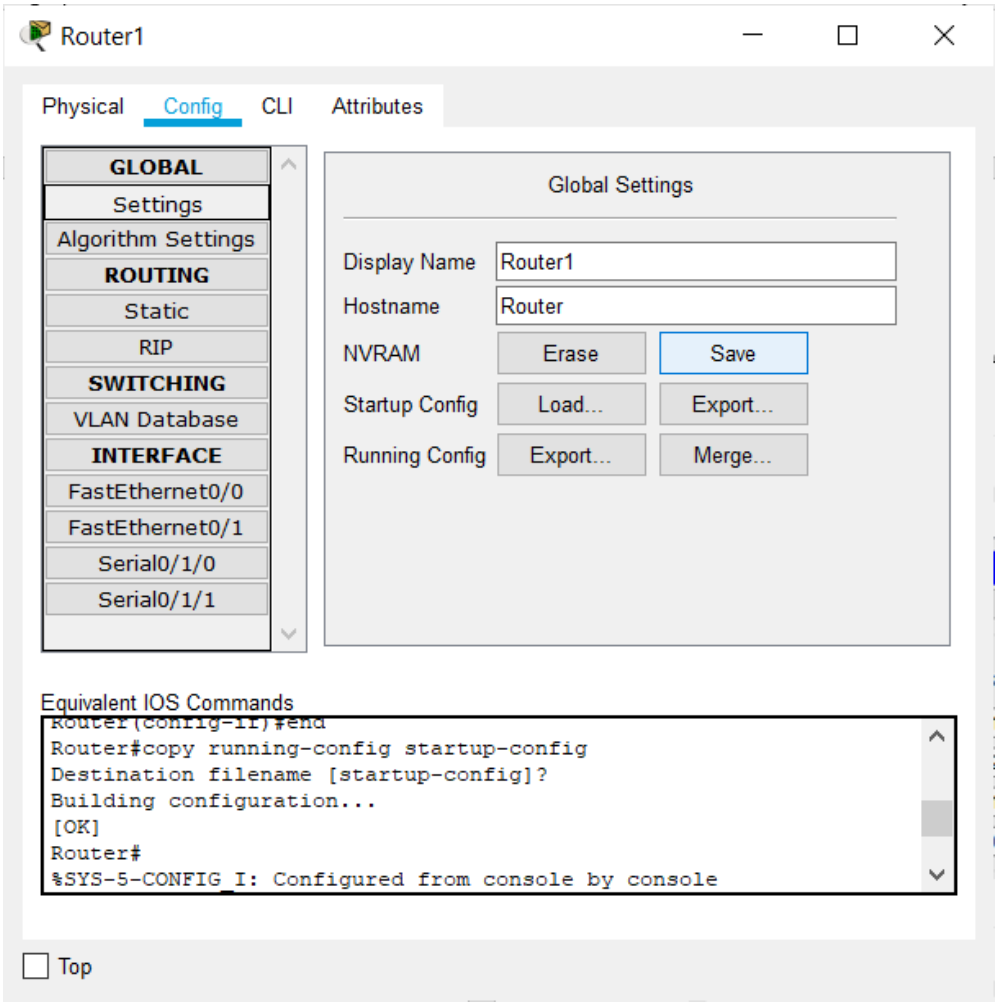
Task 3: Configure the Serial and Fast Ethernet Addresses.

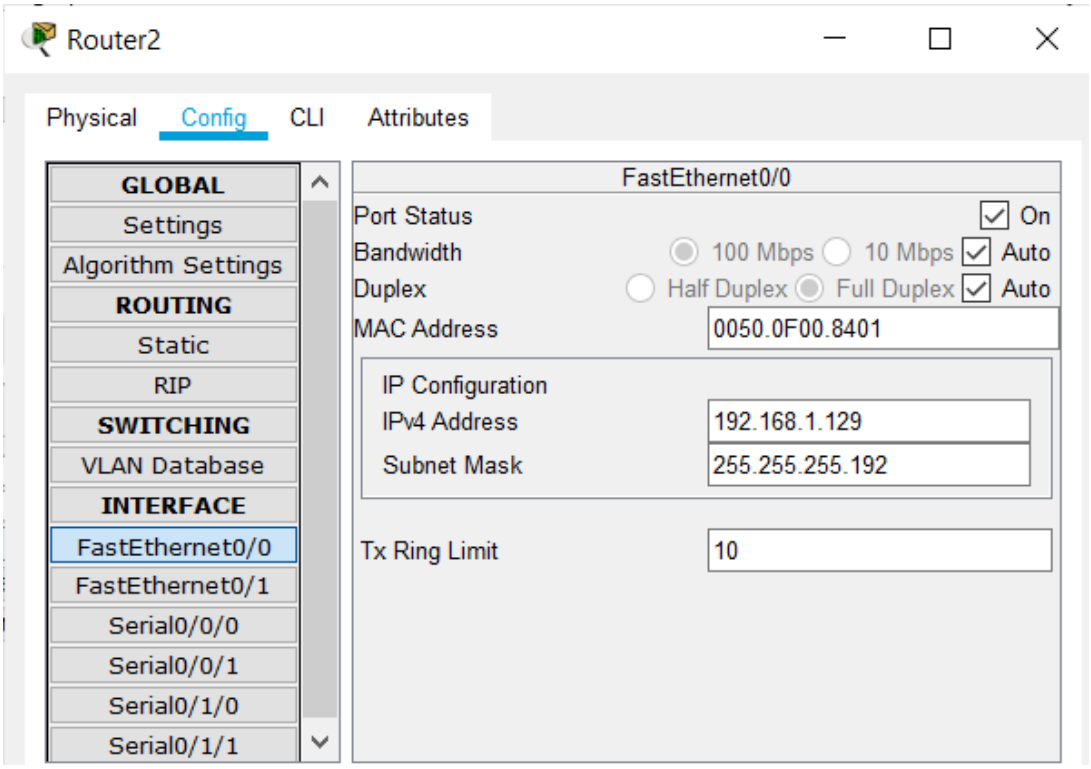
Step 1: Configure the router interfaces.

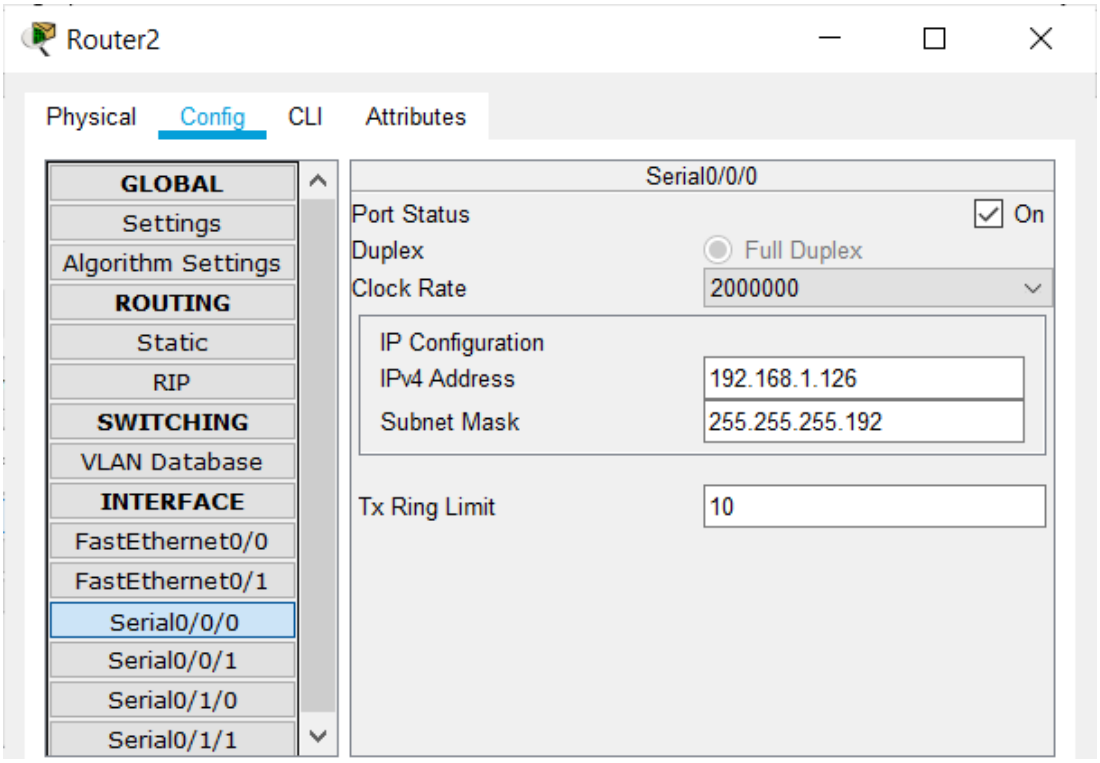
Configure the interfaces on the R1 and R2 routers with the IP addresses from your network design. Please note, to complete the activity in Packet Tracer you will be using the Config Tab. When you have finished, be sure to save the running configuration to the NVRAM of the router.

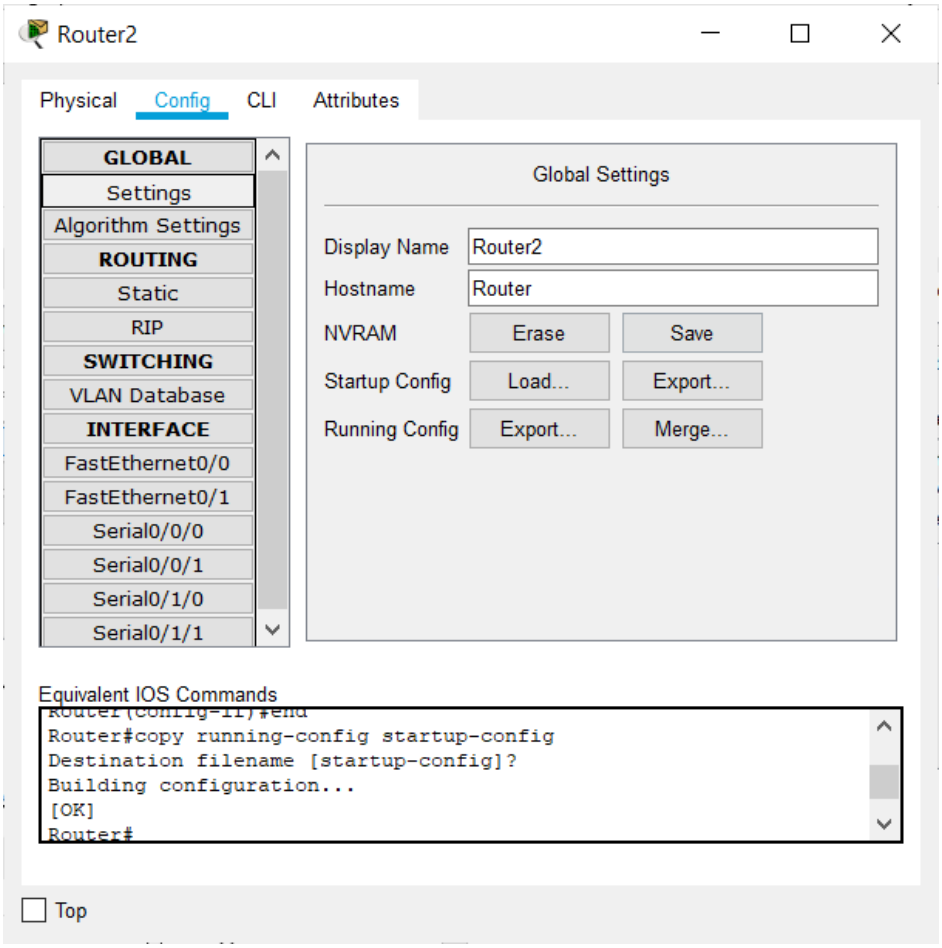

Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/1/0
Serial0/1/1
FastEthernet0/0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
00E0.F7AB.2C01
IP Configuration
IPv4 Address
192.168.1.1
Subnet Mask
255.255.255.192
Tx Ring Limit
10


Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/1/0
Serial0/1/1
Serial0/1/0
Port Status
On
Duplex
Full Duplex
Clock Rate
1200
IP Configuration
IPv4 Address
192.168.1.65
Subnet Mask
255.255.255.192
Tx Ring Limit
10


Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/1/0
Serial0/1/1
Global Settings
Display Name
Router1
Hostname
Router
NVRAM
Erase
Save
Startup Config
Load...
Export...
Running Config
Export...
Merge...
Equivalent IOS Commands
Router(config-if)#end
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
%SYS-5-CONFIG_I: Configured from console by console
Top

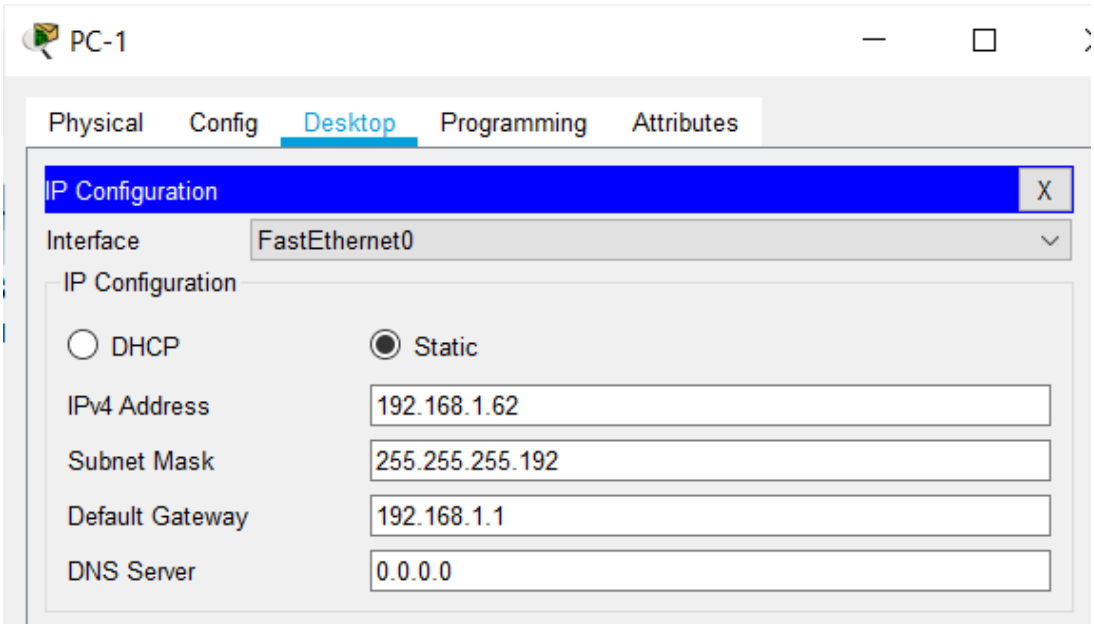

Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
Serial0/1/0
Serial0/1/1
FastEthernet0/0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0050.0F00.8401
IP Configuration
IPv4 Address
192.168.1.129
Subnet Mask
255.255.255.192
Tx Ring Limit
10

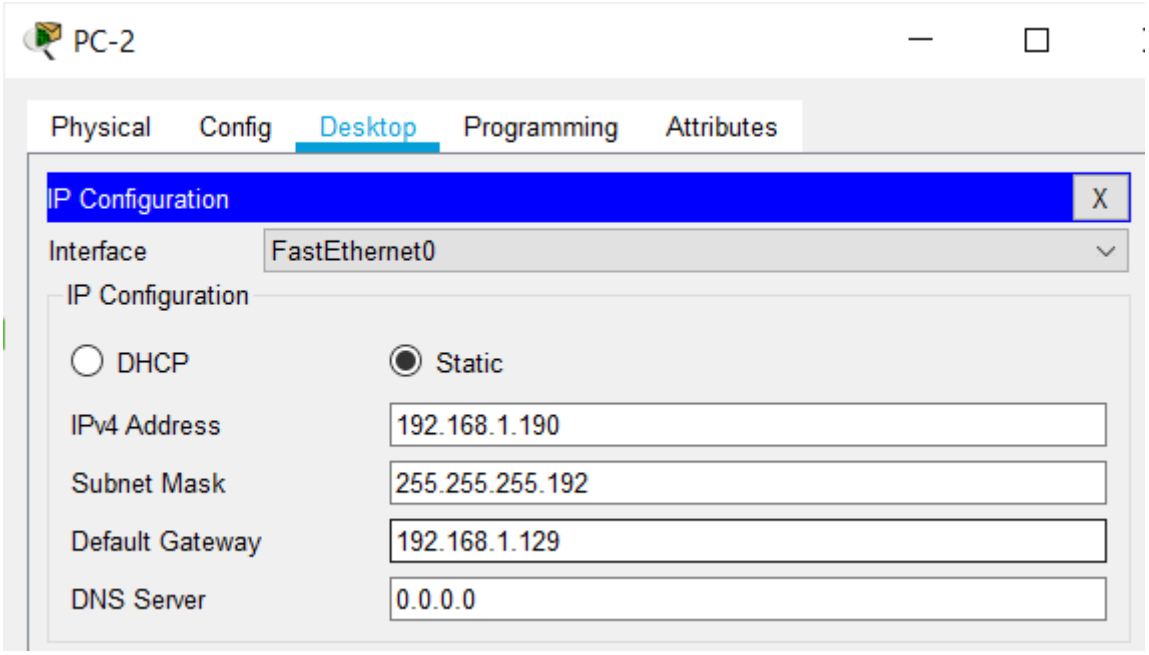

Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
Serial0/1/0
Serial0/1/1
Serial0/0/0
Port Status
On
Duplex
Full Duplex
Clock Rate
2000000
IP Configuration
IPv4 Address
192.168.1.126
Subnet Mask
255.255.255.192
Tx Ring Limit
10

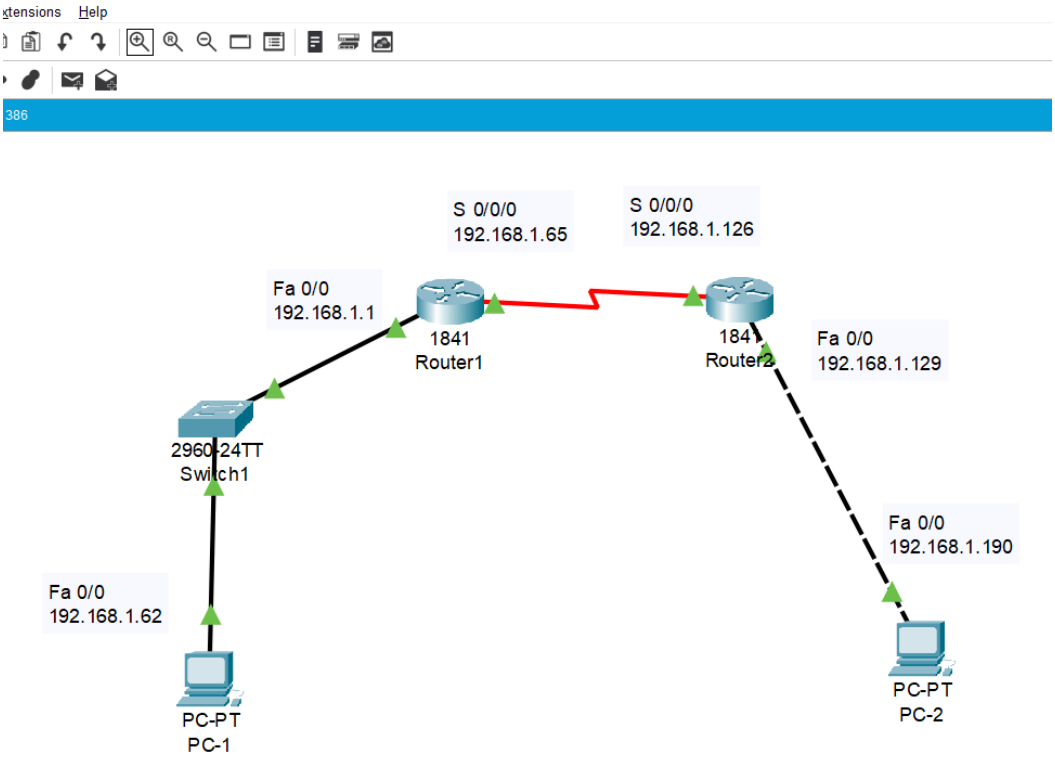

Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
Serial0/1/0
Serial0/1/1
Global Settings
Display Name
Router2
Hostname
Router
NVRAM
Erase
Save
Startup Config
Load...
Export...
Running Config
Export...
Merge...
Equivalent IOS Commands
Router(config-if)#end
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
Top

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.





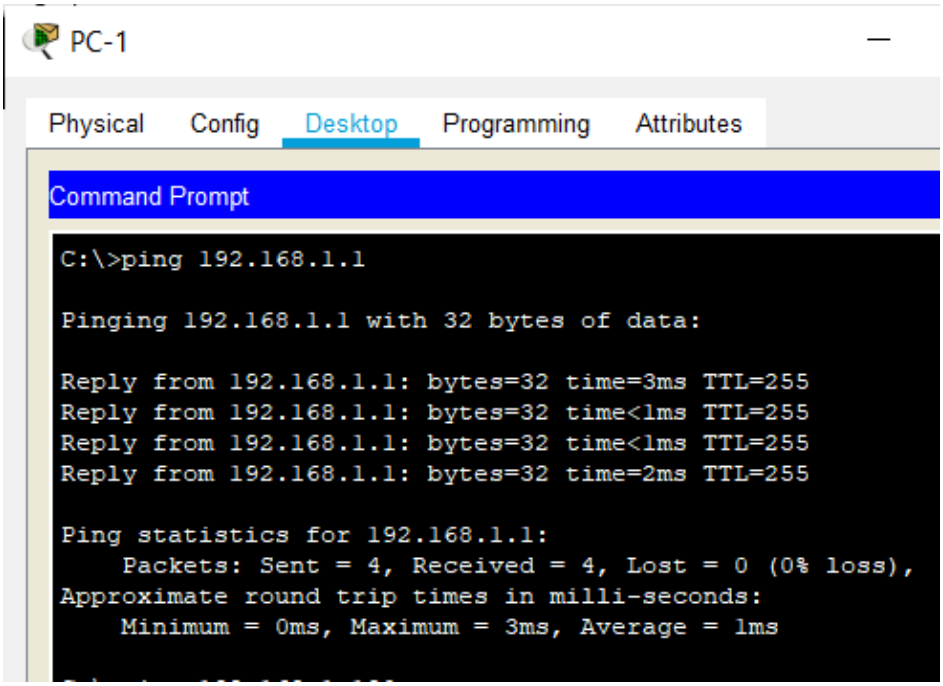


Task 4: Verify the Configurations.

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

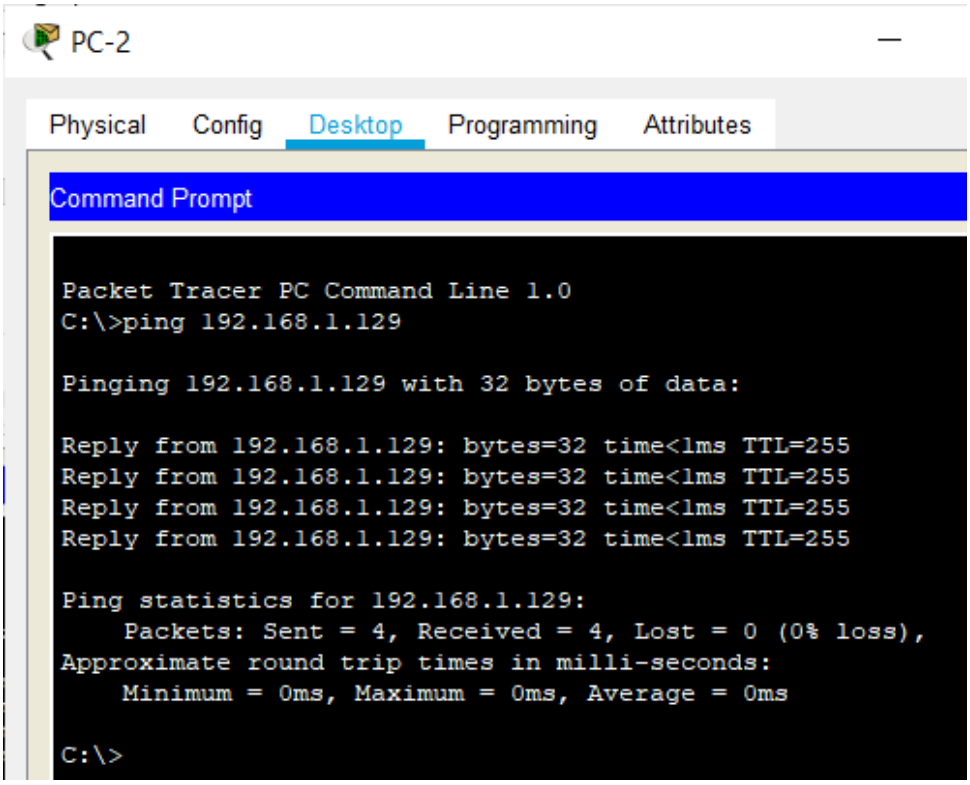
Q. From the host attached to R1, is it possible to ping the default gateway?

Ans: Yes



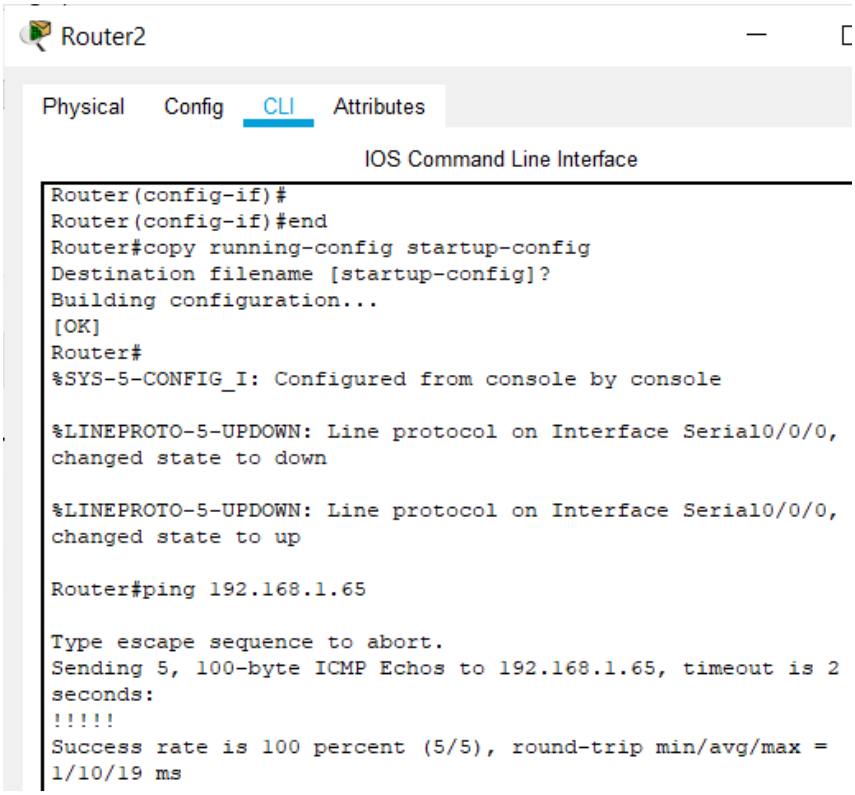
Q. From the host attached to R2, is it possible to ping the default gateway?

Ans: Yes



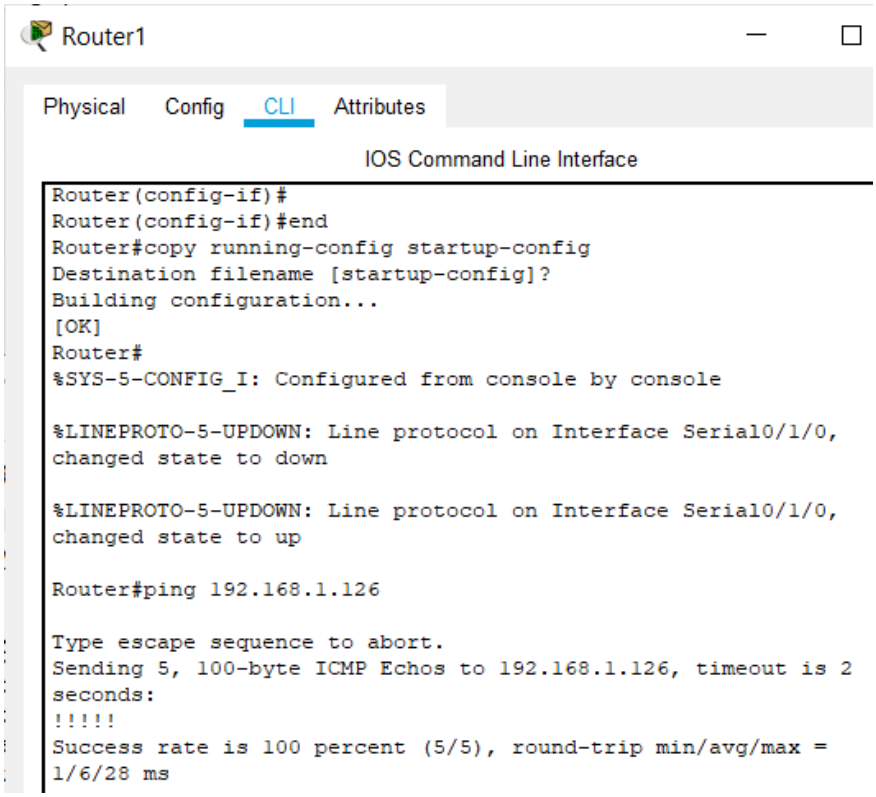
Q. From the router R1, is it possible to ping the Serial 0/0/0 interface of R2?

Ans: Yes



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

Ans:

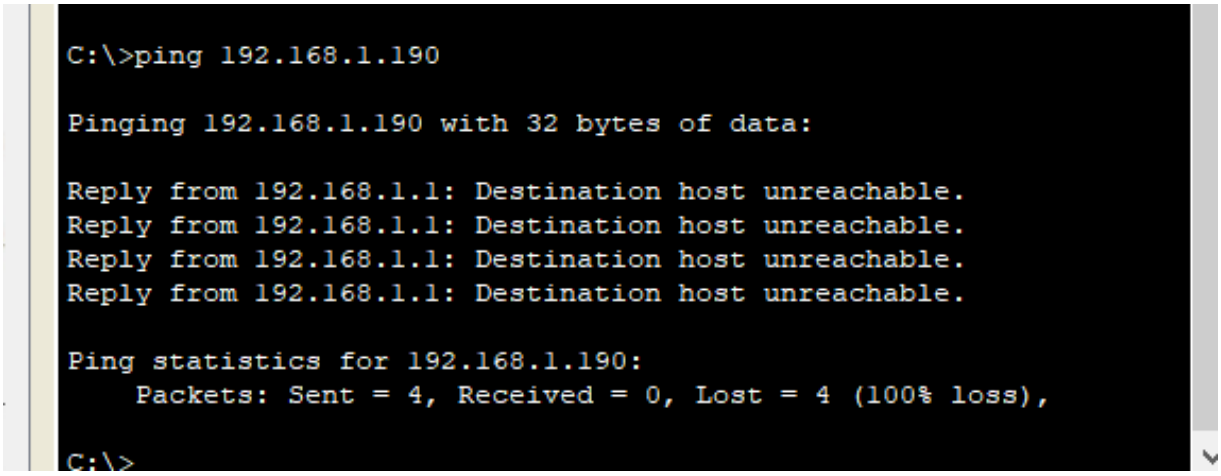


The answer to the above questions should be **yes**. If any of the above pings failed, check your physical connections and configurations.

Task 5: Reflection

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

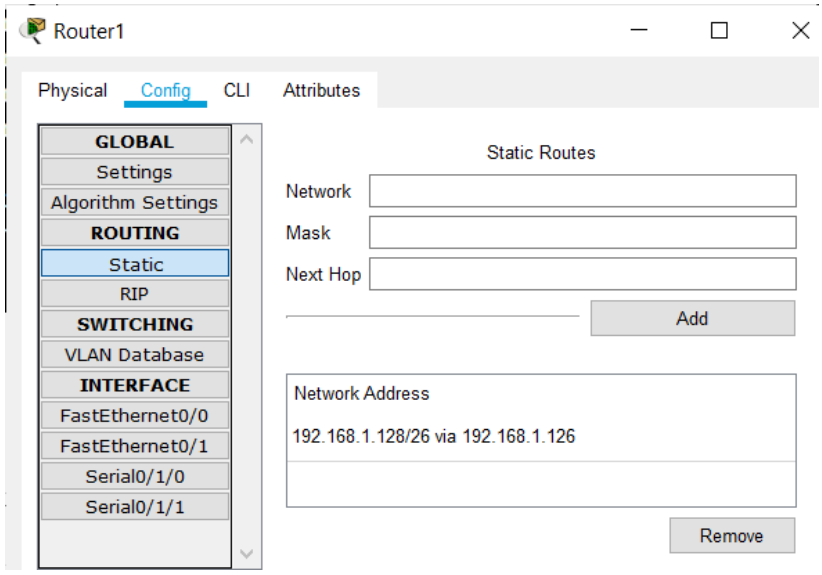
Ans: Yes. PC-1 and PC-2 cannot ping each other.



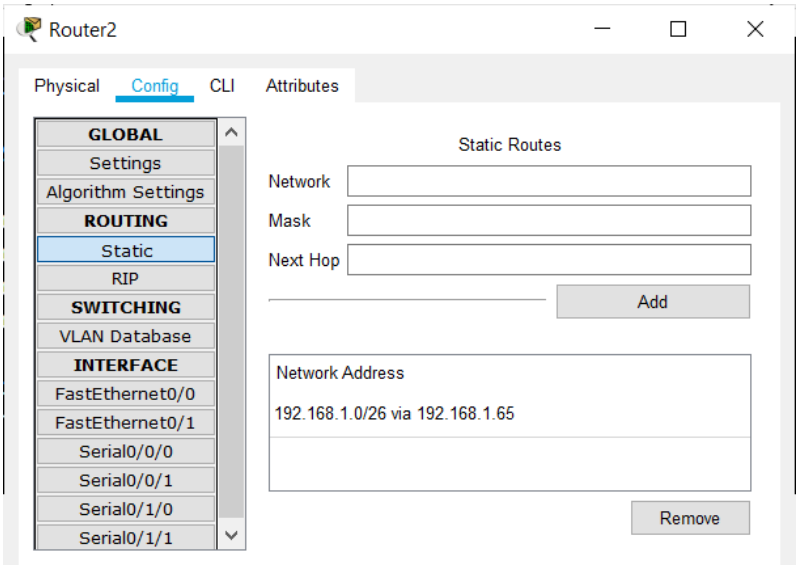
Command Prompt of PC-1

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

Ans: We have to make the following static routing configurations to enable successful pig operations.




```
Router(config)#ip route 192.168.1.128 255.255.255.192
192.168.1.126
Router(config)#
```




```
Router(config)#ip route 192.168.1.0 255.255.255.192 192.168.1.65
Router(config)#
```

```
C:\>ping 192.168.1.62

Pinging 192.168.1.62 with 32 bytes of data:

Reply from 192.168.1.62: bytes=32 time=3ms TTL=126
Reply from 192.168.1.62: bytes=32 time=1ms TTL=126
Reply from 192.168.1.62: bytes=32 time=1ms TTL=126
Reply from 192.168.1.62: bytes=32 time=3ms TTL=126

Ping statistics for 192.168.1.62:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 3ms, Average = 2ms

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=20ms TTL=126
Reply from 192.168.1.190: bytes=32 time=2ms TTL=126
Reply from 192.168.1.190: bytes=32 time=1ms TTL=126
Reply from 192.168.1.190: bytes=32 time=2ms 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 = 20ms, Average = 6ms

C:\>
```